Wild Minds: What Animals Really Think

Summative Evaluation of Science Center-Zoo Collaboration
Exhibition and Programs

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September 2012

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Background

Wild Minds: What Animals Really Think (*WM*) is a collaborative project pairing science centers and zoos in the same or nearby urban communities, in cooperative and simultaneous exhibit and program delivery. The New York Hall of Science (NYSCI), New Knowledge Organization, and Hunter College developed *WM*, a traveling exhibition on animal cognition provides an opportunity to test cross-institutional programming strategies unique in the informal science education field. The Oregon Zoo and the Oregon Museum of Science and Industry (OMSI) were originating partners in project development, which received support from the National Science Foundation (NSF).

The New Knowledge research team conducted formative evaluation of the exhibition in the New York Hall of Science. Ellen Giusti, an independent evaluator, was contracted to conduct summative evaluation at OMSI and the Oregon Zoo, where the exhibitions and programs were open to the public from February 11 through August 19, 2012. Summative evaluation instruments were modified versions of those used in formative evaluation and approved by the Hunter College Institutional Review Board. A June date was chosen for the evaluation for two reasons: first, Portland weather was deemed more conducive to draw both science center and zoo audiences and second, because schools were on summer break and children would be more likely to visit the sites.

The project's primary goal is to develop public understanding of the complex concept of animal cognition. While scientists have discovered cognitive abilities in non-human animals, the public perception of these abilities has not caught up with the scientific advances in the field. The public persists in believing that animals act on instinct or training: a common misconception identified in front-end research[1] is the belief that dolphins are smart because people trained them to be smart. *WM* was developed to address this and other commonly held misconceptions.

Wild Minds began with a set of goals that were modified in response to practical considerations and front-end and formative audience research. Though no longer explicit in the text, the following themes and communication goals remain implicit in the exhibits and programs:

- *Cognition:* The exhibition will convey to visitors that animals have cognitive abilities once thought of as only available to humans (such as problems solving and tool use), that animal cognition is both similar to and different from human cognition, and that we can learn about ourselves by studying animals.
- *Evolution*: Visitors will learn how science is discovering brain structures that produce cognition, allowing them to see an evolutionary continuum based on shared cognitive capabilities between species.
- *Conservation:* Conveying a clearer understanding about the social and cognitive lives of animals to the public will help visitors build a conservation ethic.

The exhibition's introductory panel states *WM*'s principal message:

> *Until recently people thought that humans were the only animals capable of thinking. Now, scientists who study animals—in the wild, in zoos and aquariums, and in the lab—have seen evidence of cognitive abilities that are much like our own.*

In addition to the exhibit components designed for each venue, OMSI and Oregon Zoo education staff each developed ancillary programs to help convey—particularly to children—*Wild Minds'* communication goals.

This summative evaluation examines the exhibitions' and programs' impact on visitors with respect to four organizing principles:

1. Solving Problems
2. Communication
3. Using Tools
4. Recognizing Self

Intended impacts for public audiences reflect the *Framework for Evaluating Impacts of Informal Science Education Projects* (NSF, 2008) and the American Competitiveness Council impact categories for informal science literacy (ACC, 2007) upon which the framework is based. Using this framework, visitors to *Wild Minds* will demonstrate:

- Understanding of how a variety of animals—including humans—think *(awareness, knowledge, and understanding)*
- Increased interest in the topic of animal cognition and the results of scientists' work *(engagement and interest)*
- Respect and concern for animals in the wild and at home *(attitudes)*

[1] Fraser,J, Maust-Mohl, M., Morrison, R., *Wild Minds: What Animals Really Think*, Front-End Evaluation, Public Perceptions of Animal Cognition, Unpublished report prepared for the New York Hall of Science, 2010.

- A conservation ethic developed through the understanding of animals as complex cognitive beings *(behavior)*
- Application of scientific observation skills to learn about animal cognition *(skills)*

To help us understand *WM*'s impact on its audience, we explored the following questions:

- What do visitors do in the OMSI exhibition and Zoo installations and presentations—what attracts and holds their attention?
- What do visitors learn about animal cognition? Do the exhibits and programs broaden and deepen visitors' understanding of animals' cognitive abilities?
- Might increased understanding lead to greater empathy for animals and thereby support for environmental conservation?

