Collection of Evaluation Reports: Energy Explorers Exhibition Development

During the development of the first permanent exhibition to be installed at COSI, a science center in Columbus, Ohio, a number of front-end, developmental, and remedial evaluations were implemented over the course of 3 years. As the embedded evaluator for this project, I was considered part of the design team and was present at almost all the project team meetings and facilitated all of the evaluations except for the summative evaluation, in which an outside evaluator was hired to perform the evaluation. This collection of reports contains a front-end evaluation that explored what COSI guests knew about energy use and what they might be interested in seeing in an exhibition about energy. Formative evaluations found in this collection covered development of early exhibit elements, prototyping evaluations, and exhibition title testing. The remedial evaluations found in the collection cover many of the hands-on exhibition elements. While not all evaluations that were done during the development of the exhibition can be found in this collection, those reports that are found in it are representative of the overall project.

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EIS: Guest Preferences Front-end Evaluation Report

October 27, 2011
E. Elaine T. Horr, Ph.D.

Energy Investigation Stations is the second phase of the three-year Innovations in Energy project. The project will result in exhibits and programs that explore human energy use and what that means for an evolving energy system. The intent of the project is to empower COSI guests to make informed decisions and take personal actions regarding their energy use that will lead to a more sustainable world. The experiences will be designed to reach adult bill payers and families with children at least 8 years of age and to teach towards behavior change in the area of energy consumption.

This front-end evaluation of the Energy Investigation Stations project is designed to help inform as to what degree COSI guests are concerned about reducing their energy use, what they presently know about energy conservation practices and what they would like to know about that topic. Observations made during evaluations on a proposed exhibition not associated with the Energy Investigation Stations revealed some COSI guests were experiencing fatigue with those issues and topics that appear in the majority of exhibits and programs surrounding the field of natural resources conservation. As one guest told us, "I want to hear something on how to save water other than to turn off the tap when I'm brushing my teeth. Tell me something new." In order to attempt to determine what COSI guests want to hear about energy conservation practices that are more innovative and less well-know, we need to first find out what they currently know about these issues.

The overarching evaluation questions driving this evaluation are as follows:

1. How committed to energy conservation are the COSI guests who participate in this study?
2. What energy conservation topics will COSI guests who participate in this study be interested in learning more about?

Answers to these questions will help inform the COSI Team who are developing and designing the Energy Investigation Stations as to which topics, themes and components should be included in this phase of the Innovations in Energy exhibition.

Method

COSI guests will randomly be recruited to individually complete a paper/pen questionnaire which will consist of a short ranking activity, with ranked items provided by interview participants, a Likert-type item and four open-ended items. The questionnaire form is found at the end of this proposal. Data collection sessions will occur on two days during the week and on a Saturday and Sunday in order to obtain a representative sample of COSI guests. Areas of COSI will be used that have been found to be most conducive to successful recruitment of COSI guests for a questionnaire have been the Atrium and while they are in line waiting to enter the theater, both on the first floor, and on the Mezzanine while they are waiting for someone to ride the elevated unicycle.

Qualitative data obtained from the open-ended items were first recorded in a Word document and then analyzed for emerging patterns. Categories were then developed to describe the theme of the responses, responses were listed in one of the categories and frequency distributions were calculated for each category. Data from the item asking guests to list the top three energy consuming appliances or electronics were analyzed and compared to information obtained from an expert source. Quantitative data from the Likert-type question will be analyzed to determine the mode and median values.

Findings

A total of 100 questionnaires were collected over a four-day period which included two week days and a Saturday and Sunday.

Both the mode and median values were 3 for the item that asked guests to rate their concern pertaining to reducing their energy use, on a Likert-type scale of 1-7 with 1 being very concerned and 7 being not at all concerned.

Twenty-four appliances and electronics were listed by guests as responses to what they thought were the greatest "energy guzzlers" found in their homes. Frequency distributions for this open-ended item were calculated for each of the appliances or electronics listed by guests under the 1st, 2nd or 3rd ranked categories given in the questionnaire.

Table 1: Top Energy Consumers in the Typical Home

COSI Guest Responses	From an Expert Source
1. Air conditioner	1. Air conditioner
2. Refrigerator	2. Heat pump furnace
3. Clothes dryer	3. Electric water heater
4. Furnace	4. Lighting
5. TV; computer	5. Freezer
6. Washing machine	6. Electric clothes dryer
7. Water heater	7. Refrigerator
8. Dishwasher	8. Area fan
9. Range/oven; freezer; hair dryer	9. TV
10. Lighting	10. Range/oven

Table 2: What I am now doing to conserve energy	
General behavior category	**Frequency**
lights and light bulbs	74
buy efficient/turn off electronics	27
appliance purchase/usage	26
heating/cooling	22
home improvements	12
water usage/hot water temp	10
recycling	7
fuel efficient/alternative fuel car	4
misc	4

One item requested COSI guests to list energy conservation behaviors they presently perform. Table 2, located to the left, shows the frequency distribution of those general categories of behaviors identified by guests participating in this study.

Responses for the item requesting guests to share what energy conservation behaviors they know they should be engaging in but are not and why they are not doing so are found in Table 3 on p. 5. Behaviors are listed in the left-hand column and reasons for not engaging in those behaviors are listed across the top row, totals are calculated for each variable and are recorded at the end of the columns or rows.

Responses for the item requesting guests to tell us what topics they would not be interested in hearing about in the exhibit why they are not interested in those topics are found in Table 4 on p. 6. The topics they would not be interested in are listed in the left-hand column and reasons they are not interested in those topics are listed across the top row, totals are calculated for each variable and are recorded at the end of the columns or rows.

Responses for the item requesting guests to inform us as to what topics they would not be interested in hearing about in the exhibit and why they are interested in those topics are found in Table 5 on p. 7. The topics they would be interested in are listed in the left-hand column and reasons they are interested in those topics are listed across the top row, totals are calculated for each variable and are recorded at the end of the columns or rows.

Table 3: Energy conservation behaviors COSI guests know they should be doing but are not and why they are not doing these things.

		Why they are not doing these things												
		cost	not in the habit or incon-venient	not practical	uncom-fortable	children resist and/or refuse	starting to try	don't believe it's necessary	don't know what to do	not sure why I don't	already doing everything we can	have environ-mental concerns	rent our home	Total
Things COSI guests are not doing to conserve energy but know they should do	Nothing I can think of	0	0	0	0	0	0	1	2	1	1	0	1	6
	Walk/ride bike or bus	0	2	1	0	0	0	0	0	0	0	0	0	3
	Recycle	0	1	0	0	0	0	0	0	0	0	0	0	1
	Alternative energy sources	8	0	1	0	0	0	0	0	0	0	0	0	9
	Decrease appliance/electronic usage	0	5	1	1	0	0	0	0	0	0	0	0	7
	Turn off electronics/appliances	0	14	0	0	1	0	0	0	2	0	0	0	17
	Fuel efficient/alt. energy car	0	0	2	0	0	0	0	0	0	0	0	0	2
	Water usage/hot water temp.	0	3	0	2	0	1	0	0	0	0	0	0	6
	New windows/more insulation	8	0	1	0	0	0	0	0	0	0	0	0	9
	Heating and cooling	0	0	0	2	0	0	0	0	0	0	0	0	2
	Purchase energy efficient appliances/electronics	7	0	0	0	0	0	0	0	0	0	0	0	7
	Lights and light bulbs	2	4	0	0	2	0	0	0	0	0	1	1	10
Total		25	29	6	5	3	1	1	2	3	1	1	2	79

Table 4: What COSI guests would not like to see in this exhibit and why they would not want to see it

		Why they do not want to hear about this						
		already know/do this	disbelief/don't agree	arguments are politically based	fuel source has negative environmental effects	cost	not shown to be effective/worth the cost	Total
What COSI guests do not want to hear about in this exhibit	Solar power	0	1	0	0	1	0	2
	Nuclear power	1	0	0	1	0	0	2
	Fossil fuel sources	0	1	0	2	0	0	3
	Global climate change/warming	0	2	3	0	0	0	5
	Electric/hybrid cars	1	0	0	0	0	1	2
	Well-know conservation behaviors	2	0	0	0	0	0	2
	Recycling	2	0	0	0	0	1	3
	General environmental effects of behaviors	1	0	0	0	0	0	1
Total		7	4	3	3	1	2	20

Table 5: What COSI guests want to see in the exhibit and why they want to see it

		Why they want to see this								
		save money and/or energy	it is a realistic goal	it is interesting	energy indepen-dence	responsible stewardship	when will it be affordable for most people?	know more about this	no reason given	Total
What COSI guests want to see in the exhibit	**Conserving electricity**	5	0	1	0	1	0	0	2	9
	Feasible alternative energy	2	5	1	2	2	3	3	3	21
	Heating/cooling	1	0	0	0	0	0	0		1
	Cars: alternative fuels, increased mpg	1	0	1	0	2	0	2	1	7
	Recycle and/or reuse	0	0	0	0	1	0	0	2	3
	Home improvements	1	1	0	0	0	1	1	1	5
	Pros and cons of conservation measures	0	0	1	0	0	0	0	1	2
	Tips on affordable and/or convenient conservation behaviors	4	1	0	0	7	0	2	0	14
	What is presently being done	0	0	2	0	0	0	0	0	2
	Information on appliances	0	0	0	0	0	0	0	2	2
	Environmental impacts	1	0	0	0	1	0	0	0	2
	Landscaping measures	1	0	0	0	1	0	0	0	2
	Anything	1	0	1	0	0	0	0	0	2
Total		17	7	7	2	15	4	8	12	72

Discussion

Responses of COSI guests(mode and median = 3) to the 7-point Likert-type scale item asking them to rate the level of their concern about reducing their own energy use indicate guests are only slightly concerned about this. Data from this item were used to answer evaluation question one pertaining to the level of commitment to energy conservation of the COSI guests who participated in this study.

The data from the rest of the items on this questionnaire were used to answer the second evaluation question regarding what topics COSI guests would most like to see in the Energy Investigation Stations exhibition. These items cover not only what people might and might not like to see in the exhibition and why, but also in which behaviors they are currently engaging and what they do and do not know about energy efficiency in their own homes. The intent of these items is to help inform COSI as to what to include in the exhibition and what to rule out of the final design.

COSI guests listed what they thought the top three energy-consuming appliances and/or electronics were in their home. After frequency distributions were calculated for the responses, the top three appliances or electronics that were identified by guests, the air conditioner, the refrigerator, and the clothes dryer, were compared to the list compiled from a number of internet websites dealing with the appliance and electronics energy consumption of an average family of four, the air conditioner, the heat pump furnace and the electric hot water heater. The assumption that was made when examining this item was that the heating device and hot water heater used electricity as the energy source. COSI guests did identify the air conditioner as being the top energy consuming electric device in the typical home and although they did not correctly identify the second and third highest energy consumers, the second highest energy-consuming device, the furnace, was in 4th place on the COSI guest list. However, when we look at the top ten energy-consuming devices we see that COSI guest responses did not identify the water heater and lighting, in third and fourth place on the expert source list, as being high energy consumers while guest response frequencies placed the TV and the computer just after the furnace as being a top energy consumer. Then again, if we look at those electric devices that use little energy, very few guests identified things such as the hair dryer, curling iron, water well pump, toaster, and video games systems as being the top energy consuming devices in their homes. Therefore, data indicate that COSI guests have some idea as to which electric devices use the most and the least energy in their homes, there is still a gap in the preciseness of the knowledge in this area of the average COSI guest.

When requested to tell us what they are presently doing to conserve energy, the majority of guests listed one or two behaviors, with a few listing 3 or more behaviors and only 6 persons telling us they were not doing anything at this point or just did not respond to the item. The overwhelming majority of responses are associated with turning off the lights and/or replacing incandescent bulbs with CFL bulbs. The next two most frequent behaviors guests told us they performed were to purchase energy efficient electronics and/or appliances and to turn them off and/or unplug them when not using them. One person shared “we always turn off the TV or computers when not in use” while another wrote s/he

conserved energy by "unplugging things not using at the time, like microwave and TV". Another frequently performed behavior was setting the thermostat low in the winter and high in the summer as a way to lower heating and cooling energy usage and to add insulation and/or replace doors and windows. A few people indicated they lowered the hot water temperature or used less hot water or both to help lower their electric bills. Some guests listed recycling and driving energy efficient or alternative fuel cars as a means of saving energy. Other behaviors shared ranged from being involved with building a biodiesel plant at Susquehanna University to using rain barrels to driving slower and planning/combining trips when running errands. Overall data suggest the great majority of COSI guests are willing to take steps to reduce their energy consumption in some way.

