



Wild Research: Summative Evaluation

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Executive Summary

In 2007 Miami University, in partnership with the Cincinnati Zoo and Botanical Garden (Zoo) and the Institute for Learning Innovation (ILI), received a National Science Foundation Grant to develop, create, implement, and evaluate the impacts of Wild Research, a whole zoo exhibit. The purpose of Wild Research was to promote Zoo visitors' engagement in inquiry, across generations, and increase visitors' awareness of conservation issues.

ILI was charged with conducting the summative evaluation for Wild Research. This study was conducted to answer the question:

What is the impact on visitors to the Cincinnati Zoo and Botanical Garden of engaging in Wild Research programming?

Data were collected onsite at the Zoo from visitors (N=254) as they were exiting the Zoo. Participants above the age of 18 were asked to complete an interview and questionnaire.

The study found that 88% of participants recognized at least one Wild Research activity from pictures they were shown, and 54% of participants reported they had actively engaged with at least one Wild Research activity. The three most frequently engaged in activities, *Hoot Like a Gorilla*, *Create a Conservation Poster*, and *Which Gorilla are You*, each contain elements of technology not typically found in zoo exhibits: digital voice recorder and touch screen computers.

Examining our findings by number of Wild Research activities engaged in suggested those who engaged in three or more activities had greater levels of enjoyment, interaction between group members, and likelihood of engaging in Wild Research activities in the future than other groups. We did not find significant differences between groups on items used to measure visitors' perceived gain in knowledge and skills related to observation as a means of inquiry, visitors' perceived gain in knowledge and skills related to asking questions, or visitors' perceived gain in knowledge and skills related to conservation of animals and natural resources.

For items measuring visitor feeling (affect) related to conservation of animals and natural resources we found significant differences between groups for two negatively worded items: *Humans should not interfere with trying to save animals* in which we found significantly more disagreement from participants who engaged in two Wild Research activities over participants who engaged in none or three Wild Research activities, and *There are far other more important things to worry about than conservation of animals* in which we found significantly more disagreement from participants who engaged in two Wild Research activities over participants who engaged with three Wild Research activities.

Participants were asked to rate various items pertaining to the Zoos' contribution to greater communities. A significant difference between group means was found for the item *the Zoo contributes to worldwide conservation efforts*, participants engaging in three or more Wild Research activities had significantly higher means than participants engaging in one Wild Research activity.

Overall, these findings support that Wild Research has begun to shift the awareness of visitors to the presence of Wild Research activities, but a shift in visitor attitudes and knowledge towards inquiry and

conservation behaviors, based on participating in these activities was not identified by our measurements. As the presence of Wild Research activities continues to expand and visitors continue engaging in these activities it is possible that future measurements will yield results reflecting increases in these measurements.

Because the summative study did not include the many studied elements of individual components, it seemed appropriate to add a section highlighting findings from the formative studies and a follow-up study of the effectiveness of each of the components. This is important to the work of this project as the high risk approach of whole-zoo experience could easily mask the outcomes generated by each of the individual components of Wild Research. For example, stay time at some exhibits increased from walk through as the average holding time to over 18 minutes as average for a series of components (formative study on Leaf Cutter Ants). Thus, the summative report has been amended to add some component findings. The key outcomes of these studies include:

- Nearly half zoo visitors participate in one or more Wild Research interactive during their visit.
- Wild Research Stations increase stay time
- Wild Research Stations strongly encourage intra-group communication
- Those who participate in Wild Research inquiry activities tend to demonstrate stronger inquiry-related outcomes than those who do not
- Those who participate in Wild Research public interaction activities tend to exit with a sense of having completed a conservation action
- Wild Research outcomes are experience specific.
- Wild Research interactives have strong appeal to visitors.



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Introduction

In 2007 Miami University, in partnership with the Cincinnati Zoo and Botanical Garden (Zoo) and the Institute for Learning Innovation (ILI), received a National Science Foundation Grant to develop, create, implement, and evaluate the impacts of Wild Research, a whole zoo exhibit. The purpose of Wild Research was to promote Zoo visitors engaging in inquiry, across generations, while visiting the zoo. Wild Research incorporated high tech exhibit enhancements such as touch screen kiosks, as well as lower tech enhancements such as plastic tubing to allow visitors to observe leaf cutter ants at work, in multiple exhibit areas throughout the Zoo. ILI was tasked with conducting front end and formative studies to provide data to inform the Wild Research activities throughout the life of the grant, and with conducting the summative evaluation at the conclusion of the project.

This report addresses the summative evaluation of Wild Research conducted by ILI. The evaluation was developed around the following outcomes for visitors, which were identified by the Wild Research planning committee at the beginning of the project and modified during a meeting held in December 2008:

Cognitive

- Increased awareness of conservation research
- Understand the connections/how science knowledge is built
- Know how to participate
- Know what makes a good question

Affective

- We learn from each other in zoos
- Zoos are an important part of my community
- Zoos are a valuable part of community
- I value the skill of observation
- I enjoy participating in science

Intent

- Repeat this process – how to repeat this process on a personal level
- Participate in conservation action
- Participate in ongoing web activities
- Visit the zoo again

Skill

- More effective observers
- More effective question formulators

In order to explore the impact of Wild Research on these identified outcomes, ILI researchers collected data onsite at the Zoo, from visitors, on Thursday August 26th – Sunday August 29th, 2010.



Research Questions and Method

Questions

The question driving this summative evaluation was:

- What is the impact on visitors to the Cincinnati Zoo and Botanical Garden of engaging in Wild Research programming?

This question was broken down into eight sub-questions to allow for analysis of the impact of Wild Research on the different outcomes identified by the program logic model created by the Wild Research advisory team. These sub-questions were:

- To what extent do visitors recognize and engage in Wild Research activities in the Zoo?
- To what extent do visitors with children age 8-16 in their group engage in Wild Research activities in the Zoo?
- Are there differences, based on interaction with Wild Research activities, in Zoo visitor perceived gain in knowledge and skills related to observation as a means of inquiry?
- Are there differences, based on interaction with Wild Research activities, in Zoo visitor perceived gain in knowledge and skills related to asking questions as a means of inquiry?
- Are there differences, based on interaction with Wild Research activities, in Zoo visitor perceived gain in knowledge and skills related to conservation of animals and natural resources?
- Are there differences, based on interaction with Wild Research activities, in Zoo visitor feeling (affect) related to conservation of animals and natural resources?
- Are there differences, based on interaction with Wild Research activities, in Zoo visitor perceptions of how the Zoo contributes to larger communities?
- Are there differences, based on having a child(ren) age 8-16 in a visiting group, on any of the scaled item measurements for the questions above?

Method

Recruitment of participants and data collection procedures

All data were collected by ILI researchers onsite at the Zoo, from Thursday August 26th – Sunday August 29th, 2010. Data were collected from adult Zoo visitors (age 18 and over), who were approached as they neared the exit by ILI researchers and asked to participate in the study before exiting the Zoo. Visitors were made aware they were under no obligation to participate in the study, they were free to end their participation at any time, they were free to leave any items unanswered that they did not wish to complete, and they needed to be 18 years old or older to participate. Upon verbal agreement, visitors were asked to engage in a modified card sort technique in which visitors identified from pictures, which Wild Research activities they were familiar with from their visit. Subsequently, a self-administered questionnaire was given to these same visitors. The process took approximately 10 minutes to complete, after which participants were given a small token of appreciation, a pencil from the Zoo gift shop.

Measurements

Independent Variable: Wild Research Programming Engaged In

Participants were asked to identify from a collection of 18 pictures, which of the Wild Research activities they had engaged in, while visiting the Zoo on the day data were being collected. A list of these pictures can be found in Appendix A. The total number of Wild Research programming elements a participant engaged in was used to create groups to examine the impact of engaging in Wild Research programming during a visit. Participants were also asked to identify the Wild Research activities they recognized from their visit, if they were able to recall any signage about Wild Research, if they were able to recall the content of the signage, why they thought the Zoo would incorporate Wild Research activities into its' exhibits, and to identify their level of familiarity with Wild Research's web-based programming.

