

Global Warming Activity Toolkit: Power the Future field trip program

Evaluation report

**Prepared by Stephanie Thompson
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Power the Future field trip overview

The Power the Future field trip program was developed by the Sciencenter as part of a larger Global Warming Activity Toolkit, funded by a grant from the Institute of Museum and Library Services. The field trip addresses deliverable #3 for the project, creating a “45-minute field trip for children on climate change and renewable energy for delivery in a museum setting.”

The field trip integrates science education with the Sciencenter’s goal of “encouraging the long-term stewardship of our environment, society, and economy through education and our actions.” From the Sciencenter’s program description: “The Power the Future field trip program uses models and hands-on activities to discuss how our energy consumption is linked to climate change.” The program uses earth and environmental science concepts as a building block for conveying energy conservation concepts and facilitating a discussion of energy sources that do not contribute to global warming, thus connecting science content to a current topic area that is relevant to students’ everyday lives.

There are two stated goals for the field trip:

1. Participants feel empowered to make changes to reduce energy use and climate change.
2. Participants feel empowered to learn more about energy and the causes and effects of climate change.

Local teachers were invited to participate in the development of the field trip through two workshops held in 2009. A total of 10 teachers attended the workshops and provided feedback on the proposed program and planned activities, assisting the Sciencenter staff with their efforts to make the field trip content both engaging and age-appropriate for their target audience. Learning objectives for the field trip are aligned with multiple New York State Math, Science and Technology curriculum standards.

The final field trip program includes the following elements:

- Pre-visit activities developed by the Sciencenter for teachers, to be conducted with students prior to their field trip.
 - Greenhouse gas model building, designed to provide students with a foundation for understanding of environmental science concepts presented during the field trip; specifically, how CO₂ forms as a result of energy use.
 - An Energy from Wind powerpoint which introduces students to the basic science behind wind and how we can capture energy from wind in a variety of ways.

- Demonstrations of several different energy sources.
- Use of a model of the Earth's surface and atmosphere to introduce several concepts
 - How some energy sources, such as coal, emit carbon dioxide
 - How carbon dioxide contributes to the warming of the earth's atmosphere, which in turn contributes to climate change
 - Need to adopt alternative energy sources, such as wind power
- An inquiry-driven hands-on activity in which students design and test windmills in order to learn how energy from wind can be captured to do work.
- Interactive discussion of how students can reduce their own energy consumption and thus reduce carbon emissions.
- Post-visit activities developed by the Sciencenter for students and families, to be conducted after their field trip.
 - Energy Detectives activity designed to reinforce the field trip discussion about energy consumption and conservation.
 - Draft Catcher: Instructions for a low cost hands-on activity designed for families to construct a simple device that can locate areas of unwanted air flow in their homes.
 - Draft Stopper: Instructions for making a simple device to stop drafts from doors or windows around their homes.
- The KDT and TKED programs also provide each student with a book to take home and keep; the book for the Power the Future field trip was *Our Earth, Clean Energy* by Peggy Hock.

Evaluation

The purpose of the evaluation was to assess the extent to which the Power the Future field trip program developed by the Sciencenter meets the stated goals for this deliverable, by examining feedback provided by participating teachers and families of participating students.

Evaluation data was collected from two sources: an online survey of teachers whose classrooms participated in a Power the Future field trip, and a paper take-home survey for participating students and their families. All data was collected as part of the 2010 evaluation of the *Kids Discover the Trail!* (KDT) and *Trumansburg Kids Explore and Discover* (TKED) field trip programs in Ithaca, New York. As part of these programs, all

of the 2nd grade classrooms in the Ithaca City School District and Trumansburg Central School District took part in the Power the Future program during a field trip to the Sciencenter. Questions pertaining to Power the Future were integrated into the existing evaluation materials for the KDT and TKED programs.

The online teacher survey focused on the following issues:

- Perceived educational effectiveness
- Student enjoyment
- Feedback on specific program components, including pre- and post-field trip classroom activities and the on-site program conducted by Sciencenter staff.

A total of 25 2nd grade classrooms in the Ithaca area took part in the KDT/TKED programs in the winter and spring of 2010. Fourteen 2nd grade teachers representing 7 elementary schools completed the evaluation survey following the classroom field trips. The response rate of 56% (one survey was returned as “undeliverable”) is on par with the overall teacher response rate for the KDT/TKED programs.

Questions related to the Power the Future field trip on the student/family survey focused on activities that children may have engaged in at home following their participation in the Power the Future program. Surveys were sent home with students and returned to the classroom teacher, who forwarded all completed surveys to the evaluator. We received 53 completed surveys from parents in 14 2nd grade classrooms, which represents about a 10% response rate (again, on par with the overall response rate for parent surveys in the KDT/TKED programs).

Teacher feedback

Teacher feedback suggests that this was a well-received trip overall. Teachers appreciated how well organized it was, and reported that students enjoyed the windmill activity. Several teachers also commented on how much their students learned about conservation and energy, and said that their students talked about their experience long after the trip was over.

All of the teachers agreed that their students enjoyed the field trip to the Sciencenter, and all but one thought that their students enjoyed the Power the Future program: “Power the Future activities were very hand-on, easy and exciting to do!” The remaining teacher was not sure that *all* of her students enjoyed the program; she was concerned that there was too much time spent on presentation/lecture, and not quite enough time for the hands-on activities and discussion of what actions students could take to reduce energy consumption. A few other teachers also commented that shifting the balance of time between presentation and activities to favor the hands-on activities more would improve their students’ experience.

