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# Being Me

## Summative Evaluation

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## Executive Summary

The “Being Me” program was developed to bring the educational process to life through hands-on learning that promotes children’s awareness of health issues and encourages scientific inquiry in an art-focused curriculum supporting National Science Content Standards (now Next Generation Science Standards). In 2009, the “Being Me” partnership – Children’s National Medical Center (CNMC), the National Children’s Museum (NCM), and George Washington University’s Graduate School of Education and Human Development (GW) – received a five-year National Institutes of Health Sciences Education Partnership Award grant (#R25RR025132) to develop and promote health and inquiry-based science among youth, in collaboration with public elementary schools in the Greater Washington, DC Metropolitan Area, encompassing Washington, DC and Prince George’s County, MD. The program focused on five prioritized health topics (asthma, obesity, sleep, bullying, and sickle cell disease) that concern youth in these urban public school communities where high rates of poverty and other disparities in healthcare and health outcomes are common.

This report describes results from New Knowledge Organization Ltd.’s Summative Evaluation conducted in the final two years of the “Being Me” project’s efforts, with specific focus on how successful the project was at achieving the program’s three objectives:

- Increase students’ *understanding* of actions that will improve their health outcomes;
- Teach students to become *independent thinkers* through the use of art and science activities; and
- Promote students’ sense of *self-efficacy* in ways that could improve their health and the health of their families.

### FRONT-END AND FORMATIVE EVALUATION

The Institute for Learning Innovation (ILI) began the project as “Being Me’s” external evaluator and carried out the front-end and formative evaluation in the first three years of the grant. New Knowledge Organization Ltd. (NewKnowledge), a 501(c)(3) non-profit research think tank, succeeded ILI as external evaluator in mid-2012 through the end of the project. Dr. John Fraser, Founder and CEO of NewKnowledge, led both front-end and formative evaluation for ILI and continued that work with NewKnowledge.

Throughout all phases of the project, the evaluation design remained consistent for the front-end, formative, and summative evaluations, using a narrative inquiry approach for assessing the activities, processes, and products (Clandinin & Connelly, 2000). This approach uses context of the narrative as part of the data collection and analysis. Given the nature of Title I schools (where a minimum 40% of students are low income and qualify for subsidized lunch and other subsidies), the context in which teachers taught was considered an important variable.

The arts- and science-based curricula, targeting third through fifth graders, was implemented in four venues: classes in public elementary schools, family learning events at the schools, a hospital-based summer youth camp that included exposure to CNMC’s facilities, and a hospital-based teacher training institute where participating teachers received curricula training by GW, were

supported by NCM art staff, and had access to CNMC professionals for technical information. Three methods were used to assess student outcomes: in-class program observations, in-class student discussions, and teacher interviews after they delivered the class.

### Front-End Evaluation

In early 2010, ILI conducted a front-end evaluation with two partner public elementary schools: Chamberlain Elementary School (a public charter school) located in Washington, DC and Seat Pleasant Elementary School in Prince George County, MD. This effort assessed their administrators and teachers’ familiarity with the health issues affecting their student population and determined if they were interested in working with the project team to develop and integrate health topics into their curriculum, using an arts and technology-based approach. The research results, collected through phone interviews and group discussions, confirmed that teachers were aware of their students’ health issues and welcomed the curricula as a way to help them stay healthy. They even recommended that the team change the original “preventing injury” module to “bullying,” and introduce smoking and HIV / AIDS to the related asthma and sickle cell disease modules. The teachers, also aware of their professional standing and their own gaps in science knowledge, had two stipulations for participating in the program: 1) the curricula had to be integrated into existing science curricula and standards, and 2) they would receive additional information and training on the health topics.

## Formative Evaluation

Throughout the next two years (2010-2012), ILI conducted formative evaluation on the teacher training and pilot testing of the five health modules developed primarily by the GW team in collaboration with NCM, and provided feedback to the project team on what worked, what didn't work, and where additional support and information was needed. During the first year, Chamberlain Elementary School dropped out of the program, participating in neither the teacher training nor youth camp, although they were invited to both. They subsequently were replaced by two other Washington, DC Title 1 elementary schools that served predominantly Black and African American communities: Whittier and Anne Beers. Seat Pleasant continued to participate. The evaluation focused on Dr. Bear's Summer Teacher Training program at CNMC; implementation of the health curriculum modules in third through fifth grade classrooms and family learning events at the three schools; and Dr. Bear's Cubs Summer Science Camp for youth at CNMC.

Using a mixed methods data collection strategy, including classroom observation and teacher interviews, the evaluation team found teachers supportive of the curriculum, confirming that it was relevant to their students' health issues and well suited to the students' interests and learning needs. The evaluators also found that modifications were still needed in the curriculum. They recommended a shift towards more self-directed student inquiry activities rather than more content-oriented projects (which they felt resulted in teacher-led presentations and less student engagement). Based on feedback from the teachers, the evaluators also recommended additional teacher and student instructions to supplement the lessons including primers on the key points of each module, and more scaffolding for the teacher training. The sickle cell disease module was particularly challenging. Teachers felt their students would find the content difficult to grasp and believed their own technical skills and knowledge were inadequate for the topic.

Although teachers asserted that some of the concepts and vocabulary were too difficult for their students, the observer believed that the issue lay with the teachers rather than the curriculum. How well the students understood the concepts varied by topic, teachers' skills, and students' abilities. The bullying topic was considered the most accessible topic, attributed to its social orientation as opposed to a more science-focused approach. Sickle cell disease was the hardest for students to comprehend, especially the concept of genetics. The "Being Me" team considered and implemented many of the suggested modifications.

## SUMMATIVE EVALUATION

In 2013-2014, at the conclusion of the five-year project, NewKnowledge conducted a summative evaluation to assess how well the project achieved its three objectives. This summative evaluation aimed to help the project team determine which efforts met the objectives of the project, what barriers limited achievement of the full aspirations of the program, and to suggest modifications that might increase impact should the program receive continued support.

Early in summative evaluation, it became clear that institutional comparison was necessary for attribution of change since school culture varied substantially across the three sites. Despite Title 1 status and similar minority demographics, there was little common ground in pedagogy or community culture. To differentiate which findings should be attributable to the curriculum, pedagogical approach, or the school culture, the "Being Me" team recruited two additional public elementary schools to support a comparative study of the final curriculum: Washington, DC's J.O. Wilson (Grade 3) and Robert R. Gray in Prince George's County, MD (Grade 3 through Grade 5).

This evaluation also sought to pursue objective assessment through comparison of test scores on key concepts taught through the curriculum for schools that had received Institute training and/or a modified curricula training against those that had not been part of the program. Unfortunately, due to high teacher and principal attrition, specifically among study participants (i.e. two principals and all but one teacher had been replaced, including the two teachers in the control schools by the last year of the program), the program delivery was often disrupted or changed considerably, and some participant schools mislaid materials and even entire curriculum kits. This lack of internal control and variation in delivery precluded attribution of impact by any specific intervention to a larger population. Furthermore, new administrative faculty interpreted school board policy as prohibiting access to test scores for comparison study.

The external evaluation shifted focus from a traditional experimental design to a case study approach, recognizing that much of the formative phase involved developing a multi-layered program that represented all partners' structural, professional, and personal goals for the project, and the complex set of variables presented by the District of Columbia area Title 1 school communities. In the case study approach, evaluators looked for patterns of learning and understanding in different settings, taking into account different pedagogical perspectives, experience, training, and access to curriculum materials.

## Summative Evaluation Findings

The results demonstrated that “Being Me” met its three objectives by:

- Increasing students’ *understanding* of actions that will improve their health outcomes;
- Teaching students to become *independent thinkers* through the use of art and science activities; and
- Promoting students’ sense of *self-efficacy* in ways that could improve their health and the health of their families.

### Specifically, the Summative Evaluation revealed:

- The topics were relevant and important to the students in their classes and to the curriculum standards for health and science;
- The “Being Me” program gave teachers a useful array of resources, creative models, new science information, and helped develop skills they felt they needed to better teach to the current science standards;
- Based on observed behavior and teachers’ assessments, students were engaged and excited by the hands-on art- and science-based activities, having fun while learning;
- Seeing and touching real organs (lungs, heart, brain), learning fun facts, and hearing personal stories from people with a health issue particularly piqued their curiosity, leading to more questions and connections;
- The hands-on activities helped students explore a topic and discover ways to stabilize or prevent the health problem, thus giving them a heightened understanding of how the science process works and a sense of self-efficacy;
- Students independently and through teachers’ scaffolding questions were able to connect their science learning in the “Being Me” topics to other science topics, such as biology and life science, although these connections were not made explicit in the curriculum;
- The curriculum served teachers’ cross-curricular goals with other non-science subjects, such as math (liquid measures, lapsed time), and English (vocabulary, talking in complete sentences, reading);
- The curriculum was flexible and varied, with art and science activities geared towards independent, small or large group learning, or homework, which allowed teachers to modify the lesson to serve the needs of their room (or venue), class culture, and school setting;
- The experiential nature of the activities engaged students of different ages, intellectual levels, and learning styles;
- After the first year in formative testing, materials provided to support the curriculum were often misplaced or lost, and even

if not, teachers tended to supplement the curriculum with additional materials, such as film, songs, internet information and pictures, in order to better scaffold student learning to meet their needs. It appeared that these adaptations were ways that teachers anticipated using curricula and that they were not perplexed by the lack of material support;

- Teachers found the hospital-based training informative, motivational and inspirational, and gave them sufficient depth of training in the health topics to enable them to feel confident in teaching them;
- While teachers felt more prepared and supported after “Being Me” training at the Summer Teacher Institute, and appreciated the pre-course curriculum refresher and having all the materials needed for a lesson, what mattered most for effective learning in the classroom appeared to be the experience and resourcefulness of the teacher in combination with the creative, objective-driven structure of the curriculum;
- Cub campers enjoyed the camp’s varied art- and science-based activities, and knew what they could do to address a particular health issue. However, it was less clear if that connection was made at home as none of the campers told their parents why they were doing a particular activity and none of the parents, according to the campers, asked;
- Students who attended the sickle cell disease-focused camp in 2013, proudly recalled some of the lesson, such as parts of the blood, when studying the unit again in 2014 at Anne Beers School, demonstrating that the camp has residual science value;
- The Family Learning Experience (FLE) art and science activities proved a valuable, and fun way to reach a large number of parents and their children with important health information and effective actions for improving families’ sleep, weight, lung functioning, and overall health;
- Teen mentors played an important role helping with student projects at FLE’s and youth camp, but without adequate training and talking points, the links between the science and the art project was typically lost; and
- Previous concerns about gender balance of campers and training of mentors and staff at youth camp were mollified when more collaborative, small group, and inquiry-based activities were created by the fifth year. These were not considered a limitation to the final curriculum in the summative evaluation.

### Program Barriers

- Time constraints emerged as the most critical barrier for teachers to introduce all the modules or even all the lessons within a module during the school year;

- Constant pressure on teachers to adhere to prescribed test preparation prevented delivery of the “Being Me” curriculum until after testing was complete;
- Students became aware of the need for nutritious food, exercise, and adequate sleep to achieve their best, but the institutions in their lives (school and family life) hinder the necessary behavioral changes;
- Administrative and teaching staff attrition, missing modules and items within modules, and alterations to lesson plans limited the evaluators’ ability to execute a quasi-experimental assessment necessary to attribute outcomes to any one intervention;
- Missing kits or items were described as barriers for some teachers implementing the lesson plans. However, the teacher without a kit delivered a program with results consistent to those with kits; and
- Staff changes at NCM stymied the development of the planned web-based resource.

### Program Modifications

NewKnowledge recommends the following program modifications to continue developing “Being Me’s” capacity to successfully realize its intended outcomes:

- Offer explicit connections between art making and science concepts, in all settings, to encourage synthesis;
- Provide more take-home activities that the kids produce, along with a few bullets on the health lesson, to better facilitate a discussion within the family setting for health issues and mitigation measures;
- Consider pairing a brief worksheet or a game to the lessons, such as connecting vocabulary to concepts, so teachers have a way of assessing student learning;
- Consider videotaping teacher training, training teachers to teach other teachers, and/or offering professional development credit to teachers to attend training and provide a modified curriculum so the program can be scaled and sustained within the schools;
- Consider developing the web-based resource center so that existing and new curricula can be accessed by teachers, both as a model for creative, objective-based curriculum, and as ready-made, tested lesson plans on important health issues;
- Consider developing a printed training manual for mentors (camp, FLE’s, libraries, youth centers, etc.) that includes talking points on key health concepts and health behaviors so they can become effective advocates;

- Develop a rental or loan program for module kits so they are less likely to be lost over the course of the year at the schools; and
- Bring the program out of the schools and into the community through community centers, libraries, other after-school facilities where staffing is stable, time manageable, and materials more carefully safeguarded.

### CONCLUSION

The “Being Me” hands-on, arts-based program was considered important and applicable to both students and the National Science Content Standards or Next Generation Science Standards by all teachers across the five years. Although teachers had different pedagogical styles, the flexibility of the curriculum allowed each of them to engagingly implement the program and scaffold the lessons to children of varying ages and intellectual capabilities, in groups that were large, small, and/or collaborative, or for individual learning, so that all students learned about health-related issues and enjoyed themselves in the process. The students proved to be enthusiastic learners and the curriculum heightened their curiosity about science, their bodies, their health, and what they can do to keep themselves and their families healthy. While the program ran into issues about materials going astray and a lack of time to implement the program, it still met all objectives. This success illustrates the professionalism and resourcefulness of the teachers, and underscores that good curricula can be leveraged by creative teachers and adapted to individual learning abilities and school cultures.

The only limits to this program were the lack of instructional time in formal school settings. Because prescribed test preparation and snow days will continue to limit instructional time, even though these programs align to testing goals, we recommend that the program move to an informal learning setting. This setting may be community centers, libraries, YMCA/YWCAs, or museums, where facilitators have more control over the resources and lesson time, and can support more in-depth exploration in an after-school or summer camp setting. We believe this will allow the “Being Me” program to achieve its full potential and to be scaled up to reach a larger community of Title I students and their families.

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## Introduction

The “Being Me” program seeks to bring the educational process to life through hands-on, inquiry-based learning that promotes children’s self-awareness of health-related issues and an active understanding of scientific inquiry using an art-focused curriculum to support National Science Content Standards. The program was developed by a partnership among the Children’s National Medical Center (Children’s National), the National Children’s Museum (NCM), and the George Washington University’s Graduate School of Education and Human Development (GW) in collaboration with public schools in the metropolitan Washington, DC area (DCPC) and public schools in Prince George’s County, MD (PGCPS). It is supported through a five-year National Institutes of Health, Science Education Partnership Award grant (NIH SEPA). The “Being Me” program was designed to support teachers and children in becoming creative experts in understanding the scientific process through exploration of health issues that they or their peers commonly experience: asthma, sleep, obesity, bullying, and sickle cell disease.

The Institute for Learning Innovation (ILI) was hired as the external evaluator for the “Being Me” project. When ILI ceased operations in June 2012, New Knowledge Organization Ltd. (NewKnowledge), founded by Dr. John Fraser, became the successor firm for the “Being Me” evaluation. Dr. Fraser, who had been ILI’s Project Director for “Being Me’s” front-end research, is leading NewKnowledge’s summative evaluation for “Being Me,” and is treating the formative evaluation reports, mostly completed by ILI, as evidence for the summative evaluation. Full reports on the front-end (Year 1), formative (Years 2 and 3), and summative evaluation Phase I (Year 4) were submitted to the Principal Investigator, Dr. Naomi Luban of the Children’s Research Institute following those years’ evaluations. This report constitutes a summary of results for Years 1-4 and a full summative report for the activities evaluated in Year 5 (2014).

### FRONT-END EVALUATION

The Institute for Learning Innovation, under the direction of Dr. John Fraser, PhD, AIA, conducted front-end evaluation to explore how partner schools’ understanding of the health topics prioritized by the “Being Me” team; the relevance of these topics to their schools’ population; any limiting factors that might impact the success of the program; and suggestions for integrating the topics into their health and science curricula (Fraser & Kraemer, 2010). The evaluation was undertaken through telephone interviews and in-person focus groups with administrators and teachers at two of the partner schools, Chamberlain Elementary School (a public charter school) in Washington, DC and Seat Pleasant Elementary School in Prince George County, MD. The results revealed that:

- The structures of the schools were different, but the health topics were deemed relevant and important to both and were a welcomed inclusion into the teachers’ curricula;
- The teachers themselves needed additional information and training to increase their personal literacy on the health issues;
- The teachers were receptive to using art and technology to teach the health topics;
- The lessons needed to be integrated into the existing science curricula and standards for learning; and
- HIV and smoking were other community health concerns that should be considered, possibly tying them into the related lessons on sickle cell disease and asthma.