Dependent Variables: Knowledge and Skills Related to Observation; Knowledge and Skills Related to Asking Questions; Knowledge and Skills Related to Conservation of Animals and Natural Resources; Feeling (Affect) Towards Conservation of Animals and Natural Resources; Perceptions of how the Zoo Contributes to the Larger Community.

Knowledge and Skills Related to Observation

Participants were asked to rate on a seven point scale (with one being strongly disagree and seven being strongly agree) how much they agreed with the statements:

During today's visit to the zoo I learned more about animals by:

- Comparing two or more animals to learn similarities between them
- Contrasting two or more animals to learn differences between them
- Counting how many animals are in an area to learn more about them
- Observing animal behaviors to learn more about them
- Observing animals in order to answer important questions about them

Knowledge and Skills Related to Asking Questions

Participants were asked to rate on a seven point scale (with one being strongly disagree and seven being strongly agree) how much they agreed with the statements:

During today's visit to the zoo I learned more about animals by:

- Duplicating the ways that scientists answer questions they have about animals
- Asking questions about the animals here at the Zoo
- Creating a hypothesis about an animal on display here at the Zoo
- Finding answers to my questions about the animals here at the Zoo

Knowledge and Skills Related to Conservation of Animals and Natural Resources

Participants were asked to rate on a seven point scale (with one being strongly disagree and seven being strongly agree) how much they agreed with the statements:

During today's visit to the zoo I learned more about:

- Finding out things I can do to help endangered animals
- Learning things that I can do to help reduce my consumption of natural resources



- Discovering the importance of asking good questions
- Hearing about organizations I can join to help improve the environment
- Finding things my family can do together to help animals
- Determining things my family can do together to help conserve our resources

Feeling (Affect) Towards Conservation of Animals and Natural Resources

Participants were asked to rate on a seven point scale (with one being strongly disagree and seven being strongly agree) how much they agreed with the statements:

- I feel it is important to help save endangered animals
- I feel connected to nature
- I feel connected to the animals here at the zoo
- I feel connected to animals in nature
- I feel it is important to conserve our natural resources
- Being here today makes me feel conservation of animals is important
- Being here today makes me feel conservation of habitat is important
- It is important to conserve resources for all animals
- Humans should not interfere with trying to save animals
- There are far too many other, more important things to worry about than conservation of animals
- There are far too many other, more important things to worry about than conservation of plants

Perceptions of how the zoo contributes to the larger community

Participants were asked to rate on a seven point scale (with one being strongly disagree and seven being strongly agree) how much they agreed with the statements:

The Cincinnati Zoo and Botanical Garden:

- Contributes to the betterment of the local community
- Is a good resource for members of the local community
- Contributes to local conservation efforts
- Contributes to national conservation efforts
- Contributes to worldwide conservation efforts

Additional items for those who engaged in Wild Research activities

Participants who stated they had engaged with one or more Wild Research activity were asked to rate the following items on a seven point scale (with one being strongly disagree and seven being strongly agree):

- I enjoy engaging in the Wild Research activities
- The Wild Research activities were informative
- The children in my group participated in the Wild Research activities
- The adults in my group participated in the Wild Research activities
- We participated in the Wild Research activities as a family/group
- I would engage in the Wild Research activities again in the zoo

Analysis

Data were entered into an SPSS database and analyzed using central tendencies and measures of significance (ANOVA and MANOVA). Qualitative data were coded and analyzed for trends. Specific data analysis processes are shared in the findings section.

Demographics

A total of 254 questionnaires were returned completed. For those who chose to respond, 102 (41%) were male and 147 (59%) were female; 5 (2%) stated they were adults visiting the Zoo alone, 85 (34.4%) stated they were in a group of adults visiting the Zoo, and 157 (63.6%) stated they were visiting as part of an intergenerational group containing children and adults with 36 participants (19.3%) stating their group contained a child between the ages of 8 and 16 years old. Two hundred eight (98.1%) participants identified as Caucasian/White, 2 (1%) identified as African-American/Black, and 2 (1%) identified as Asian. Sixty nine (32.5%) participants stated they were between the ages of 30 and 39 years old, 65 (30.7%) stated they were between the ages of 19 and 29 years old, 40 (18.9%) stated they were age 50 and above, and 38 (17.9%) stated they were between the ages of 40 and 49 years old.

A participant was, therefore, most likely to be female, visiting as part of an intergenerational group, Caucasian/White, and between 30 and 39 years old.

Findings

To what extent do visitors recognize and engage in Wild Research programming in the Zoo?

Recognize Wild Research

The presence of Wild Research activities was well noted by our sample, with 88% of participants recognizing at least one of the Wild Research activities in our pictures. Thirty (12%) out of 254 participants stated they were unable to recognize any of the activities in the photographs, 95 (38%) stated they recognized one of the activities in the photographs, 78 (31%) stated that they were able to recognize two activities, 41 (16%) stated they were able to recognize 3 activities, and 9 (4%) stated they were able to recognize 4 or more activities in the photographs. Examining this by location shows that the activities in the gorilla exhibit were most likely to be recognized by participants, with 166 (65%) recognizing at least one of the gorilla elements pictured. Ninety eight (39%) participants recognized an activity from the manatee exhibit, 83 (33%) recognized a Wild Research cart activity, 53 (21%) participants recognized an activity from the leaf cutter ants exhibit. Least likely to be recognized were the activities in Discovery Forest, with 19 (8%) participants stating they recognized an activity from that area.

Forty nine (19%) participants stated they explicitly recalled seeing a sign about Wild Research during their visit. However, none were able to recall what the contents or message of the signs had been. One participant did show the researchers that Wild Research stations and logo were located on Zoo maps. Four (2%) participants stated they recalled having seen or read something about Wild Research in the Zoo's member magazine.

Engaged in Wild Research



A slight majority of participants reported that they had engaged in one or more of the Wild Research activities in the photographs (55%). Seventy seven (30%) stated they engaged in one Wild Research activity, 42 (17%) identified two Wild Research activities they had engaged in, 9 (4%) identified three Wild Research activities they had engaged in, and 9 (4%) identified 4 or more Wild Research activities they had engaged in during their visit. This left 117 (45%) visitors who did not engage in any Wild Research activities during their visit.

Of the 137 visitors stating that they engaged in some way with a Wild Research activity, there were 222 total incidents of engagement with Wild Research activities recorded. Of these incidents in which participants reported engaging in a Wild Research activity, 184 (83%) stated they did the activity, 15 (7%) read a Wild Research sign with others in their group, 13 (6%) asked themselves the questions from a Wild Research sign, 5 (2%) observed the animals in the exhibit to answer the questions from a Wild Research sign, 3 (1%) asked their own question after reading the sign, 1 (<1%) discussed the animals on display with others in their group after viewing a Wild Research sign, and 1 (<1%) asked others in their group the questions from the sign. This suggests that visitors who do engage with a Wild Research activity are most likely to do the activity by themselves. Table 1 displays the frequency and percent of total engagement recorded by participants for each activity. Hoot like a Gorilla, Create a Conservation Poster in Manatee Cove, and Which Gorilla Are You were the most frequently reported activities participants engaged in. This is interesting in that each of these three activities contains a higher technology component than traditionally found in zoo signage: voice recording, touch screen quiz, and touch screen manipulation of pictures and words. These were followed by three of the Wild Research carts (giraffe, manatee, and elephant). The three least frequently engaged in elements were all located in the leaf cutter ant exhibit. Leaf cutter ants is an indoor exhibit, and these numbers may have been influenced by the moderate outside temperature experienced during the weekend of data collection.