Most teachers conducted the pre- and post-visit activities provided by the Sciencenter, but some did not conduct all three, and a few did not use any. Those who skipped some or all of these activities reported that they did so due to classroom time constraints. Teachers appreciated receiving the activities and field trip information on a CD. One teacher mentioned that the pre-visit molecule-building activity was essential for students in order to understand the program content at the Sciencenter, while another felt that this activity went over students' heads. Most teachers also incorporated the keepsake book into their lesson plans. One teacher mentioned making connections between the FOSS Air and Weather kit and the Sciencenter's Power the Future program.

When asked if they agreed that their students learned new things from the program, and whether the program content was appropriate for their students, all but one teacher agreed. A few teachers expressed concern that the concept of molecules was too abstract for a 2nd grade audience. However, all of the teachers agreed that the program's structure and content met their expectations, and that the program effectively addressed related science education standards. One teacher said the program was "very organized, with pre-, worksheet, and post-program activities." Another said "The students continued to talk about the trip throughout the year. They could really connect it to their lives, conservation of resources, and use of energy."

The greenhouse gas model building pre-visit activity involved having students make molecules using gumdrops and toothpicks. Nine of the 14 responding teachers indicated that they conducted the activity with their students. All of the teachers who used the activity said that their students enjoyed it, but some wondered whether the connection between building the molecules in class and the presentation about energy during the field trip was clear to the students. One teacher commented that "They certainly learned about wind energy and conservation. Doing the pre-visit molecule activities was essential!" and two other teachers made similar comments.

The Energy from Wind pre-visit activity was used by 10 of the teachers. All agreed that the activity was engaging, appropriate for their students, and effective at conveying the intended information. One teacher mentioned that the activity worked well and that she was able to tie it in to other classroom science lessons on weather.

Selected comments from teachers about the Power the Future program:

- "(This program) is...useful for the children and they are very enthusiastic about conservation."
- "Power the Future Activities were very hand-on, easy and exciting to do."
- "The open-ended exploration building the windmills was great as was the presentation with the beautiful board."
- "The book (*Our Earth, Clean Energy*) is a wonderful way to preview what we learned at the Sciencenter and it is also a great resource for the activities we did afterwards."

- “This is a wonderful program and is very beneficial to the children. The children really loved making the (windmill) blades.”
- “The students continued to talk about the trip throughout the year. They could really connect it to their lives, conservation of resources, and use of energy.”
- “The children are very enthusiastic about conservation. We discussed things THEY could do to help conserve energy in school and at home. They seem to have thoroughly enjoyed learning about how they can make our earth a better place!”

Parent feedback

In order to get a sense of the lasting impressions the field trip made on students, parents were asked to list and briefly describe anything their child did at home related to the field trip. This might include telling family members about what they learned, reading books about energy or conservation, doing activities suggested on a take-home sheet that was distributed to all students who attended the field trip, or other activities. Table 2 below summarizes at-home student activities related to the Power the Future field trip, as reported by parents.

Table 2. Field trip-related activities students engaged in at home.

| Activity | Percentage of parents who reported their child did this activity |
|---|--|
| Read book <i>Our Earth, Clean Energy</i> provided by KDT/TKED | 88% |
| Talked about what they learned | 67% |
| Took steps to conserve energy | 37% |
| Read other books | 23% |
| Made a draft-catcher (activity from take-home sheet) | 7% |
| Made a draft-stopper (activity from take-home sheet) | 5% |
| Other | 7% |

Parent responses and open-ended comments suggest that the conservation message of the Power the Future program made a strong impact on students. The vast majority of students read the book provided by the KDT/TKED program, and almost ¼ read additional books related to the topic. Over 1/3 of parents reported that their children told them about the need to conserve energy and that children had specific plans for doing so, including turning off lights, reducing water use, replacing incandescent light bulbs

with CFC bulbs, and suggesting that the family drive less and walk more.

Summary

Overall, the Power the Future program was very well received by teachers and students. In particular, the windmill testing activity and discussion of conservation measures appeared to be effective and engaging for 2nd graders. Parent and teacher feedback suggests that the topic and content resonated with students, and that both of the stated goals for the program were met, as evidenced by the feedback provided by teachers and parents:

1. Participants feel empowered to make changes to reduce energy use and climate change.
 - Teachers reported that students were excited to talk about changes they could make to reduce energy use.
 - About 2/3 of students told their parents/families about the field trip and what they had learned.
 - Many parents reported that their children took action to reduce energy use at home, indicating that students understood the relevance of the program content to their own lives.
2. Participants feel empowered to learn more about energy and the causes and effects of climate change.
 - The hands-on windmill building and testing activity helped students understand one type of alternative energy.
 - Teachers reported that student discussion of energy use and conservation continued long after the field trip, indicating that student interest in the topic was sustained.
 - The majority of parents reported that children read the book *Our Earth Clean Energy*, and many sought additional reading material on the topic.
 - Students were exposed to basic environmental science and energy use concepts that will enable them to learn more about these topics in the future.

While some of the concepts included in the program may be too abstract or complex for some second grade students, it is important to keep in mind that the program is aimed at elementary students of varying ages, including those who are several years older. For students who do not achieve complete understanding of all of the concepts included in the Power the Future program, the program provides exposure to new vocabulary

and concepts which can provide a foundation for future learning and experience in this science content area. Additionally, by grounding the discussion of global warming and alternative energy sources in the context of student behavior and actions, the program capitalizes on students' interest in the current science topic of climate change/global warming to demonstrate how basic science is relevant and useful in addressing questions and problems in everyday life. In all, the Sciencenter's Power the Future program offers a cohesive set of activities and information on the timely science topic of global warming and climate change at a level that is appropriate for the target age range, and that successfully engages and empowers students who take part.