### FORMATIVE EVALUATION

During the first two years and through May of the third year, ILI’s formative evaluations explored how the program was being implemented across a number of venues, including:

- Dr. Bear’s Summer Training Institute for teachers;
- Pilot testing the schools’ classroom curricula for the five health topics;
- Pilot testing one or more health topics at Family Learning Events (FLE); and
- Pilot testing Dr. Bear’s Cubs Summer Science Camp for youth.

Their research included investigating any barriers and opportunities they found for meeting the project objectives, as well as overall information on skills, knowledge, attitudes, interactions and learning behaviors acquired by participants during the pilot phases across the five health topics. As with the front-end evaluation, the goal was to use that information to adjust the curricula and training to better reach the program objectives. For all modules, the curricula was developed by GW team in collaboration with NCM; training was carried out for the most part at Children’s National with their professional staff.

#### **Dr. Bear’s Summer Training Institute: (See ILI Formative Report Draft, dated August 4, 2010 for full details.)**

The initial teacher training at Dr. Bear’s Summer Training took place June 28-July 1, 2010 at the Children’s National Medical Center and involved nine teachers from two Washington, DC elementary schools: three teachers from Anne Beers and six from Seat Pleasant, with teaching experience ranging from one year to twenty years. (Chamberlain Charter Elementary School was invited but did not

participate.) The pilot training covered two of the health topics: sleep disorders and asthma. In its formative evaluation, ILI found that:

- Overall, teachers appreciated the training;
- They found the programs provided by the hospital faculty particularly informative, motivational, and inspirational;
- The content was of sufficient depth to enable the teachers to master the two health topics;
- Teachers also wanted one-pagers and other “quick reminder” resources to which they could refer post-training;
- In contrast, topics relating to professional practice of classroom teachers were considered too basic and thus inadvertently condescending;
  - Evaluators recommended that the format should allow for more collaborative thinking and sharing of personal experiences; and
- Participants wanted earlier mealtimes, more breaks and more food choices.

An additional formative evaluation of the Dr. Bear’s Summer Training Institute, scheduled for 2012, did not occur until 2013 due to transition in the evaluation team.

### **Pilot Testing Health Curricula in the Schools**

#### **Asthma**

In May/June 2010, three Washington, DC and Prince George County, MD public elementary schools—Anne Beers (DCPS), Chamberlain (DCPS), and Seat Pleasant (PGCPS)—pilot-tested the asthma curriculum over a three-week period, using a pig’s lung for demonstration of lung-functioning (Fraser, Messick & Kraemer, 2010). There were challenges in that not all the participating teachers had attended the teacher training, nor were all the modules used in the classrooms. Using observations, student journals, and teacher feedback, ILI researchers learned that:

- Teachers appreciated the curriculum and the opportunity to present health topics in their classes;
- Teachers needed to become more familiar with human anatomy and bodily functions as scaffolding for the health topics;
- Although the curriculum was characterized as inquiry-based, implementation was mostly teacher-led;
  - Some teachers did not feel the social dynamics in their classrooms were suitable for inquiry-based learning;
  - Other teachers did not think the curriculum was designed as inquiry-based;

- Teachers felt that the art-based curriculum helped reach students with non-traditional learning styles and was a nice break from their normal curricula;
- Teachers tended to modify the curriculum to fit their own teaching styles, to fit what they felt was a more appropriate way of doing the activity for their students, or to squeeze it into the available time;
- Teachers, like their students, expressed a need for a scaffolded learning process, i.e. they felt they needed more support in training, additional support materials and guided content/instructions, and preferably, to be part of the collaborative process in developing these materials, specifically:
  - Broader content and more hands-on activities;
  - Complete art-kits, with enough materials for multiple activities to take place simultaneously or for teachers to pick and choose what to use based on student/classroom needs;
  - Explicit instructions on goals and indicators of success for each activity; and
  - Additional support (guided questions, simpler vocabulary, step-wise learning modules) for teachers and students to allow for different learning styles, developmental stages, and knowledge base.

#### **Sleep**

The sleep curriculum was pilot tested at three schools in the Washington, DC area, over a three-month period from November 2010 to February 2011. In all, ILI observed ten classes: three at Anne Beers (DCPS), three at Seat Pleasant (PGCPS), and four at Whittier Education Campus (DCPS) (Fraser, Messick Cherry, & Kraemer, 2010). Among the schools, they interviewed six teachers and investigated journals from two schools and the student artwork at a third school in order to assess student learning and teacher reactions to the curriculum. Two of the five teachers—one from Anne Beers (third grade) and one from Seat Pleasant (third and fourth grade)—had attended the Training Institute; Whittier (fifth grade) was not then a partner school and thus the teacher had not attended training. However, all five teachers attended an after-school introduction to the sleep curriculum prior to the pilot. The evaluation revealed that:

- The curriculum was relevant, practical, and engaging to students, allowing them to understand how much time they needed for sleep, how the body functions during sleep, their dreams, and the effects of sleep on their growth, emotions, and school performance;



- Students were able to draw a clear concept of time management and sleep, and could use the knowledge to affect their sleep behaviors;
- Teachers found the curriculum challenging to implement due to the amount of teacher-directed time involved versus self-directed inquiry or peer-related scaffolding that takes place in group activities; and
- Some games and clay art activity needed re-tooling.

### Obesity

The obesity curriculum's five lesson plans were developed primarily by GW, in collaboration with the NCM, and pilot-tested in three DC area schools, Anne Beers Elementary School (DCPS), Seat Pleasant Elementary School (PGCPS), and Whittier Elementary School (DCPS) (Kraemer, Messick & Fraser, 2011). Prior to introducing the curriculum into the classroom, the five participating teachers attended a two-afternoon training given by GW and CNMC. Dr. Hancock, an obesity expert from CNMC, gave an overview of obesity and was available for teachers' questions; a GW instructor modeled a classroom teacher presenting the five-part, art-based lessons, while the teachers took on the role of students doing the corresponding activities.

To assess student learning and teacher reactions to the curriculum, ILI researchers observed instruction and learning in nine classes of students. These included six third-grade classes (three from Anne Beers and three from Seat Pleasant) and three fifth-grade classes (from Whittier). They carried out in-person interviews with the five participating teachers about their experience with the curriculum and reviewed a sample of students' investigation journals. The researchers also observed one family learning event (see FLE section below). The major findings were:

- Students and teachers found the curriculum relevant, engaging, and useful to students and their families' lives;
- Teachers felt they needed more science and theory than what was provided, such as the effects of food and exercise on the body, to better scaffold their students' learning;
- Although the curriculum was inquiry-based, teachers felt it was too teacher-led and preferred more opportunities for independent learning in small groups, although one teacher felt her students were not self-disciplined enough to work without direct teacher instruction;
- "Obesity" did not correspond with the lesson focus on eating healthy and exercising, leading many teachers to suggest that the course be renamed;

- Teachers found the training adequately prepared them for teaching the lessons and that the communication with CNMC was effective and helpful; and
- Better support needs to be given both at home and at school if students are going to be able to follow through on eating healthy and exercising.

### Family Learning Event (FLE): Obesity

On June 2, 2011, ILI conducted a formative evaluation of "Being Me's" Family Learning Event during a STEM night held at Anne Beers Elementary School (Kraemer, Messick & Fraser, 2011). Approximately 200 families participated in the event, mostly African American and Black. Competing with "Being Me" for families' attentions were Gold's Gym, science-based exhibits by NASA and others, and a US Coast Guard helicopter. Given these many partners, the "Being Me's" three activities—exploring sugar, learning about fat, and "healthy food on my mind" crowns—attracted few groups despite trying to draw attention through the use of a costumed Dr. Bear mascot from Children's National. In total, the 15 groups (11 adults and 16 kids) spent an average of 11 minutes on the activities. Of the ten groups observed and interviewed, all spent time at the crown activity, about half learning about sugar, and less than half learning about fat. Although not generalizable, salient findings from the research were:

- Participants understood the goal of healthy eating and that they must choose healthy foods and encourage healthy eating habits for all family members;
- Families learned how much sugar is appropriate and how much sugar there is in commercial sodas and other drinks;
- The exhibit helped them realize that some foods are fine to eat some of the time but not all of the time as they won't satisfy nutritional needs; and
- They gained awareness of National Children's Museum's hands-on, self-directed activities.

The researcher concluded that interactive and appealing health exhibits can result in intentional behavior change and promote healthy lifestyles at home, but others ways will be needed to reach larger numbers of families.

### Bullying

In fall 2011, ILI conducted a formative evaluation on the piloting of the five-lesson bullying curriculum at the three elementary schools—Anne Beers (DCPS), Seat Pleasant (PGCPS), and Whittier (DCPS)—covering nine classes of third- through fifth-grade students (Kraemer, Messick & Sickler, 2012). This curriculum was also the

focus topic of that summer's Training Institute for the teacher's who would be teaching the topic in the fall and family learning events at the three schools.

Data for the evaluation was collected by observations in the classrooms of teachers' instructional strategies, student behaviors, activities and responses to lessons, and interviews with teachers afterwards to learn about their experience with the curriculum. Both classroom discussions and teacher interviews were taped. Findings revealed that:

- Students were excited and engaged with the topic and activities, especially creating a Public Service Announcements;
- The curriculum was particularly relevant because there had been confrontations at the schools and online, such that hypothetical situations quickly turned into lived experiences;
- Partly because of the ever-present reality of bullying, teachers appeared more comfortable teaching the bullying curriculum than other topics, both in class and when learning it at the hospital;
- Through the curriculum and Stop Bullying Now videos, students learned to identify bullying situations, use the correct terminology (such as reinforcer and bystander) when calling each other out, and were more aware of the choices they could make to stop it, rather than just resort to physical retaliation;
- Because bullying addresses a social issue, rather than a health science one, the lessons were less scientific inquiry based (less data gathering and analysis) than other modules, trending instead towards broader inquiry that led students to discover how they could manage their feelings and play out possible resolutions to and roles in bullying situations;
- Some of the vocabulary and concepts were difficult for the students to understand, such as stereotype and empower, whereas others, such as reinforcer or bystander, they would use correctly when call each other out;
- Teachers varied the timetable for teaching the curriculum, stringing it out over several weeks instead of one, and either shortening or lengthening the intended instruction time of 45 minutes, with the result that some teachers did not get to all the activities and lessons;
- Just as timetables were different, teachers also varied how the projects were carried out, with some adhering to all the steps, and others skipping or reordering steps;
- The teachers felt that the curriculum didn't provide enough student-directed learning or differentiated learning to accommodate different learning styles, and some of the

activities used up too much time preparing the materials for the activity;

- Many of the teachers did not complete the lessons intended to go home, but of those that did go home, teachers heard from parents voicing their concern and interest in the topic; and
- Teachers felt supported by the "Being Me" team members, and the training they received.

### Family Learning Event: Bullying

As a follow on to the class discussions on bullying, "Being Me" participated in family learning events at each school (Kraemer, Messick & Sickler, 2012). Two were part of the school's STEM night, with 200-300 people in attendance and competition from a number of other groups, including Museum Without Walls (MWW), and the third as the main focus with 100 people. For all of the FLE's, researchers focused their observations and interviews with the individuals or groups who visited the "Being Me" table, which featured "friendship" trading cards to indicate that friendship is a cure for bullying. However, when MWW tables were involved, half of the interviews focused on "Being Me" and half on MWW. In all, the adults in 25 groups were interviewed, with groups averaging one adult and two children (Grades K-5). Findings revealed that:

- Attendees found the "Being Me" activity creative and enjoyable and the MWW one interesting and informative;
- While students focused on the activity, parents hovered, talked to each other, or helped their child with the activity;
- Six of the 25 groups mentioned the activity was a health science topic about bullying;
- Only eight groups made mention of science topics in their answers and none of those referred to "Being Me"; and
- All of the groups made a connection to the activity being about the creative process.

### Sickle Cell Disease

This topic was not part of the formative evaluation of the pilot testing of curriculum in the schools because teachers were reluctant to teach it, fearing their students wouldn't connect with the topic and that it would be too technical for their skill level. It was a topic for the summer youth camp in 2011, as detailed below.

### Dr. Bear's Cubs Summer Science Experience

The first pilot of Dr. Bear's Cubs Summer Science Experience took place June 21-25, 2010 at Children's National Medical Center with seven students: four female and three male (Fraser & Kraemer,

2010). Six of the seven students were entering fifth grade and one was entering sixth grade. Of these, all knew someone with asthma, two had asthma themselves, and one was growing out of it. A narrative inquiry approach was used to assess the program, but no statistical claims could be made because of the small group in the study. This pilot test on asthma appeared to have been well-received by students who were interested in learning more about the lungs, how asthma affects their breathing, and how it is treated. They especially enjoyed touching the lung and using art to recreate the body. While some of the material was over their heads, in general they were able to synthesize the information in personal terms. The program demonstrated an important opportunity for students to engage with content that they will share with others. Focus on the body and self-understanding were key learning opportunities that fit well with the age and developmental strivings of the target age for students. A number of logistical, training, and pedagogical recommendations were made.

The second Dr. Bear's Cubs Summer Science Experience, held June 20-24, 2011, focused on obesity, through the lens of healthy eating and physical fitness (Foutz & Kraemer, 2011). Twenty students, entering third, fourth, and fifth grades, from Anne Beers, Whittier, and Seat Pleasant Elementary Schools attended, almost tripling enrollment over the 2010 pilot. Sixteen of the twenty mostly African American and Black students were female and four were male. ILI used a narrative inquiry approach, along with two talk sessions of 30 and 15 minutes to capture memorable moments and a short survey about their program experience. Major findings were as follows:

- The issues around staff composition, roles, and numbers that were apparent in the pilot had been resolved by Year 2, with a student:adult ratio of 2:1 and well-defined roles for mentors and staff;
- The weeklong program was well-paced, activity varied and had good use of space;
- Youth reported learning new information on both nutrition and fitness, but focused more on the nutritional information;
- Youth at this age need more explicit scaffolding in order to enact behavior changes, so the more explicit the behavioral modifications needed, the better; and
- The program did not take full advantage of an arts-based approach to inquiry and science learning, and activities that may have been intended as inquiry-based or science-related were not fully realized in implementation.

## SUMMATIVE EVALUATION

### Summative Evaluation – Year 4

In the fourth year of the program, NewKnowledge conducted its first summative evaluation for Phase I. Summative evaluations were carried out during the spring of 2013 on the school curriculum and family learning events (FLE's) (NewKnowledge Report #NIH.90.75.04), and in the summer of 2013 for Dr. Bear's Training Institute and Dr. Bear's Cub Science Camp Experience (NewKnowledge Report #NIH.90.75.05).

### Methodology

NewKnowledge researchers approached the evaluation using a narrative inquiry method (Clandinin & Connelly, 2000). This method is a constructivist approach that recognizes that the evaluator is present and brings his/her own perspectives to a project. The evaluation is an intervention that provokes reflective thinking by participants that may not occur without the evaluator's questions, and attempts to account for that bias in the analysis. Narrative inquiry differs from other approaches (such as a thematic analysis which may disregard context and sequence) by situating all data within a larger experiential event considered within its original dynamic context. As a result, narrative inquiry makes use of a mixed method approach (qualitative and quantitative data), contextualizing the information as it is gathered in order to pursue an analysis based upon real life and lived experiences of participants.

The corpus of data for this evaluation includes:

- Dr. Bear's Cubs Summer Science Experience
  - observation of classes
  - discussions with participants
- Dr. Bear's Summer Institute Training
  - quantitative post-survey used to assess teachers' self-efficacy, confidence and knowledge gain
  - observations of training
- Public School Curricula
  - observation of lesson activities being implemented
  - observation of teacher-led post lesson activity to elicit student reactions to their experience
  - one-on-one post-lesson teacher interview regarding their experience with the curriculum.
- Hospital programming
  - observation of one-on-one interactions
  - follow-up delayed post survey of participants families



Student outcomes for assessment are:

- *Increasing knowledge* and understanding: promoting students' understanding of actions that will improve their health outcomes by highlighting the environment and health-related behaviors that affect the human body;
- *Enhancing science skills*: teaching students to become independent thinkers through the active process of gathering information, evaluating data, perceiving patterns, and explaining phenomena through art and science; and
- *Promoting healthy attitudes*: promoting students' sense of self-efficacy in changing behaviors.

In addition, student behaviors related to their peers, teacher and mentors were assessed.

The results of these summative evaluation reports represent the formal assessment of the implementation of an existing curriculum in standard education programs. This section is a summary of those report findings.