The energy conservation behavior listed most often as one that COSI guests knew they should be doing but are not doing is turning off electronics and appliances and the major reason listed as to why they are not doing the behavior is that they just are not in the habit of doing so or that it is inconvenient, although two persons told us it was not practical or was uncomfortable to do so. One guest told us "I just forget most times" while another shared that it "takes too long to boot up the computer" after having turned it off. The second behavior we found guests least likely to engage in was dealt with turning off and replacing incandescent light bulbs with more energy efficient types. The most listed reason for not doing this was just not being in the habit or that it was inconvenient, as in the electronics and appliances, but other reasons given dealt with the cost involved in replacing the light bulbs and that the children in the family would not cooperate. One person told us she had concerns with the disposal of the mercury found in the CFL bulbs. This behavior rate was followed closely by investing in alternative energy sources for the home and home remodeling activities, both of which were cited as being too costly to invest in at this point for the COSI guest although one response for each behavior indicated it was not practical for that person to do so. Other behaviors listed ranged from hot water usage to recycling to energy related to transportation. The two most often cited reasons for not engaging in one or more of any of the listed behaviors were not being in the habit of doing so or it being inconvenient (29 responses) and the cost related to that behavior (25 responses). The next most cited reason to not engage in the behavior, that it was not practical to do so, was only listed 6 times. This would indicate that the major reasons more people do not engage in specific energy conserving behaviors is due to inconvenience/not remembering to do so and/or financial reasons.

We asked guests to share with us things they would not like to hear about in this type of an exhibition. Although the majority of participants left this question blank or told us they wanted to hear about anything we chose to include in the exhibition, of the 20 responses we did receive regarding things they did not want to see in this, 5 responses reflected no interest in global warming/climate change. Reasons given for this were that they either did not believe in the topic, did not agree with the topic, or felt the treatment of the topic was politically based or biased. One person shared s/he did not want to hear about "how fossil fuels are evil" while two persons told us they did not want to see fossil fuels in the exhibition because of the negative environmental impacts of this fuel source. Three guests said they did not want to hear about recycling, two because the topic is well-known and they are already doing recycling and one because recycling does not show a "direct tangible

savings". Reasons given for not wanting to hear about solar power were one person thought "the information is an inaccurate representation of a theoretical maxim" while another told us the cost was prohibitive for the average homeowner. One person did not want to hear about nuclear power because s/he already knew about this but a second person did not want nuclear power discussed because of the "very toxic by-products" produced by nuclear power plants. Finally, a very few guests did not want the exhibition to cover well-know conservation behaviors and the general effects on the environment of conservation behaviors because they already know those things. One person shared that "I already know I am wasting" energy and another told us "there is too much emphasis on this already – tired of hearing about it". Overall, it would appear that while a few guests may not want certain topics covered, the overwhelming majority has nothing in particular they do not want included in the exhibition.

This brings us to what COSI guests would like to see in this exhibition. The category that had the most responses to this item was the one covering feasible alternative energy sources. One person told us s/he was interested in learning more about "wind energy – it is currently evolving and is cutting edge". Another shared the desire to learn more about "ways of generating energy (trash, wind, solar)" in order to become more energy independent. The other two categories with the most responses were tips on how to save energy in general and especially how to conserve electricity. A number of persons were interested in learning about alternative fuels for cars or how to increase their mpg efficiency and also what types of home improvements they could implement to help conserve energy. A few told us they would like to see the exhibit cover everything from information on appliances, heating/cooling and landscape measures they could take in the home arena to environmental impacts and what is currently being done. The two primary reasons given for interest in what they want to see in Energy Investigation Stations is first, to save money and/or energy, and second, to be responsible stewards of the environment. Some people gave no reason for why they wanted to see certain topics, but others cited that the topic is realistic and interesting and they would like to learn more about the topic itself and when it might be an affordable option for the average person to implement.

Conclusion

COSI guests participating in this study indicated only a slight concern regarding reducing their energy use, yet most told us they were engaging is some type of energy conservation behavior, especially those behaviors dealing with lighting in the home and purchasing and using electronics and appliances. Most guests admitted there were some behaviors they knew they should be engaging in yet were not, and the main reasons given for this were forgetting to do so or the inconvenience associated with this and the costs involved in implementing these rather than actual disinterest in those actions. Initially, there was a concern that some topics which might be included in the Energy Investigation Station exhibition might not be of interest to a large number of guests, but data actually indicated this is not the case. Therefore, we can assume most guests would be open to any topic the COSI Team believed to be relevant and important to the Energy Investigation Stations exhibition.

Alternative Fuels ETS Sign Test: Phases 1 & 2

Future Fuels ETS Sign Test: Phase 1

April 11, 2011
E. Elaine T. Horr, Ph.D.

Background
Josh Kessler has developed 3 sets of graphics for the Alternative Fuels panel, part of the Innovations in Energy exhibit due to open in July 2011. The graphics differ only in comparing the amount of CO_2 pollution given off by gasoline and 4 other alternative fuels for automobiles. After taking these mock up graphics to other COSI Team members and asking which of the 3 designs they preferred, there was no definitive preference. The purpose of this ETS, therefore, is to inform a decision about which set of graphics best conveys the idea of CO_2 pollution when comparing 5 sources of automotive fuels. On Friday, April 8, 2011 we tested mock-ups of the 3 designs for clarity and ease in reading with COSI visitors.

Research Question
The research question for this test was: Which set of graphics best compares the amount of CO_2 pollution for gasoline and four other sources of automobile fuels?

Methodology
Methods used are a ranking activity followed with a brief interview. Mock ups of the 4 alternative fuel graphics were mounted on foam board for the 3 possible designs and Velcro was put on the back of each of the 3 foam boards. Targeted population is adult COSI guests. Participants were asked to rank the designs by placing the boards in order of preference on the felt board. After they ranked their choices, they were asked questions relating to what the main idea of the graphics is and why they ranked the designs as they did. Data collection was done from 10:00 AM – 11:30 AM in the area along the outside wall of the atrium closest to the East Box Office Pods. A total of 31 interviews were completed.

Results

The first task for participants was to put the 3 design mock-up signs in order of their preference for clarity and ease of reading. Frequencies were then calculated for each of the design types. This was done for both the first design choice and the last design choice. Results for both are shown in the following tables.

First Choice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	• **weight/tons icon**	12	38.7	38.7	38.7
	• **scale with car**	16	51.6	51.6	90.3
	• **car with emission**	3	9.7	9.7	100.0
	Total	31	100.0	100.0	

Last choice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	• **weight/ton icon**	9	29.0	29.0	29.0
	• **scale with car**	5	16.1	16.1	45.2
	• **car with emissions**	17	54.8	54.8	100.0
	Total	31	100.0	100.0	

As can be seen, the design using the scale running from green to yellow to red and having a color-coded car was the first choice for almost 52% of the participants, followed by the weight/tons icons with 39% as the second choice. Only 10% of participants chose the car with the smoke puff emissions as their first choice for the design style.

Reasons participants gave for choosing a particular design as their favorite were listed and general categories were developed, determined according to patterns of responses. Each response was then placed in what was deemed to be the most appropriate category. These general categories are used for both the reasons for first and last choices of the designs:

1. Color usage was appealing or contributed to graphic clarity
2. Format component that contributed to the ease in understanding the scale of the emissions
3. Format component that contributed to the ease in comparing different fuel emissions

4. Format component that contributed to the ease in understanding the intent of the graphic
5. Other miscellaneous reasons

Frequencies and percentages for reasons given by participants for listing a particular design as a first choice and last choice positions can be seen in the tables on the following page.

Reason first choice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	• **Color usage was appealing or contributed to graphic clarity**	4	12.9	12.9	12.9
	• **Format component that contributed to ease in understanding scale of emissions**	18	58.1	58.1	71.0
	• **Format component that contributed to the ease in comparing different fuel emissions**	3	9.7	9.7	80.6
	• **Format component that contributed to the ease in understanding the intent of the graphic**	6	19.4	19.4	100.0
	Total	31	100.0	100.0	

Reason last choice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	• **Color usage was appealing or contributed to graphic clarity**	4	12.9	12.9	12.9
	• **Format component that contributed to the ease in understanding the scale of the emissions**	18	58.1	58.1	71.0
	• **Format component that contributed to the ease in understanding the intent of the graphic**	7	22.6	22.6	93.5
	• **Other miscellaneous reasons**	2	6.5	6.5	100.0
	Total	31	100.0	100.0	

According to these results, the primary reason visitors chose a favorite or least favorite design centered on the format they considered to best contribute to the ease in which they could understand the scale of the car emissions, with this category having 58% of the responses for both first and last design choices. One visitor noted that they liked the scale with the car design best because it was "the easiest to read" while another noted it was their least favorite design option because it was "hard to understand the difference in the scale – think more about where the car is on the scale". When explaining why the weight/tons design was their favorite, one visitor said it was because you could "easily see the tons amount" but another visitor said that was their least favorite because there were "too many tons – made it confusing". And with the car with emissions design, 2 of the 3 visitors who chose this as their favorite did so because, as one of them said, it was "really graphic – could easily compare emission amounts between fuels", while most visitors who chose it as their least favorite did so because they considered the smoke to be confusing. Two people, in fact, thought the smoke puffs were actually rocks.

The second reason chosen by visitors for both favorite and least favorite picks was how the format contributed to the ease of understanding what the intent was of the graphic - how it demonstrated what the graphic was all about with 19% (favorite) and 23% (least favorite). Four visitors (13%) cited color usage as their reason for picking both favorite and least favorite design component. The component design that was not mentioned by any visitor as a reason for their least favorite design dealt with ease in comparing car emissions. There were a few miscellaneous reasons given as to why a design was the least favorite, such as "junky" and "too dry, boring" for the weights/tons design. The next two tables list the design and reasons for choosing it first or last.

Reason first choice * First choice Crosstabulation

		First choice			
		weight/tons icon	scale with car	car with emission	Total
Reason first choice	**Color usage was appealing or contributed to graphic clarity**	0	4	0	4
	Format component that contributed to ease in understanding scale of emissions	9	8	1	18
	Format component that contributed to the ease in comparing different fuel emissions	0	2	1	3
	Format component that contributed to the ease in understanding the intent of the graphic	2	3	1	6
Total		11	17	3	31

Reason last choice * Last choice Crosstabulation

		Last choice			
		weight/ton icon	scale with car	car with emissions	Total
Reason last choice	**Color usage was appealing or contributed to graphic clarity**	3	0	1	4
	Format component that contributed to the ease in understanding the scale of the emissions	3	5	10	18
	Format component that contributed to the ease in understanding the intent of the graphic	1	0	6	7
	Other miscellaneous reasons	2	0	0	2
Total		9	5	17	31

The final item on the interview schedule asked visitors what they thought the signs were trying to get across. As in the reasons given for first and last choices, reasons participants given were listed and general categories developed, determined according to patterns of responses. Each response was then placed in what was deemed to be the most appropriate category. These general categories are:

1. Comparing fuel types
2. Comparing fuel costs
3. Comparing emissions of each fuel type
4. Comparing costs and emissions of different fuel types
5. Determining the best energy source
6. Use of natural resources and production of emissions
7. Other miscellaneous statements

The following table shows frequencies and percentages for each of the categories.

Main idea of graphics

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	• **Comparing fuel types**	5	16.1	16.1	16.1
	• **Comparing fuel costs**	2	6.5	6.5	22.6
	• **Comparing emissions of each fuel type**	9	29.0	29.0	51.6
	• **Comparing costs and emissions of different fuel types**	8	25.8	25.8	77.4
	• **Determining the best energy source**	3	9.7	9.7	87.1
	• **Use of natural resources and production of emissions**	2	6.5	6.5	93.5
	• **Other miscellaneous statements**	2	6.5	6.5	100.0
	Total	31	100.0	100.0	

The largest percentage (29%) of visitors identified the main idea of the graphics as comparing the emissions of each fuel type, closely followed by 26% of visitors identifying the main idea as comparing both costs and emissions of the different fuel types. This would indicate that 55% of visitors would identify the main idea of the graphics as having to do with comparison of the emissions of the different types of fuels. Almost 10% of visitors thought determining the best energy source was the main idea of the graphics, but did not explain why an energy source would considered to be the best. And 6.5% of visitors thought the main idea was either comparing fuel costs or the use of natural resources and how they produced emissions or other reasons such as “how much energy we use”.