Table 1: Frequency and percent of engagement with Wild Research activities total (N=222) and for groups with child age 8-16 (n=44)

Activity	Total Frequency (N= 222)	Percent of total	Group with child age 8-16 frequency (n=44)	Percent of group with child age 8-16 frequency
Hoot like a gorilla	38	17	6	14
Create a conservation poster (manatee)	36	16	6	14
Which gorilla are you	25	11	8	18
Giraffe discovery cart	20	9	2	5
Manatee discovery cart	16	7	5	11
Elephant discovery cart	12	5	2	5
Wild me quiz (manatee)	11	5	7	16

Do gorillas have friends	10	5	0	-
Dress up ants	9	4	5	11
Ants touch screen kiosk	9	4	0	-
Where do gorillas hang out	9	4	0	-
What do gorillas do all day	7	3	1	2
Shaman quest	6	3	1	2
How many – leaf cutter ants	6	3	1	2
Pentrometer – leaf cutter ants	5	2	0	-
How fast – leaf cutter ants	3	1	0	-

Note: Activities presented in descending order by total frequency

Purpose of activities

Participants were asked to respond to why they thought the Zoo would include these types of activities as part of their exhibits. Responses were coded by topic, with a response getting multiple codes if it contained multiple themes. Of the responses given 166 (65%) contained terminology related to education being the purpose of the activities (e.g. learning, teaching, and education). The second most frequently coded responses were 58 (23%) participants who stated the main purpose of these activities was to provide “kids” with more to do or an enhanced experience. Thirty five (14%) statements contained the term “interactive,” in that the activities made the exhibits more interactive. There were 13 (5%) statements by participants that contained the term “family” or suggested that the activities promoted learning by family groups. This suggests that most participants thought the purpose of the Zoo having Wild Research activities was to provide children with an opportunity to learn more about animals while at the Zoo.

Familiarity with website

Participants were asked if they were aware of the website components of Wild Research. The most frequent response, given by 160 (63%) participants, was that they were not aware of the website. Fifty four (21%) participants stated they intend to visit the website, 23 (9%) participants stated they were aware of the site but unsure if they would visit, 10 (4%) stated that they were already a member of the website, and 7 (3%) stated they had signed up to become a member of the site during their visit. These numbers suggest that over one quarter of Zoo visitors are familiar with the Wild Research website and have used or plan to use the website in the future. This does also suggest there may be a disconnect between the website and the visit for most of the visitors.

Engagement, enjoyment, and likelihood of future engagement

Additionally, participants who stated they had engaged in one or more Wild Research activity were asked to complete six items related to their level of enjoyment, engagement, and likelihood of future engagement in Wild Research activities. As reflected in Table 2, participants who engaged in three or



more Wild Research activities during their visit expressed the strongest positive means for each of the items. Participants who engaged in two Wild Research activities during their visit had the second highest means for each item with the exception of *The Wild Research activities were informative*. The standard deviations were high for each item, across groups, with the exception of those who engaged in three or more Wild Research activities for the item *I enjoy engaging in the Wild Research activities* (SD= 0.89). Participants expressed low to moderate levels of agreement with each statement, suggesting that participants enjoyed the Wild Research activities, both adults and children engaged in the activities, and participants are somewhat likely to want to engage in the activities in the future.

A MANOVA indicated the difference between groups was significant for the item *I enjoy engaging in the Wild Research activities*, (F(2, 81)= 3.21, p= .046) partial η^2 = .073. Post hoc analysis (Bonferonni) indicated the significant difference between groups for this item was between those who engaged in three or more Wild Research activities (M= 6.00) and those who engaged in one Wild Research activity (M= 4.98). This suggests those who engaged in three or more Wild Research activities did enjoy these activities more than those who engaged in only one Wild Research activity.

Table 2: Engagement, enjoyment, and future engagement with Wild Research activities, Mean and SD by group.

	Total (n= 84)		1 (n= 46)		2 (n= 27)		3 or more (n= 11)		P value
	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	
I would engage in the Wild Research activities again in the zoo	5.35	1.65	5.13	1.61	5.33	1.60	6.27	1.79	.117
I enjoy engaging in the Wild Research activities	4.98	1.62	4.67	1.73	5.07	1.52	6.00	0.89	.046
The children in my group participated in the Wild Research activities	5.26	1.67	5.00	1.65	5.44	1.67	5.91	1.70	.214
The Wild Research activities were informative	5.06	1.50	5.02	1.48	4.89	1.53	5.64	1.50	.371
The adults in my group participated in the Wild Research activities	4.99	1.66	4.78	1.66	5.19	1.60	5.36	1.86	.444
We participated in the Wild Research activities as a family/group	4.90	1.73	4.78	1.79	5.04	1.48	5.09	2.17	.778

Note: Items are in order descending order by mean of participants who engaged in three or more Wild Research activities.

To what extent do visitors with children age 8-16 in their group engage in Wild Research activities in the Zoo?

Recognition of Wild Research activities by participants who were in groups with at least one child age eight to 16 paralleled the overall sample, with 31 (86%) of these participants recognizing at least one

picture of a Wild Research activity. Five (13.9%) participants stated they did not recognize any Wild Research activities from the pictures, 12 (36%) recognized one, 10 (28%) recognized two, and 8 (22%) recognized three or more.

A majority of these participants engaged in at least one Wild Research activity during their visit with 11 (31%) stating they engaged in one Wild Research activity, nine (25%) stating they had engaged in two Wild Research activities, and four (11%) stating they engaged in three or more Wild Research activities. This left 12 (33%) participants with a child age eight to 16 in their group who did not engage in any Wild Research activities during their visit. As with the total sample, each of the top three Wild Research activities engaged in contained an element of technology: Which Gorilla are You, Wild Me Quiz, Hoot like a Gorilla (tied for third), and Create a Conservation Poster (tied for third).

Twenty two (61%) of these participants stated they believe the purpose of Wild Research activities is for teaching learning, or educating visitors. Two (5.6%) noted the purpose being to increase interaction with exhibits. Four (11%) believed the activities are for children, while two (6%) saw them as family activities. An independent samples t-test did not indicate significant differences between those who engaged in one or more Wild Research activity and had a child between the age of eight and 16 in their group, and those who engaged in one or more Wild Research activity and did not have a child between the age of eight and 16 in their group, for any of the items measuring engagement (shown in Table 2), enjoyment, and likelihood of future engagement with Wild Research activities. This would suggest that those who engaged in Wild Research activities had similar levels of engagement, enjoyment, and likelihood of future enjoyment with or without a child age eight to sixteen in their group.

Are there differences, based on interaction with Wild Research programming, in Zoo visitors' perceived gain in knowledge and skills related to observation as a means of inquiry?

The mean score on the five items used to measure visitor perceived gain in knowledge and skills related to observation as a means of inquiry, reveal that there was slight agreement with these items. No item had a mean higher than 5.94, while no item had a mean lower than 4.44. Items that contained the terms compare and contrast were scored lower than items using the term observing. The item *Observing animal behaviors to learn more about them* had the highest mean overall and by each group. Those who engaged with two Wild Research activities had the highest means between groups for four of the items. As reflected in Table 3, those who engaged in three or more Wild Research activities had the highest mean for the item *Observing animal behaviors to learn more about them* (5.94), suggesting that doing more Wild Research activities increased visitor's perception that they were observing animals to learn more about them. Those who stated they had engaged in three or more Wild Research activities had the lowest mean for the items *Comparing two or more animals to learn similarities* (4.63), and *Contrasting two or more animals to learn differences between them* (4.44), suggesting those who engaged in a greater amount of Wild Research activities did not feel stronger than others that they had contrasted or compared the animals on exhibit.

The standard deviations for each group on each item were between .98 and 1.93, suggesting that there were some groups of individuals who had much higher or lower responses than the mean suggests. To examine the differences in mean between groups, A MANOVA was run using number of Wild Research activities engaged in as the independent variable and each item as a dependent variable. There were no significant differences between groups for these items. These findings suggest that overall, participants felt slight agreement that they gained some knowledge and skills related to observation as a means of



inquiry. While there were slight differences in mean scores between the groups, these differences are not statistically meaningful.