The project's secondary objective is to encourage sustainable science center-zoo partnerships that last beyond the life of the program in the hosting communities. To that end, we explore briefly the collaborative process itself.

Method

A multi-method approach was used to gather data at OMSI and the Oregon Zoo (see Appendix 1 for demographic data and Appendix 2 for instruments). OMSI has its own internal evaluation department, whose staff was very helpful in the data collection phase of the evaluation, both at their own institution and the Zoo. OMSI evaluation department staff participated in piloting the instruments, suggesting modifications, and data collection.

1. Systematic Observation/Timing and Tracking: OMSI staff trained by the evaluator systematically and unobtrusively observed visitors in the exhibition. They noted where people paused, stopped (for at least 3 seconds), read, watched a video, used an interactive, and the order these interactions, using a form designed for that purpose. Data collectors used stopwatches to time how long visitors spent with exhibits. They also noted personal observations about visitor behavior and conversation. Some 50 visits were observed.
2. Exit Interviews: Before visitors left the OMSI exhibition area and the Zoo, they were asked to spend a few minutes to provide feedback about their experience. Zoo visitors were offered an incentive—two vouchers for admission to OMSI. OMSI staff, trained by the evaluator, engaged consenting visitors in in-depth conversational but structured, open-ended interviews. Refusal rate was very low at OMSI but quite high at the Zoo (see Zoo interview section below). Sixty-seven exit interviews were collected at OMSI and 50 at the Zoo. Participants were asked for their email addresses for possible follow-up research.
3. Visitors who participated in ancillary programs developed by each institution's education department were observed at each venue and asked to provide feedback about programs and presentations via self-administered questionnaires. Five programs at each institution were selected for evaluation. More than 75 visitors provided feedback on programs at each institution (>150 visitors).

   OMSI staff data collectors stationed themselves near one of the presentations. Many visitors were timid about approaching a demonstration cart, and many were not aware that they were supposed to interact with staff at the demos. Some presentations were as simple as a staff person sitting on the ground with a handwritten *Wild Minds* sign and a couple of rocks (otters' *Tool Use* at the Zoo) or a table with an array of egg cartons and piles of sticks and feathers (bowerbird nest-building at OMSI). Some presentations were elaborate and highly orchestrated (the sheep's brain dissection demonstration at OMSI). It was sometimes necessary for data collectors to *invite* visitors to interact, e.g., "Would you like to try this out?" After the visitor tried the activity, data collectors asked if they would answer a few questions to help the institution improve its programs.

In total, data from some 325 individuals in Portland contributed to the summative evaluation. Data were transcribed and analyzed and the findings reported below.

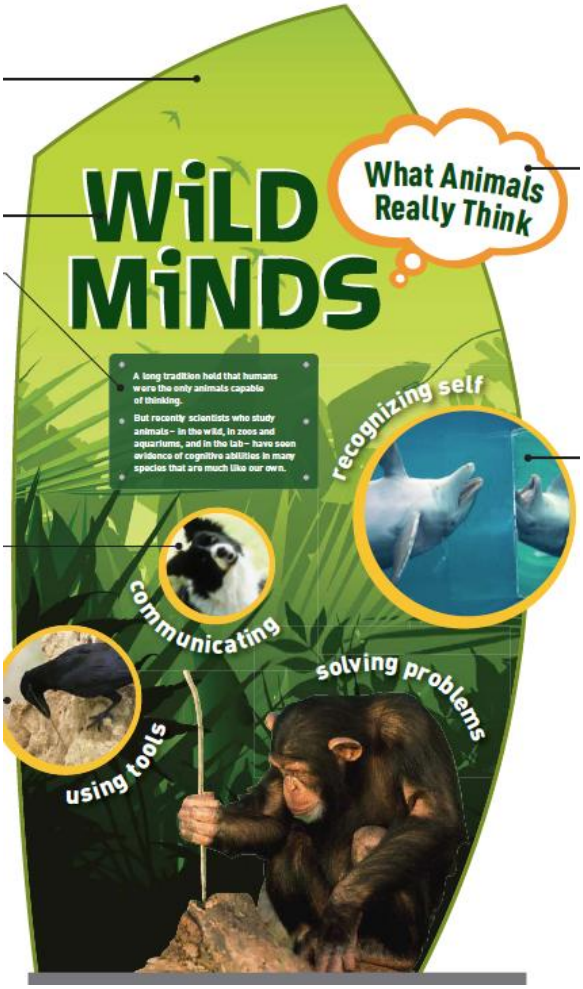
The first section of this report focuses on the visitor experience in *Wild Minds* at OMSI, beginning with an overview of the exhibit components and ending with a discussion. The second part of the report examines the visitor experience with *Wild Minds* exhibit components at the Oregon Zoo, followed by a discussion that compares the impact of the OMSI and Zoo visitor installations. The third section summarizes visitors' response to the ancillary programs at OMSI and at the Zoo. Finally, section four explores the project's effectiveness in relation to its goals and *The Framework*'s impact categories.