Summary

The following conclusions can be drawn based on the data collected during this sign test:

- The design cited as the first choice by the majority of visitors (52%) was the one that had the color scale going from red to yellow to green and had a car with one of those colors placed at an appropriate point along the scale that reflected the amount of emissions from that fuel.
- The design cited as the last choice by the majority of visitors (55%) was the one that had the puffs of smoke indicating emission amounts coming out of the car, which was also color coded (red-yellow-green) as to emission amounts.
- The main factor that led visitors to choose one design over another for both first and last choices centered on design components that made it easier for the visitor to determine and compare emission amounts of the different types of fuels.
- Color usage in the design had the least impact of visitor choices except when looking at the weight/ton design. In that case, 33% of the responses dealing with why this design was the last choice indicated too much black as the reason while none of the visitors cited color as being a reason they would prefer this design style.
- The majority of visitors (55%) identified comparing the emissions of the different fuel types (26% of these also added comparing fuel costs to this) as being the big idea of the graphics.

Future Fuels ETS Sign Test: Phase 2

May 6, 2011
E. Elaine T. Horr, Ph.D.

Background
Josh Kessler has developed 3 sets of graphics for the Future Fuels panel, part of the Innovations in Energy exhibit due to open in July 2011. On Friday, April 8, 2011 we tested mock-ups of the 3 designs for clarity and ease in reading with COSI visitors. Using the results from this test, Josh then developed the modified Future fuels panel and on Wednesday, April 27, 2011 we tested the mock-up of the modified panel.

Research Question
The research question for this test was: Will visitors identify the overall message of the newly modified Alternative Fuels sign panel?

Methodology
Methods used are a sign reading activity followed with a brief interview. Targeted population is adult COSI guests. Participants will be asked to disseminate specific information from the Alternative Fuels panel and then to answer questions relating to what the main idea is of the panel. Goal is to complete 40 interviews or until data saturation occurs.

Results
A total of only 26 interviews were done for this test due to by this time having reached the data saturation point. The interview schedule consisted of four items, three of which were open-ended and one being a sign-reading comprehension item. For each open-ended interview item we obtained multiple responses from some participants. Responses to the open-ended interview items were analyzed to determine thematic patterns and categories were developed from the patterns that were identified. Finally, each response from the open-ended interview items were placed in one of the response categories and analysis consisted of determining frequencies of responses for each category.

The first interview item requested the participant to identify the main idea for the panel sign. Six categories were developed for the 30 participant responses given to this item. Categories and frequencies per category are listed in the following table.

Main Idea		
	Frequency	Valid Percent
not sure/misc.	4	13.3
general comparison of fuel types	11	36.7
compare emissions	2	6.7
compare costs	4	13.3
compare costs and emissions	6	20.0
compare costs, emissions, resources	3	10.0
Total	30	100.0

The second interview item was the sign-reading comprehension exercise in which participants were asked to find specific information on the Future Fuels panel sign. Analysis for this item consisted of examining whether or not participants had any problem in finding the information we were requesting. The frequency distribution table for this item is listed below.

Sign-reading Comprehension		
	Frequency	Valid Percent
no problem finding information	22	84.6
had some problem finding information	4	15.4
Total	26	100.0

We next asked visitors to share with us what parts of the sign they thought were very helpful when trying to determine specific information listed on the sign. This item garnered the most responses of all the interview items, with the 26 participants we interviewed giving us 60 responses. Additionally, it was determined that 8 categories were needed to adequately list all participant responses given. The frequency distribution table for this item can be found on the following page.

Helpful Sign Parts		
	Frequency	Valid Percent
colors	6	10.0
graphics	4	6.7
font/numbers	3	5.0
general organization of sign	11	18.3
notice/used car and scale	3	5.0
did not notice or use car and scale	9	15.0
noticed but did not use car and scale	9	15.0
comparison of fuel types	15	25.0

Helpful Sign Parts		
	Frequency	Valid Percent
colors	6	10.0
graphics	4	6.7
font/numbers	3	5.0
general organization of sign	11	18.3
notice/used car and scale	3	5.0
did not notice or use car and scale	9	15.0
noticed but did not use car and scale	9	15.0
comparison of fuel types	15	25.0
Total	60	100.0

The final item on the interview schedule asked visitors to share with us what parts of the sign they thought were confusing when trying to determine specific information listed on the sign. Six categories were developed for the 26 participant responses given to this item. Categories and frequencies per category are listed in the following table.

Confusing Sign Parts		
	Frequency	Valid Percent
nothing	11	37.9
text	3	10.3
graphics	6	20.7
color	1	3.4
lacking some information	6	20.7
organization of information	2	6.9
Total	29	100.0

Conclusion

When asked what they thought the main idea was that the sign panel was trying to convey, 11 participants (almost 37% of responses) told us it had to do with a general comparison of automotive fuel types. Of those participants who cited specific information about each fuel type, the most often given response (20% of responses) was a comparison of costs and emissions, followed by a comparison of costs only (13% of responses); a comparison of costs, emissions and resources from which the fuel type is derived (10% of responses); and finally a comparison of emissions only (7% of responses). Only 4 participants (13% of responses) said they were not sure what the main idea was for the sign.

The sign-reading comprehension activity asked participants to find emission amounts of the different fuel types listed on the sign panel. Of the 26 persons we interviewed, only 4

(15%) had some problem finding the information, with the remaining 22 persons (85%) had no problems. When the 4 persons who had some difficulty were given some direction with finding information for one fuel type, all were then able to find the information for the remaining fuel types.

We next asked participants to share with us what parts of the sign were most helpful. Because the major component of the sign that was modified from the original version we tested was how the CO_2 emission amounts were presented, we would prompt the participant to give us feedback on the car positioned on a scale under the written emission amount in tons if they did not do so without the prompt. The top two response categories for this item, the comparison of fuel types (25% of responses) and the general organization of the sign (18% of responses) are similar enough to combine since the general design of the sign is a comparison of the fuel types. Graphic, font and color choices combined are responsible for 22% of the given responses. When we examine the car and scale emissions component, there was an even division between people who did not notice the car and scale (15%) and those who did notice this graphic but did not use it when trying to determine CO_2 emissions (15%). Only 3 persons interviewed (5% of responses) told us they had noticed the car and scale and also used it when determining emissions.

Finally, we asked visitors what parts of the sign were a source of confusion. Eleven persons (38% of responses) replied that there was nothing about the sign they found confusing. For those persons who shared some concerns about the sign, the confusing sign components most often cited dealt with the graphics (21% of responses) and that some information was lacking that would be helpful (21% of responses). The main graphic component that initially confused some participants was having the flame as the fuel resource graphic for both the CNG and hydrogen fuels. However, the color for both was very similar and was also cited (3% of responses) as adding to the confusion for the information on those two fuel types. The main concern shared by some participants regarding what information was lacking centered on the zero emissions listed under electricity. While participants understood the electric car gave off no CO_2 emissions, at the same time they noted that the coal burned to produce the electricity did give off emissions. Some felt that this was being slightly dishonest and biased.

Data we collected would suggest that the latest modified version of the Future Fuels panel sign communicates the main idea of comparing the pros and cons of alternative fuel sources for automobiles. Additionally, participants in our test indicated to us the sign that was tested is visually easy to use when trying to disseminate information on the different types of fuels.

Challenge Tables Approaches for the Energy Investigation Stations Exhibition

Experience Testing Station Report

Prepared by: E. Elaine T. Horr

Date: April 30, 2012

What was the purpose of the test?

Energy Investigation Stations is the second phase of the three-year Innovations in Energy project. The project will result in exhibits and programs that explore human energy use and what that means for an evolving energy system. The intent of the project is to empower adult bill payers and families with children at least 8 years of age to make informed decisions and take personal actions regarding their energy use that will lead to a more sustainable world. One exhibit element being explored is what is presently being termed as a "challenge table". This goal of this exhibit element is to initiate conversations, which we define as high level thinking and/or learning, primarily among adult COSI guests and would have different approach designs/formats that could be changed periodically.

The purpose of the test wass to determine which, if any, approaches would best generate COSI guest conversation in the Energy Investigation Stations (EIS) exhibit space. We also wanted to discover if one or more of the approaches better stimulates conversations among age groups. Qualitative data was analyzed for trends and patterns and quantitative data was analyzed for frequencies.

What were the evaluation questions?

The overarching evaluation questions for this study are as follows:

- To what degree will the different Challenge Table approaches initiate the level of conversation as defined by the project team?
- Which, if any, approach(es) would be the best choice for specific age groups within the target audience?

What were the methods used to address these questions?

A challenge table area, consisting of a table, chairs and the materials for a specific approach design was set up in the Energy Innovations Showcase hallway and was tested three days a week for a month. Originally we hoped to gather 35 observations/approach design, but due to the low response level, chose to limit the study by time rather than number of observatons. Each approach had the same written prompts designed to initiate conversation, but one approach was only text, one was visual graphics and one was an interactive, hands-on activity.

Findings

Although no data was recorded regarding the total number of persons that visited the area in which the study was done, it can be estimated that the overwhelming majority of COSI guests who passed the challenge table either ignored the purpose of the table. Many either did not even look at the challenge table or sat at it to rest, text message on their cell phone, etc. For the text format, only 1 group of two women accompanying their young children had any discussion whatsoever. These two women stood and did engage in evaluative discussion while the children played with the fuel pumps. Two factual level discussions occurred with the graphics format. One discussion was between the parents of two young children, but the children claimed the father's attention even as the mother continued to read the information on the table, and the father never returned to the table to continue the discussion. The second discussion occurred as a woman pointed out some information on the table to the man who was with her and said "I want to do this" but the couple then walked away. Two adults accompanying a young child started discussing the Stepping Stones activity, but only progressed to the factual stage as the child got bored after about two minutes and the group left the challenge table area. It was decided to then change the location of the challenge table to an area that would possibly have more persons in it, so the table was moved to the Water exhibit hallway area and placed in three different locations in the hallway, with no better results than had been seen in the Innovations Showcase hallway.

To better understand why no one was stopping at the challenge table we decided to ask persons why they had not stopped after they had passed the table. One person told us they had not stopped because they had not noticed it, another because no one else was at the challenge table, and one man accompanying about 4 boys (later determined to be part of a school field trip group) said one of the boys was heading for the restroom but once he got the boy to the restroom wanted to do the activity. Although the adult was engaged, the boys soon became bored after having just played around with the activity but not really paying attention to the purpose of the activity and the group soon left the area.

Discussion

My observation of the challenge table areas would suggest that there needs to be some type of design element that would grab the attention of persons in order to get them to see and

decide to engage in a challenge table discussion. Those persons who did engage in the discussions seemed to do so because one person in the group just happened to be by the table and glance down at the information displayed on the table and then became interested. However, most people did not even look at the table surface for the text and graphics formats and those that did look at the Stepping Stones may have picked up one or two pieces and even read the instructions I wrote up to try to get more persons to engage with the activity, but usually were pulled away by others in the group.

Conclusion

The challenge table format does not seem to draw COSI guests to engage in higher level conversations regarding personal electrical energy conservation. The different format choices did not seem to have any effect on attracting visitors of any of the target audience ages to connect with the focus of the challenge table.

Energy Investigation Stations: Potential Proposed Exhibition Title Testing in 2 Phases

Phase 1: Experience Testing Station with COSI Guests

Prepared by: E. Elaine T. Horr, Ph.D.

Date: June 28, 2012

What was the purpose of the test?

The purpose of this test is to explore potential titles for the Energy Investigation Stations (EIS) exhibit regarding COSI guests' perception of what the proposed titles indicate to them about the experiences and main idea of the EIS exhibition that is being designed and will open early summer 2013. Discussion during an EIS team meeting led to the development of a list of 15-20 possibilities for potential titles for the EIS exhibition. This list was narrowed to a final list of eight potential titles to test: Charged; Empower; Energy; Power Switch; Power Up; Switch; Watts Up; Zap.

What were the evaluation questions?

The overarching questions for this Experience Testing Station test are:

- Which proposed potential title for EIS do COSI guests perceive as being the most provocative for drawing people into the exhibit area?
- From the proposed potential titles that COSI guests will be shown, what are some topics they would associate with the EIS exhibition?