### Dr. Bear's Training Institute

In summer 2013, NewKnowledge conducted the summative evaluation for Phase I of the teacher training. The training took place over five days from June 24-28, 2013 at Children's National Medical Center during the same week as the Dr. Bear's Cubs Science Experience for students, and drawing from the same three partner public elementary schools in the Washington, DC area. Nine teachers participated with experience ranging from five to 19 years. The content of the training covered all five of the curriculum's health topics: asthma, blood disorders, sleep, bullying/injury prevention, and obesity. The inquiry-based pedagogical focus specifically addressed cooperative grouping and inquiry and effective questioning.

Using pre- and post-training survey questionnaires, informal focus group discussions and observation, the NewKnowledge researchers found that:

- Teachers thought training was useful, relevant, and fun;
- Teachers were engaged with the material and with each other;
- All five health topics were sufficiently covered for teachers to feel confident teaching about them in their classes;
  - They still expressed some concern on how to teach the blood disorders (HIV and sickle cell disease);
- They would have preferred more hands-on learning experiences for themselves;

- Teachers deal with real health issues that affect their students' wellbeing and academic performance. Some of these factors cannot solely be mitigated through student learning;
  - Many of their Title I students' home situations preclude students from getting sufficient sleep and exercise, and although teachers could teach about them, implementation might not be possible;
  - School schedules also make getting enough exercise problematic;
  - The open discussion format, with teachers sharing personal experiences, helped to refine how teachers might become more effective advocates in their classrooms and at home;
- Teachers bonded with one another, and felt that they had become a part of a community of learners working together to help their students;
  - The sharing of experiences in an open discussion format helped build camaraderie and mutual support among teachers;
- Teachers were more confident using the various teaching pedagogies after the training;
  - They were most comfortable using cooperative grouping, noting that it can effectively engage students at all levels, including ADHD students; and
- Teachers felt prepared to teach the curriculum and integrate its components into their classrooms after training.

### Dr. Bears' Cubs Summer Science Experience

The first phase of the summative evaluation for Dr. Bear's Cubs Summer Science Program took place June 23-28, 2013 at Children's National Medical Center. Nineteen children between eight and ten years of age (11 female and 8 male) attended the summer program. The program topic was sickle cell disease, a genetic blood disorder most commonly found in people with African heritage.

NewKnowledge used a narrative inquiry approach to develop and analyze the data. Data were collected using a journal for recording observations, descriptions, reflections, and memos during the camp sessions. Interviews were recorded and a representative sample of the campers' work was photographed to illustrative purposes. These data were coded, noting a presence or absence of increased knowledge and understanding, science skills, and healthy attitudes, as well as how students behaved and interacted with teachers and each other during class. Highlights included:

- Cub Campers were engaged with the curriculum, especially when people suffering with the sickle cell disease talked about it;
- Teen mentors, a mix of male and female, were actively and positively engaged in facilitating campers' learning, project activities, and deportment;
- Students' responses to questions indicated that they understood how environmental factors, behaviors, and actions can affect people suffering from sickle cell disease, but had difficulty understanding the genetic derivation of the disease;
- The art projects designed to advance scientific thinking were enjoyable and had the potential to achieve their goal even if the research was unable to verify or deny whether students actually made the connection between the art and science, in part because that link was not specifically addressed;
- There was a good gender balance of Cub Campers and mentors; and
- Campers complained about the amount of walking and stair climbing they were required to do, and to a less extent about breakfast offerings.

### Public School Curricula

The summative evaluation of Phase I (Year 4) of the Public School Curricula was designed as a quasi-experimental contextual study that would be combined with student assessments or test scores in the fall of 2013 to understand the effectiveness of the "Being Me" program and what inputs contributed or were barriers to impact. The study focused on three public elementary schools teaching the same curriculum, but with differing access to curriculum preparatory training and support materials (classroom kits). Specifically, the evaluation focused on the asthma curriculum, "Breathing Easy," at Robert R. Gray, J.O. Wilson, and Whittier Elementary Schools. In addition, the teacher at Whittier was trained on it at the Institute and had access to the classroom kits, whereas the teacher at J.O. Wilson received no Institute training but did have the kits, and the teacher at Robert R. Gray neither received the training nor the classroom kits.

The three classes observed included third, fifth, and sixth graders, with 11 to 19 children per class. One of the three teachers (a new Teach for America teacher) had two aides who assisted for part of the time.

A narrative inquiry approach was used for both data collection and analysis (Clandinin & Connelly, 2000). The evaluation used three methods for assessment: journaled observations of lesson implementation, a teacher-led, post lesson activity to elicit student reactions to their experience, and a one-on-one post-lesson

interviews with the teacher about his/her experience with the curriculum. All sessions were recorded. Students were assessed based on increased knowledge and understanding, enhanced science skills and changes in attitudes towards healthy behaviors, as well as their behaviors in class, interactions with their teachers and peers.

Salient findings of this Phase I evaluation revealed:

- Teachers believe their students' understanding of health topics, science skills, and health-related attitudes improved following participation in the "Being Me Breathing Easy" curriculum;
- A teacher who used the curriculum without either training or the supporting materials demonstrated that effective learning can be achieved by a skilled teacher with a robust curriculum;
- Students were engaged by the content and demonstrated self-efficacy in addressing the topics in all settings;
- Effectiveness seemed to vary more by teacher experience and the social dynamics in the classroom;
- Teachers believe the content is relevant and important for their students, but continue to feel that they need more support with suggestions for probing or scaffolding questions in the teacher's guide to help their students to self-direct scientific inquiry;
- Teachers did not perceive the activities to be art-based, but the creative activities did support the project's science learning goals; and
- Optional, alternate activities, or adaptation ideas may help teachers who do not have access to the toolkit, local resources or other materials.

### Hospital Programming

Due to a limited amount of hospital staff time and program delivery, the program resulted in only a dozen interventions. While the evaluators sent email follow-up requests to all participants and received only one reply, that reply was incredibly supportive of the program with the family reporting increased knowledge gains related to asthma triggers and that the child who participated in the program had taken it upon himself to educate those in his area about asthma triggers. Unfortunately, the lack of data prevents further claims about this effort despite the promise shown and positive feedback received about this effort.



## Summative Evaluation – Year 5

At the conclusion of the “Being Me” five-year project, NewKnowledge conducted a summative evaluation to assess how the multi-year effort met the three program objectives:

- Increase students’ *understanding* of actions that will improve their health outcomes;
- Teach students to become *independent* thinkers through the use of art and science activities; and
- Promote students’ sense of *self-efficacy* in ways that could improve their health and the health of their families.

The results of this summative evaluation also aimed to help the “Being Me” team determine where barriers still exist that would restrain the project from achieving full implementation, what modifications to the program might help to overcome these obstacles in the future, and how a future program might best be implemented.

This final summative report is comprised of assessments of the “Being Me” program in five public elementary schools, a family learning event (FLE) held at the Annual USA Science and Engineering Festival, and the Dr. Bear’s Cubs Summer Science Camp held at Children’s National. The Teacher Training Institute was not re-assessed after Year 4, as the “Being Me” program had reached its full five-year grant cycle.

### Methodology

As with the fourth year summative evaluation, NewKnowledge researchers used a mixed method, narrative inquiry approach (Clandinin & Connelly, 2000) for both data collection and data analysis. We had set out to do a quasi-experimental study in which we compared test scores on key concepts taught through the curriculum for schools that had received Institute training and/or a modified curricula training against those that had not been part of the program. However, due to the fluid circumstances of high teacher and principal attrition in these Title I schools (40% of students are low income and qualify for subsidized lunch and other factors), and specifically among study participants, it was not possible. (Two principals and all but one teacher had left the schools by the fourth year of the program, and that teacher had changed grades in 2014.) We also could not get access to test scores or other forms of student assessments.

Taking these factors into account, each class and year was treated as a case study in and of itself in which researchers looked for patterns of learning across schools during curriculum implementation. Because of the nature of Title I schools, the wide structural and

situational variations in family, classroom, and school context for teaching was deemed important for this study, including scaffolded and experiential learning and deportment.

The evaluation used the following procedures for assessing student outcome:

In the public schools:

- Observations of school classes, student work
- One-on-one post-class interviews with teachers, and
- Group discussions with students during class

At FLE events:

- Observations of program activities
- Open-ended survey of adult participants, mostly parents

At youth summer camp:

- In-class observations
- Group discussions with students

The student outcomes for assessment are:

- Increasing knowledge and understanding
- Enhancing science skills
- Promoting healthy attitudes

### Public School Curricula

#### Participants

The “Being Me” curricula was taught at five elementary schools: J.O. Wilson, Whittier, and Anne Beers elementary schools in Washington, DC, and Seat Pleasant and Robert R. Gray in Prince George’s County, MD. Implementation of four of the five curriculums was observed for one class (asthma was taught by two schools; bullying was not taught). All five third to fifth grade teachers were interviewed by the NewKnowledge researcher. Youth group discussions were held with students as they completed assignments (Table 1).

The composition of the five classes varied. In three classes, the majority of students were female, while the other two classes had relative gender parity. Classroom sizes also varied, ranging from five students for the afterschool program to 25 students in a mixed grade class. Most of the students appeared to be African American or Black. Three of the teachers were African American/Black and the other two were White/Caucasian, with a mix of genders in both ethnic groups. A Teach for America teacher in one of the classes was assisted by two aides, both African American/Black.

Table 1. Classroom demographics.

Elem. School	Anne Beers	J.O. Wilson	Whittier	Seat Pleasant	Robert R. Gray
Grade	4	3	3	3/4	3-5
# Students	18	23	21	25	5
Observed Student Gender	12/6	11/12	10/11	15/10	4/1
Girls/boys	18AA	19 AA	15AA	22 AA	5 AA
Observed Student Ethnicity		1 W 3 H	1 AS 1 W 4 H	1 W 2 Mixed or H	
Teacher	Male	Male	Female	Male	Female
Teacher Ethnicity	AA	AA	AA	White	White
Aides Ethnicity				2 AA	

AA – African American/Black  
 AS – Asian American  
 W – White/Caucasian  
 H – Hispanic/Latino

### Data Collection

To effectively use the narrative inquiry method, the NewKnowledge researcher was a participant observer during implementation of the curriculum in order to understand the lived experiences of the students. Observations were time recorded in a journal and supplemented by additional impressions. Additional data was collected from the students about their lessons through group discussions and samples of their work (which was photographed). After class, teachers were interviewed using open-ended questions about their experience with the “Being Me” curricula and their perception of students’ learning vis-à-vis other curricula they used. All data collection was audio recorded and listened to/coded by a different NewKnowledge researcher.

### Instruments

The classroom observer took notes in a journal and recorded times of activities and what students and teachers were doing or saying. The class interactions and discussions were recorded and the observer commented into the mike verbally at times to describe what was happening. The researcher supplemented these observations with reflections on what she learned and observed. Photos taken of the class materials and students’ work augmented the formal data collection.

Student interviews in groups took place at different times during or after the class, depending on classroom schedules. Care was taken to ensure that students could not be identified and that if they didn’t want to be recorded, they wouldn’t be. One student asked not to be recorded; the observer turned off the recorder when that student spoke. Questions and probes (paraphrased) to students included:

- What are you learning about (module topic)?
- What have you learned new about (module topic)?
- What would you like to know more about?
- Do you talk to your families about what you are learning?
- What have you learned that will help you stay healthy?
- Is there anything you can tell or do to help your family stay healthy?

After class was over, the researcher interviewed the teacher and recorded the interview. The interviews were centered on how the program worked and how it could be improved and expanded to other settings. Topics included the following:

- The relevance and importance of the “Being Me” program;
- The impact of the program on science learning and in other disciplines;
- How the curriculum was received by students and teachers;
- The extent that students are sharing curriculum content with their families;
- What worked/didn’t work in the curriculum and how to improve it; and
- Where the program could be expanded beyond the classroom.

Coding the information gathered from teachers, students, and class observations focused on the three major learning outcomes: increased knowledge and understanding, enhancing science skills, and promoting healthy attitudes. It was further broken down and coded into sub-outcomes.



Table 2. Outcomes codes.

Outcome Category	Coding Description
Knowledge	Understanding of how:
K1	environment affects human body
K2	health-related behaviors affect human body
K3	intended actions to improve their health outcomes
Skills	Evidence of (science inquiry) skill development:
S1	thinking independently
S2	gathering information
S3	evaluative thinking
S4	perceiving patterns
S5	explaining phenomena
Attitudes	Evidence of positive or negative attitude:
A1	self-efficacy attending to health issues in their lives
A2	intentional statements to address the health issues
A3	engagement (or interest) expressed in science learning

As in the previous year, data on behaviors and interactions between students and peers, and students and teachers (as observed and journaled by the researcher), were coded according to the following outcomes and sub-outcomes:

Table 3. Student/Teacher outcome codes.

Code	Description
Course Program	
C1	Attending (paying attention, listening, following along)
C2	Narrative engagement (story sharing, personal experience)
C3	Distraction (lack of attention, off-topic discussion)
C4	Scaffolding (helping others, shared reasoning through problems, building on what others say or do)
C5	Defiance (disturbing others, challenging direction, redirecting to unrelated content)
Student Actions	
S	Independent action/reaction
I	Interaction with teacher
T	Interaction with other student(s) (talking, nudging, writing, answering question, laughing, etc.)
Teacher or Other Adult Activity	
D	Direct instruction (talking, questioning)
F	Teacher as facilitator (guiding, assisting, etc.)
O	Teacher observing students (hands-off, no intervention)

### Analysis

A narrative inquiry approach was used to analyze the educational experience of teachers and students (Clandinin, Connelly, 2000). Researchers were looking for patterns and exceptions to teachers presenting information, helping students retain and reason out the information they needed, and promoting the behaviors and attitudes needed both for learning in class and for advocating for their own health. This included if and how the teacher was scaffolding the students' learning; the context in which learning took place and its impact on the learning process; how the students were responding to both the content and the pedagogical approach of the teacher in presenting it; what the students said they were learning; and classroom deportment. We specifically listened for analytic and synthetic thinking, for instance, were students making connections between vocabulary words, science concepts, and their own lived experiences, and could they take that information and use it to influence healthy behavior for themselves and their families.

## Results

The five classes were observed on different days, with two of them taking place at the end of the year, after testing was over. Four of the modules were covered by two teachers: sickle cell disease, obesity, sleep, and asthma. Bullying was not taught by any of the teachers this year although two teachers said they wanted to but didn't have time. Testing and snow days were the two cited reasons for lack of time. Prior to teaching the "Being Me" modules in 2014, four of the five teachers had attended training at the CNMC-based Institute in the curriculum; the other teacher was briefed on the curriculum and materials prior to teaching the module. Only one teacher had prior experience teaching the module observed; that teacher taught it the previous year but changed it *from a large group to a smaller group format so students were more talkative*. In all but one case, "Being Me" kits were missing items (or entire kits were missing) so that teachers had to borrow the items from other classrooms or improvise by supplementing their lesson with other materials. Class time varied, sometimes unpredictably, as when assemblies were called or cancelled unexpectedly.

Table 4. Observation and familiarity with "Being Me."

School District	Anne Beers DC	J.O. Wilson DC	Whittier DC	Seat Pleasant PGC	Robert R. Gray PGC
Grade	4	3	3	3/4	3-5 Club
Module Taught	Sickle cell disease	Asthma	Obesity	Sleep	Asthma
Yrs. Taught Module	1	2	1	1	1
Years Teacher in Prgm.	4 <sup>1</sup>	2 <sup>2</sup>	1	2	1
Training Kit Access	Instit. Inc	Instit. <sup>3</sup> Yes	Instit. Inc	Curric Inc	Instit Inc
time	1 hr 40 min <sup>4</sup>	55 min	50 min	1 hr 20 min <sup>5</sup>	1 hr
Date Observed	6/17/14	5/14/14	6/12/14	2/21/14	1/28/14

<sup>1</sup> Taught third grade in previous years; <sup>2</sup> Taught same topic previous year; <sup>3</sup> Trained between first and second year; <sup>4</sup> Expected to have 30 min but started early and extended it to 100 min. <sup>5</sup> Came back for 15 min discussion after unexpected assembly.