Findings

***Wild Minds* at OMSI**

Wild Minds consists of discreet standalone components—14 exhibit elements including some back-to-back displays—arrayed in an 1,800 square-foot space, separated from the adjacent exhibits by three arc-shaped painted screens that depict animals in the wild. The following overview of the exhibition provides a description of each component, its communication goals, and a brief review of visitor interaction. This will be followed by

detailed analysis of the visitor experience of *Wild Minds* at OMSI.



Introductory Panel
The Introduction (pictured left) highlights the four main cognitive themes—using tools, communication, solving problems, and recognizing self. It introduces the idea that animals have cognitive abilities much like our own.

It is not unusual for visitors to skip an exhibition's introduction: they look beyond to all the exciting

displays and can't stop to read the text that explains what they are about to see. There were three places visitors could enter the OMSI installation, and only one Introductory Panel. It is therefore not surprising that only five of the adult-tracked visitors (12%) paused to look at the sign and two of them appeared to read some of it.

Remembering Numbers
This computer-based component (pictured right) allows visitors to take the same short-term memory test as a chimpanzee—memorizing and then touching, in numerical order, the digits 1–9 displayed on the screen.

About one-third of the tracked sample stopped here, spending a relatively long time—several minutes on average. Most of the visitors who stopped used the interactive. The component was popular with adults and children, and often used by adult-child groups cooperatively. This component had high impact, attested to by the many interview respondents who referred to it.

Is this thinking?

Using a large touch screen monitor, visitors are asked to weigh in on whether the behaviors they observe in a diverse group of animal species shown on video clips, are hard-wired or require "thinking." After recording their opinion, users can hear what scientists think the behavior demonstrates.

This interactive (pictured left) attracted more than one in four visitors (27%) and held their attention for several minutes on average. One adult male stayed for more than 7 minutes—going through each section alone and again with his young son. Adults and children who stopped tended to use the interactive. Like *Remembering Numbers,* the chimpanzee exhibit, this component seemed to promote adult child cooperative interaction, and also featured prominently in interview responses.

Wild Minds at the Zoo
On the back side of *Is This Thinking,* this display (pictured right) includes a video, describing zoo enrichment programs to help captive animals exercise their brains.

A relatively high number of visitors stopped at this component (37%). The majority of those who stopped appeared to read something and half of them watched the video.

Brain Comparison
The display (pictured left) includes five plastinated brains from species featured in the exhibition (parrot, dog, chimpanzee, dolphin, and human), comparing their size and complexity. A demonstration dissecting a sheep's brain, took place nearby periodically.

The component was the only one to attract more than half the sample. However, visitors did not spend much time—less than a minute on average. The longest "dwell time" at this component was just under 2 minutes. The majority of visitors who stopped read some of the interpretive text. Interview responses revealed that visitors were impressed by the size comparisons.