What were the methods used to address these questions?

A short semi-structured interview, which will include a potential title card sort, was implemented for this study.

Findings

A total of 65 guests or guest groups were interviewed for this study. Ranking data for the potential titles tested was entered into the SPSS data analysis program and frequencies were calculated regarding ranks 1-8 given by COSI guests for all eight potential titles. Final

ranking positions for the titles were calculated using the reverse ranking technique. All the data for this section of the study can be found in Table 1on the following page.

Table 1: Reverse ranking of potential titles

	1st	2nd	3rd	4th	5th	6th	7th	8th	Total Points	Rank
Charged	10 X 8 = 80	13 X 7 = 91	10 X 6 = 60	7 X 5 = 35	14 X 4 = 56	7 X 3 = 21	2 X 2 = 4	2 X 1 = 2	349	**3**
Empower	8 X 8 = 64	11 X 7 = 77	9 X 6 = 54	4 X 5 = 20	13 X 4 = 52	6 X 3 = 24	6 X 2 = 12	8 X 1 = 8	311	**5**
Energy	5 X 8 = 40	0 X 7 = 0	3 X 6 = 18	6 X 5 = 30	4 X 4 = 16	11 X 3 = 33	8 X 2 = 16	28 X 1 = 28	181	**8**
Power Switch	0 X 8 = 0	3 X 7 = 21	6 X 6 = 36	9 X 5 = 45	9 X 4 = 36	17 X 3 = 51	17 X 2 = 34	4 X 1 = 4	227	**6**
Power Up	9 X 8 = 72	10 X 7 = 70	17 X 6 = 102	13 X 5 = 65	7 X 4 = 28	4 X 3 = 12	4 X 2 = 8	1 X 1 = 1	358	**2**
Switch	1 X 8 = 8	3 X 7 = 21	3 X 6 = 18	7 X 5 = 35	10 X 4 = 40	5 X 3 = 15	23 X 2 = 46	13 X 1 = 13	196	**7**
Watts Up	23 X 8 = 184	14 X 7 = 98	9 X 6 = 54	4 X 5 = 20	4 X 4 = 16	6 X 3 = 18	1 X 2 = 2	4 X 1 = 4	396	**1**
Zap	9 X 8 = 72	11 X 7 = 77	8 X 6 = 48	15 X 5 = 75	4 X 4 = 16	9 X 3 = 27	4 X 2 = 8	5 X 1 = 5	328	**4**

For the open-ended items of the interview, guest responses were analyzed to detect trends and patterns for each of the potential titles, then to identify category headings for the responses, and to calculate frequencies for each category. Table 2, below, contains frequency data for guests' responses to the item asking them to share why they chose a particular title as their favorite title for the exhibition area.

Table 2: Frequency of responses for first choice reasons

	Watts Up	Power Up	Charged	Zap	Empower	Power Switch*	Switch	Energy
Catchy/play on words	18	4	**3**	4	3	0	1	0
Intriguing - draws you into exhibition	3	2	3	7	0	0	0	0
Descriptive of exhibition	1	2	1	0	2	0	0	3
Sounds fun/interesting	0	2	1	1	0	0	0	0
Strong/powerful word	0	0	2	0	4	0	0	0
Refers to behaviors and/or savings pertaining to energy use	0	2	1	0	2	0	0	2
Miscellaneous reason	1	3	2	2	0	0	0	0

* Received no first place ranking from guests

Guests were also asked to explain what they would expect to see or do in an exhibition that had their favorite title choice as the title for the exhibition. Data from this item can be found in Table 3, below.

Table 3: Frequencies of responses for what guests would expect in exhibition due to exhibition title

	Watts Up	Power Up	Charged	Zap	Empower	Power Switch*	Switch	Energy
Information pertaining to electricity/electrical energy	19	4	5	7	3	0	1	1
Information about different types of energy/power	5	2	2	0	4	0	0	2
Hands-on activities	4	5	1	0	5	0	0	1
Information on energy in general	2	4	3	3	6	0	0	4
Behaviors/savings pertaining to energy	4	1	0	0	5	0	0	1
Pertaining to the exhibition environment and/or experience	1	1	0	1	2	0	0	1
Not sure, but title would get me inside exhibition	3	1	0	0	0	0	0	0
Not sure/miscellaneous	0	1	0	3	0	0	0	0

* Received no first place ranking from guests

Table 4, on the following page, contains results from the interview item asking guests why they chose a particular title as their least favorite title for the new exhibition area.

Table 4: Frequencies of responses for last choice reasons

	Energy	Switch	Power Switch	Empower	Zap	Charged	Power Up	Watts Up
Boring/not interesting	26	7	2	1	1	1	1	0
Does not reflect energy theme of exhibition	0	5	2	5	0	0	0	1
Sounds like a negative experience	0	0	0	0	2	1	0	0
Silly/"cheesy"	0	0	0	0	1	0	0	1
Other titles were better/just did not like	1	1	0	1	1	0	0	1

The final interview item was **"Anything you would like to add about this that I haven't asked?"**
Only seven of the sixty-five guests interviewed for this study responded to this item, with one person giving multiple responses covering diverse topics. Due to the small number of responses, all are listed here:

- Could combine my top 3 choices in some way (these were "Watts Up", "Zap", and "Charged")
- It would be cool if the electrostatic generator was in there
- (This person added more information on why she made the choices between her first and last rankings)
- It should be like/have stuff like in the Water Exhibit – quiz there that had kids doing it over and over again to improve their score
- Should cover deregulation issues and how electricity is delivered to homes
- Have something about unique energy sources.
- Things that are powered by energy.
- Solar energy.
- Maybe agricultural uses of energy

Discussion

'Watts Up' was clearly the favorite title choice for the new energy exhibition being designed by COSI. When asked why they liked that title best, the overwhelming majority of responses indicated it was because it was a catchy, play on words title that would grab someone's attention while only one guest told us it was descriptive of the exhibition topic. When guests were asked what they would expect to see in an exhibition with this title, "Watts Up" had at least one guest response in each of the categories, except for the "not sure/miscellaneous" category, although half of the responses fell into the category of

"information pertaining to electricity/electrical energy". Data indicates, then, that "Watts Up" is the overall favorite title for the new exhibit because it is a catchy phrase and people would expect to see things primarily about electrical energy in the exhibition area.

Coming in as the second favorite title of COSI guests interviewed was "Power Up", mainly because it is a catchy title that sounds fun and would draw people into the exhibition. "Power Up" was the only title that had at least one guest response in each of the categories when asked what they would expect in an exhibition with this title, although most told us they would expect to see hands-on activities that would explore information on energy in general and information pertaining to electricity/electrical energy.

The third most-favorite title chosen by COSI guests was "Charged", because it was catchy, would draw one into the exhibition and was a strong, powerful word. If the exhibition had this title, people would expect to see information mainly about electrical energy, although some told us they would expect to get information about energy in general.

As to why a few guest chose "Zap", "Empower", and "Switch" to be their favorite title for the exhibition, all were chosen because they were catchy or a play on words, although more chose "Empower" because they perceived it to be a strong, powerful word that exemplifies the essence of energy. Guests who chose "Zap" and "Switch" primarily expected the exhibition to be about electricity/electrical energy while those who chose "Empower" perceived a more diverse range of topics relating to energy that would be in the exhibition area. The title choice "Energy" was chosen by a few guests mainly because they thought it was very descriptive of the exhibition topic and, like the title "Empower", it would make them expect to see a diverse range of topics relating to energy in the exhibition area.

On the other hand, "Energy" was without doubt the least favorite title choice, with almost half the guests interviewed ranking it last because it was boring, common, not interesting, etc., and only one person telling us s/he ranked it last only because the other title choices were just more appealing. The remaining seven potential titles also all had at least one person ranking them last due to the feeling the title was boring. The other most frequently cited reason for ranking a title last was that it did not seem to be descriptive of the exhibition topic, with "Switch" and "Empower" having the highest response frequency of 5.

Conclusion

This title test for the developing EIS exhibition area did clarify one point for the COSI design team working on this project: although some thought "Energy" would be the best choice because it paralleled other one-word COSI exhibition titles, such as "Life" and "Ocean" and "Space", most of the guests we interviewed did not care for "Energy". Whether or not we choose to use top guest choices from this title test, such as "Watts Up" or "Power Up", we have at least obtained important feedback from our guests. If none of the high-ranking potential titles from this study are chosen for the exhibition, we can continue to propose more potential titles that can undergo title testing such as this.

If, however, we want to pursue testing on some of the potential titles from this study, the next step might be developing one or more short exhibition descriptions and testing which title best goes with the description(s).

Phase 2: Testing Potential Titles with COSI Guests (Round 2), COSI Team and Argyll Design Team

Prepared by: E. Elaine T. Horr, Ph.D.

Date: August 15, 2012

Introduction

The purpose of this test was to explore potential titles for the Energy Investigation Stations (EIS) exhibit regarding COSI guests' perception of what the proposed titles indicate to them about the experiences and main idea of the EIS exhibition that is being designed and will open early summer 2013. During phase one of this study, a list of 8 potential titles was narrowed to 4 selections. A meeting with some COSI marketing department personnel generated other title suggestions which were taken to the next EIS team meeting. From this meeting an additional 6 potential titles were selected which will be added to those narrowed during phase one for phase two of this title test study.

Evaluation Question(s)

The overarching question for this Experience Testing Station test is:

- Which proposed potential title for the EIS exhibit do COSI guests perceive as best reflecting what the exhibit seems to be about?

Method

A short semi-structured interview, which will include a potential title card sort, was implemented for this study. COSI guests were asked to look over a laminated one-page sheet containing a sketch of what the new exhibition area might look like, sketches of some potential activities that would be found in the exhibit, and a brief description of what the theme of the exhibit will be. They were then asked to rate the 10 potential titles from the one most appropriate for the exhibit to the one least appropriate. Guests were then asked to share with us why they chose specific titles as their first and last choices. Final title rankings were determined by using a reverse ranking system. Guest responses to the open-ended interview items asking why they chose a title as being most or least appropriate for the new exhibition will be shared in their entirety.

Sharon Tinianow proposed that in addition to getting COSI guest input in this study we invite COSI Team involved with marketing, development and exhibit design to share with us their thoughts on which titles are most appropriate and least appropriate and to explain why they chose a specific title, with regards to their area of expertise. A brief questionnaire was sent to 15 COSI Team and to the Argyle Design Group who are contracted to design the exhibit area. It should be noted that Argyle Design Group had access to the COSI guest title choice results and COSI Team were unaware of results of that part of the title test when asked to participate.

Findings

A total of 51 COSI guest interviews were conducted over a four day period. Table 1, the ranking table used for the potential title card sort portion of the test, can be found on the following page of this report. COSI guest responses to the open-ended interview items regarding why they chose a title as being either the most appropriate title or least appropriate title for the exhibit are listed in their entirety in the Discussion section of this report.

Eight COSI Team responded fully to the questionnaire, with the Argyle Design Group response addressing only the most appropriate title portion of the questionnaire but not the least appropriate title portion. Results can be seen in Table 2 and Table 3, both below. Data from the COSI Team and Argyle Design Group data was analyzed simply by calculating frequencies for the most appropriate title choice and least appropriate title choice. Therefore, some titles will appear on both the Most Appropriate Title and Least Appropriate Title lists.

Table 2

COSI Team/Argyle Most Appropriate Title (N=9)
Energy (5)
Charged (4)
Energy Challenge; Energy City; Energy Explorers (2 each)
Power Challenge ; Power Switch (1 each)

Table 3

COSI Team/Argyle Least Appropriate Title (N = 8)
Power Savers (4)
Power Challenge (3)
Energy; My Power (2)
Charged (1)

As with the COSI guest reasons for their title choices, COSI Team and Argyle Design Group reasons for choosing a title as being most or least appropriate are listed in their entirety in the Discussion section of this report.