## CASE STUDIES

### Anne Beers (Grade 4): Sickle Cell Disease

The fourth-grade teacher at Anne Beers prepared the whiteboard ahead of time with materials relating to the day's lesson on the blood (sickle cell disease). On it were: 1) A 'warm up' exercise - *What are the functions of the circulatory system?*; 2) Objectives of the day - *By the end of the lesson, you will be able to: a) identify parts of the blood; b) explain functions of each part of the blood*; 3) Materials needed for the hands-on experiment; and 4) The 'roll-out slip' which students would answer at the end of the day: *What do you think would happen if your blood did not have any plasma?* What are the reasons for your answer? All of this had been quickly assembled because the material (pig's heart for dissection) for the originally planned lesson was not available. While the teacher had the materials for making blood plasma (today's alternative experiment), the teacher had also improvised and added an animated video on the blood, a rap song entitled "Circulation Is the Name of the Game," and slides on circulation to the curriculum (Figure 1).

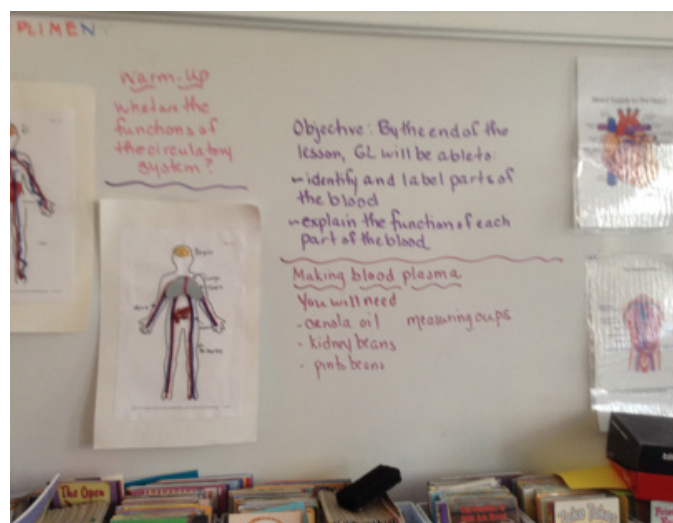


Figure 1. Focusing the lesson on circulation.



## Knowledge and Understanding

While the teacher did not discuss health behaviors in this day's class (the module covers several days), the observer asked the students, *What did you learn new about blood cells and what could you do to stay healthier?* A student responded, *I didn't know we had red and white blood cells. I didn't know we had so many things inside us. I didn't know what happens when we breathe. I didn't know valves (in our hearts) went "thump, thump, thump."* Other students mentioned that if they take care of their body, they will stay healthy, but white blood cells will help them get better if they get sick or hurt. *I will try not to hurt myself because white cells would have to work harder,* said one. Another student added that they were learning about *what the blood does and why they have sickle cells in them. We're learning about the heart and how the body works. I knew that white blood cells help the body and red cells bring oxygen.* (As pointed out by another student, she knew this because they and another student went to Dr. Bears Cub's summer camp the previous year and the topic was sickle cell disease.) A different student volunteered, *White and red blood cells float in plasma. Another added, If you don't have blood plasma in your body, you need water. It has 90% water. A third study contributed, I'm learning about red and white bloods cells and capillaries and veins and how we'll die if we don't have plasma.*

They also mentioned eating healthy foods and getting exercise as ways to stay healthy (K1, K2, K3). Students also told the observer that they shared information they learned at school with their families, such as the parts of the body, what blood is made of, the role of white blood cells in fighting infections, and not to eat junk food.

## Evidence of Science Skills Development

Throughout the class, the teacher was helping students to hone their science inquiry skills. They wrote in their journals about what they remembered about circulation the day before (S1, S5) and, as they wrote, they listened to a rap song on circulation for information they might have missed (S2); and then they discussed as a group the concept of blood circulation, with each student adding on (with teacher encouragement) to what the previous student had said. Then the teacher added new material – the parts of the blood and asked the students what they noticed. He called on different students to describe the differences in what they had seen between red and white blood cells (S1, S4) and asked other students to read aloud from the text about the functions of each. The students learned the word "hemoglobin" and were encouraged to practice pronouncing it. A student inquired, *Why do we need white blood cells if we have red?* Another student answered that *white ones help with infections.* The first student, still investigating the role of white blood cells perhaps

from personal experience, persisted, *What if the infection is already there and white tries to make it go away but it's still there, why do we need white?* (S1, S3).

The teacher showed a film clip about blood transfusions and again asked students what they observed. Students didn't quite understand the significance of transfusions, suggesting that the patient should get a new heart, which is technically right but not the point the teacher was trying to make. The teacher then segued into antigens in the blood and the composition of blood plasma. He again tested the students on their retention of the blood parts (D, F) which they answered in unison. Students conducted an experiment approximating how red and white blood cells move through plasma (beans in oil) and then answered the roll-up plasma question in their journals (S1). In follow up questions by the observer, the students indicated that they can identify the parts of the blood and explain the functions of red and white blood cells and have a rudimentary understanding of the life-sustaining transport role of plasma and of its water composition (S1, S3). One student mentioned that he observed that the beans (R/WBC) moved more slowly without oil and that they moved more in fluid than air (S1, S3, S5).

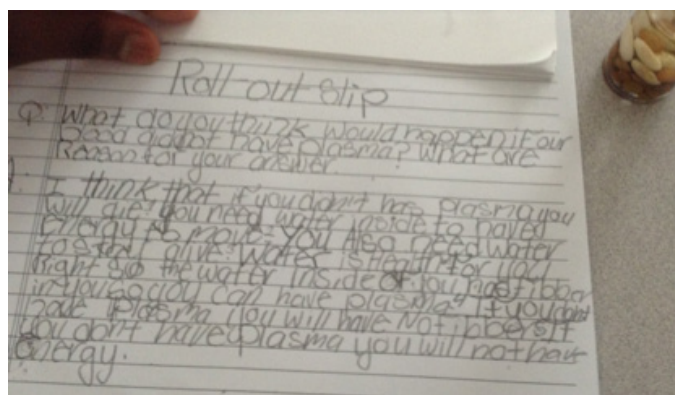


Figure 2. Student perspective on blood flow.

## Attitudes and Behaviors

This class appeared quite keen on learning science, as indicated by their readiness to begin class. Throughout the almost two-hour session, students were engaged, excited, attentive, and eager to participate. All hands went up to answer questions posed by the teacher and to share their work (A3, C4, I). They concentrated when writing in their journals, were focused when doing experiments, and interacted with their teacher and peers when appropriate. Except when leading the students in discussions on what they saw, the teacher walked around quietly observing but not interfering (S, O).

Although there was one special education student in the class, it was not obvious to the observer, as all students participated. The teacher encouraged each of the students to respond and others to help a student out by building on what s/he said (C4, T). The teacher was constantly asking, *What do you think of this? or, why do you think that?* and scaffolding their learning using various media (F). He commented that he likes to leave students hanging and come back to the topic again the next day; they are more excited to come back to it (A3).

### Teacher Interview

In an after-class interview, the teacher responded that he thought the entire “Being Me” program was applicable to his students and the circulation module definitely went along with the unit. In particular, he thought the interactive, hands-on, and collaborative aspects of the modules worked well. He added that various parts of the health curriculum spilled over into other subjects, besides science, such as liquid measures in math or in language arts when students learn new complex vocabulary words and read complex text. If he were to change anything, he would make modules about 25% leaner in order to fit into the schedule. As it is, he noted, *I don’t put everything into the lesson because I’d have to juggle time to incorporate it. However, I have it on-hand in case the students ask about it.* Would the program work elsewhere? To that question, he was non-committal, explaining that *notices would have to go out and kids involved for it to work.* Overall, he said it is a great program; the kids enjoyed it and they learned (A3). (Of note, this teacher is not a science teacher, but rather teaches all subjects, and science gets woven in. Until this year, the teacher, trained at the Institute on the “Being Me” curriculum, was teaching third grade.)

### J.O. Wilson (Grade 3): Asthma

The class was taught in a bright, colorful room, decorated with student work and instructional material related to math and science. On a table were models of clay lungs the students made in an earlier session on asthma. The students were seated at three long tables for their 45-minute class—they just completed a 90-minute math class, no break—when the “Being Me” workbooks were distributed. The teacher began the “Being Me” program by asking what they discussed about asthma the last time. After one wrong guess, a student suggested, *Triggers*. The teacher asked, *What did we discuss?* To which all students repeated in unison, *Triggers*. He then passed around a bag of items and asks each table to pick out two items, and discuss them amongst themselves for ten minutes.



Figure 3. Materials for the asthma triggers lesson.

The noise level was relatively high as students engaged in a lively discussion about “their triggers” (T). The teacher circulated between the table to encourage discussion of what students learned the day before about the *lungs, trachea, and bronchiole* and what happens when someone has asthma (I). A few students shared their triggers with their classmates. One student mentioned mucous buildup from dog fur. Then, the teacher interrupted to elicit feedback on what the students were supposed to know, using Q&A: Teacher (T): *What happens to the asthmatic bronchiole?* Students in unison (Ss): *It gets smaller.* T: *What else?* Ss: *It’s inflamed.* T: *Whenever something gets into the body it doesn’t want, it builds up...* Ss: *Mucous.* T: *Mucous build-up makes it hard to...* Ss: *Breathe.* T: *When smoke gets in the lungs, is mucous produced because of smoke?* Ss: *No.* T: *No, because mucous builds up because of things you can touch. Smoke gets in the lungs.* Then more students presented their triggers (fumes from cockroach droppings, dust from bird feathers, fur or dander from dogs) and incorporated whether there was mucous build-up or it goes straight into the lungs into their presentations.



Figure 4. Student work exploring asthma triggers.

After the “trigger” discussions, students moved directly into making “trigger” bracelets, using three beads (triggers) to create a pattern that would help them remember the triggers. A short while later, another teacher came into the room to discuss asthma and her own triggers. This provocative encounter produced a lively discussion, demonstrating students’ mastery of how the major triggers for asthma impact others and how students could work to help asthma sufferers avoid these situations. Unfortunately, the time did not permit students to finish their bracelets before the next class.

### Knowledge and Understanding

During the class on asthma, the teacher used a scaffolding approach, leveraging various techniques; group and small group discussion; individual student presentations on observations of objects, collaborative work on the art project; efforts to connect the main lesson to various asthma triggers; and a guest’s personal testimony about their own experience with asthma.

Students presented their thoughts about how things in the environment might affect a person with asthma and their own experience with these possible triggers (fumes vs. tangible objects). Smoke, fumes from cockroach droppings, bird feathers, dog fur, pollen, and pollution were mentioned (K1).

The observer’s questions about what students had learned about asthma elicited a great number of enthusiastic responses. One student said, *When people smoke, you breathe it in and it causes asthma.* Another student added, *Seeing symptoms of what feathers*

*do; they collect dust and that makes mucous* (K1). Smoke and cockroaches were also mentioned as important environmental triggers (K2). When asked about what they might tell their families to do, *no smoking and stay away from cockroaches* were the most frequently mentioned activities for staying healthy (K3). The observer felt that the questions only touched on a portion of what the students had learned through their group discussion.

### Evidence of Science Skill Development

Students were asked to take what they had learned about triggers and observe certain environmental irritants, and then make individual presentations about what the object was, what it represented, and how it affected the body. They used S1 through S5 behaviors (thinking independently, gathering information, evaluative thinking, perceiving patterns, and explaining phenomena). For example, one student presented, *This is a dog collar and it represents a dog. The dog’s fur gets in your lungs and produces mucous.* While not exactly correct, the teacher then spent ten minutes with the students discussing the difference between fumes getting into the lungs and tangible substances causing mucous build-up. The students then correctly included this new information in their presentations, so everyone understood what was happening in the body.

### Evidence of Positive or Negative Attitudes

As explained in the Knowledge and Understanding section, students were quite clear that there were things that they personally could do to mitigate triggering an asthma attack (A1, A2). While not all the students had asthma, all were highly engaged in learning about it and excited to share what they knew with other students, the teacher, the observer, and the guest. Many of those that did have asthma told their teacher they took the information home and told their parents (A2). The students, in general, were in the early stages of science learning, and the building blocks for observing, evaluating, and explaining were being forged, and most importantly, they were enjoying the process as they eagerly learned new vocabulary, parts of the body, and how their bodies functioned (A3).

### Student and Teacher Behavior Codes

The students were louder in this class than other classes observed at other schools. The teacher continuously called out various individuals, politely asking them to pay attention and focus, and always thanking them. Despite the occasional distractions, overall, students were respectful to the teacher and one another and directed most speech to each other and the teacher on the topic at-hand (C1, C3, C5, I, T behaviors). None got unruly, which was not the case last year when he taught the same course. Then, several students had

to leave the classroom, according to this year's observer who also observed his asthma class last year. This year, kids were noticeably excited to learn and proud of what they had learned. Some of the instructor's efforts appeared to have created a calmer, more engaged classroom of eager science learners, including:

1. Greater familiarity with the topic, having taught it once before: *The second time doing it, you get a sense of what works, not works and have time to prepare. It's important to know what to expect, how the lesson will flow;*
2. Being more comfortable with the science: *I learned a lot of vocabulary that I was not accustomed to use and could expose students to. The lesson on lungs, so just knowing the windpipe is called trachea and I learned about bronchiole...Helpful to me as a teacher and so kids could learn it as well;*
3. Using different learning strategies: *Once you do it once, you can see where you can make adjustments to fit the need of students. Since I did it last year, instead of doing it with a large group, I did it with smaller groups so they were more talkative (D, F);*
4. Getting training at the summer Institute before the second year: *I thought it made a difference. I could talk to the experts about project-based ideas that I could implement in the classroom;*
5. Using art and hands-on activities: *The module has definitely increased students' interest in learning about science. It has a lot of hands-on and a lot of activities integrated with art. Kids get excited about hands-on and art. They were really excited about the pig's lung; and*
6. Making connections to other science learning: *When talking about animal life, they could make a connection to that. Asthma is a disease {sic} of lungs, so animals have lungs, too. It connects to life science and body parts as well...The connection was made when comparing lungs to a sponge;*

#### Teacher Interview (not-reported in the previous section)

In general, the teacher thought that it's a really good program. Very hands-on. It allowed kids to see things they wouldn't normally see if the program didn't provide those materials and it's a good idea to integrate art into the curriculum because it's reaching kids on a creative level. He felt that the program could be expanded by recording and streaming some of the training at the Institute, and also training teachers to train other teachers. It could also be provided in medical settings, boarding schools, summer camps, or even to young athletes. An ideal class time would be 90 minutes.

#### Whittier (Grade 3): Obesity

The class was in a bright, colorful, somewhat cluttered room, with lots of student work decorating the walls. In the front corners were

two desks piled with teaching materials and off to the side of the room was an anatomical figure displaying internal organs. At the appointed time, all students were seated, looking attentively at the teacher and the slides on the screen. To start, the teacher distributed printed materials and announced that the topic of the day was the "capacity" of the stomach to hold liquids and solids.

The teacher used a Q&A approach to teaching. The opening questions were: *What is "capacity"? What does obese mean? What causes people to be obese?* Students responded until someone got the answer right: *Eat fast foods.* Teacher: *I like that choice of words. Eat unhealthy foods.* Students snapped their fingers in agreement.

The teacher encouraged students to use the new vocabulary words and talk in whole sentences. She carefully helped to scaffold their thinking about the digestive process. *What is popcorn? Food. What does food give us? Energy. Now let's eat the popcorn. What's happening in your mouth?* Her efforts produced a variety of enthusiastic and rapid responses. *Once you eat the popcorn, what do you think is happening in your body? This is tied back to our objective boys and girls...I like that your hand is up, I haven't heard from you.* In general, the vast majority of students answered correctly about the asthma triggers and impacts.

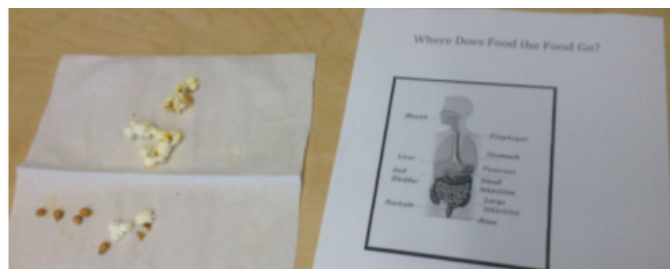


Figure 5. The popcorn exercise.

The teacher provoked thinking about the impact of popcorn by asking what "it meant," coaxing them to verbally describe their reasoning process until a student found the correct answer. The teacher then rewarded that discovery by adding a "Fun Fact" that she found on the Internet. *What happens when you eat upside down?*

*How much do you think the average person can put in their stomach?* She kept pouring liquid into a beaker until students told her to stop. She then led them to the concept of food turning to liquid and how it is *absorbed* into the body. *What does absorption mean?* (She used a paper towel to *absorb* water so that students understood the concept.) She told them that when a person eats, their stomach expands. She tried an experiment with a bottle and balloon to



illustrate *capacity* but there was leakage and the experiment failed. The students' enthusiasm was not dampened.