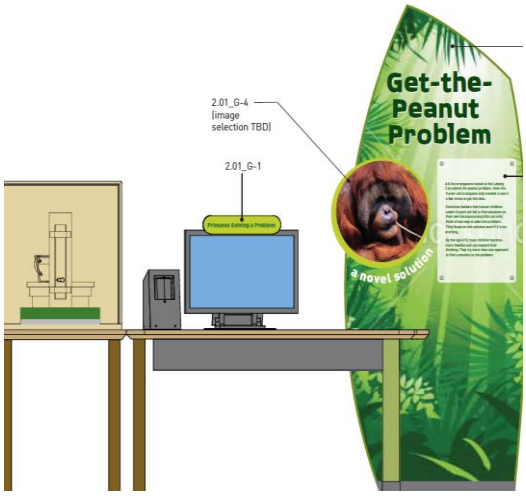
What Animals Really Think
On the back of the *Brain Comparison* display, visitors can press buttons to see which "higher thinking" behaviors are performed by the animals highlighted in the exhibit's case studies.

This component (pictured right) attracted only 14% of visitors who spent an average time of just under 1 minute. Again, most of those who stopped appeared to be reading the text. While the exhibit is interactive, it's placement behind the brain

comparisons meant it was on the outer edge of the exhibition area and could not be seen from within the exhibition space.

Get the Peanut Problem

The problem: How to get a peanut out of a tube? Before viewing a video of children and apes taking this challenge, the visitor is invited to try it as a "thought experiment." A replica of the experimental setup is located next to the computer display.



This component (pictured left) attracted 31% of the sample that spent an average of several minutes with it. One female adult with children spent almost 7 minutes watching the video. A few people stopped at the exhibit more than once, bringing others to see it. Most people who stopped watched the video and read the text. Interview respondents mentioned this component often.

Lyrebirds Mimicking Sounds
At this computer station (pictured right), visitors watch a short clip introducing the lyrebird. The visitor then tries to determine the sounds being mimicked by the bird (i.e., camera with motor drive, car alarm, and chain saw).

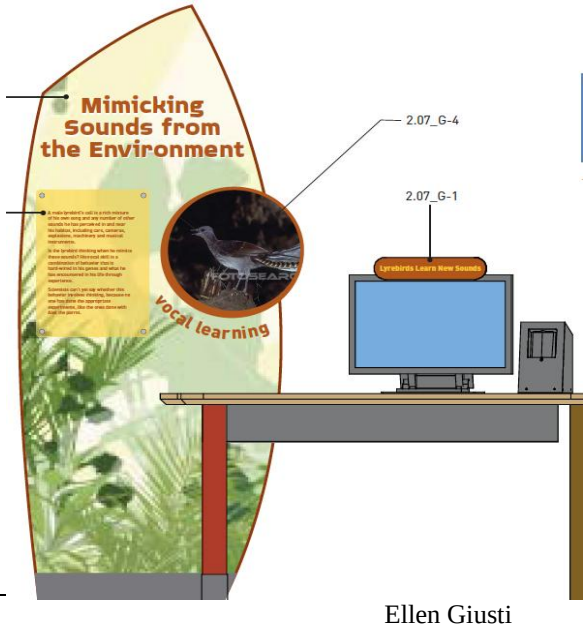
People who stopped (25% of the sample) tended to sit, watch the video, and read the text. On average people spent 2 minutes at the component, but one woman stayed for more than 5 minutes, guessing the sounds with her children.

Birds with Big Brains
At this computer-based station (pictured left), the activity begins by posing a "thought experiment" to visitors—a challenge identical to the one given to Betty the Crow: How can you get a piece of meat (lodged in a small basket) out of a tube, using only the materials you see in front of you. A replica of the experimental setup is located next to the computer display. The video shows how Betty, a New Caledonian crow, makes a tool and retrieves the food.

This display attracted 31% of the sample that stayed for 2 minutes on average. One man returned and brought others to the exhibit, staying for more than 5 minutes overall.

Learning Colors, Shapes and Numbers
In this three-minute video presentation, Alex, an African Gray parrot, is shown undertaking cognitive

challenges with research scientist Irene Pepperberg. A physical replica of the experiment apparatus is displayed next to the computer display.



This component (pictured right) attracted 35% of the tracked sample; virtually all of them watched the video and read some of the text. A group of high school students stayed and talked about the exhibit for more than 9 minutes. "Dwell time" averaged about 2 minutes.