Table 1: Energy Investigation Stations Title Test
Rankings: COSI Guests

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total pts.	Rank
Charged	3X10 = 30	6 X 9 = 54	5 X 8 = 40	1 X 7 = 7	4 X 6 = 24	2 X 5 = 10	5 X 4 = 20	8 X 3 = 24	8 X 2 = 16	9 X 1 = 9	234	7
Energy	3X10 = 30	5 X 9 = 45	1 X 8 = 8	4 X 7 = 28	1 X 6 = 6	4 X 5 = 20	4 X 4 = 16	2 X 3 = 6	10 X 2 = 20	17 X 1 = 17	196	10
Energy Challenge	2 X 10 = 20	5 X 9 = 45	14 X 8 = 112	5 X 7 = 35	3 X 6 = 18	4 X 5 = 20	4 X 4 = 16	6 X 3 = 18	5 X 2 = 10	0 X 1 = 0	294	5
Energy City	21 X 10 = 210	7 X 9 = 63	3 X 8 = 24	6 X 7 = 43	6 X 6 = 36	0 X 5 = 0	3 X 4 = 12	2 X 3 = 6	2 X 2 = 4	2 X 1 = 2	400	1
Energy Explorers	13 X 10 = 130	10 X 9 = 90	8 X 8 = 64	7 X 7 = 49	4 X 6 = 24	6 X 5 = 30	1 X 4 = 4	1 X 3 = 3	0 X 2 = 0	1 X 1 = 1	395	2
My Power	2 X 10 = 20	3 X 9 = 27	2 X 8 = 16	5 X 7 = 35	5 X 6 = 30	6 X 5 = 30	10 X 4 = 40	6 X 3 = 18	5 X 2 = 10	7 X 1 = 7	233	8
Power Challenge	2 X 10 = 20	4 X 9 = 36	6 X 8 = 48	5 X 7 = 35	11 X 6 = 66	10 X 5 - 50	6 X 4 = 24	4 X 3 = 12	3 X 2 = 6	3 X 1 = 3	300	4
Power Savers	2 X 10 = 20	2 X 9 = 18	3 X 8 = 24	6 X 7 = 43	8 X 6 = 48	6 X 5 = 30	8 X 4 = 32	6 X 3 = 18	6 X 2 = 12	4 X 1 = 4	249	6
Power Switch	0 x 10 = 0	1 X 9 = 9	2 X 8 = 16	6 X 7 = 43	4 X 6 = 24	6 X 5 = 30	5 X 4 = 20	11 X 3 = 33	8 X 2 = 16	8 X 1 = 8	199	9
Power Up	3X10 = 30	8 X 9 = 72	7 X 8 = 56	6 X 7 = 43	5 X 6 = 30	7 X 5 = 35	5 X 4 = 20	5 X 3 = 15	4 X 2 = 8	0 X 1 = 0	309	3

Discussion

There was a large gap in points between the two top contenders, Energy City and Energy Explorer, and the third highest ranking title. This large point difference between the 2nd and remaining potential title rank points suggests a strong COSI guest preference for one of the two top ranked potential titles. As with the highest scoring titles and those directly below them, there was a substantial difference in points between the 8th and 9th ranked titles, Power Switch and Energy, and those which ranked higher, indicating that COSI guests decidedly believed these were the least appropriate titles for the new energy exhibit. Most guests who participated in this study took little time in making their decisions, especially for the most or least appropriate rankings, although some seemed to put a longer period of analysis and thought into the process. However, even though the most and least appropriate titles were definitively chosen by guests, those titles that ranked between 3 and 8 are also being discussed in this report.

Although the more accepted method for analyzing open-ended responses to interview items is to identify trends and patterns for the responses, then determine category headings for the trends/pattern, and finally to list responses under the categories and calculate frequencies of responses in each category, it was felt to be better to record the actual responses of the guests in their own words since the reasons for their choices are as important in exploring the most appropriate potential title for the exhibit as are the title choices themselves. These responses should be taken into consideration when attempting to determine why guests chose one potential title over another as being either most or least appropriate for the new EIS exhibit.

Discussion of COSI Guest Results

Reasons guests gave for their choices are as follows (each bulleted point is the response of one guest). Ranking placement for the title can be found in parenthesis at the end of the title.

Energy City (1)

Reason <u>most</u> appropriate:

- Sounds urban – sticks out
- Has all the things you would find in a city – all are connected. Sounds neat to learn about.
- Good combination of words.
- Exhibit is like a city and it's about energy.
- All the stuff in the picture is part of the city. It's about how we should treat the environment.
- It just describes it (exhibit). Using energy in every part of the exhibit.
- Looks like lots of games and the word "energy" popped out at me – best description.
- About how you get energy and it looks like a city. Is for the area around COSI

- Looks like there is manufacturing and living in the exhibit – universal and ties it all together.
- From reading description seems best. About building a new energy system.
- Sounds like a big exhibit – lots of things inside it.
- It (exhibit) is a city. Got all sorts of things in it that are related to energy, like foods, travel, appliances.
- Comes across as fun and is descriptive. A whole system for energy.
- Mimics real life – sound like energy that is used in a city.
- Encompasses what the exhibit is about.
- Kind of a theme that would relate to other COSI exhibits. Revolves around everything (all types of energy, etc.,) in a city.
- Not 1 particular thing – lots of things in it.
- Looks like a little city
- It's a blanket title – covers it all. Looks like different parts of a city with different kinds of energy.

Reason <u>least</u> appropriate:

- Doesn't seem descriptive
- About a city instead of what you can do.

Energy Explorers (2)

Reason <u>most</u> appropriate:

- Kids would like it – would appeal to them.
- Kids are coming to explore the exhibit and it's based on energy. Everything is energy.
- Mind explores new things!
- It's about energy, pro-active/interactive. Exploring energy – how to save it in all different areas, especially things like food.
- More for kids (kids' title). Exploring energy.
- Looking into a lot of different types of energy – exploring them.
- Sounds entertaining/better.
- You're exploring energy in the exhibit. It appeals to kids and makes energy exciting.
- The word "energy" is more appropriate (than power) and the word "explorers" sounds interactive, hands-on, and appealing.
- It's an active title – appealing to kids.
- Sounds exciting – people would like it.
- "Energy" better describes the exhibit over "power". The word "explorers" shows people participate in it – get involved.

- Sounds fun, adventurous, exciting and interesting

Reason least appropriate:

- Exhibit not as much about exploring energy as much as saving it – doesn't sound as "green"

Power Up (3)

Reason most appropriate:

- That's what we do with things – power them up.
- It sounds energetic.
- It sounds cool, fun.

Reason least appropriate: this was not chosen to be least appropriate by any guest.

Power Challenge (4)

Reason most appropriate:

- It catches your attention. From the way it's (exhibit) laid out it looks like a city and all things about energy in a city, from distribution power to an outlet (this guest is an electrician).
- This implies an interactive exhibit: "Power" part of title better than "energy".

Reason least appropriate:

- "Power" – old word. And "challenge" doesn't sound fun.
- Seems like a lot of work.
- Kids wouldn't like it. "Power Challenge" could be weight-lifting, etc. Not explicit enough.

Energy Challenge (5)

Reason most appropriate:

- "Energy" is a better word than "power" and "challenge" means something to do.
- Makes sense – applies to what you do.

Reason least appropriate: this was not chosen to be least appropriate by any guest.

Power Savers (6)

Reason most appropriate:

- Says it all – saves.
- We're so energy conscious at home (in Kentucky). The power company turns the electricity off for 2 hours at night to teach people to save power.

Reason least appropriate:

- Brings to mind a man in a cheesy cape! Like the Power Rangers cartoon – not serious and this is a serious subject.

- From the exhibit description, it's not about how to save power, it's about where it is used and where to find it.
- Doesn't sound very exciting.
- Doesn't sound that exciting.

Charged (7)
Reason most appropriate:
- "Jump out" kind of title. Makes you want to see it.
- Catches your eye/grabs your attention. Can remember it. Powerful.
- Sounds cool. Grabs attention. Makes you think of energy and power.

Reason least appropriate:
- Just didn't like it.
- Could be anything, like a credit card.
- Boring, plain, one word.
- Not a good description. Doesn't look like the exhibit.
- Think of batteries being charged rather than using energy.
- Very vague.
- Vague – could mean so many different things (like financial charge). Not descriptive.
- Could mean a million different things.
- Not sure I'd know it was about energy.

My Power (8)
Reason most appropriate:
- "My" thing to do – it's for me!
- All of the exhibit is about choices we can make. Change comes from within – make choices on your own. "Power" is about electricity.

Reason least appropriate:
- Think it's more about muscles, endurance, physical strength, etc.
- Just lame – not catchy.
- Didn't see any correlation with the exhibit.
- Makes me think of human body power.
- The exhibit isn't about my power (like weight lifting). It's about city's power.
- More "our" than "my" in this – takes everyone to make a change.
- Didn't do anything for me.

Power Switch (9)
Reason most appropriate: this was not chosen to be most appropriate by any guest.
Reason least appropriate:

- Just didn't seem to fit.
- No sort of ideas as to what it (exhibit) is about.
- Just not interesting.
- Doesn't "catch" my attention to want to go to exhibit.
- Not that exciting – doesn't captivate me.
- Doesn't really describe the exhibit.
- Just didn't appeal to me.
- Not very descriptive of what the new exhibit would be.

Energy (10)
Reason most appropriate:

- Succinct, concise, follows COSI naming theme – sums up exhibit without bias.
- About energy.
- All things have to do with energy

Reason least appropriate:

- Too plain.
- Too generic. Too broad.
- Not as explanatory.
- Not that descriptive
- Doesn't explain it – too broad. All of COSI is energy.
- Boring!
- Most generic – too broad.
- Boring – doesn't explain anything.
- Blasé, boring – too broad.
- Not as descriptive.
- Plain!!
- Kind of boring.
- Think about physical energy/body energy. Power would indicate other energy type.
- Not catchy. Over used, as in "energy drink"
- Boring
- Boring, not original.
- Bland

The most appropriate title as determined by data from the COSI Team and Argyle Design Group was Energy, closely followed by Charged. The least appropriate title was Power Savers, with Power Challenge a close second least appropriate title. Below are the reasons that were given choosing titles as being most or least appropriate titles. Each bulleted point reflects the response from one person, with the number of choices for that particular title in parenthesis following the title.

Discussion of COSI Team and Argyll Design Team Results:

Most Appropriate title, number times chosen, and reason:

Energy (5)

- A clear concise title that allows for tag lines and the guests' curiosity to explore
- I know Energy as a stand-alone title didn't fare well, but I like that its consistent with our other exhibit titles and believe it can have some more life and "energy" once it's accompanied by key art or a subtitle
- Fits with all the current exhibit titles we use, which means no redesigning menus and materials for longer names. It's also the name I think will cause the least amount of questions or confusion and that can be said in short descriptive sentences. Short, powerful word that is easily used in a huge variety of mediums.
- Maybe include a fun tagline??
- One word descriptions are consistent for the branding of the other exhibition areas; the words (either really) are strong with creating some excitement but leaving some room for interpretation or imagination – which allows for flexibility for us particularly for changing programming, exhibit components, etc. Both names lend themselves well to potential graphic and logo treatments. Finally, they seem more grown up than some of the other names, which might sound young.

Charged (4)

- Fits well with COSI's one word exhibitions. It's a strong word and explains the exhibition well.
- Short word with a bit more fun in it. Lends itself to being used playfully in outbound materials.
- One word descriptions are consistent for the branding of the other exhibition areas; the words (either really) are strong with creating some excitement but

leaving some room for interpretation or imagination – which allows for flexibility for us particularly for changing programming, exhibit components, etc. Both names lend themselves well to potential graphic and logo treatments. Finally, they seem more grown up than some of the other names, which might sound young.

- Great name because you can do a lot with it graphically to help reflect the contents of the exhibit, like a lightning bolt as an exclamation point. It also has a double-meaning in that we are "charged" with the responsibility to help save power in our homes. The word also makes the exhibit sound exciting.

Energy Challenge (2)

- I like that this says what the exhibit is about – energy – but sounds engaging/interactive with the word Challenge.
- It's a challenge, Energy. Makes me think about what's the exhibit about, what I might learn.

Energy City (2)

- I feel like this could be a good fit for COSI as well and that it would inspire intrigue in the exhibit and in the media.
- Seems like it is easiest to "design' to/support with the designs. You are going places in the city, you can meet people.

Energy Explorers (2)

- Sounds young (which your visitors pointed out as a good thing!), and less descriptive overall. More generic. Feels super hero-ish.
- It includes the primary theme (energy) and explorers is action-oriented.

Power Challenge (1)

- Great name because it describes what you will be doing in the exhibit – hands-on challenges. Power Challenge makes it sounds like you will be doing interactive activities, which is accurate and what we want people to think.