Table 3: Perceived gain in knowledge and skills related to observation items. Mean and standard deviation by number of Wild Research activities engaged in.

	None (n= 106)		One (n= 71)		Two (n= 38)		3 or more (n= 18)		P value
	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	
Observing animal behaviors to learn more about them	5.62	1.23	5.89	0.98	5.76	1.08	5.94	1.00	.409
Comparing two or more animals to learn similarities	4.82	1.47	4.94	1.27	5.00	1.34	4.63	1.36	.762
Contrasting two or more animals to learn differences between them	4.59	1.51	4.94	1.15	5.11	1.13	4.44	1.21	.093
Observing animals in order to answer important questions about them	5.00	1.48	4.80	1.49	5.55	1.35	5.06	1.44	.087
Counting how many animals are in an area to learn more about them	4.69	1.73	4.44	1.65	5.03	1.44	4.88	1.93	.344

Note: Items are in descending order by participants who engaged in one Wild Research activity mean

Are there differences, based on interaction with Wild Research programming, in Zoo visitors' perceived gain in knowledge and skills related to asking questions?

Again, the mean scores on the four items measuring perceived gain in knowledge and skills related to asking questions suggest participants felt a slight agreement with these items. *Finding answers to my questions about animals here at the zoo* had the highest mean overall and by groups, and the lowest standard deviation for two of the groups. Table 3 shows that *Duplicating the ways that scientists answer questions they have about animals* had the lowest mean overall, with those who engaged in one Wild Research activity expressing slight disagreement (M= 3.77). Interestingly, those who engaged in three or more Wild Research activities had the highest mean (4.38) on this item, which was followed by those who engaged in none (4.20), those who engaged with two (4.08), and one (3.77). Each group which engaged with at least one Wild Research activity had a higher mean than the group that had not engaged in any Wild Research activity for the item *Discovering the importance of asking good questions*. Those who engaged with no Wild Research activities rated each item, with the exception of *Creating a hypothesis about an animal on display here at the zoo*, higher than those who engaged with one Wild Research component.

Standard deviations for the items ranged from .96 to 1.87 with those who engaged in no Wild Research activities having the highest or second highest standard deviation for each item, suggesting a broader difference in scores within groups. A MANOVA indicated the differences in mean between groups for

each item were not significant. Participants expressed slight agreement with items measuring increased knowledge and skills related to asking questions, with one group expressing slight disagreement to the item *Duplicating the ways that scientists answer questions they have about animals*. There were differences in means between the groups as shown in Table 4, but these differences were not statistically significant.

Table 4: Perceived gain in knowledge and skills related to asking questions items. Mean and standard deviation by number of Wild Research activities engaged in.

	None (n= 106)		One (n= 71)		Two (n= 38)		3 or more (n= 18)		P value
	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	
Finding answers to my questions about the animals here at the zoo	5.55	1.46	5.44	1.65	5.87	1.47	5.44	0.96	.531
Asking questions about the animals here at the zoo	5.34	1.79	5.20	1.64	5.39	1.41	5.13	1.67	.894
Discovering the importance of asking good questions	4.59	1.75	4.90	1.56	4.83	1.39	4.88	1.41	.588
Creating a hypothesis about an animal on display here at the zoo	4.66	1.87	4.85	1.79	4.68	1.58	4.37	1.82	.791
Duplicating the ways that scientists answer questions they have about animals	4.20	1.85	3.77	1.54	4.08	1.48	4.38	1.82	.358

Note: Items are in descending order by participants who engaged in One Wild Research activity mean

These findings might suggest a perception issue. Engaging in the Wild Research activities could make an individual more aware of the processes asked in the items. Being more aware of them, one might respond more critically (the ceiling effect seen in affect measures and perception measures—if one does not know what one does not know, there is a tendency to overestimate ones’ abilities, attitudes, or interest.)

Are there differences, based on interaction with Wild Research programming, in Zoo visitors’ perceived gain in knowledge and skills related to conservation of animals and natural resources?

Participant response was mixed on items measuring perceived gain in knowledge and skills related to conservation of animals and natural resources. The items containing the term *animals* tended to have higher means than those with the term *natural resources*. *Hearing about organizations I can join to help improve the environment* had the lowest means and those who engaged with two wild research activities (M= 3.85) or three or more Wild Research activities (M= 3.88) expressed a slight disagreement that they had done this while visiting the Zoo. Those who engaged in two Wild Research activities had the highest mean for the items *Finding out things I can do to help endangered animals* (5.40) and *Learning things I can do to help reduce my consumption of natural resources* (5.13). Those who



engaged in three or more Wild Research activities had the highest mean for the items *Finding things my family can do together to help animals* (5.00) and *Determining things my family can do together to help conserve our resources* (5.06). Participants who did not engage with any Wild Research activities had the lowest mean for each item, with the exception of *Hearing about organizations I can join to help improve the environment*.

Table 5 reflects standard deviations ranged from 0.99 to 1.86 for each item, suggesting there were individuals within each group that had scores quite higher and lower than the mean. A MANOVA did not indicate significant differences between group means for any of these items. Our findings suggest that those who did not participate in any Wild Research components do reflect lower means for perceived gain in knowledge and skills related to conservation of animals and natural resources, with the exception of the item *Hearing about organizations I can join to help improve the environment*. However, the differences in mean between groups for each item are not statistically meaningful. These findings may reflect that some of the activities most engaged in did not have conservation messages and specific actions as part of the activity.

Table 5: Perceived gain in knowledge and skills related to conservation of animals and natural resources. Mean and standard deviation by number of Wild Research activities engaged in.

	None (N=112)		One (N= 75)		Two (N= 40)		Three or more (N=17)		P value
	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	
Determining things my family can do together to help conserve our resources	4.71	1.63	5.05	1.46	4.93	1.46	5.06	1.20	.459
Learning things I can do to help reduce my consumption of natural resources	4.50	1.71	4.90	1.66	5.13	1.29	4.82	1.51	.144
Finding out things I can do to help endangered animals	4.72	1.63	4.79	1.62	5.40	1.35	5.24	1.52	.091
Finding things my family can do together to help animals	4.55	1.73	4.61	1.55	4.70	1.64	5.00	1.46	.753
Hearing about organizations I can join to help improve the environment	4.16	1.72	4.26	1.86	3.85	1.23	3.88	0.99	.571

Note: Items are in descending order by participants who engaged in One Wild Research activity mean

Are there differences, based on interaction with Wild Research programming, in Zoo visitor feeling (affect) related to conservation of animals and natural resources?

There were eight positively worded items measuring participants' feelings about nature, animals, and conservation of natural resources. Participants expressed moderate to high levels of agreement with each of these items. There was a noteworthy reduction of standard deviation for these items, with a range from 0.61 to 1.47. Table 6 reflects that *I feel it is important to help save endangered animals* had the highest mean across groups with those who engaged in no Wild Research activities having the highest mean (6.67) followed by those who engaged with three Wild Research components (6.55), those who engaged with one Wild Research component (6.49) and those who engaged with two (6.45). Those who engaged with three or more Wild Research components had the highest mean on three of the items: *I feel connected to nature*; *I feel connected to the animals here at the zoo*; and *Being here today makes me feel conservation of habitat is important*. Participants who engaged with two Wild Research components had the highest mean between groups on the item *I feel connected to animals in nature*. Participants engaging in one Wild Research activity had the highest mean for the item *It is important to conserve resources for all animals*. Those who did not report engaging with any Wild Research activity during their visit had the highest mean on the items *I feel it is important to help save endangered animals* and *I feel it is important to conserve our natural resources*. A MANOVA did not indicate significant differences in mean between groups for any of the positively worded items. These findings suggest that, in general, all participants expressed high levels of agreement with items measuring their positive feelings towards conservation of animals and natural resources.