The teacher said that the stomach of an average adult can hold about a liter of liquid until it reaches *capacity*. She then poured a liter into the beaker and students realized they were wrong when they told her to stop pouring earlier. Curiosity piqued, a student asked, *How much does an oversized person hold if an average person holds a liter?* (The teacher did not know the answer and responded that she assumed they eat over- capacity, and quickly moved on.) The students continued to ask questions, raising their hands, and listening to their classmates, but for the most part there was little time for discussion or to answer the students' many questions.

### Knowledge and Understanding

When asked what they learned, the students cited a number of health-related behaviors that can affect the body and what they could do to stay healthy. These included, *I learned you can get overweight by eating junk food. I learned you can't eat a lot.* Other students added, *If you don't chew your food, you will choke. The stomach will hold a liter of liquid. Walk everyday and exercise.* While they didn't mention stomach expansion, the health message was clear: if you eat too much, you'll become overweight and need to exercise. The information the students provided indicated that they accumulated information from one or more prior lessons (either in this class or elsewhere) as many of the comments were not specifically mentioned in the observed day's lesson (K2, K3).

### Evidence of Science Inquiry Skill Development

The students clearly absorbed the lesson. They learned new vocabulary words (capacity, digest, absorption, and saliva) and concepts (anatomical digestive pathway). *I learned how food is digested and turns to liquid or Even though you're upside down, food can still go to the stomach or I learned that food goes into the esophagus and gets broken up into smaller pieces and digestion starts in the mouth* (S2, S5). They also learned to use information to form new questions, such as when the student asked, *If an average size person's stomach holds one liter, how much does an oversized person's stomach hold?* (S3) Other students also had questions but there was no time for discussion, and the teacher was unsure how to answer the student's question, *Probably the person eats more than capacity.*

Beyond science, the lesson spilled over into language arts. Students, adhering to the teacher's request, spoke in full sentences and used the new vocabulary words correctly.

### Evidence of Positive or Negative Attitudes

As mentioned in the knowledge section, students understood that overeating and eating junk food is problematic, as is not getting adequate exercise (A1, A2). Whether they got this information from the "Being Me" program or from a Wal-Mart program on eating healthy and exercising that was also taking place in the school was unclear. In this lesson, although the topic was obesity—and the teacher by her own volition told the students that she would be considered obese—the discussion and experiments did not bring the lesson full circle back to the topic of obesity.

When the teacher was asked if the students' interest in science had improved as a result of the "Being Me" curriculum, she responded that she didn't know because it was *too short a time*. Although they were engaged and interested, and wanted to continue the curriculum the next day (A3 students), she didn't know how (science interest) might carry forward since the third grade curriculum was about social science, not science. She claimed she was *not well versed in science*. There were also no handouts or note-taking by the students to enable them to remember the lesson (A3 teacher).

### Student and Teacher Behavior Codes

Throughout the class, although students were seated the entire time, only rising occasionally as their hands were raised, there was no fidgeting, goofing around, and only minimal extraneous conversation. The teacher did not need to discipline them. They were alert and engaged, and clearly interested in what they were learning (C1). The teacher's style of teaching was a tightly structured Q&A, with her leading the children's learning in small steps, and her doing the experiments for the students to observe (I, D). Other than a visual of the esophagus, which she had printed off the Internet because the model in the kits was missing, there was no handout and no note taking. However, the students learned and were excited to learn.

### Teacher Interview, Additional Information on Curriculum and Expansion

Overall, the teacher thought the curriculum was relevant, noting that she observed children not moving around a lot during their day (one theory was because of video games), and they were choosing sugary drinks and unhealthy food in the cafeteria. The lesson addressed these real world problems.

Time, as was common across the entire program, was a critical issue for this teacher. She couldn't teach as much as she had wanted because she had to add to the lesson to scaffold children's learning, knowing they didn't have the requisite background. When asked if the lesson needed to be abbreviated, she said that it was up to the

teacher to decide whether to carry over the lesson to the following day. Earlier in the year, she was constrained by the third grade curriculum, which was focused on social studies, not science. When asked if any of the health science elements that could be weaved into other curriculum, she responded, *I would have to research and study it because I'm not versed in science.*

The teacher acknowledged how engaged and interested her students were in the science class, but indicated that she would not encourage their interest beyond this lesson. Obesity was a topic that interested her personally, but her hesitation to include science in her curriculum was twofold: first was a discomfort with science; and second was the very structured, albeit scaffolded, pedagogical approach (in contrast to science being exploratory). This was not to say she didn't like the program. She had seen the youth camp when she did her Institute training, and thought it was fantastic, but suggested that it would best be handled by the "Being Me" team, either at the Camp or in general assembly like the Wal-Mart program, in which the teachers serve as assistants, rather than as presenters.

### Seat Pleasant (Grades 3/4): Sleep

Visitors were welcomed as soon as they stepped foot on campus and throughout the school. The classroom echoed cheerfulness; it was large and bright, with posters, charts and students' work adorning the walls. The only thing that interrupted this apparent calm was a continual series of PA announcements throughout the day. On this day, an unexpected assembly that had been cancelled twice before due to snow had been rescheduled for the same time as the "Being Me" lesson. To compensate, class began early while some students finished their breakfast. Students were seated in groups of three to six at large rectangular tables, and computers were at the far end of the room.

After requesting students clear their desks, the teacher drew from an earlier discussion on how much sleep they needed, leading with the question, *Why do we need sleep?* The teacher wrote the students' responses on the white board until there were a variety of answers. The students were then asked to provide "sleep stealers" or "sleep promoters:" which were also written in large format and hung on the wall. After an animated discussion, the class was divided into three groups: one group wrote down some "sleep promoters" on glow-in-the-dark stars; another played a card matching game that paired "sleep promoters;" and a third group completed self-directed work in math and science at the computer. Two aides assisted the students. After a period of time, students rotated positions, orderly and quickly.

### Knowledge and Understanding

Answering the question about why we need sleep, students mentioned, *To give us energy. So we can grow. So we can do well in school. So our brain can remember things and we can learn new things the next day* (K2). Pulling largely from their own personal situations, students, with additional input from their teacher, noted a great number of sleep stealers affecting their sleep habits and therefore their performance in school. These included: *noise from the TV and family, light, nightmares, dogs or siblings climbing into their bed, phone calls, TV, computers, cell phones, and tablets* (K1). When eliciting possible solutions, several students mentioned TV as a sleep promoter. Surprised, the teacher asked for a show of hands as to how many agreed. Unexpectedly, many hands shot up and a discussion ensued, with students giving their reasoning for TV helping them fall asleep. In the end, it made both columns, with a promoter being a *boring or relaxing TV show*. Other promoters mentioned were: *darkness, reading a book or magazine, comfy bed, eating a snack (granola bar, ice cream, chips), taking a shower or bath*. The teacher mentioned *going to bed at the same time every night* and asked whether it's a stealer or promoter. The students reasoned it out as a promoter.

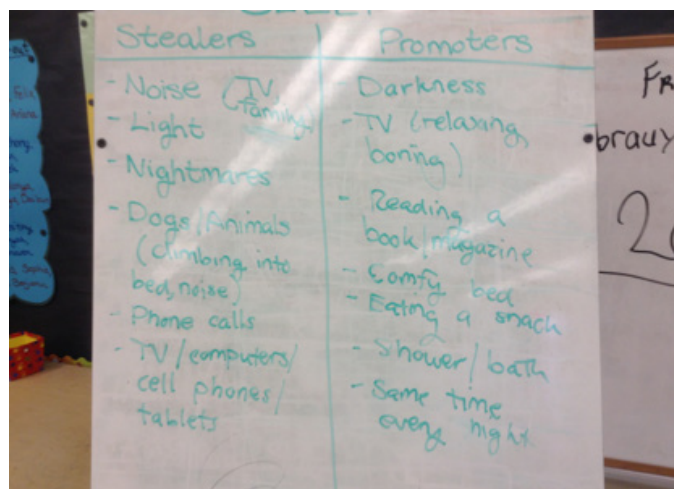


Figure 6. Student chart of sleep inhibitors and promoters.

The discussions indicated that students were aware of how their environment affects them and what healthy things they could do to address the situation (K1, K2). In some of the situations, it was unclear how much control students would actually have over their environment, but there were some notable examples of intended action students would take to help them fall asleep, such as *take a*

*hot shower, read a book, or go to bed earlier.* One student said he puts on the TV, which at first blush seemed counter-productive, but he explained that he did it because his older brother is noisy when he comes into the room, and the TV keeps him quiet (K3).

### Evidence of Science Inquiry Skill Development

During the discussion on sleep promoters and stealers, students were gathering information (S2) and evaluating whether watching TV helped or hindered sleep and what effect going to bed at the same time had on sleep (S3). In terms of actual accumulation of science knowledge, as compared to health behavior, there was little discussion in the observed class, but connections to the brain, learned in an earlier lesson, were made.

### Evidence of Positive or Negative Attitude

In general students were predisposed to do something to help themselves fall asleep, such as go to bed early, read, or reduce the noise level (A1). They also offered a few suggestions for getting family members to sleep. One suggestion was to *get my sister (age 5) so tired she'll fall asleep* (A2). Another more improbable one was to *give my mom some ice cream so it will make the baby relax and Mom will be able to sleep at night*. In one instance, a student relayed what seemed more like what he would *like* to be a sleep promoter rather than an actual sleep aid when he said he would *watch a really good TV show for an hour and then a boring one for an hour*. It did demonstrate, however, that he was applying reasoning skills. Also, the teacher was receiving feedback from families, demonstrating that the family conversation about sleep was starting to happen.

The students were animated during the open discussion and quietly focused for the breakout groups. Based on the promoters they wrote on their stars, most, if not all, of the students had learned the lesson for sleep aids. However, one student had written *tablet* on his sleep promoter star, and when queried indicated he considered it a promoter. Whereas the observer thought he didn't understand the lesson or was ignoring it, it's equally possible that this student was using his independent thinking skills to relate to his own personal situation, rather than rely on the teacher's addition of electronics as sleep stealers (A1). Perhaps at this age, electronics don't have the same impact as they do later in life.

There was little in this observed exercise to relate directly to science (A3), but comments by students to the teacher's question at the beginning of the lesson, *Why do we sleep?* indicated that students related the current exercise to an earlier science lesson (*so our brain can remember and we can learn new things*).

### Student and Teacher Behavior Codes

Students were attentive, engaged, and focused on the activity at-hand (C1). They shared their personal stories for reasons why they couldn't sleep and aided one another in coming up with solutions (C2, C4). During the breakout groups, students were mostly engaged in independent work with the art project and on the computer, but they also interacted with each other playing the card matching game (S, I, T).

For the most part, the teacher took an inquiry-based approach to teaching. He teaches science 90 minutes every day, and clearly wants his students to like science. He tended to use the *I do it, you do it, you do it approach* in which he models the type of answers he's looking for, then has students as a group come up with their own answers and reasons to back up their response, and then independently do the exercise (F).

### Teacher Interview about Curriculum and Program Expansion

The teacher initially thought the topics of the "Being Me" program were a bit specific, albeit relevant to his students. Once he got into them, he also found them very relevant to the science curriculum, especially sleep when it dealt with how the brain works. (He did not have a lesson plan for sickle cell disease.) Although he hadn't taught all the modules in the two years he's been with the program (only asthma and sleep), he thought they were *enlightening, and heightened student excitement and engagement with science*. As an example, in the sleep module, he said that it *blew their minds to learn how much other animals slept, such as the albatross sleeping while flying 125 miles an hour*. This fun fact enticed the students to look up *albatross* because they didn't know what it was.

There were other things he liked about the "Being Me" curriculum. Although he personally had to piece together what he was supposed to do from half a kit left by a prior teacher, he liked that the kits made it easy on teachers by supplying all the materials. Secondly, he liked the flexibility of the lessons, with each lesson having activities that were for independent, whole, or small group learning or for homework so that teachers could choose whatever worked in their rooms. Third, he really liked the game aspect of an activity that crossed over into math. In the flamingo game, students would calculate how much sleep they got, based on when they went to bed and when they got up, and match that to how much they were supposed to get. Then they would hypothesize that the more sleep they got, the longer they could stay up on one leg, with the long sleepers doing very well. (Of note, when his students were asked in the observed class whether the kid who only slept an hour stood for a long time or short time, they didn't know and when stated



differently, none of the students could reason out the answer. Thus, it appears that the understanding, if any, of the correlation between sleep and focus was short-lived, and needed to be revisited.) Fourth, he liked that the scientific method was embedded in all the lessons. In the asthma model, for instance, a matter (borax), mixed with liquid, went through a chemical process to become “snot” and then it underwent a physical change in the trachea (straw) when it got blocked up by the “snot” packed inside. When kids tried to breathe through the straw (trachea), they got a sense of what it was like to have asthma.

What would he want that he didn’t have? He would like more scientific activities that the students produce themselves. He also would like a way of measuring what they were learning, even a few questions. *Students may know how something felt, or be able to describe how it affects them, but don’t necessarily know what asthma is.* Whether this was a curriculum issue or that he didn’t work on the lesson long enough, he couldn’t say. He just needed a way to assess what they learned from a lesson.

Has the “Being Me” curriculum better prepared him as a teacher? His background was not in science, so he had to prepare himself to teach science. What the “Being Me” curriculum had done was *show him, with a lot of great examples, how to make health science enjoyable, engaging, whether or not I used the “Being Me” curriculum.*

If he had to describe the “Being Me” program to someone unfamiliar with it, he would say, *It’s miles and miles away from what book health is supposed to do and is what is assigned by the county. It’s more engaging and collaborative with students. They get to do lots of fantastic experiments that are well thought out. The ones out of the textbook are fun and exciting too, but sometimes it’s a stretch to get back to the curriculum. What I really love about the “Being Me” experiments is that they are really focused strategically on teaching students what they are supposed to learn. It’s objective driven.* While he thought the behavior of the students was about the same as with other standard science or health curriculum, he felt that if they did get out of their seats during a “Being Me” lesson, it would be because they were excited, not because they were restless.

He did not know how to expand the program outside of school. Within school, train more teachers. They are always looking for professional development opportunities. Off campus, he said there’s a rec center across the street and a smaller day care center, albeit small in numbers. He said, *most kids go home.*

### Robert R. Gray (Grade 3-5, Afterschool): Asthma

The room used for the afterschool “Being Me” program was large and cheerful, reflecting its primary function as the Kindergarten classroom. The chairs seemed relative low, but most students seem relaxed and didn’t seem to mind the configuration. The students ranged in age and academic ability, but all appeared alert, excited about the class, and were prepared to participate.



Figure 7. Classroom setup for the asthma class.

The class began with students taking turns blowing up an asthmatic lung and observing what happens. Then the teacher announced that today they were going to talk about asthma and what triggers asthma. A student recited her personal experience going to the hospital after an asthma attack, and when asked, told students what tool the hospital gave her to address her asthma and caused the attack. The rest of the class was focused on various asthma triggers, with the teacher alternating between asking the students what triggers asthma and giving them some extra information. After each short discussion, she asked them to write the answers to: 1) What happens when the air is not fresh? (Students mentioned *you are uncomfortable, can get dizzy, hard to breathe*); 2) What triggers an asthma attack? (*Pollution, pollen, air freshener, bleach, dog hair, perfume* were mentioned); and 3) What things are harmful to the environment? (*Pollution, pollen, and ducks* were mentioned). She then had them make a trigger bracelet, after which each student discussed what the beads on his/her bracelet represented. Generally they included pollen, sports/exercise, smoke, and animal hair.



Figure 8. Friends display their completed asthma bracelets.

### Knowledge and Understanding

When the observer asked the students what they learned that was new and what they could do or help their family to do to stay healthy, collectively and individually the students confidently offered many correct strategies. This discussion demonstrated that they had learned new triggers that impact asthma sufferers. Environmental triggers named by the students included animals, excess heat, cold, smoke, sun, pollen, bleach, petrol, some allergies, hairspray, perfume, and bus fumes (K1). They also demonstrated that they understood that certain behaviors affected the human body, offering examples including running and smoking (K2).

Similarly, they could relate actions they or their family could take to improve health outcomes. Responses included, *Pollen is not good for you. You shouldn't be around people that smoke. If you see someone smoking, walk away from the smoke. Keep house clean. Don't spray too much perfume on you when you're going to the mall. Stay away from animals because they have dust mites and dandruff. I would tell my little brother to stop running so much. Don't use hairspray* (K1, K2, K3). An earlier lesson with pig's lungs and the difference between a healthy lung and a smoker's lung (black) made a huge impression on the kids as many mentioned that they would tell their family *no smoking* and *stay away from smoke* (K3).