What Dogs Want
Visitors listen to a variety of barks and attempt to determine what the dog might be saying (i.e., "Don't leave me alone," "Let's play," "I see a stranger," "I'm on the attack," "I want the ball," or "Let's go for a walk").

Half the tracked visitors stopped (49%) and the majority read and/or interacted with this exhibit (pictured left), trying to figure out what the barks were trying to communicate. "Dwell time" was 2 minutes on average, varying from less than a minute to 4 minutes. Many visitors keep dogs and were presumably interested in decoding their own pet's barks. Adults and children worked together to decode dog barks.

Chaser's Story

This panel is on the reverse of the *What Dogs Want* component. It tells the story of an amazing dog that understood hundreds of words. Only two people stopped and read some of it.

Is that me I see?
In this two-minute video presentation, dolphins are shown examining themselves and "clowning" in front of a mirror, with commentary provided by scientist, Diana Reiss. Dolphins are one of the few species other than humans that have this self-recognition cognitive ability.

The video attracted 27% of the visitors, most of who sat, watched, and also read some of the text. The average time at this component (pictured right) was just over 1 minute, with little variation.

The Thinking Octopus?
At this computer station (pictured left), visitors watch a short clip introducing the "mimic octopus." They are then shown images of three distinct mimic behaviors of the octopus and try to guess the type of poisonous animal being imitated (banded sole, poisonous sea snake, or lion fish).

One-third of tracked visitors stopped and interacted with this exhibit component. Most of them sat and watched the video, and read some of the text. "Dwell time" averaged about 2 minutes, but a young boy spent over 4 minutes engaging with the video. The component attracted adults and children and encouraged intergenerational interaction.

Talkback Station: What do you think?
Users write on cards about their thoughts. Potential questions include, "What does your pet do that shows its thinking?" or "Do these exhibits make you think about animals in a new way?"

The display (pictured right) attracted 11 tracked visitors but only 4 of them wrote something (the visitors pictured probably did not write a legible answer.) The research team will analyze collected visitor comments.

Systematic Observation

Data collectors observed some 50 visitors, who were not in organized groups, during weekdays between June 14 and 22, 2012. Crowd level was mainly "light" but occasionally "medium." While weekday traffic may not be representative of OMSI's crowd

levels on weekends, it provides the "best case scenario" for observing visitors in an exhibition: visitors are able to interact with exhibit elements that attract them without the impediments that crowded conditions create when visitors often skip a popular exhibit component rather than wait their turn.

The sample was selected at random and evenly divided between male and female visitors (48% and 52% respectively). Adults made up half the sample and the rest were children ranging from 8 years of age. Since the vast majority of adults (80%) were accompanied by children, analyzing adults' and children's exhibit interactions separately was deemed pointless.

Where Visitors Stopped

Figure 1 illustrates the percent of visitors who stopped at each exhibit component.