Power Switch (1)

- Makes me think about what I might switch, or why it is called power switch which gets you to think what does it mean and what the exhibit will be about.

Not on Most Appropriate Title list:

- My Power
- Power Savers

Least Appropriate title, number times chosen, and reason:

Power Savers (4)

- This makes me think superheros! (which is a fun concept, but not the direction we took).
- As a title, this word combo is weaker than the others; our materials and copy would have to counteract the title and be more exciting… which means more reading for the customer (which we know people prefer not to do).
- It's too directed and narrowly focused on saving.
- Also not very interesting and would also be hard to "sell" to the media.

Power Challenge (3)

- In my mind this presents a couple different connotations – none related to the exhibit topic (mainly I think Powerball lottery or video/arcade games)
- Might think of it as a body-building power thing.
- Sounds more like a strength test

Energy (2)

- Too easy, doesn't make you think that there may be more than a basic science about energy, doesn't lead to the possibility that there may be something that pertains to the individual and society.
- The word Energy by itself really doesn't do much. It makes the exhibit sound boring to be honest. The word by itself does not guide guests to think they will be doing any kind of interactive activities.

My Power (2)

- Not something that sounds interesting and would be hard to "sell"to the media.
- Non-descriptive which means we need to use more copy to describe what it is. It also sounds like it could mean too many things. It's less of an exhibit title and more of a phrase you might see on an exhibit component.

Charged (1)

- Less clear what the exhibit is about, requires explanation to "get it"

Not on the least appropriate list:

- Energy Challenge
- Power Switch

In order to more easily compare COSI guest title choice ranks and COSI Team/Argyle Design Group results, the tables below were developed. The light blue shading indicates the most appropriate title(s) as determined by each group and the light tan shading indicates the least appropriate title(s).

COSI Guests Title Choices (N = 51)	
Most Appropriate Choice rank	Energy City (400 pts)
2nd rank	Energy Explorers (396 pts)
3rd rank	Power Up (309 pts)
4th rank	Power Challenge (300 pts)
5th rank	Energy Challenge (294 pts)
6th rank	Power Savers (249 pts)
7th rank	Charged (234 pts)
8th rank	My Power (233 pts)
9th rank	Power Switch (199 pts)
Least Appropriate Choice rank	Energy (196 pts)

COSI Team/Argyle Most Appropriate Title (N=9)
Energy (5)
Charged (4)
Energy Challenge; Energy City; Energy Explorers (2 each)
Power Challenge ; Power Switch (1 each)

COSI Team/Argyle Least Appropriate Title (N = 8)
Power Savers (4)
Power Challenge (3)
Energy; My Power (2)
Charged (1)

Conclusion

COSI guests who participated in this potential title test clearly preferred Energy City and Energy Explorers as the most appropriate titles for the exhibit and deemed Energy, for the second time (it also ranked last in the first title test), and Power Switch to be the least appropriate. However, reasons guests gave for choosing a title

as being most or least appropriate should be examined to determine the extent to which a title reflects the focus and main idea of the exhibit when determining the most appropriate title for the new exhibit presently referred to as Energy Investigation Stations.

Conversely, “Energy”, chosen as the least appropriate title for the exhibit by COSI guests, was chosen as the most appropriate title by the COSI Team/Argyle Design Group. Again, the reasons that were given for individual most and least appropriate title choices should be taken into consideration during the process of determining the final title for the new energy exhibition.

Exhibition Elements Remedial Evaluation Reports

CENTER FOR RESEARCH AND EVALUATION

Energy Explorers: Switch It Activity Report

Prepared by: E. Elaine T. Horr, Ph.D.

Date: July 28, 2013

What was tested?
Remedial testing was done on the Switch It activity from the newly opened Energy Explorers exhibition.

What was the purpose of the test?
The purpose of the test was to inform the Energy Explorers project team as to how COSI guests engage and interact with the Switch It activity.

What were the evaluation questions?
The evaluation questions which drove this test are as follows:

- To what extent are guests able to intuitively engage with the Switch It activity?
- What, if anything, do COSI guests identify as problems with Switch It activity?
- What is the capture time range and average for this exhibit activity?

What were the methods used to address these questions?
We used a mixed methods instrument with an observation and an interview component. The observation component consisted of a start and end time section, a section in which single or group composition demographics can be captured, and a final section in which guest ease of interaction can be recorded. The interview will follow up on guest ease of interaction with the exhibit element and specific problems they encountered. Frequencies were calculated for both the quantitative data and for the trends/patterns categories detected for the qualitative data.

Findings

A total of 40 observations/interviews were completed, with most being done with groups of persons of various numbers participating in the activity testing. The first 19 observations/interviews were completed with having the original directions posted with the remaining 21 completed having the modified directions posted in which the significance of the substation colors was explained. In order to determine if the modified signage had any effect on gaining a better understanding of how to engage with this activity, we analyzed the data by filtering for participants who had had the original directions posted and those who had had the modified directions posted. Results for this are found in Table 1, below.

Table 1: Comparing results with original and modified direction signage

	Read the directions	Yes (n = 13)	No (n = 3)
original directions	Mean engagement time	6.4 min.	7.3 min.
	Initial engagment pattern	equally random and intentional	random
	Noticed substation colors	8	1
	Understood substation colors	6	1
	Ease of understanding how to engage with activity	fairly easy	fairly easy
	Read the directions	**Yes** (n = 13)	**No** (n = 8)
modified directions	Mean engagement time	5.9 min.	3.5 min.
	Initial engagment pattern	intentional	random
	Noticed substation colors	9	4
	Understood substation colors	6	2
	Ease of understanding how to engage with activity	fairly easy	difficult

We also wanted COSI guests to share with us any problems they might have had when engaging with the Switch It activity. We see the results of this interview item in Table 2, below.

Table 2: Problems identified by COSI guests	
Problem	Frequency
Didn't understand something about the power icons	5
Didn't understand something about the different colors on the substations	4
Didn't understand how to solve it and/or what "Line Down" meant	2
Icons on board not sensitive enough	2

Discussion

The shortest time guests engaged with the Switch It activity was 2 minutes and the longest time was 12 minutes, with the overall average mean time being 5.6 minutes.

One of the behaviors we observed was if guests started engaging with the activity in a random manner, by just trying to manipulate various activity components, or if the engagement was more intentional, with guests taking a moment to study the activity prior to engaging with it. What we found was that if guests took the time to read the directions first, the engagement pattern was more intentional than if they did not read the directions. This was even more pronounced when the modified directions were posted. With the original directions posted, about half the guests observed were randomly engaging with the activity and half were intentionally doing so, while with the modified directions, the primary style of engagement was intentional. For those guests who did not read the directions, the style of engagement with the activity was overwhelmingly random in nature.

We noted that guests often did not seem to understand, whether or not they had read the original directions, the significance of the different colors that would appear on the substation icons that indicated if power was either going through the substation and/or if power was available to send through the substation to neighborhoods served by that substation. When these directions were replaced with a modified version that explained the color difference, we found that there was no difference in our results: there were still about the same percentage of persons who noticed but did not understand the significance of the different colors after having read the modified directions. However, we must add that the decision to ask specifically about the color difference was made after the data collection instrument was created and the question regarding whether or not the person had noticed and understood the significance of the color difference was not always posed to the guest. But the fact that guests who read the modified directions initially engaged with the activity in a more intentional manner than those who read the original directions or did not read any directions leads us to conclude that the modified directions do help clarify what guests need to do to successfully work with the activity.

When specifically asked if there was anything that was confusing or a problem, guests usually told us no, it was just a matter of trying to balance all the power between the neighborhoods that could be a bit difficult. Still, there were a few concerns guests had that allowed us to determine four trends forming, listed below in order of decreasing frequency:

1. not quite understanding how to use the power icons to distribute power to the different substations
2. not understanding the significance of the different colors of the power icons on the substations (discussed above)
3. not understanding what the "Line Down" light meant
4. the icons were not sensitive enough because they would push them and nothing would happen

Most guests, however, told us they found the activity fairly easy to figure out regarding how to work with it, although a few told us it was difficult. This, however, seemed to coincide with the amount of time the guest(s) spent engaging with the exhibit. The ones who seemed to feel it was difficult to figure out how to work the exhibit were also the ones with the lowest mean time of engaging with the exhibit and who did not read the directions. We cannot conclude, though, if this is due to either aspect: time or not reading the directions.

We did not record whether or not the guests were successful in "solving the puzzle" and restoring power to all neighborhoods, but anecdotally we would say the large majority was able to do so.

Conclusion

The Switch It activity seems to function quite well in its present configuration, with the majority of guests we observed quickly figuring out how to use it once they took the time to analyze what they needed to do, whether they initially engaged with the activity randomly or intentionally. And while some guests voiced a few concerns about the activity, these were usually guests who had not taken the time to read either the original or modified directions. The majority of those we spoke with and observed told us they enjoyed the activity, that it was fun and challenging.

People Miles per Gallon Remedial Evaluation Report

October 22, 2013
E. Elaine T. Horr, Ph.D.

Background/Purpose

COSI's new Energy Explorers exhibition focuses on how energy powers the world around us – from the transportation we take, to the products we buy, to the ways we live and work. One choice we all have is deciding on our transportation choices. The People Miles Per Gallon (PMPG) activity was designed to demonstrate how the number of passengers in a vehicle can be used to determine the overall fuel efficiency of the vehicle by taking into account how many persons can be transported by that vehicle.

The purpose of this remedial evaluation is to discover the extent to which COSI guests are engaging with this exhibit in the manner it was designed. This will inform COSI as to what modifications, if any, need to be made to the labels and other exhibit components.

Evaluation Question

The overarching evaluation questions for this study are as follows:

- How are COSI guests engaging with the PMPG exhibit?
- To what extent would COSI guests rate the instructions for this exhibit as being clear and intuitive?
- What will COSI guests tell us the main idea is of the PMPG exhibit?

Methods

Data was collected using a semi-structured interview consisting of a mixture of Likert-type items and open-ended questions. For this evaluation we recruited and interviewed 40 adult COSI guests after they have engaged with the PMPG exhibit and are leaving the exhibit, or until data saturation has occurred. Recruitment of study participants will be done on a continuous ask basis.

Quantitative data was analyzed using SPSS software for central tendencies. Qualitative data obtained from the open-ended items was first recorded in a Word document and then analyzed for emerging themes and patterns. Categories were then developed to describe the theme/pattern of the responses, responses were listed in one of the categories, and frequency distributions were calculated for each category.

Findings/Discussion

In evaluating this exhibit, it was easy to observe how people were using the exhibit prior to approaching them and asking them to answer a few questions about their experience. Therefore, I felt it was important to include these observations in this report. The following behaviors were observed:

- Exhibit is a magnet for little boys (mainly preschool who can reach them) who just want to put pegs (people) in the vehicles and then take them out.

Also to "play cars" with. Some little girls also played in this manner. This is only a problem when the exhibition area is crowded and children are playing with the cars as if they were toys, prohibiting others from engaging in the correct manner with the exhibit.

- People often go to one side of the exhibit and don't always look at the other side, so they only get ½ the information/instructions this way. However, they do think the instructions/information are clear and easy to understand.
- People also often only use the vehicles on the side of the exhibit they are looking at.
- People often don't realize the vehicle platforms are in the middle, underneath the graphic with no instructions, and think the exhibit isn't working because they can't get the numbers on the monitor to change – they aren't putting the vehicle on the right platform – they think the "parking" platform is the one they should use. Usually figure it out through trial and error, but a number of guests walked away after trying to get it to work. They had the right idea, but just used the wrong platform.

From the responses to the items we asked COSI guests who were engaging with the PMpG exhibit we discovered the following points:

- Guests understood what to do with this exhibit. Most read the instructions/information on at least 1 side before engaging with the exhibit.
- Most guests ranked the instructions as being very easy to understand. Lowest ranking was "somewhat difficult" (3 out of 7), and the main concern was while the instructions talked about the "platform", the guest had trouble figuring out which platform to use to get the calculations.
- Almost everyone figured out the exhibit was about using the vehicle that gets the best mpg, with the majority adding that larger vehicles with lower mpg weren't always the best vehicles because they usually could not hold as many people as did the larger ones, and thus had a lower PMpG rating.