There were three negatively worded items measuring participants' feelings towards conservation of animals and natural resources. A lower score on these items reflects disagreement, which would be considered positive towards conservation. Those who did not engage in any Wild Research activities had lower means for each item than those who engaged in three or more Wild Research activities. There is a notable increase in the standard deviations for the negatively worded items, with a range from 1.17 to 2.15, suggesting that there were a number of participants within each group who rated the items far from the mean or this may suggest that some visitors did not catch the negative wording of the items. A MANOVA indicted significant differences between group means for *Humans should not interfere with trying to save animals* ($F(3, 240) = 4.79, p = .003$), with group type explaining approximately six percent of the variance, partial $\eta^2 = .057$. Post-hoc analysis (Bonferonni) indicated that the difference was significant between those who engaged in two Wild Research activities and those who engaged in either none or three. Those who engaged in two Wild Research activities had a lower (more positive) mean. Significant differences between means were also found for *There are far too many other, more important things to worry about than conservation of animals* ($F(3, 240) = 3.28, p = .022$), Post-hoc analysis (Bonferonni) indicated those who engaged in two Wild Research activities had significantly lower scores on this item than those engaging in three Wild Research activities, with group type explaining approximately four percent of the variance, partial $\eta^2 = .039$. The amount of variance explained by the number of Wild Research activities engaged in is relatively small for both of these items in which significant differences were detected. No meaningful pattern of response emerged to answer the question.

Table 6: Zoo visitor's feelings related to conservation of animals and natural resources, Mean and SD by group.



	None (N=112)		One (N= 75)		Two (N= 40)		Three or more (N= 17)		P value
	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	
I feel it is important to conserve our natural resources	6.58	0.89	6.56	0.68	6.37	1.15	6.53	0.72	.633
It is important to conserve resources for all animals	6.44	1.05	6.53	0.81	6.50	1.04	6.47	0.94	.928
I feel it is important to help save endangered animals	6.67	0.72	6.49	1.07	6.45	1.09	6.65	0.61	.434
Being here today makes me feel conservation of habitat is important.	6.33	1.00	6.19	1.05	6.33	1.12	6.53	0.62	.588
Being here today makes me feel conservation of animals is important	6.30	1.02	6.13	0.98	6.45	0.82	6.35	0.70	.366
I feel connected to the animals here at the zoo	5.73	1.37	5.69	1.34	5.58	0.93	5.82	1.13	.894
I feel connected to nature	5.78	1.25	5.61	1.39	5.78	1.10	5.94	0.83	.720
I feel connected to animals in nature	5.60	1.20	5.53	1.47	5.67	1.00	5.65	1.00	.945
Humans should not interfere with trying to save animals	2.86	2.15	2.72	1.90	1.77	1.17	3.71	2.14	.003
There are far to many other, more important things to worry about than conservation of plants	2.79	2.04	2.60	1.74	2.40	1.53	3.82	2.01	.061
There are far too many other, more important things to worry about than conservation of animals	2.34	1.66	2.33	1.59	2.10	1.30	3.53	2.15	.022

Note: Items are in descending order by participants who engaged in One Wild Research activity mean

Are there differences, based on interaction with Wild Research programming, in Zoo visitor perceptions of how the Zoo contributes to larger communities?

The mean scores on the five items measuring perceptions of how the Zoo contributes to the larger community suggest high levels of agreement with these items, overall and by group. Table 7 displays the findings that participants who engaged with three or more Wild Research activities had the highest mean for three of these items: Contributes to the betterment of the local community (6.59), Contributes

to local conservation efforts (6.41), and Contributes to worldwide conservation efforts (6.59). Conversely, those who did not engage in any Wild Research activities had the highest mean for the item Contributes to national conservation efforts (6.37), and the second highest mean for the items Contributes to the betterment of the local community (6.36), and Is a good resource for members of the local community (6.36).

These items had the lowest standard deviations for all of the items asked, ranging from .051 to 1.41, suggesting a high level of cohesiveness within groups. A MANOVA indicated a significant difference between groups for the item *Contributes to worldwide conservation efforts* ($F(3, 243) = 3.38, p = .042$). Post hoc (Bonferonni) analysis revealed participants engaging in three or more Wild Research activities had a significantly higher mean than participants engaging in one Wild Research activity, however variance explained by group type was very small with a partial $\eta^2 = .033$ or approximately three percent. These findings suggest most participants felt strongly that the Zoo contributes to the community at scales beyond the zoo level, regardless of which group they were in.

Table 7: Perceptions of how the Zoo contributes to larger communities, Mean and SD by group.

	None (N= 112)		One (N= 75)		Two (N= 40)		Three or more (N= 17)		P value
	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	
Contributes to the betterment of the local community	6.36	0.93	6.29	0.98	6.32	1.21	6.59	0.62	.703
Is a good resource for members of the local community	6.44	0.94	6.16	1.05	6.45	1.09	6.41	0.71	.235
Contributes to local conservation efforts	6.18	1.08	6.00	1.41	6.25	1.03	6.41	0.51	.478
Contributes to national conservation efforts	6.37	1.01	5.99	1.27	6.30	0.97	6.35	0.79	.108
Contributes to worldwide conservation efforts	6.25	1.09	5.93	1.26	6.43	0.98	6.59	0.62	.042

Note: Items are in descending order by participants who engaged in One Wild Research activity mean

Are there differences, based on having a child(ren) age 8-16 in a visiting group, on any of the scaled item measurements for the questions above?

An independent samples t-test was run on each item measured in the previous sections (Tables 3 through 7), comparing mean scores of those who had a child age 8-16 in their group and engaged in at least one Wild Research activity (n= 24), and those with a child age 8-16 in their group who did not engage in any Wild Research activities (n=12). The group who had engaged in at least one Wild



Research activity had a significantly higher mean ($M= 5.13$) than those who had not engaged in any Wild research activities ($M= 3.67$) on the item *Finding out things my family can do together to help save animals*, ($t(34)= 1.46$, $p= .046$). This suggests those who did have a child age 8-16 and engaged in at least one Wild Research activity felt they had learned more about conserving animals than similar groups who did not engage in Wild Research activities. No other significant differences were found between these groups.

Discussion

These findings provide insight, as well as more questions, on the impacts of Wild Research. Most participants expressed that they were aware of the Wild Research activities which were pictured in this study, and over half stated that they had engaged with at least one of these activities. Each of the top three activities engaged in contained a component of higher technology than traditional signage. Although participants were unable to restate what the signage related to Wild Research was about, they were clearly aware of the educational purpose of the activities, and that the activities were meant to enhance the experience. Our findings do suggest that many participants feel these types of activities are geared towards children, a common misconception in informal learning settings that seems to have been associated with Wild Research activities as well. We did see slight agreement across groups who participated in Wild Research activities that suggest adults did participate in these activities as well as children. Our findings suggest that approximately three percent of our participants signed up for the Wild Research website while visiting the Zoo. While this is a small percentage for one day, over time, three percent of visitors per day would be a large contingent.

Generally speaking, our findings suggest that all participants have relatively similar levels of agreement with how much they perceive they have learned about asking questions, making observations, and gaining skills for conservation behaviors. The mean scores reflect that most participants expressed agreement with the positively worded items in the study. Statistically we found very little differences between groups based on the number of Wild Research activities in which they engaged. Our findings suggest that those who engaged in two Wild Research activities had lower mean scores on negatively worded items on conservation than those who engaged in none or three Wild Research activities. No clear pattern emerges from examining the differences in magnitude based on the number of Wild Research activities in which the groups engaged. It is notable, and quite positive, that we found evidence to suggest families with children age eight to 16 who engage in Wild Research activities perceived their gain in knowledge related to what they can do as a family to help save animals significantly higher than with children age eight to 16 who did not engage in Wild Research activities. This meets one of the stated outcomes of Wild Research.