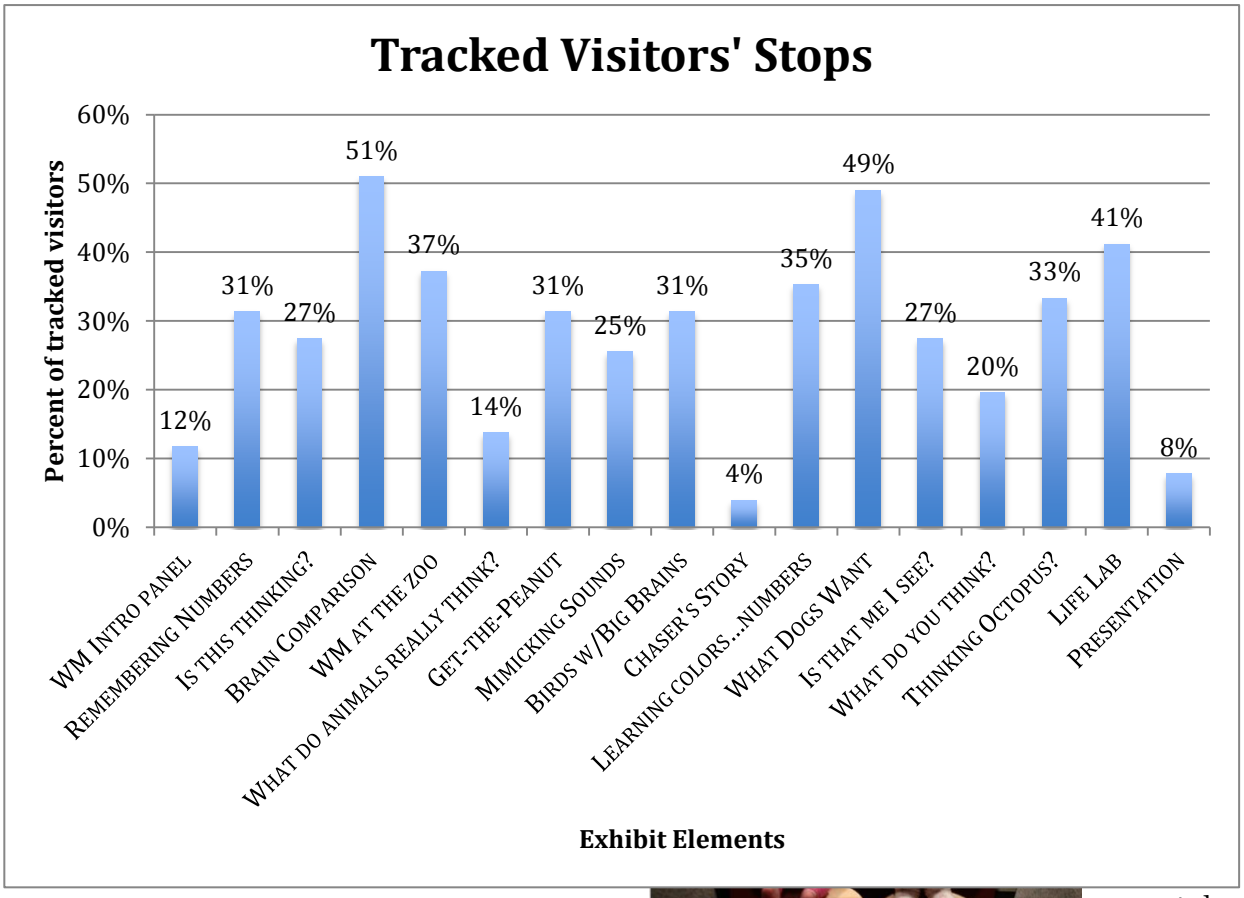


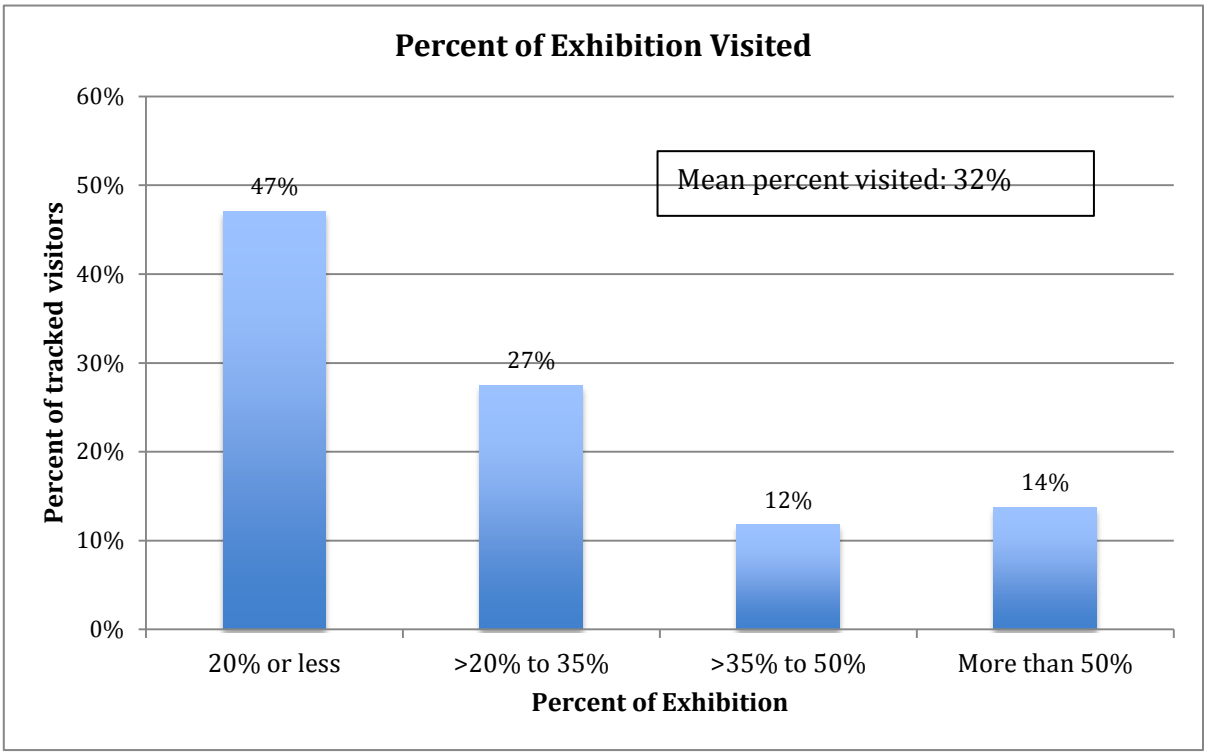
Figure 1. Percent of visitors stopping at each exhibit component