Recommendations:

- Put all the instructions/information on the middle panel so guests see all the instructions/information.
- Place the "parking" platform under the instructions – put both together so guests can have access to all the vehicles rather than only the ones on "their side" of the exhibit.
- Put the weighing platforms on each side under the monitors, maybe with either a label indicating this is the platform to use, or make the text on the

platform a different color – most people didn't even notice there were letters on the platform they were supposed to use.

Conclusion

The People Miles per Gallon activity is one in which most COSI guests understand the main idea of the exhibit. A few modifications could make engagement with the exhibit more intuitive. The one problem that might be difficult to correct is the attraction this exhibit has as a toy car for younger children, especially boys. As was stated earlier, this is only a problem when the area is crowded and the playing with the cars prohibits others from engaging with the exhibit as it was designed.

Watts Up? Exhibit Remedial Evaluation Report

October 22, 2013
E. Elaine T. Horr, Ph.D.

Background/Purpose

COSI's new Energy Explorers exhibition focuses on how energy powers the world around us – from the transportation we take, to the products we buy, to the ways we live and work. For many persons, transportation is a major area of energy use. We use over 20% of the energy consumed in the United States in our homes, from heating our water to toast our bread to watching TV. By better understanding the energy use of the appliances, utilities, and electronics we might have in our homes, we can make informed energy choices at home. The Watts Up? activity presents us with a number of these home options and asks us to rate them in increasing amounts of energy needed for them to function.

The purpose of this remedial evaluation is to better understand how COSI guests are using the Watts Up? activity, any issues we might identify that would affect the efficacy of the activity, and what guests will tell us the main idea is of the activity. Results of this evaluation will help inform COSI as to what, if any, modifications to the activity might be needed.

Evaluation Question

The overarching evaluation questions that guided this study are as follows:

- To what degree do COSI visitors connect the height of the bars on the screen and the amount of energy used by each appliance?
- To what extent would COSI guests rate the instructions for this exhibit as being clear and intuitive?
- What will COSI guests tell us the main idea is of the Watts Up? exhibit?

Methods

Data was collected using a semi-structured interview consisting of a mixture of Likert-type items and open-ended questions. For this evaluation we recruited and interviewed 40 adult COSI guests after they had engaged with the Watts Up? exhibit and were leaving the exhibit, or until data saturation had occurred. Recruitment of study participants was done on a continuous ask basis.

Quantitative data was analyzed using SPSS software for central tendencies. Qualitative data obtained from the open-ended items was first recorded in a Word document and then analyzed for emerging themes and patterns. Categories were then developed to describe the theme/pattern of the responses, responses were listed in one of the categories, and frequency distributions were calculated for each category.

Findings/Discussion

We only gathered data from twelve COSI guests, but it was apparent early on that we had already reached data saturation. The following points sum up what the data told us:

- There are no discernible problems: guests make the connection between the appliance and the bars showing how much energy is used.
- Instructions are simple, clear, and easy to understand, although many only read the ones on the horizontal surface.
- Guests told us the main idea of the exhibit is that it can be surprising how much energy an appliance or electronic device uses and that we should try to make choices to use as little energy as possible.

Conclusion

This exhibit appears to be working as it was designed and is reaching the goals and objectives that were set for it.

Driving Habits Simulation Remedial Evaluation Report

October 23, 2013
E. Elaine T. Horr, Ph.D.

Background/Purpose

COSI's new Energy Explorers exhibition focuses on how energy powers the world around us – from the transportation we take, to the products we buy, to the ways we live and work. For many persons, transportation is a major area of energy use. The Driving Habits Simulator exhibit was designed to help COSI guests understand how they can get the highest mpg for their vehicle by implementing a few simple driving skills.

The purpose of this remedial evaluation is to discover the extent to which COSI guests are engaging with this exhibit in the manner it was designed. This will inform COSI as to what modifications, if any, need to be made to the labels and other exhibit components.

Evaluation Questions

The overarching evaluation questions for this study are as follows:

- To what extent are adult guests interacting with this exhibit? Are they the primary users, or are they observing and/or helping other visitors who are using the exhibit?
- What will adult guests tell us they learned from this exhibit? Where did they get the information from?
- What will COSI guests tell us the main idea is of the Driving Habits exhibit?

Methods

Data were collected using a semi-structured interview consisting of a mixture of Likert-type items and open-ended questions. For this evaluation we first observed adult COSI guests as they were engaging with the Driving Habits Simulation exhibit, then recruited and interviewed them after they had engaged with the exhibit and were leaving it. Our goal was to interview up to 40 guests, or until data saturation had occurred. Recruitment of study participants was done on a continuous ask basis.

Qualitative data obtained from the open-ended items was first recorded in a Word document and then analyzed for emerging themes and patterns. Categories were then developed to describe the theme/pattern of the responses, responses were listed in one of the categories, and frequency distributions were calculated for each category.

Findings/Discussion

We collected data from 22 COSI guests over the course of three days. The first part of collecting data was to observe behaviors of how guests engaged with the exhibit. We then asked them if they would be willing to answer a few questions about their experience. From the observations we made, we discovered the following:

- Slightly over half (12) of those who engaged with this exhibit were adults without any children accompanying them.
- The remaining 10 groups of persons were children who appeared to be under the age of 12 years and were accompanied by an adult who either helped them "drive" or gave them tips as they were doing so.

From the interview items we discovered the following points:

What they did with the exhibit:
- Most indicated they "drove" a car
- A few told us they saved fuel

What they learned:
- Most adults told us they learned nothing – they already knew the driving tips that were given on the screen, which they did notice during their interaction with the exhibit
- A few told us they learned that higher speeds decrease fuel efficiency.
- Other tips learned by guests were to accelerate, turning left and right saves fuel, and how **much** gas you can save.

How they learned what they did:
- Most who learned something did so because of the driving tips
- One person told us the fuel monitor on the screen helped and another that just the driving helped them learn

Main idea of the exhibit:
- The overwhelming majority said the main idea is how you can conserve gasoline by using good driving habits.
- Fuel efficiency/conserving gas (no mention of driving habits)
- Safety and traffic rules

The only problems/concerns that were shared with us were from three women who told us they experienced nausea and/or dizziness when looking at the monitor.

Conclusion

Many of the guests we interviewed told us the exhibit was a fun way to get good driving skills across, especially for children. Although most adults did not learn anything from the exhibit, a few did acquire knowledge concerning good driving habits, primarily from the driving tips that popped up on the monitor. The driving tips were also noticed by adults who indicated they had not learned anything new when engaging with the exhibit. The only concerns that were shared were from three women who said they experienced nausea and/or dizziness when looking at the monitor. Finally, almost all guests we interviewed told us the main idea linked good driving habits with fuel conservation.

Role Playing Game Remedial Evaluation Report

October 28, 2013
E. Elaine T. Horr, Ph.D.

Background/Purpose

COSI's new Energy Explorers exhibition focuses on how energy powers the world around us – from the transportation we take, to the products we buy, to the ways we live and work. The core of this exhibition is the role-playing game (RPG) that was developed to better motivate COSU guest engagement in the exhibit elements, most of which provide information about how we procure and use energy. As COSI guests enter the exhibit, they first encounter a kiosk with a wide variety of avatars, both male and female, of varying ages, life stages, and life situations, such as a single-parent with 3 children or a 10 year old boy living with both parents. They start the RPG by entering their avatar into a computer and making their first choice of the game based on the avatar they chose. The goal of the Energy Explorer RPG is for COSI guests to gain knowledge and skills that enable them to make wise decisions regarding how their energy use choices impact their avatar's comfort and finances, friends and family, the environment, and our planet as they progress from one check-in kiosk to the next. The "pay-off" at the end of the game is a score indicating if the energy choices they made for their avatar make them an energy hero.

The purpose of this remedial evaluation was to discover if COSI guests are making a connection between the Energy Explorers RPG and the other exhibit elements that help them make the decisions for their avatars during the game. Additionally, we wanted to understand how the RPG enhances or detracts from the overall experience in the Energy Explorers exhibition. Results of this study will help inform COSI as to which types of modifications, if any, might need to be made to the game.

Evaluation Questions

The overarching evaluation questions for this study are as follows:

- Which exhibit elements do COSI guests identify as providing information on energy that helps them experience success in the RPG?
- How helpful do guests perceive the information they get from other exhibit elements in helping them make energy choices for their avatars during the game?
- What role does the RPG play in helping guests better understand the main idea of the Energy Explorers exhibition?
- To what degree does the RPG enhance or detract from, if at all, the overall guest experience in the Energy Explorers exhibition?

Methods

Data was collected using a cued, semi-structured interview consisting of a mixture of Likert-type items (7-point scale), open-ended questions, and a card sort activity that consisted of photos of the 26 activities, graphics/labels, and artifacts found in the Energy Explorers

exhibition. Our sample size for this study was to be 80 interviews, 40 of which were to be conducted with COSI guests who will be instructed to thoughtfully engage in the exhibit, starting with choosing their avatar, and 40 who were to be instructed to randomly go through the exhibition, engaging with activities but not the RPG. Each person/group of persons we recruited were given a study ticket on which we recorded the time they entered the exhibition and were instructed to give it to the interviewer as they exited the exhibition, allowing us to determine the amount of time they spent in Energy Explorers. We recruited our target audience of adults and families with children aged 8 years and. Recruitment of study participants was done on a continuous ask basis.

Quantitative data was analyzed using SPSS software for central tendencies and independent-samples *t*-tests. When calculating the *t*-tests, we chose to exclude outliers and extreme values so as to not bias results . Qualitative data obtained from the open-ended items was analyzed for emerging themes and patterns. Categories were then developed to describe the theme/pattern of the responses, responses were listed in an appropriate category, and frequency distributions were calculated for each category.

Findings

We interviewed at total of 55 persons/groups of persons: 27 of those interviewed were instructed to play the game and 28 were instructed not to play the game. Although we did not realize our goal of inteviewing40 persons per sample group, for a total of 80 interviews, we did reach data saturation.

During the card sort activity portion of the interview, we asked guest to either choose the exhibition elements they thought connected to the game (played the game group) or that gave information about energy (did not play the game group). Table 1contains their responses to this portion of the interview. As a second part of this point, we asked guests to explain why they thought those particular exhibition elements connected to the game (group that played the game) or gave information on energy (group that did not play the game). Results for this are found in Table 2.

We continued probing guests' perceptions of the exhibition elements by asking them to rate how useful, as a whole the elements they chose in the card sort were in giving them information on energy, and why they rated the exhibition elements as they did. This information appears in Table 3.

In Table 4 we recorded COSI guest responses to the question "What did you learn from the Energy Explorers exhibition?" And along the same lines we wanted to know what guests thought the main idea was for Energy Explorers, results of which can be seen in Table 5.

Table 1: Exhibits that connect to game/give information on energy

	Frequency	
Exhbits that either connected to the game (played game) or gave information on energy (did not play game)	**Played game (N=27)**	**Did not play game (N= 28)**
Feel a Watt	4	19
Dig Deeper/Energy in the News	5	17
Fueling the Nation	1	4
Switch It/Restore the Power	8	21
Deconstruct a Chair	9	23
Scan a Product	10	17
Product Life Cycle graphics	2	4
Landscaping	10	18
Clothes Line	4	2
NPR Energy Monitor	4	4
Plan-It Green	1	0
Focus on CO_2	4	2
Smart Meter	10	11
May the Best Bulb Win	13	20
Energy Vampires (kitchen area)	16	22
Smart Home (Home Zone area)	8	13
Energy Star Washer	11	14
Caulking the Drafts	9	15
Watts Up?	12	18
People Miles per Gallon	12	18
Walk or Bike (running errands)	8	15
Driving Habits simulation	12	17
Fuel It Up!	17	20
Advanced Technology graphics	2	13
Types of siding	0	1
Types of insulation	2	8
Pledge Table	2	16
Your Home's Energy graphic	4	2

One of the main evaluation questions dealt with the degree to which the role playing game (RPG), around which the exhibition elements were designed to complement, enhanced the guest experience in the exhibition. We chose to compare results from the group that played the game to the results from the group that did not play the game of four of the interview questions as a means of measuring this. First we

looked at the difference in the mean length of time each group spent in the exhibition area. We also looked in the differences in the mean number of exhibition elements with which each group engaged and in the mean overall satisfaction rating of their experience from each group. We found there was a significant difference in the mean time spent in the exhibition and the mean number of exhibition elements with which guests engaged while in Energy Explorers. These results can be seen in Table 6, p.8.