The study design has limitations, which are necessary to acknowledge. These are areas that social science study designs traditionally have difficulty in addressing. First, there are myriad variables that may influence at what level individual participants felt they were at prior to their Zoo visit for each of the items asked. We are not able to say that those who participated in our study did not already feel they had high levels of observation, questioning, and conservation skills and therefore they may not have had much room to increase these scores. Additionally, we are not able to attach causation to participating in the Wild Research activities. That is to say we cannot say that any of the differences in means between groups are directly attributable to having participated in Wild Research activities. Many

other Zoo or non-Zoo experiences may have factored in to participants considerations of what they gained in observation and question asking skills during their visit.

Overall, our findings suggest that Zoo visitors have embraced the Wild Research activities added to exhibits, and that they understand the purpose of the activities is to enhance the educational opportunities afforded by the exhibits. There may be a skewed view by participants that the activities are meant purposely for use only by children, a perception that is counter to the desire of the Wild Research team. Having zoo educators or volunteers model adult use of these activities may help to overcome some of these misconceptions held by visitors. While for the most part our findings do not support a claim that engaging in Wild Research activities significantly affects attitudes or knowledge towards inquiry and conservation, there are many reasons why this may be. Our study explored, using a survey method design, measurable differences between groups, based on the number of Wild Research activities participants reported engaging in during their visit. It may be that our measurements did not accurately reflect the type of outcomes that visitors are getting from engaging in Wild Research activities, or it may be that more time is needed, time for reflection, for the differences that exist to become apparent to the individuals. Inherent to free-choice learning is the ability of the learner to choose what meaning they make of an exhibit. Further, that few of the participants reported having engaged in a series of activities at any one site would suggest that the Wild Research activities are viewed as independent and not cumulative. Making the connections among elements more explicit is something that could be addressed in future efforts of this nature. The designs of the stations are such that the cumulative activity leads to the message, and without the additive effect, the skills and messages from one, two, or three activities are not reinforced enough to make an explicit difference on the visitor.

Conclusion

The overarching question for this summative evaluation was:

What is the impact on visitors to the Cincinnati Zoo and Botanical Garden of engaging in Wild Research programming?

To answer this question, eight sub-questions were asked to allow for analysis of the impact of Wild Research on the different outcomes identified by the program logic model created by the Wild Research advisory team.

- To what extent do visitors recognize and engage in Wild Research activities in the Zoo?
- To what extent do visitors with children age 8-16 in their group engage in Wild Research activities in the Zoo?

Two thirds of visitors with children ages 8-16 in their group engaged in one or more Wild Research activities during their visit. Those who engaged in Wild Research activities had similar levels of engagement, enjoyment, and likelihood of future enjoyment with or without a child age eight to sixteen in their group.

- Are there differences, based on interaction with Wild Research activities, in Zoo visitor perceived gain in knowledge and skills related to observation as a means of inquiry?



To some degree. Overall, participants felt slight agreement that they gained some knowledge and skills related to observation as a means of inquiry. While there were slight differences in mean scores between the groups, these differences are not statistically meaningful.

- Are there differences, based on interaction with Wild Research activities, in Zoo visitor perceived gain in knowledge and skills related to asking questions as a means of inquiry?

Participants expressed slight agreement with items measuring increased knowledge and skills related to asking questions, with one group expressing slight disagreement to the item *Duplicating the ways that scientists answer questions they have about animals*. There were differences in means between the groups as shown in Table 4, but these differences were not statistically significant.

- Are there differences, based on interaction with Wild Research activities, in Zoo visitor perceived gain in knowledge and skills related to conservation of animals and natural resources?

Perhaps. Those who did not participate in any Wild Research components did have lower mean scores for perceived gain in knowledge and skills related to conservation of animals and natural resources, with the exception of the item *Hearing about organizations I can join to help improve the environment*. However, the differences in mean between groups for each item are not statistically meaningful. These findings may reflect that some of the activities most engaged in did not have conservation messages and specific actions as part of the activity.

- Are there differences, based on interaction with Wild Research activities, in Zoo visitor feeling (affect) related to conservation of animals and natural resources?

No. No meaningful pattern of response emerged to answer the question.

- Are there differences, based on interaction with Wild Research activities, in Zoo visitor perceptions of how the Zoo contributes to larger communities?

No. Findings suggest most participants felt strongly that the Zoo contributes to the community at scales beyond the zoo level, regardless of which group of interactivity they were in.

- Are there differences, based on having a child(ren) age 8-16 in a visiting group, on any of the scaled item measurements for the questions above?

To some degree. Those who did have a child age 8-16 and engaged in at least one Wild Research activity felt they had learned more about conserving animals than similar groups who did not engage in Wild Research activities. No other significant differences were found between these groups.

Wild Research Component Follow-up

Because the summative study did not include the many studied elements of individual components, it seemed appropriate to add a section highlighting findings from the formative studies and a follow-up study of the effectiveness of each of the components. This is important to the work of this project as the high risk approach of whole-zoo experience could easily mask the outcomes generated by each of the individual components of Wild Research. For example, stay time at some exhibits increased from walk through as the average holding time to over 18 minutes as average for a series of components (formative study on Leaf Cutter Ants). These types of findings are important for understanding the value of the components, separate from the whole.

To address this, the project conducted a station –specific study including tracking, observations, and interviews at specific stations. Data were collected by researchers and research assistants at selected Wild Research Stations throughout the grant period. Results reported here are primarily from a multi-week study conducted in the summer of 2011. Researchers gathered tracking, simple observational, and interview data on families that participated in a Wild Research interactive as well as families in the same time period at the same exhibit who did not participate. A family was defined as a small, intergenerational group with at least one adult and one child (no school or informal education groups). Data recorded included family composition, use of selected interactives (time spent, page reached, and target behaviors where appropriate, for example “feel or measure leaf”). Researchers also recorded whether participants invited others to join them in completing the interactive and whether participants talked to others about the interactive. Participants and nonparticipants were interviewed upon leaving the exhibit area. Researchers asked adults in the participating group (age 18 or over) to answer on behalf of their family or intergenerational intact group. Adults typically conferred with other family members when answering interview questions. For the purpose of data analysis, a participant is defined as a person in an observed group who used a Wild Research touch screen interactive for at least 60 seconds, with time recorded by a researcher. The summer 2011 data collection effort focused on four Wild Research interactives:

- 1) Which Plants for Ants. This is a full inquiry interactive on leaf choice that prompts visitors to make a prediction, conduct observations (on which of two plants leaf-cutter ants are choosing, as well as on the size and texture of sample leaves), record data, and view results.
- 2) Wild Me Quiz. A personal quiz based on conservation psychology that, when completed, provides participants with graphical representations of their degree of environmental concern, perceived connection to nature, biological knowledge, and their preference for anthropomorphic/domesticated vs. wild animals. Participants have the option to explore whether different types of respondents (e.g., kids vs. adults, males vs. females) have higher or lower scores on these dimensions.
- 3) Save Manatees Poster. A public action tool that enables visitors to select a type of conservation message, choose poster images based on their message choice, add a verbal message by dragging and dropping words, add animations, and send their conservation poster via email to friends and family directly from the exhibit.
- 4) Night Hunters Sign Interactive. A public action tool that enables visitors to choose one of four wild cat species, select a background, create an acrostic or sense poem for their selected species, and see their completed sign appear as the actual exhibit sign on a screen below the selected cat exhibit. Visitors can also email their sign to themselves and others as a conservation

poster. This interactive was developed using the same approach as the Wild Research components, but was not part of the original Wild Research Project.



Data were analyzed using JMP (version 9.0.2) statistical software, including descriptive statistics as well as comparison of nominal and ordinal data using Pearson's χ^2 test of independence. The findings are embedded in the trends.

Finding 1. About 1 in 2 zoo visitors participate in one or more Wild Research interactives during their visit, indicating that Wild Research reaches about 500,000 Cincinnati Zoo visitors each year.

More than half (55%) of the 254 zoo visitors in the summative study both recognized and reported engaging in a Wild Research activity during their visit. Of these: 77 (30%) stated they engaged in one Wild Research activity, 42 (17%) identified two Wild Research activities, 9 (4%) identified three Wild Research activities, and 9 (4%) identified 4 or more Wild Research activities they had engaged in during their visit.