On average, visitors stopped at between 4 and 5 *WM* components, or 32% of the exhibition. Only 14% of the visitors used more than 50% of the components. The last two components in Figure 1—*Life Lab* and *Presentation*—are not part of the *WM* traveling exhibition package: *Life Lab* is OMSI's popular interactive science laboratory that houses live reptiles and small mammals. It is included in this evaluation because the only way to access it was through *WM*. Some visitors who entered *WM* headed straight for the *Lab* and some decided to look around before and/or after their *Lab* visit. As Figure 1 indicates, the *Lab* attracted a high percentage of visitors. Although not officially part of *WM,* the *Lab* featured animals and their behavior that could have enriched visitors' exhibition experience. Interview responses suggest that visitors did not distinguish between the *Lab* and *WM* (for example, when asked about her favorite part of the exhibition, a woman said: "[I liked] the live animals. 'Cause they are things you don't normally see [in a museum]." Thus because the *Lab* inadvertently became part of the exhibition, it also became part of the evaluation of the *WM* visitor experience.

The last item in the chart, *Presentation*, refers to *WM* educational programming that was designed to enhance the exhibition experience. Programs were

presented within the exhibition, but on an ad hoc basis and hence not available to all tracked visitors.

Figure 2. Percent of *Wild Minds* seen by tracked visitors



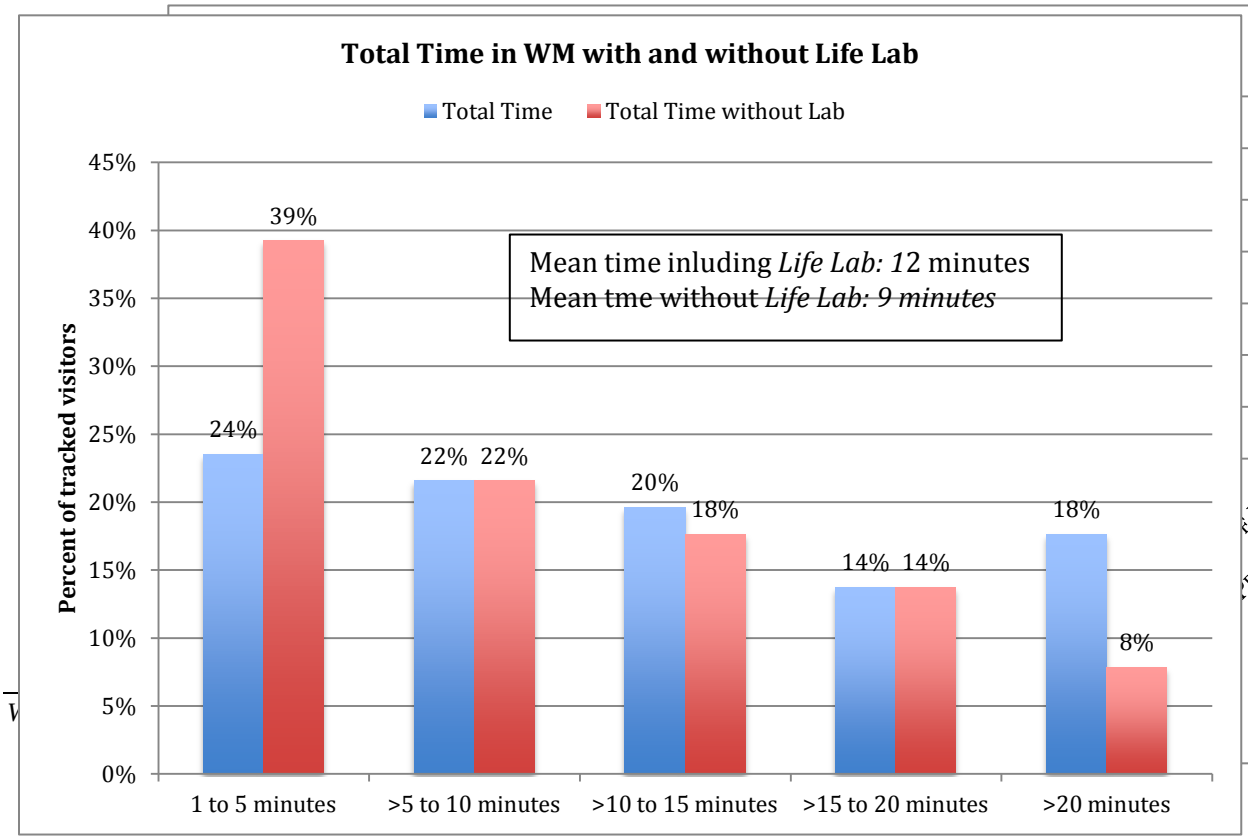
Two tracked visitors stopped at only 1 exhibit component (we cannot determine if they were returning or would return later) and one visitor stopped at 12 of the 14 components. On average, visitors stopped at between 4 and 5 exhibit elements. The only exhibit component that attracted more than 50% of the visitors was *Brain Comparisons* (*What Dogs Want* just under 50%).

Time in Exhibition

The average time tracked visitors spent in *Wild Minds* is just under 12 minutes. If we exclude the time spent in the *Lab*, the average is just under 9 minutes. Figure 3 illustrates the range of time spent in *Wild Minds* including and excluding the *Lab* component. The *Lab* had the greatest impact on the time of the shortest and the longest visits.