### Evidence of Science Inquiry Skill Development

Students took the lesson they had learned and made bracelets with the beads, patterning each to represent a different trigger (S1, S4). They then presented their bracelet to the other students and teacher, explaining what each bead represented (S5). They also correctly answered the teachers questions about what the trachea is for (*breathing*), why one lung is smaller than the other (make room for the heart), what they breathe in (*oxygen*) and out (*carbon dioxide*), and what to do with someone who has an asthma attack (*get them to the hospital*). They also answered that asthma is not a disease but caused by swollen lungs (sic) and that the lungs are different sizes (S5).

As the students thought about what they had learned, it sparked their curiosity to want answers to other science questions they had. One student said, *I want to know more about triggers so I can be more cautious*. Another wanted to know, *Why do both lungs blow up; why not one at a time?* A third student said he wanted to know *does smoking affect your brain?* Another question was if you hurt yourself and you're sick, *would you get very sick if you have asthma?* To a student's last question, *can people with asthma smoke?* the student with asthma knew the answer. *No*, she said, *because I have asthma and it triggers it* (S1).

### Evidence of Positive or Negative Attitudes

The students in this after-school class were very earnest in wanting to stay healthy. One student with asthma, in particular, wanted to learn all that she could to prevent another asthma attack on top of the five she'd had already (A1). As demonstrated in the section on Knowledge and Understanding, students could name a number of things they or family members could do on an individual basis to address asthma, including not smoking and keeping the house clean and free of airborne allergens and fumes (A2). They were eager science learners and wanted to learn more, as evidenced from their behavior, the many questions they had, and their expressed interest in coming to science club (A3).

### Student and Teacher Behavior Code

The students in this class were absorbed in the lesson, listening to the teacher, sharing their own personal experiences, and building on what others said before them (C1, C2, C4). Generally, it was a teacher-led discussion (D), but all the students took their turn explaining their bracelets, listening to each other's responses (S, I). On one occasion, when a younger student contributed *eat healthy foods* to the discussion on healthy practices, the older students applauded him with *Good job!* (T).

### Teacher Interview

This teacher was surprised at how many people have asthma and everyday health issues, and was appreciative that the “Being Me” program helped them to explore the issue and discover ways to prevent or stabilize their condition. In particular she thought the obesity module (although she hasn’t taught it yet) was the most critical issue because of the large number of obese children and the lack of exercise during the school day.

She was sure that the “Being Me” module had increased the after-school students’ interest in science because they kept asking her when they were coming to club again. And, she felt more prepared to teach it now that she had additional knowledge. They were eager to do the activities and “touch the stuff.” *This program gives them an opportunity, that’s not standardized testing, to explore and touch and do and learn through their own ways*, she explained. Hands-on is the critical component, and because of that she thought it worked equally well for older and younger kids, and kids with different academic capabilities; *it was about learning, not testing with right or wrong answers*. If younger children needed assistance with writing, she could help them, and there were pictures that could help their learning, too. With respect to the asthma unit (the only one she’s taught so far), she thought it was beneficial to have someone with asthma share his/her experiences; it made it more real for the other students and made them all think.

When asked how the program could be improved and scaled, she thought that despite not having some of the supplies for the lessons, it went really well. She liked that all the lessons were hands-on and had products that the kids could take home, touch, and continue learning. The only suggestion she could think of was for the kids to make packets of printed materials that they could take home as homework. As for other places to scale to outside the classroom, she thought churches, libraries, and summer camps were potentially good locations.

### DISCUSSION

All five teachers found the lessons important, applicable, and aligned well with the Core Curriculum. For instance, at Anne Beers, the teacher said that circulation went along with the unit, and found both the obesity and sleep topics relevant to the students (and the latter to him as well since he has sleep apnea). The bullying curriculum got them excited and to think differently about what happens online.

All five teachers also thought the curriculum added to students’ interest in science learning; the proof being the eagerness with

which students wanted to come to class and start on time, and the level of engagement in the classroom. Put more succinctly by another teacher, *Kids enjoyed it and they learned*. One teacher noted that the “fun facts” were super for getting kids, as well as teachers, interested in science. Teachers also noted that they learned something new, too.

Teachers also appreciated that the curricula encouraged interaction between them and their students, and the students with each other, and that it entailed hands-on activities (hands-on being the most critical component).

Another point of agreement was the flexibility built into the curriculum. One teacher talked about how it *worked equally well for different age groups and different intellectual levels because there are no right or wrong answers; it’s about learning*. A different teacher liked its flexibility in terms of being able to pull different items that could be integrated with other materials, and a third teacher liked that it was adaptable to both large and small group learning situations.

Although teachers had different pedagogical styles, background, and comfort level in science, and access to different materials, students learned from and were engaged by each of them. What mattered most was the curriculum, the teacher’s ability to scaffold their learning, and to a lesser degree his/her resourcefulness in providing alternative resources if support materials were missing.

The major challenge to all the teachers, except the afterschool teacher, in implementing the curriculum was time. Snow days and test preparation consumed their time until after testing season was over. Contributing to this already shortened span of time to implement the lessons were constant interruptions during the school day with unexpected assemblies, announcements, and other disruptions. Moreover, because the health curriculum, despite being tied to the Core Curriculum and other science standards, was not generally what the students, and by extension the teachers, would be tested on, the health curriculum was shoehorned into a few weeks, or less, at the end of the year.

There were many health behaviors that students, even young ones, could take on themselves, but there were others that need to be implemented at the institutional level, within the family and school structures. To address this challenge, parents need to be brought into the equation at teacher conferences and with information sent home that complements the art-based science lessons.

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## CONCLUSIONS

- The topics were relevant and important to the students in their classes and to the curriculum standards for health and science;
- The “Being Me” program provided teachers with resources, creative curriculum, and new science information;
- The training and innovative curriculum helped develop teachers’ skills and ideas for teaching “Being Me” and other curriculum, making them better teachers overall for teaching to the current science standards;
- Based on observed behavior and teachers’ assessments, students were engaged and excited by the hands-on art- and science-based activities, having fun while learning;
- Seeing and touching real organs (lungs, heart, brain), learning fun facts, and hearing personal stories from people with a health issue particularly piqued their curiosity, leading to more questions and connections;
- The hands-on activities helped students explore a topic and discover ways to stabilize or prevent the health problem, thus helping them with science and empowering them to take control of their own health;
- Students independently and through teachers’ scaffolding questions were able to connect their science learning in the “Being Me” topics to other science topics, such as biology and life science, although these connections were not made explicit in the curriculum;
- The curriculum carried over to other non-science subjects, such as math (liquid measures, lapsed time), and English (vocabulary, talking in complete sentences, reading), supporting other necessary skills and knowledge;
- The curriculum was flexible and varied, with art and science activities geared towards independent, small or large group learning, or homework, which allowed teachers to modify the lesson to serve the needs of their room (or venue), class culture, and school setting;
- The experiential nature of the activities engaged students of different ages, intellectual levels, and learning styles;
- Teachers were disappointed but undaunted when they found the support materials for lessons missing as they often used other resources to supplement the lessons and scaffold students’ learning needs, including film, songs, Internet information and pictures; and
- Teachers found the Institute training helpful for giving them the confidence to teach science and health topics for which they weren’t familiar but even those without the training were able to teach the material effectively. Teacher experience and the innovative curricula was key.





## Family Learning Events

### INTRODUCTION

In an effort to reach the widest possible population of families and students with its “Being Me” program, CNMC teamed up with NCM to exhibit its program at the four-day third annual USA Science and Engineering Festival held in April 2014 at the Walter E. Washington Convention Center in Washington, DC. To have the best chance of capturing “early traffic,” the “Being Me” exhibition booth was located in the front of Health and Medicine Pavilion (A), near the escalator, and in the vicinity of National Institutes of Health, Illumina and Agilent Technologies.

The “Being Me” exhibit was set up in a horseshoe configuration, with art and science activities set up for its sleep, obesity, and asthma/smoking modules. Each activity was at a separate table and manned by student mentors, CNMC, and NCM staff. Children and their families stood on the other side of the table to participate in the art and science activities.

### Methods

The event attracted over 350,000 people during its four-day run. The “Being Me” team counted over 8,500 people (adults and children pre-K to sixth grade) who visited the “Being Me” and NCM activities during the three weekend days (Friday, Saturday, and Sunday) it operated its booth. Schools were invited to attend the Friday event; families and the public-at-large attended on Saturday and Sunday.

### Data Collection

New Knowledge, as the independent evaluator, attended the event for two of the three days (Friday and Saturday) to gather information about the activities, how families were relating to them, and how they interacted with the mentor/instructor at the table. The strategies used for the data collection were twofold:

1. Observation of the students and their families as they interacted with the “Being Me” activities at the tables, with each other, and with exhibit staff; and
2. Open-ended intercept, self-report surveys, targeting adults of participating families.

### Observations

The observer recorded observation of families’ experiences as they unfolded and evolved, the tasks and activities involved, and any conversations between participants. The following coding system was used in the analysis and recorded per activity.

Table 5. Child, Adult, and Exhibit Staff Observed Behavior Codes.

Code	Description
<b>Student Actions</b>	
S1	Not paying attention/seemingly uninterested
S2	Intent on activity but little, if any, interaction with instructor/monitor
S3	Listening/Watching/Touching/Pointing
S4	Engaged with Instructor by asking or answering questions
<b>Caretaker/Parent Actions</b>	
A1	Stands back/not involved
A2	Involved with child’s activity
A3	Listens/Watches/Touches/Points
A4	Engages with Instructor – asking/answering questions or discussing topic
<b>Instructor / Mentor Actions</b>	
T1	No interaction with child/parent during activity
T2	Explains materials/topic to participant
T3	Encourages child to participate/touch/come closer to hear
T4	Engages Child/parent with questions/discussion of topic

### Intercept Surveys

In order to get a further understanding of the family experience, NewKnowledge collected information from adults in the visiting group, focusing on the “family” experience. This self-complete questionnaire took approximately five minutes to complete. The open-ended qualitative survey, targeting children’s caregivers, adults (18 or over), included the following questions:

- What did you like best about this activity?
- Did you learn (didn’t learn) something you didn’t know before?
- What health lesson stood out most for you from this activity?
- What actions if any would you take to improve the health of your child around the issue presented in this activity?
- If you were to tell your family and friends about this activity, what would you tell them?
- What will you remember most about this activity?

All surveys were anonymous.

## Analysis

On average, visitors (an ethnically diverse mix of families) spent between five and ten minutes at each activity. A NewKnowledge researcher observed and took notes about the interactions of visitors with one another and their interactions with the staff. After observing the visitors at an exhibit, the researcher intercepted that group and asked an adult to complete the self-report survey and asked them about which activity the child in their group completed. In total, 53 families were observed, representing 57 activity sessions. Three families were observed participating in a second activity after they completed their survey. In total, 84 surveys were completed representing a total of 102 activity-related responses.

In aggregate, 75% of the respondents said they learned something new and two thirds (67%) named a specific health action they could take to address the health topic on which they reported. Fourteen respondents complimented the staff, describing them as kind and informative. Specific results on each activity are reported below:

### Station 1: Sleep-Mask Making.

This activity consisted of white cardboard masks that children decorated with magic markers, glitter glue, eyes and other colorful, small objects (pompoms, jewels, animals, etc.). There was also an 8.5x11 paper mounted on a plexiglass stand off to one side that outlined how much sleep different age groups needed.



Figure 9. Sleep-mask making at the science fair.

#### Observation (11 observations):

Staffing: On day one, most of the time the table was manned by two people, usually two young adults or later in the day a pairing of young and older adults; at other times, only one young adult volunteer was at the table. On day two, a Children's National professional moved

over from the adjacent sleep-sequencing table to sit and assist at the mask-making table.

Interactions: The children (from age two through middle school) seemed to enjoy the art activity and were very intent on their coloring/stickering and overall creativity, mostly not interacting with any adult (9-S2). About half of the time, there was also no attempt by the mentor/instructor to engage the child (5-T1). This was especially true on the first day when young adults were volunteering at the table (4-T1). In contrast, on the second day, professionals from NCMC did engage the parents about their children's (and often the parent's) sleep issues, such as sleep apnea, nightmares, and inadequate sleep-time (5-T4). If children needed help with their art project, volunteers helped them, usually with gluing objects on the mask or with the glue itself. The parents exhibited a range of activities, either standing back, looking at their cellphones or just watching (2-A1), helping the younger children with the gluing instead of the volunteer (2-A2), listening to the instructor talking to the child (2-A3), or talking to the instructor themselves about a sleep issue (3-A4).

*Note: The observer did not witness any parents, children, or volunteers at this table referring to the sleep chart or mentioning that sleep masks were an aid to help one fall asleep, although some participants were directed to other sleep-related tables on day two.*

#### Self-reports (n=20).

- Over half (13) mentioned that what they liked best about the mask-making activity was that it was a fun, kid-friendly activity with sparkles and stickers;
- Less than half (11) said they learned something new from this activity;
- The same number said they learned about the number of hours their child should sleep;
- Two-fifths (8) said their child needed to develop better sleep habits; one-fifth (4) said they learned how to talk to their child about nightmares;
- About half (9) said they would tell family/friends that it's a fun, kid-friendly activity; and
- Six respondents stated they would remember most that the mask-making was a fun activity and the mask was a good reminder; two respondents felt they would remember the health message related to how much sleep their child needed. Eight (8) did not answer this question.



## Station 2: Sleep Cycle and the Importance of Sleep.

This activity was not available on day one due to a computer problem, but was presented on day two. The interactive consisted of a cloth doll with wires (electrodes) coming off various parts of the body and face to simulate how a sleep study patient might be monitored. The read-outs represented recorded respiration, heart rate, and brain activity. Next to the doll, a computer displayed the *polysomnographic* readings or waves showing babies' patterns of breathing, heart rate, body temperature, muscle activity, brain activity, and eye movement during the stages of non-REM and REM sleep, and sleep/dreaming. A second doll on the other side of the computer wore a breathing apparatus used to compensate for sleep apnea. Next to the first doll stood an 8½" x 11" graph of an adult male's sleep cycle and a photograph of a man.

### *Observations (five observations):*

**Staffing:** For the first half of the day, the two adult professionals worked together, one engaging a child with questions and answers about his/her sleep patterns, nightmares and dreams, while the other went page by page explaining the sleep sequences the child was observing on the computer, with frequent gestures to ensure everyone in the group understood what the graphs meant (3-T4). For the second half of the day, there was only one instructor who felt he was not adept at engaging the child in discussions about sleep patterns. Despite this trepidation, the instructor was successful at maintaining children's interest and engagement (2-T2).

**Interactions:** The children (of all ages) would press the space bar to go to the next page (and were not asked twice), indicating that they were paying attention (5=S3). The explanations were such that both children and adults appeared to understand and be deeply engaged in learning about the stages of sleep and how important deep sleep is for children's growth and health. Parents and children were asked if they had other questions. Parents would generally personalize it, asking questions related to their or their children's sleeping issue, such as sleep apnea (3-A4). Children would ask questions about nightmares or a fun fact, like the porpoise sleeping in different hemispheres at different times (3-S4).

At the end of the session, the researcher observed the instructors sending three families to the sleep calendar table to learn more about how much time their children needed to sleep, after the child or parent mentioned a specific sleep issue. On one occasion, the observer heard the instructor mention the sleep mask table and asked if the child knew what the sleep masks were for (she did, with a question mark). The observer did not witness the graph of the sleep cycle being referred to or read by the instructors, nor acknowledged

by the parents or older children. Perhaps it was because it was too small to read from where the parents stood (i.e. mostly behind their children), or other things on the table captured their attention more.

### *Self Reports (n=12):*

- Eleven respondents (and one didn't answer) described learning something new;
- Half (6) the respondents mentioned that they liked how the information was easy to understand;
- The reported health lessons were equally divided between: the importance of sleep; what happens during REM sleep; and the causes of sleep apnea (4 each);
- Half reported that either the child or another family member needed to get more sleep; and
- One third said they would remember the fun facts most; another third the brain waves during sleep and dreaming; and the other third commented on the kind, responsive and talented staff.

## Station 3: "Bedtime for Bears."

This station focused on sleep needs for different age groups. This station included a handout exercise (8½"x 11" black and white sheet of paper) that a child could fill out at the table with a pen or marker after determining how much sleep s/he needed for their age; what time s/he needed to go to bed to get that amount of sleep (marked on a clock and in numbers); and what B.E.A.R. activities were best before bedtime (B-brushing teeth, E-turning off electronics, A-and, R-reading a bedtime book). The station had a daily calendar of two weeks in which the child would place a sticker (handout) for each day when s/he did all the B.E.A.R. activities and got to bed on time. Markers and pens were on the table for writing the information and drawing the "bedtime" hands of the clock. Also on the table were one-page handouts from the CNMC Pediatric Sleep Clinic on age-related (infants/toddlers/preschoolers/school-age/adolescents) sleep needs, range of sleep experiences, and best sleep practices for falling and staying asleep.