Findings from the exit survey are consistent with results from tracking studies reported below; daily family participation rates exceeded 80% at some exhibits.

Finding 2. Wild Research Stations are recognized by nearly all zoo visitors.

About 88% of the study subjects recognized at least one Wild Research activity when prompted when leaving zoo grounds in the summative study. Of the 254 respondents, 95 (38%) stated they recognized one of the activities in the photographs, 78 (31%) stated that they recognized two activities, 41 (16%) stated that they recognized 3 activities, and 9 (4%) stated they recognized 4 or more activities in the photographs. Activities in the gorilla exhibit were most likely to be recognized by participants, with 166 (65%) recognizing at least one of the gorilla elements pictured. 98 (39%) participants recognized an activity from the manatee exhibit, 83 (33%) recognized a Wild Research cart activity, 53 (21%) participants recognized an activity from the leaf cutter ants exhibit, 19 (8%) participants recognized an activity from the Discovery Forest.

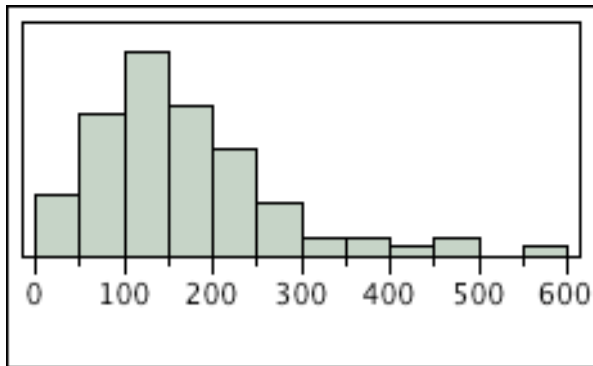
Finding 3. Wild Research Stations increase families' stay time in an exhibit area.

Wild Research was created in part to test whether zoo visitors will engage in inquiry on their own (without a zoo staff or volunteer present) on zoo grounds. Zoos are only recently incorporating inquiry into their exhibits and there has been no discussion in the literature of inquiry as a reason people visit zoos. The front end evaluations for Wild Research also suggest visitors have difficulty envisioning how inquiry at zoos might occur. However, despite the lack of expectation, evidence clearly indicates that zoo visitors will engage in inquiry if the opportunity and tools are available, which opens an important avenue for improving zoos as informal science institutions.

In terms of stay time, at Leaf Cutter Ants, on the single station, time before station was 41 seconds, and time after the station was 5:40 minutes. The percentage time at leaf cutter ants as a component of the time in Insect World went from 4.4% to 34.3%.

For individual stations, time spent on a single touchscreen interactive ranged from 2 minutes, 41 seconds (Which Plants for Ants) to 4 minutes, 1 second (Manatee Poster) for the four focus interactives in the WR Station-specific tracking study. A small but important number of people at each interactive far exceeded the mean.

Which Plants for Ants?



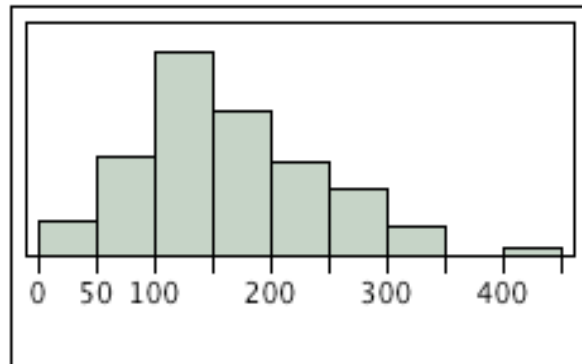
Time at touch screen (secs)

N	Mean	Max	Std Dev
103	161	584	99

Wild Me Quiz

Time at touch screen (secs)

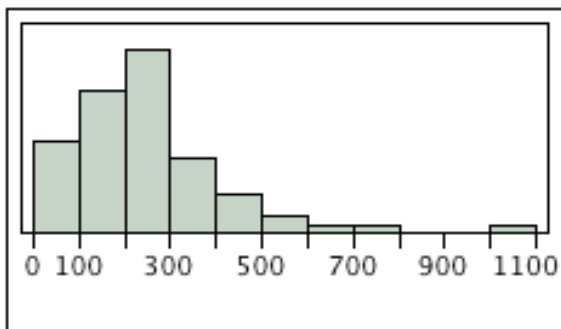
N	Mean	Max	Std Dev
102	162	440	78



Manatee Poster

Time at touch screen (secs)

N	Mean	Max	Std Dev
121	241	1,072	157

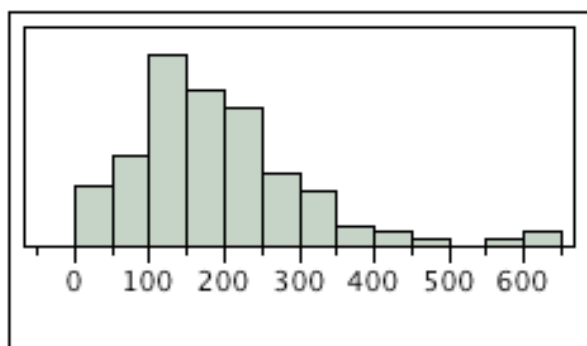


Night Hunter Sign



Time at touch screen (secs)

N	Mean	Max	Std Dev
136	186	616	112



Finding 4. Wild Research interactives elicit high levels of communication and collaboration among family members.

The station-specific study observations were of the four focus interactives offering different types of visitor experience: a full inquiry, a self-quiz, a visitor-created conservation poster, and a visitor-created exhibit sign. Results indicate that at least three out of every four participants individuals who engage for more than 60 seconds invite other members of their group (family) to join them in experiencing the interactive, and at least two of every three participants talk to other family members about the interactive.

Interactive	Invited others to participate	Talked to others about the interactive
<i>Which Plants for Ants (N=105)</i>	78%	76%
<i>Wild Me Quiz (N=94/93)</i>	80%	63%
<i>Manatee Poster (N=121/116)</i>	87%	81%
<i>Night Hunter Sign (N=136)</i>	84%	73%

Finding 5. Those who participate in Wild Research inquiry activities tend to demonstrate stronger inquiry-related outcomes than those who do not

One question in this inquiry was if participation in a Wild Research activity seems to affect visitor knowledge of the exhibit and the point of the inquiry. In the case of the leaf-cutter ant exhibit, the determinant was if visitors knew that leaf-cutter ants actively select leaves to bring back to the nest, and that the leaves differ in their characteristics (e.g., size, surface texture), which could affect their appeal to ants. The question asked was “Did you notice that the ants have a choice about which leaves to cut and take back to their nest?” Nearly 80% of respondents who participate, versus approximately 60% of

visitor who did not participate for 60 seconds or more were likely to notice that ants had a choice of which plant to cut and bring back to their nest, a key point of the leaf-cutter ant exhibit (N=205, DF=1, $\chi^2 = 14.0$, $p < .001$).

A second question asked: Can you tell me anything about the leaves the ants are choosing to cut and take back to their nest? If yes, what can you share with me? For this question, over 82% of those who participated noticed the leaf details versus 50% who did not participate. This was a statistically significant difference (N=205, DF=1, $\chi^2 = 24.1$, $p < .0001$).

The Wild Me Quiz was not a full inquiry, but was designed to elicit reflection on how people relate to nature. The interview question for this interactive was: Did this exhibit make you think about how you relate to nature and the environment? Nearly 90% of participants who engaged for more than 60 seconds responded positively, versus the 75% of those who did not engage for 60 seconds or more. This was a statistically significant difference (N=198, DF=1, $\chi^2 = 5.6$, $p = .018$).