However, there was no significant differences in the mean rating, based on a 7-point Likert-type scale, for how useful they thought the exhibition elements were in giving information on energy or their satisfaction with their overall experience between the group who played the game and the group who did not play the game. We also explored guest perceptions of the importance of having an avatar/character as part of the RPG. Response results for this can be found on page 8, Table 7.

Table 2: Why exhibit connects to game/gives information onenergy

		Frequency	
		Played the game	Did not play the game
Why the exhibition element connects to the game (played the game) or gives information on energy (did not play the game)	Information given	17	
	Could "see" the effects of the exhibit	6	
	Part of the game	6	
	Hands-on, interactive	4	10
	Interesting	1	12
	Fun	3	7
	No lines at exhibit		3
	Child's choice		2
	No particular reason		3
Why the exhibition element DOES NOT connect to the game (played the game) or give information on energy (did not play the game)	Did not do them	18	
	Already knew the information	2	
	Not relevant to me	2	
	Lines, too crowded	5	11
	Difficult to do or understand	3	5
	Not as interesting or interactive as othes	2	3
	Did not work	1	1
	Did not notice them		8
	Didn't realize there was something to do there		4
	Too much reading		3
	Child's choice		2

Table 3: How useful exhibits were in giving information

How useful exhibits were in providing information on energy		Frequency of responses	
		Played the game	Did not play the game
How Useful Rating Mean		5.8	5.8
Reason for usefulness rating			
	Helped with the game	3	
	Reinforced what I already knew	1	
	Too much reading involved	1	
	Gave good information	9	12
	Visual, concrete	1	6
	Relevant to real life/me	4	3
	Interactive	3	3
	Fun and interesting	1	3
	Comparisons make information clear and easy to understand	1	2
	Too difficult/hard to understand	2	2
	I already knew the information	5	1
	Explained "why", not just "what"		2
	Appropriate reading level		1

Table 4: What COSI guests learned from their experience in Energy Explorers

What I learned after going through Energy Explorers	Frequency	
	Played the game	Did not play the game
What/how to recyle	2	
Choices we can mke to use/conserve energy	15	9
Amount of energy needed for lights, transportation, appliances/electronics	6	11
I know/do things to conserve energy	4	1
I/we use a lot of energy	2	4
Cost of energy	1	1
Environmental impacts		5
Need to think more about conserving energy		2
Types of energy		1

Table 5: Guests' perceptions of the main idea of Energy Explorers

Main idea of the Energy Explorers exhibition	Frequency	
	Played the game	Did not play the game
Options/choices we can make to save energy	16	11
Energy conservation awareness	9	11
Environmental impacts of energy use	4	4
Energy sources and how used	3	6
Economic impacts of energy use		1

Table 6: Significant differences in played game/did not play game guest experiences

		Mean	Std. Dev.	*t*	df	Significance (2-tailed)	Cohen's *d*
Time spent in Energy							
	Played the game	25.81	7.73	2.32	50	0.03	0.6
	Did not play the game	19.73	10.85				
Number of exhibit elements with which guests engaged							
	Played the game	6.36	2.40	-6.7	43	0.00	-1.64
	Did not play the game	12.71	4.34				

Table 7: Importance of the avatar in the RPG

Reasons for importance of having an avatar as part of the game satisfaction rating		Frequency
Rating Mean		4.4
Reason for importance rating		
	Gives your experience a purpose/ keeps you connected	8
	Not needed to engage with/enjoy the exhibition	7
	Helps you think more about your choices/answers	6
	Could not find one I could relate to	4
	Did not use much during game	2
	Carrying the card around was annoying	1
	Score at the end of the game was important	1
	Avatar was distracting from the exhibition's message	1

Discussion

We had an almost equal number of interviews from guests who were instructed to play the game (N=27) as from guests who were instructed to not play the game but to instead just engage with the exhibition elements (N= 28). We will look at how the data answers each of the evaluation questions.

"Which exhibit elements do COSI guests identify as providing information on energy that helps them experience success in the RPG?"

- The exhibition elements that were most frequently cited by guests as giving good information on energy, no matter which group we looked at, were the ones that were very interactive and concrete, such as Fuel It Up!, Scan a Product, Energy Vampires, May the Best Bulb Win!, Watts Up?, and People Miles per Gallon. One exception to this is the Feel a Watt, which was located to the left just inside the entry area, had much fewer guests who played the game telling us it connected to the game. This may have been due to the location of the element or to it having more of an entertainment value than educational one. It was, however, highly rated by guests who did not play the game.
- The main reasons guests chose these exhibition elements is that they were interactive, fun activities that gave information in a concrete way, allowing them see, hear, and feel the information .
- Guests told us they had not chosen certain exhibition elements in the card sort portion of the interview because they either had just not seen them/done them, they were difficult to do/understand, or the lines were too long and they didn't want to wait. This was especially true of the Driving Habits simulator element.

"How helpful do guests perceive the information they get from other exhibit elements in helping them make energy choices for their avatars during the game?"

- There were no differences in the mean rating (5.8 out of 7.0) from both groups as to the usefulness of the exhibition elements in giving helpful information on energy. This indicates that guests thought the exhibition elements were useful in giving them helpful information about energy, whether or not they played the game.
- The reasons for this with the highest response frequencies were that guests thought the exhibition elements gave good, concrete information that was relevant to them and everyday life in a fun, interactive manner.
- A few guests explained the lower rating they gave the elements by telling us the elements were too difficult to understand or that they already knew the information.
- Overall, we can conclude that the majority of guests, whether or not they engaged in the RPG, saw value in the information they obtained from engaging with Energy Explorers exhibition elements.

"What role does the RPG play in helping guests better understand the main idea of the Energy Explorers exhibition?"

- Guests first told us they learned about the choices they could make to use and conserve energy and how much energy we use, and sometimes waste, when powering our vehicles, appliances, and electronics.
- These points correlate directly with what they thought the main idea was of the Energy Explorers exhibition: the primary focus of the exhibit is to make us aware of energy sources and conservation and that the options and choices we make regarding our energy use has an impact on the environment.
- Since responses to both groups were very similar, we can determine that the RPG had little or no effect on guest understanding of the main idea of the Energy Explorers exhibition.
- One person in the group who did not play the game added our energy choices also have an economic impact.

"To what degree does the RPG enhance or detract from, if at all, the overall guest experience in the Energy Explorers exhibition?"

- Although some guests told us the avatar as part of the game kept them more focused on doing activities in order to gain the information they need to correctly answer the questions for their avatar and getting a high score at the end of their experience, others did not think it was as important, some because they could not find one they felt they could relate to and others because they just didn't think it added to their experience. One guest told us having a game card was good to keep track of your answers, but it didn't need the avatar aspect. Another, however, told us it was "annoying" to have to carry the card through the exhibition.
- We did find there was a moderately significant difference in the average amount of time spent in Energy Explorers, with those who played the game staying a few minutes longer (M=25.81 minutes) than those who did not play the game (M=19.73).
- We also discovered there was a large significant difference in the number of exhibition elements with which guests engaged, with the group that did not play the game engaging with twice as many elements (M=12.71) as did the guests who played the game (M=6.36).
- Guests in both groups thought the exhibition elements were useful in helping them get useful information about energy, with no significant differences in the ratings both groups gave for this interview item (M= 5.8 and 5.8).
- Guests in both groups also told us they were satisfied with their overall experience in Energy Explorers, with no significant differences in the ratings both groups gave for this interview item (M = 6.2 and 6.3).

Conclusion

In doing this evaluation of the Energy Explorers role-playing game (RPG), we found that the game itself had a significant effect on the amount of time spent in the exhibition, with guests who played the game spending more time than those who did not. However, the guests who did not play the game engaged with twice as many exhibit elements than did the guests who did play the game. We found no significant differences between the two groups in what the guests had learned in Energy Explorers. There was also no significant difference in the overall satisfaction rating: guests from both groups told us they were satisfied with their overall experience in the exhibition. For some of the guests who played the game, the avatar was a positive element of their experience (made them answer the questions and really think about how to do so) but an equal amount felt that the avatar did not add anything to their experience and for a very few, seemed to detract from their experience.

Landscape Exhibit Remedial Evaluation Report

January 3, 2014
E. Elaine T. Horr, Ph.D.

Background/Purpose

COSI's new Energy Explorers exhibition focuses on how energy powers the world around us – from the transportation we take, to the products we buy, to the ways we live and work. We use over 20% of the energy consumed in the United States in our homes, from heating our water to toast our bread to watching TV. By better understanding how landscaping impacts energy use, we can make informed energy choices at home. The Landscape exhibit presents us with the importance of choosing the correct trees for a property and siting them correctly on the property as a means of helping us protect the structure itself and of conserving energy in the home, especially that used for heating and cooling.

As we observed early COSI guest interaction with this exhibit, we quickly discovered a number of problems with the exhibit that prevented the outcomes we set for the exhibit to be realized. A number of changes were designed and implemented that we thought would correct the earlier design concerns. The purpose of this remedial evaluation is to better understand how COSI guests are using the Landscape exhibit after modifications have been mad and to identify any ongoing issues that would affect the efficacy of the activity, including whether or not guests will identify the main idea we are trying to get across with the exhibit. Results of this evaluation will help inform COSI if any further modifications to the exhibit might be needed.

Evaluation Question

The overarching evaluation questions that guide this study are as follows:

- How efficient are the modified tree exhibit pieces in blocking wind and light?
- To what extent would COSI guests rate the instructions for this exhibit as being clear and intuitive?
- What will COSI guests tell us the main idea is of the Landscape exhibit?

Methods

Data was collected using a semi-structured interview consisting of a mixture of Likert-type items and open-ended questions. For this evaluation we intended to recruit and interview 35 adult COSI guests after they had engaged with the Landscape exhibit and were leaving the exhibit, or until data saturation had occurred. Recruitment of study participants was done on a continuous ask basis.

Quantitative data was analyzed using SPSS software for central tendencies. Qualitative data obtained from the open-ended items was analyzed for emerging themes and patterns. Categories were then developed to describe the theme/pattern of the responses, responses were listed in one of the categories, and frequency distributions were calculated for each category.

Findings & Discussion

We interviewed 20 persons and observed many others as they paused by the exhibit, but within about 15 seconds continued to other exhibits without engaging with the Landscape exhibit. Most engagement with the exhibit was done by younger children who played with the buttons controlling the fan and light and with the trees. Tree placement was sometimes intentional in trying to block the wind and the light, but just as often seemed to be unintentional in that respect. Children also played with rotating the platform on which the house was placed, but with even less intentionality regarding the outcomes of the exhibit: most tried to see how fast they could make the platform rotate. Adults were much more intentional in their engagements with the exhibit, usually reading the information and instructions prior to working with the exhibit.

We did find that the modified trees blocked the wind sufficiently. They also blocked light sufficiently after we changed the angle of the light bulb that represented the sun to reflect the winter solstice position of the sun. Otherwise, the angle was such that even the tallest tree had to be place totally against the house to block part of the light.

We found that 15 of the 20 persons we interviewed read the instructions and gave them a mean rating of 5.9 on a 7 point scale, with 7 meaning very easy to understand. One person who rated the instructions a 5, the lowest rating given, told us that "it didn't give you all the instructions, but enough to understand what to do" while another who rated them a 5 said they were marked well on the exhibit and somewhat easy to understand. The majority of those who read the instructions did feel, however, they were more than adequate for the exhibit.

There was some confusion about the rotating platform. Some people, even after reading the instructions, did not grasp the idea of rotating the platform on which the house was located. One person noted the shingles were so curled up it was sometimes difficult to see the effect of the wind on them. Three persons noted it would be good to have some sort of "pay off" or response for getting the placement of the trees corrects, especially something that might indicate the amount of energy you are saving. They felt there needed to be a more concrete response to this. Otherwise, no concerns were noted.

All those we interviewed understood the main idea of the exhibit was to show how correctly placed trees and shrubs can help save energy. Often, adults who were with children at the exhibit would explain to them what the main idea is and encourage the children to try different placements of the trees, then discuss why or why not that might be a good place for the tree.

Conclusion

Although the mechanics of the exhibit and the engagement factor may not be working as had been originally designed, all the adults who either engaged with this exhibit with other adults, alone, or with children understood the main idea we were trying to get across with the exhibit. It might be of value to continue to modify this exhibit in a way to help increase the amount of time and interest in engaging with this exhibit in order to reach more COSI guests.