### *Observation (10 observations):*

**Staffing:** Most of the time, this table was staffed by one adult professional, sometimes wearing a doctor's white lab coat. For a few hours, two people manned the table, including the PI and funder.

**Interaction:** This activity could be characterized as a respectful conversation between the child and the instructor (9-S4/T4). Parents were observed mostly standing behind or off to the side of their child listening (5-A2/3), and if they, or their child, had a particular issue (snoring, nightmares) they would ask questions (2-

A4). Sessions typically began with an instructor asking the child his/her age and what time s/he went to sleep and woke up, and together (or with parental help for the smallest children) they would calculate the number of hours the child actually slept (9 -S4/T4). Then they would talk about how much sleep the child or children really needed for that age (10-T2). Sometimes parents would offer “corrective” information, especially if the child was going to bed too late, or the instructor would impress on the child that s/he needed to talk to his/her parents about bedtime (2-A2). The child would fill out the form at the table and take the form and stickers (for marking their B.E.A.R. days) with them. If there appeared to be a sleep problem, the instructor would hand the parent the age appropriate sleep sheet(s) for their child(ren).

#### *Self reports (9 surveys responses):*

- Eight respondents stated they learned something new;
- Parents liked that it was a hands-on interactive activity (3) and provided information on sleep (2);
- The takeaway health message was learning how much sleep children of different ages needed for a good performance (7);
- Some (3) parents mentioned their child needed to get enough sleep, in general; others (3) cited specific actions the child could take, such as follow the B.E.A.R. chart, go to bed earlier, have a routine before bedtime to unwind, reward cooperation, and watch less TV; and
- Parents had a range of things they would tell others about the Calendar activity: it's hands-on (3); informative (3); and puts the child in charge of his/her sleep (2); i.e. *lets the child know how much sleeps/he needs rather than the parent telling them to go to bed; and use the B.E.A.R. method if a child has trouble sleeping* (1).

#### **Station 4: Pig's lung and the effects of smoking (and asthma).**

Hanging from UVC piping about 18 inches apart were two pig's lungs: a healthy, pink one and a diseased, black one that had been chemically treated and infused with a “tumor” to resemble a lung cancerous from smoking. Attached to the piping was a bellow that the instructor used to pump air into the healthy lung and/or diseased lung to show the difference in air intake. Also on the table was a dried slice of lung that was passed around.

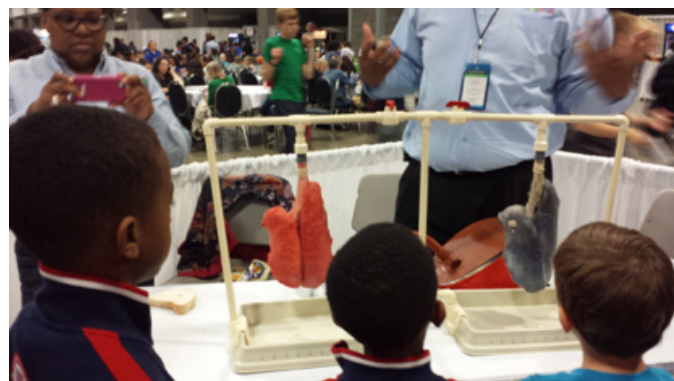


Figure 10. Pig lungs on display at an FLE.

#### *Observation (n=13):*

**Staffing:** Sometimes there were two instructors (one museum educator and a high school volunteer, or they traded off; on one day, the project PI and NIH funder took a turn as instructors).

**Interactions:** Overall, the mostly group presentations were lively, engaging, and tactile. The museum educator was very skilled at relating to children of all ages, asking them questions and eliciting enthusiastic responses. The student volunteer also had an easy manner with the younger students and was good at presenting the information; although when he asked the students questions, he tended to offer an answer before the children had a chance to respond. This made the sessions shorter, but based on exit surveys, the children and parents still enjoyed the sessions and learned the basic health lessons: how lungs function and what happens to lungs from smoking (9-T4, 2-T3, 2-T2/6-S4, 7-S3).

Children, and parents (9-T3, S3/A3), were encouraged by all instructors to touch the lungs before, during and after the air being inserted. Reluctant children were cajoled until they joined in. Afterwards, the slice of lung was passed around and children responded to questions about how it felt (with the instructor explaining it as an air sponge). Most of the dialogue was an engaged question and answer session (9=T4/S4, A3). The discussion focused on why the presentation used a pig's lung (about same size as 150-pound person); how it functioned; why the two sides were different sizes (*body is like a puzzle that needs to fit in all the pieces, so the lungs needed to make space for the heart*); compared the air intake of the two lungs; and discussed what caused the diseased lung and what they (the kids) could do to avoid having similar conditions. Smaller children, who didn't know what they were seeing, were asked to raise their arms, take a deep breath, place their hands on their chests,

and breathe out so they would get a sense of their own lungs (2=S3). The museum educator also asked if anyone had asthma (1=T4/S4) and discussed what happens to the lungs with asthma, although this topic was not mentioned systematically, and the younger educator did not include this information in his presentation at all from what was observed.

#### *Self reports (n=35):*

- Thirty of 35 survey respondents said they learned something new from the demonstration, with two not answering the question;
- Respondents particularly enjoyed seeing a real lung (10) and noted that it was exciting to touch it (15);
- Sixteen of 35 respondents thought they would remember the look and feel of the lung long into the future. One person noted, his children still remembered it (touching the lung) *from two years ago!* Another 13 said they would remember the look of the smoker's lung;
- The most common health lesson drawn from the demonstration related to the dangers of smoking or smoke (22);
- Besides not smoking (17), other healthy actions noted on the surveys included healthy eating, exercise, and staying away from smoke and pollution (5); and
- Parents mostly stated that they would tell family and friends about seeing a real lung they could touch and feel (14), followed by telling them about the smoker's lung (10). As one parent noted, *if you see a smoker's lung, you would not smoke*. Eight adults mentioned it was a *fun way to learn about lung cancer or dangers of smoking* (8).

#### **Station 6: Chefs Hat: Healthy Foods on My Mind.**

There were two long tables, with four places for the art activity, all standing. The tables featured white paper chef's hats that children could decorate with different fruit and vegetable stickers and large stamps that they would "ink" in a stamp pad.

#### *Observations (eight observations):*

**Staffing:** Staffing for this activity varied over the two observed days. Three volunteers staffed the activity on the first day: one more mature staff member supported by two young adult/student volunteers. The two younger volunteers led the activity on day two.

**Interactions:** Staff was mixed in their interactions with the children and/or parents. On day one, instructors (particularly the older adult) would engage with the children, asking them about what foods they

liked and probed for the foods on the stickers, and then handed the child that vegetable or fruit to stick on his/her hat. (7=T4, 1=T2, 1=T1, 6=S4). The more mature staff member also engaged parents/chaperones, in a discussion of how to prepare various foods so kids would be more likely to eat them (7=T4). Mothers/chaperones too would share their cooking secrets, like mixing cauliflower with mashed potatoes, or a kale smoothie so the child would eat a particular food, noting that this was particularly true for more bitter tasting foods (4=A4). On day two, the staff were more likely to ask children if they wanted to make a chef's hat and occasionally search for a particular food to hand the child. For the most part, the researcher did not observe the staff discussing food choices (9=T1, 1=T2). At times, staff were observed working on their own hat decorations or just talking to each other. On day two, adult visitors were more likely to lead the discussion about which foods children were putting on their hats (7=A2 on day two vs. 0=A2 on day one). About the same number of adults with small children stood back and watched on day one as day two (4=A1 vs. 3=A1 respectively). Children for the most part were quite focused on their art project and seemed content to work without interruption (11=S2).

#### *Self Reports (n=26):*

- Sixteen of the 26 survey respondents said they liked the project because it was a hands-on, fun, age-appropriate activity for the children; eight reported that it was a fun way for kids to learn about healthy foods;
- About two thirds of the respondents (16) reported that they learned something new;
- Twelve respondents reported that the health message to them was to "eat healthy"; while another five commented specifically about the range of healthy food choices, such as: *there are lots of food choices; different foods do different things; colors are important in food selection*;
- Parents reported on a number of actions they could take to keep their families healthy, with thirteen comments focused on "giving, encouraging, or letting children choose healthy fruits and vegetables" and six responses on other healthy behaviors, including getting exercise, taking vitamins, eating less sugar, drinking more water, and getting more sleep;
- Respondents wrote that they would tell others that the activity was a fun way to learn important information about healthy eating (N=11) or they mentioned a specific health message, (N=5) such as, *What we eat is important to our health and children will eat what we allow them (so) offer them healthy food and they will love it*; and

- Thirteen people said they would remember the chef's hat activity as a fun, engaging, well-designed activity that their child could take home, and, as mentioned by a few respondents, provide an opener for discussing healthy food choices at home; nine reported that they would remember learning about healthy foods, such as green (kale) smoothies; choosing healthy foods he loves; or colors are important.

## CONCLUSIONS AND RECOMMENDATIONS

- The "Being Me" exhibits at the USASEF were well-attended, reaching over 8,000 people, mostly families with children 13 years of age or younger. The audience reflected a diverse cross-section of Americans including White/Caucasian, African-American/Black, and Asian-American (Indian/Pakistani/Japanese) families;
  - Given the low attendance by Hispanic and Latino families (only one family was observed and the low representation was also corroborated by NCMC staff) it is recommended that the project specifically target this ethnic group in order to get their important health messages across;
- All the activities provided a good educational opportunity, appropriate and fun for all ages (including adults) and ethnic backgrounds;
  - Activities and handouts that could be taken home (mask, calendar, chef's hat) provided a reminder and another window of opportunity for discussing these health issues at home;
  - It is recommended that the sleep chart behind plexiglass at the sleep sequence table be better utilized by referring to it and providing it as a hand-out for parents to take home and use as a reference of sleep needs of children at different ages;
- Over three-fourths of respondents reported learning something new around the health activities;
  - There were missed opportunities at the mask-making and chef's hat tables when volunteers did not try to engage adults or children in health discussions as part of the art projects; and
  - If the program is repeated in coming years, we recommend greater investment in training young volunteers in strategies for engaging children. Ideally, this training would focus on how to comfortably engage participants with specific recommendations on what to say with specific talking points that can promote families learning as part of the art activity.
- The mix of hands-on and non-hands-on activities worked well to engage both parents and children;
- What stood out for the parents on the -hands-on activities were that they were fun, age-appropriate and the activity could be taken home; and
- What worked particularly well for the non-hands-on activities was the "yuk" factor (pig's lung); engaging personalities; fun facts; interactive technology (sleep) and instructors speaking respectfully one-on-one to the children as they explained the topic or answered children's questions.

## Dr. Bear's Cubs Summer Science Experience

Phase II (Year 5) of the summative evaluation for the Dr. Bear's Cubs Summer Science Program focused on sleep and was conducted during the last two days of the weeklong camp at Children's National on June 26 and 27, 2014. Including two patients being treated at Children's National, sixteen students from recently completed grades three through five at the five study public elementary schools participated. Five students attended from Anne Beers, four from J.O. Wilson, one from Robert Gray, three from Seat Pleasant, and four from Whittier. Some of the students from Anne Beers were return campers. Gender ratio was 2:1 girls to boys (11:5). All instructors and teen mentors were female. Most (13) of the students were believed to have African American heritage, and three had Asian ancestry. The main instructor and her assistant and the four mentors appeared to come from a mix of ethnic backgrounds, with half (3) being White and the rest (3) African American / Black or Hispanic / Latino; other instructors (White and African American / Black) joined the class at varying times to observe or teach.

### METHODS

#### Instruments and Analysis

NewKnowledge used narrative inquiry to develop and analyze the data. Data was collected using a journal for recording observations, descriptions, reflections and memos during the camp sessions. In addition, a ten-minute group discussion with campers and debriefings at their tables helped to elucidate what was most memorable to them and how they liked the program overall. All interviews were recorded and a representative sample of the campers' work was photographed for illustrative purposes. These data were coded, noting a presence or absence of three learning outcomes: increased knowledge and understanding, science skills, and healthy attitudes, as well as how students behaved and interacted with teachers and each other during class (see Tables 5 and 6).

Table 6. Student outcome codes.

Outcome Category	Coding Description
Knowledge	Understanding of how:
K1	environment affects human body
K2	health-related behaviors affect human body
K3	intended actions to improve their health outcomes
Skills	Evidence of (science inquiry) skill development:
S1	thinking independently
S2	gathering information
S3	evaluative thinking
S4	perceiving patterns
S5	explaining phenomena
Attitudes	Evidence of positive or negative attitude:
A1	self-efficacy attending to health issues in their lives
A2	intentional statements to address the health issues
A3	engagement (or interest) expressed in science learning

Behaviors and interactions between students and between students and teachers, as observed by the researcher and journaled, were coded according to the following outcomes and sub-outcomes:

	Monday, June 23 <sup>rd</sup> ROOM: 6 <sup>th</sup> Floor Conference Room M16a2	Tuesday, June 24 <sup>th</sup> ROOM: 6 <sup>th</sup> Floor Conference Room M16a2	Wednesday, June 25 <sup>th</sup> ROOM: 6 <sup>th</sup> Floor Conference Room M16a2	Thursday, June 26 <sup>th</sup> ROOM: 2 <sup>nd</sup> Floor Conference Room 19	Friday, June 27 <sup>th</sup> ROOM: 2 <sup>nd</sup> Floor Conference Room 19
9:00 - 9:15	Welcome & Introductions: • Children's staff • Dr. Bear's mentors • Ground rules & camp schedule	Morning Journal art • Start of the day Mentor-led discussion • Review ground rules • Monitor wall (Q&A) • The many wonders of the brain	Morning Journal art • Start of the day Mentor-led discussion • Review ground rules • Monitor wall (Q&A) • Sleep Apnea and other disorders	Morning Journal art • Start of the day Mentor-led discussion • Review ground rules • Monitor wall (Q&A) • Sleep Apnea and other disorders	Morning Journal art • Start of the day Mentor-led discussion • Review ground rules • Monitor wall (Q&A) • Sleep Apnea and other disorders
9:30 - 10:15	Mentor-led Activities • Camper ice breaker • Campers directed to their groups • Group name/color	ART Pillbox art (20 min)	ART Brain art (20 min)	ART Create a complete story (20 min)	PREPARE FOR FINAL PROJECT • Prepare final art and presentation materials (20 min)
10:30 - 11:15	Camp Overview • Introduce sleep logic • Decorate room for work. Turn on and explore the planetarium	Brain Dissection	Explore the Effects of Lack of Sleep on Behavior and Performance	Explore the Effects of Sleep on Sleep	Prepare for final presentation materials (20 min)
11:30 - 12:00	CAMP JOURNAL	CAMP JOURNAL	CAMP JOURNAL	CAMP JOURNAL	CAMP JOURNAL
12:00 - 12:30	Art Paper lanterns with bee lights	ART (Sleep art)	ART (Sleep art)	ART (Sleep art)	ART (Sleep art)
1:00 - 1:15	Movement Break	Movement Break	Movement Break	Movement Break	Movement Break
1:30 - 2:15	CAMP PROJECT Group work (20 min)	CAMP PROJECT Group work (20 min)	CAMP PROJECT Group work (20 min)	CAMP PROJECT Group work (20 min)	CAMP PROJECT Group work (20 min)
2:30 - 3:00	WRAP UP	WRAP UP	WRAP UP	WRAP UP	WRAP UP

Figure 11. The summer camp schedule.



Table 7. Student and teacher behavior codes.

Code	Description
Course Program	
C1	Attending (paying attention, listening, following along)
C2	Narrative engagement (story sharing, personal experience)
C3	Distraction (lack of attention, off-topic discussion)
C4	Scaffolding (helping others, shared reasoning through problems, building on what others say or do)
C5	Defiance (disturbing others, challenging direction, redirecting to unrelated content)
Student Actions	
S	Independent action/reaction
I	Interaction with teacher
T	Interaction with other student(s) (talking, nudging, writing, answering question, laughing, etc.)
Teacher or Other Adult Activity	
D	Direct instruction (talking, questioning)
F	Teacher as facilitator (guiding, assisting, etc.)
O	Teacher observing students (hands-off, no intervention)

### Observations

The program on the two observed days took place in a conference space (smaller than the one used earlier in the week), decorated in an American desert motif. Students sat four to a table with one of the three teen mentors or another assistant anchoring each table to help with project activities. On the wall were work pages from previous days, in addition to the camp rules they reconstructed after the original ones were left behind when they changed rooms. On the Thursday session, about half the campers wore pajamas for “Pajama Day;” two also brought stuffed animals. Both breakfast (fruit, rolls/muffins) and lunch (pizza one day and chicken kabobs / meatballs the other days) were served.