Finding 6. Those who participate in Wild Research public interaction activities tend to exit with a sense of having completed a conservation action

Both the Manatee Poster and the Night Hunter Sign are public action tools that enable participants to create and send messages related to wildlife and wildlife conservation. One evaluation question asked whether families that used these Stations were more likely to feel that they had undertaken a conservation action.

In the Manatee Springs, the interview question was: Do you feel like you took a conservation action at this exhibit? For this, approximately 50% felt they had and an additional 17 percent felt they may have done so. For those who did not engage in for 60 seconds or more, approximately 40 percent felt they had and 10 percent thought they may have. Although this is a statistically significant difference, (N=192, DF=2, $\chi^2 = 17.7$, $p < .0001$), it should be interpreted with caution in that nearly half those who did not engage in the interactive also believed they had or may have undertaken a conservation action. Because making and sending a conservation poster was the only conservation action available at the exhibit, further study is needed to determine what conservation action non-participants believed they undertook.

In the Manatee Springs exhibit the interview question was: Did you feel like you helped spread the word about saving manatees? Of those who participated for 60 seconds or more, 75% felt they had helped spread the word about manatees with an addition 24% felling they may have; this is in contrast to the slightly more than 60 % who felt they did, and 18% who felt they may have who did not engage in the interactive. Again, though statistically significant (N=188, DF=2, $\chi^2 = 14.7$, $p < .0001$), caution is urged in interpreting these findings as nearly 80% of those who did not engage with the experience thought they did or may have helped spread the word about saving manatees.

In the Night Hunter exhibit, the interview Question asked was: Did you tell anyone today about wild cats? Approximately 29% of those who engaged in the activity felt they did, while only about 10% of those who did not engage believed they had told others about wild cates. This was also a statistically significant difference (N=206, DF=1, $\chi^2 = 12.8$, $p < .001$).

Data automatically logged by the Wild Research platform indicate that nearly 50,000 conservation posters were created and sent by visitors in the summer of 2011 at the Manatee Springs and Night Hunters exhibits.



Finding 7. Wild Research impacts are experience-specific.

In the summative study, visitors were asked to rate from one to seven a series of statements relating to how they learned about animals during their zoo visit, for example: by observing animal behaviors, comparing animals, contrasting animals, or counting animals in an area. Responses to these questions were not significantly associated with self-reported levels of participation at Wild Research Stations. Participation was also not related to how visitors at the exit rated the degree to which they learned to “help reduce my consumption of natural resources.” Similarly, general affective questions (or specific affective questions not clearly connected to a Station experience) administered at the exit were also not significantly associated with self-reported levels of Wild Research participation. Participants were no different than nonparticipants in the ratings they gave exit questions such as: “I feel it is important to help save endangered animals” and “I feel connected to nature.”

Data from the Station-specific study at the leaf-cutter ant Station provides further evidence that visitors typically do not generalize Wild Research outcomes. Even though participants demonstrated significantly higher knowledge of the exhibit, their self-ratings on the question: “Did you learn anything about leaf-cutter ants” were not significantly different from the ratings of nonparticipants. In both groups, about 75% of respondents gave a rating of 3, 4, or 5 (out of 5), indicating that visitors were neutral or believed they learned had learned at least a moderate amount.

If, as suggested here and in other studies, visitors do not readily generalize experience-specific outcomes to other contexts, ISE institutions will need to provide additional support when seeking off-site visitor outcomes from on-site experiences.

Finding 8. Wild Research interactives have strong appeal to visitors.

Participants were asked to rate WR interactives on a scale of 1-5 (1=do not like them at all; 2=do not like them very much; 3=they were OK; 4=I liked them; 5=I liked them very much).

Which Plants for Ants?

Mean 4.4. (N=90) 87% “either liked” (32%) or liked the interactives very much (56%). Based on an open-ended question, the most common reasons why respondents liked this interactive were:

- 33% Ants walking through the tube
- 28% Data collection (counting, timing...)
- 14% Computer/touch screen

Other reasons included: interactive/play (9%), kid friendly (6%), and educational (6%)

Wild Me Quiz

Mean 4.3 (N=76). 86% either “liked” (43%) or liked the interactive very much (43%). Based on an open-ended question, the most common reasons why respondents liked this interactive were:

- 37% Graphics / the picture choice component of the quiz
- 15% Computer/touch screen
- 13% The score page/seeing how they relate to nature

Other reasons include that the quiz made them think (7%), kid friendly (6%), and the quiz questions (6%). Two respondents felt the quiz was too long.

Manatee Poster

Mean 4.7 (N=85). 98% either “liked” (29%) or liked the interactive very much (68%). Based on an open-ended question, the most common reasons why respondents liked this interactive were:

- 28% Creativity/choice
- 23% Graphics
- 9% Able to send poster

Other reasons include kid friendly (9%), makes you think (7%), computer/touch screen (9%); and manatees/conservation (6%)

Night Hunter Sign

Mean 4.7 (N=88). 97% either “liked” (27%) or liked the interactive very much (70%). Based on an open-ended question, the most common reasons why respondents liked this interactive were:

- 33% Creativity/choice
- 13% Graphics
- 13% Kid friendly

Other reasons include the cat theme/selections (10%), computer/touch screen (10%), ability to send the sign (5%), and learning (5%).

Finding 10. Wild Research may improve visitor perception of the Cincinnati Zoo as a conservation and education institution.

In the summative evaluation, visitors who participated more in Wild Research also more strongly agreed with the statement that the Cincinnati Zoo “contributes to worldwide conservation efforts” (N=254, $p < .05$). This association is supported by data from the Station-specific study of the Night Hunter Station: Wild Research participants gave significantly higher ratings than nonparticipants when asked: “Do you feel the Cincinnati Zoo helps visitors save wild cats?” (N=207, $DF=3$, $\chi^2 = 7.2$, $p < .05$). The difference between participants and nonparticipants was not significant at Manatee Springs—families gave the Cincinnati Zoo equivalently high marks regardless of participation.

Families were asked in several Wild Research assessments for their opinion about why the Zoo would install Wild Research Stations. Respondents commonly mentioned educational reasons such as to provide “an opportunity to learn more about the animal on display.” Visitors also mentioned that “these types of activates are attractive to children.” Also, the presence of computers and touchscreens were attractive to a portion of visitors, fitting their expectations of appropriate learning technology.

Conclusion

The component pieces of Wild Research are performing as desired. This suggests that the component approaches are viable and should be considered by zoos and other informal science education venues as tools for engaging visitors in inquiry activities that lead to desired outcomes.

The findings, when coupled with the summative evaluation, reveal that without specific connections made for visitors, these individual experiences are not necessarily connected across the full visit experience. This does *not* negate the value of each interactive or, as in the case of some of the exhibits such as the Leaf Cutter Ants and the Gorilla that the totality of experiences in the exhibit add to time spent, content learned, connections with the animals increased, and conservation actions intended (from the formative evaluation studies). Given these comparative findings, it can be recommended:



- Inquiry activities in a zoo can be powerful tools for conservation learning (cognitive, affective, and behavioral intention)
- Inquiry activities in a zoo will not be integrated by a visitor across the experience
- Zoos should consider ways to connect inquiry experiences explicitly with a message of inquiry if this is the desired outcome from the experience.

List of photographs participants were asked to view

Picture 1: Dress up – leaf cutter ants

Picture 2: Hoot like a gorilla

Picture 3: Leaf cutter ants touch screen kiosk

Picture 4: Shaman Quest

Picture 5: Elephant cart

Picture 6: Giraffe cart

Picture 7: What do gorillas do

Picture 8: Manatee cart

Picture 9: Wild packs

Picture 10: How fast – leaf cutter ants

Picture 11: Pentrometer – leaf cutter ants

Picture 12: Create a conservation poster – manatees

Picture 13: How many – leaf cutter ants

Picture 14: Play with plants cart – Discovery Forest

Picture 15: Which gorilla are you

Picture 16: Wild me quiz – manatee

Picture 17: Do gorillas have friends

Picture 18: Where do gorillas hang out