Thursday’s morning program focused on three sleep-related activities: the role of the olfactory (center for smell) inducing sleep or being an energizer, and its role in evoking memories and feelings; stretching exercises; and campfire stories which they wrote and read to each other. Students also visited the lab for the second part of the day but the researcher did not observe this activity. Friday’s program touched on health careers in epidemiology and art therapy, and

activities around the closing ceremonies that would be presented to their parents and other guests (video-taped skits about sleep and short exposes by the campers on their favorite art project). About an hour was also spent on free play (various card, coloring, and board games mostly unrelated to the camp’s sleep theme.)

The question and answer session related to the Wonder Wall that was scheduled for Thursday and Friday mornings did not occur nor was there any reference to the activity although the sheet of campers’ questions (mostly questions from two campers) was carried from the old classroom and hung in the new space.

## RESULTS

### Increased Knowledge and Understanding

Students had a clear understanding of some actions they could take to fall and stay asleep, such as reading a story, taking a shower, light exercise, although they may not necessarily engage with those options (K3). For instance, of the three students who reported having trouble sleeping (because of a storm or electrical outage), two reported crawling in bed with a sibling and the other took no action. Still, they knew what they could do, and later, after the science experiment on smells, several campers added to their toolbox of sleep enhancers, drinking jasmine tea and placing lavender or vanilla room fresheners in the room with them.

### Evidence of Science Inquiry Skill Development

Recognizing that science is a process and what is learned, from both successful and unsuccessful experiments, may not be evident until some time in the future, the researcher cannot verify whether scientific skills were developed. However, observations of the olfactory scientific experiment, in which camper teams had to determine whether each of nine scents was a sleep inducer or energizer, did not appear to have any clear evaluative thinking or pattern perception behind the campers’ categorization (S3, S4). Rather, observation and overheard comments seemed to suggest that categories were based on whether children liked a smell or not. Even after all four groups categorized the lemon incorrectly and the teacher told them all citrus fruits were energizers, all four teams still categorized the orange as a sleep inducer. Peppermint was noted as having a strong smell, but also was deemed a sleep promoter, whereas chamomile was categorized by three of the teams as an energizer. Based on their experience with parents and grandparents, they all got coffee right as an awakener (Table 7). This suggests that the lesson itself did not help children develop a conceptual understanding of the concepts.

Table 8. Olfactory scent test.

Scent	Sleep Promoter	Awakener	Correct Answer
Peppermint	3	1	Awakener
Jasmine	4		Promoter
Coffee		4	Awakener
Chamomile		4	Promoter
Lemon	4		Awakener
Orange	4		Awakener
Lavender	2	2	Promoter
Vanilla	3	1	Promoter
Eucalyptus		4	Awakener

From observations and comments (or lack thereof), there did not appear to be a residual factor of remembering (unprompted) the olfactory and its function from the brain dissection earlier in the week. As evidence, none of the campers guessed (recalled) correctly that the new word of the day “olfactory” was related to smell. The teacher had to remind them that she had shown each of them the two olfactory balls on the frontal lobe of the brain during the brain dissection (S2). However, this single observation does not mean that they will not remember the olfactory and its function in the future, especially when combined with information from the scent experiment, writing the word “olfactory” in their journals, and from discussing and writing in their journals about smells being related to memory and feeling. Instead, this observation points more to the need to reinforce and scaffold learning, front- and post-experiments, rather than rely on a one-time, short exposure to a topic to instill scientific learning.

The students were introduced to a number of new science words—olfactory, cerebellum, somnolent, epidemiology, and aromatherapy—some of which they wrote in their journals and decorated or wrote other words from the letters. Unfortunately, the definitions of these words were not also recorded, so even if the campers recall the word, they may or may not remember what it means.

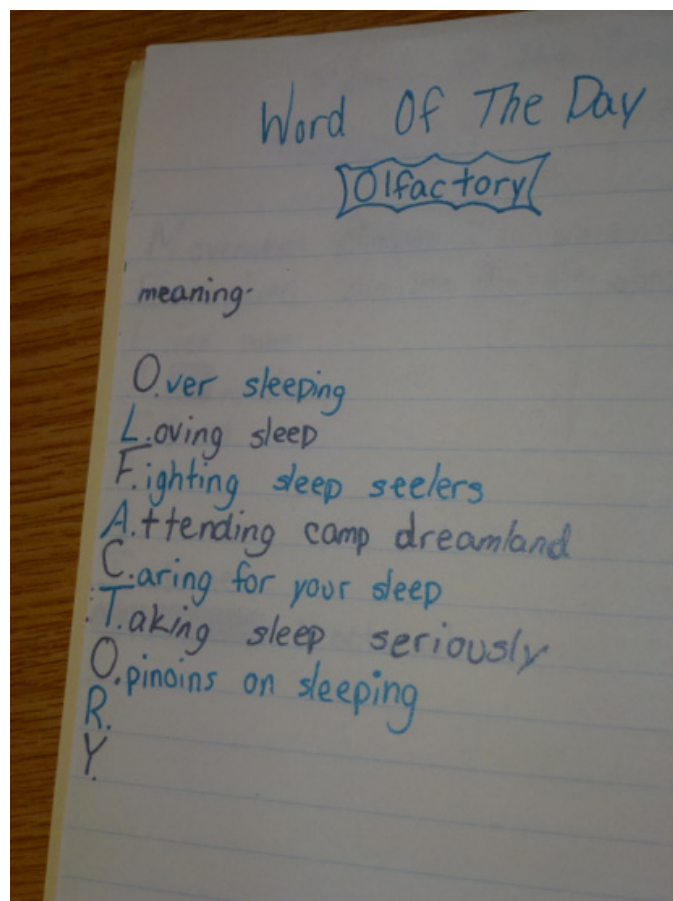


Figure 12. Olfactory exercise.

Campers were interested to hear about the instructors' health careers. They listened politely as one instructor told about her career as an epidemiologist working on infectious diseases and a related field in environmental epidemiology, but it was the art therapy profession that piqued their interest. They asked a number of questions including, *How do you know how to do things? Do you work with all the patients? (You help patients get out their feelings) like when they are scared and homesick? (A3).*

Interest in Science: The campers, a few attending for a second year, stated they enjoyed both the science and art activities. Writing and sharing their campfire stories was mentioned most often as the favorite activity (C2), followed by the dream catcher because *I want to see if it really works (S2) and the pillowcase because it glows in the dark.* Two campers, one of whom said he wanted to be a doctor,

cited liking the brain dissection and visiting the operating room the most, and on the last day several students also mentioned liking the science...*the smells*. (A3). One also wrote in his journal that he *loved dissecting brains today*.

### Promoting Healthy Attitudes

The students appeared to have a good grasp of what they can do to promote falling asleep (A1). They mentioned they could read a story, put vanilla in the room, drink a cup of jasmine tea, put their head down, do some light exercise, and use their dream catcher and lantern for thwarting nightmares. The skits created for the final ceremony underscored that they had a good understanding of various options to promote sleep, and it helped to alert the parents in the audience to these sleep aids, as well as the multiple take-home art projects. (Note, smells were not part of the skits as this “tool” was introduced after the skits had been created and videotaped.) Students also mentioned that they told their parents what they did in class, but when asked if they told them why they were learning about this issue, students said they didn’t tell them, nor did their parents ask.



Figure 13. Camp art project.

### Classroom Atmosphere

There were a variety of approaches to the learning experience. Sometimes students worked independently on their art projects or writing assignments (S). At other times, they engaged with the instructor, listening to what she had to say and answering her questions (CI, I). At still other times, they shared their campfire

stories with each other, collaborated on their skit and science project, played games together. A few of the more shy students were drawn into the program when other students read these shy students’ stories out loud (T). Teachers generally used a direct instruction approach (D), with teen mentors on-hand to assist the campers with their activities, including getting them started on their campfire stories and their “favorite art project” script for the final ceremony (F). For much of the time, however, students worked independently (S) with teachers/mentors observing or preparing for the next activity.

Late Thursday morning, the power of stories as sleep inducers was demonstrated following the story sharing activity. After all the campers had read their campfire stories aloud, they asked one of the mentors to read her story, and as they listened, they began to lie down one-by-one until at the end, all were lying down. Afterwards, in unison they asked if they could sleep for two minutes and to leave the lights off. A compromise was struck at one minute, but the campers were clearly in need of a short nap. During the “olfactory” lesson, which came next, students looked bored, were fidgeting, writing or drawing in their journals, rubbing their eyes, and one was curled up in his chair sucking his thumb. By noon, even the instructor had commented that everyone looked tired (C3).

### Classroom Management

Overall, the class was well behaved. Only on the last day when activities were less structured, a discipline issue emerged at one of the four tables. Three of the students at that table began picking on one another – one called another a name and “accidentally” touched another camper’s foot and art project. The “bully” stopped after the mentor intervened and elicited a half-hearted apology, but the other two bore their resentment with one of the campers sitting under the table, while the other sat with a pillowcase over his head for about five minutes. Once other activities started, they re-joined the group, although one of them did say he didn’t like camp when asked later in the day and gave that incident as his reason. Overall, however, students said they would tell their friends to come because they had fun and wanted them to have fun, too.

### DISCUSSION

The campers at Dr. Bear’s Cubs Summer Science Experience were excited to be at camp, some for the second summer, and wanted their friends to know about it so they could enjoy it too. Activities ran smoothly and mentors appeared to know their roles well.

The many varied sleep-themed art and science projects were well developed, and appealed to both boys and girls. Art projects

covered both performing arts (drama/songs/storytelling) and studio art (decorating pillowcases, making lanterns and dream catchers, making silkscreens). The science projects were integrated into the day's activities and included brain dissection, a visit to the operating room, sleep lab, and radiology department, and an experiment around scents. However, as mentioned in the formative evaluation reports and still holding valid, the art projects could have taken better advantage of an arts-based approach to inquiry and science learning, and the science activities needed more time and a scaffolding approach to inquiry-based learning and follow up.

Campers now have many tools in their toolbox to help them get to sleep and stay asleep. Whether they use them is unknown; the few examples presented by campers of their not being able to fall asleep suggest that old habits may be difficult to break, i.e. crawling into sibling's beds, yet other campers voiced an eagerness to experiment and see if their new tools work, such as using the dream catcher and putting lavender or vanilla in their room. Whether parents understood these sleep aids and would employ them was also unclear. Students were happy to share with their parents what they did, but according to them a "why" discussion did not take place, and no written materials explaining the various sleep aids or science behind them accompanied the projects. However, if parents had seen the skits in the final ceremony, they would have had a clear sense of the camp's theme.

We noted that while science was well integrated into the final curriculum, it was not stressed nor reinforced. For example, vocabulary words were added to journals, but not their meanings. The final project was to write about their favorite "art project" rather than "favorite activity," which might have elicited some science interests. While art projects were distributed and the skit for parents pulled the sleep aids together, there was no review of the science of sleep and the brain, nor were there art activities that might reinforce the scientific skills of comparisons or evaluating information. As such, it was a missed opportunity for campers to learn the science content and new science skills, although they did have exposure to both.

The issues identified in previous years (Rank, Katz & Fraser, 2013) including lack of satisfaction with food options and student perceptions of too much walking and climbing did not emerge this year. Given the overlap of students from prior years, we believe these issues were resolved in part through changes in the program, and likely through more attention to making the activity and food part of the program logic. We noted that campers were allowed to use the elevator, which may also have eliminated the complaints heard in prior years. The final year of the program also appears to

have resolved concerns raised about gender balance and training of mentors and staff at youth camp. Although both staff and campers were predominately female, gender balance did not emerge as an issue when the class was broken into collaborative, small group, arts or inquiry-based activities.

## CONCLUSIONS AND RECOMMENDATIONS

Campers of both genders and grades found the art and science activities fun and interesting, and would recommend the camp to their friends for those reasons. The camp program offered an effective variety of art and science activities despite the focus seeming to reinforce that art and science were distinct activities rather than art-based science inquiry. The activities helped campers to understand the complex science processes related to sleep, how different parts of the brain are involved in sleep. Campers came away knowing actions how to promote sleep or wakefulness.

The studio art activities (crafts and story-writing) had special appeal because they could take their creativity home, giving them pride and ownership of their accomplishments. The hands-on science activities made science enjoyable and accessible to all the campers but would benefit from additional scaffolding of information, follow up review or some other way of reinforcing what they learned.

Should the project team seek to offer a similar health science learning camp in the future, we recommend that the art and science activities be more overtly integrated by instructors through both instruction and scaffolding questions that help youth to understand that they are involved in an arts-based science inquiry. It is also suggested that the scheduled question and answer session, be used to engage campers in discussing their learning from the day before as an introduction and orientation to the day's activities.







## Conclusions and Recommendations

The “Being Me” program was developed to bring the educational process to life through hands-on learning that promotes children’s awareness of health issues and encourages scientific inquiry in an art-focused curriculum supporting National Science Content Standards (now Next Generation Science Standards). The funding received by the “Being Me” partnership through National Institutes of Health Sciences Education Partnership Award grant #R25RR025132 sought to develop and promote health and inquiry-based science among youth through a collaboration with public elementary schools in greater Washington, DC and Prince George’s County, MD.

The results reported here demonstrate that “Being Me’s” hands-on, arts-based program was considered important and relevant to supporting the Next Generation Science Standards by all teachers across the five years of the program. Although teachers involved in the project had different pedagogical styles, the flexibility of the curriculum allowed each of them to implement the program in engaging ways. They were able to scaffold the lessons to children of varying ages and intellectual capabilities, in groups that were large, small, and/or collaborative, or for individual learning, so that all students learned about health-related issues and enjoyed themselves in the process. The students proved to be enthusiastic learners and the curriculum heightened their curiosity about science, their bodies, their health, and what they can do to keep themselves and their families healthy. While the program ran into some challenges maintaining materials connected to the curriculum and a lack of time to implement the program, it still succeeded with all objectives outlined in the original proposal. This success illustrates the professionalism and resourcefulness of the teachers in Title 1 schools affiliated with this project, and underscores that good curricula can be leveraged by creative teachers and adapted to individual learning abilities and school cultures.

The only limits to this program were the lack of instructional time in formal school settings. Because prescribed test preparation and snow days will continue to limit instructional time, even though these programs align to testing goals, we recommend that the program move to an informal learning setting. This setting may be community centers, libraries, YMCA/YWCAs, or museums, where facilitators have more control over the resources and lesson time, and can support more in-depth exploration in an after-school or summer camp setting. We believe this will allow the “Being Me” programs to achieve their full potential and to be scaled up to reach larger audiences including Title I students and their families.

The summative evaluation demonstrated that the project:

- Increased students’ *understanding* of actions that will improve their health outcomes both through the formal curricula and through the family learning events;
- The program taught students how to become *independent thinkers* through the use of art and science activities, but these two activities were not necessarily perceived as interconnected by the students or their families; and
- The program helped promote students’ sense of *self-efficacy* in ways that could improve their health and the health of their families, as evidenced through their ability to discuss sleep regulation, management of asthma triggers, awareness of bullying challenges, and good eating habits combined with fitness efforts.

Dr. Bear’s Cub campers enjoyed the camp’s varied art- and science-based activities every year. The refined program in the final year, focused on sleep demonstrated that learners knew what they could do to address a particular health issue. It is less clear if that connection was taken home based on how campers described their discussions with their families. It may be more helpful to suggest ways of talking to caregivers to reinforce the learning outcomes;

Overall, the project achieved its anticipated goals as outlined in the funding proposal to NIH SEPA. The opportunity to work with Title 1 schools to advance a very important health and wellness program to support these communities, the challenges of working with the prescribed curriculum, lack of continuity in school personnel, unexplained loss of school supplies, and administrative roadblocks that prevented access to test scores were substantive barriers that prevented quantitative assessment of outcomes. School personnel claimed that the program directly improved scientific thinking and understanding of wellness but this could not be independently verified. While there seems to be a need for more reinforcement of the connections between science and art activities, this synergy can be easily resolved by directly encouraging mentors/facilitators to draw these connections and making explicit links that help youth explain how the science and health information going home is connected to the art projects. We conclude that the project concepts proved successful in their final iteration and seem well-suited for broad scale expansion, ideally in non-formal settings not constrained by the limits of school bureaucracies and administrative change.



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