Figure 3. Tracked visitors' time in *Wild Minds* with and without *Life Lab*

OMSI educators presented ancillary programs within the exhibition area informally and without a fixed schedule. While not part of the exhibition per se, the *Presentations* held visitors' interest.



Presentation data in Figures 1 and 3 reveals a dichotomy between attracting and holding power: not many visitors participated in an educational program presentation (8% of the sample), presumably because presentations were not available when visitors were being observed in the gallery; visitors who did participate in a presentation spent a long time with it (almost 6 minutes on average).

Figure 4. The average time spent at each exhibit component

Time at Exhibit Components

The average time visitors spent interacting with each exhibit component is summarized in Figure 4 below. As noted above, OMSI's popular *Life Lab* could only be accessed from within *Wild Minds*, substantially skewing the timing data. Some 45% of the tracked visitors spent time in the *Lab* and the average time they spent there is greater than the time spent at *WM* components.

Component Viewing Order

There were three possible entrances to *Wild Minds* at OMSI, thus visitors would see first the exhibit component that was nearest to the entrance they used. For example, only two of the five people who stopped at the *Introductory Panel* (located at one of the entrances) stopped there first. *Brain Comparisons* was close to the same entrance and was the first stop for 22% of visitors. *Get the Peanut* and *Birds with Big Brains* were also viewed first by 10% of the tracked visitors—these components were located near another entrance.

In summary, there was no discernable logical order visitors chose to view the exhibit components. Instead visitors' paths through the exhibition appear to be random, moving from one element that attracted their attention to the next. Since there was no preferred order to best convey *Wild Minds* content, the order visitors viewed the exhibits is of no consequence.

Reading and Using Exhibits

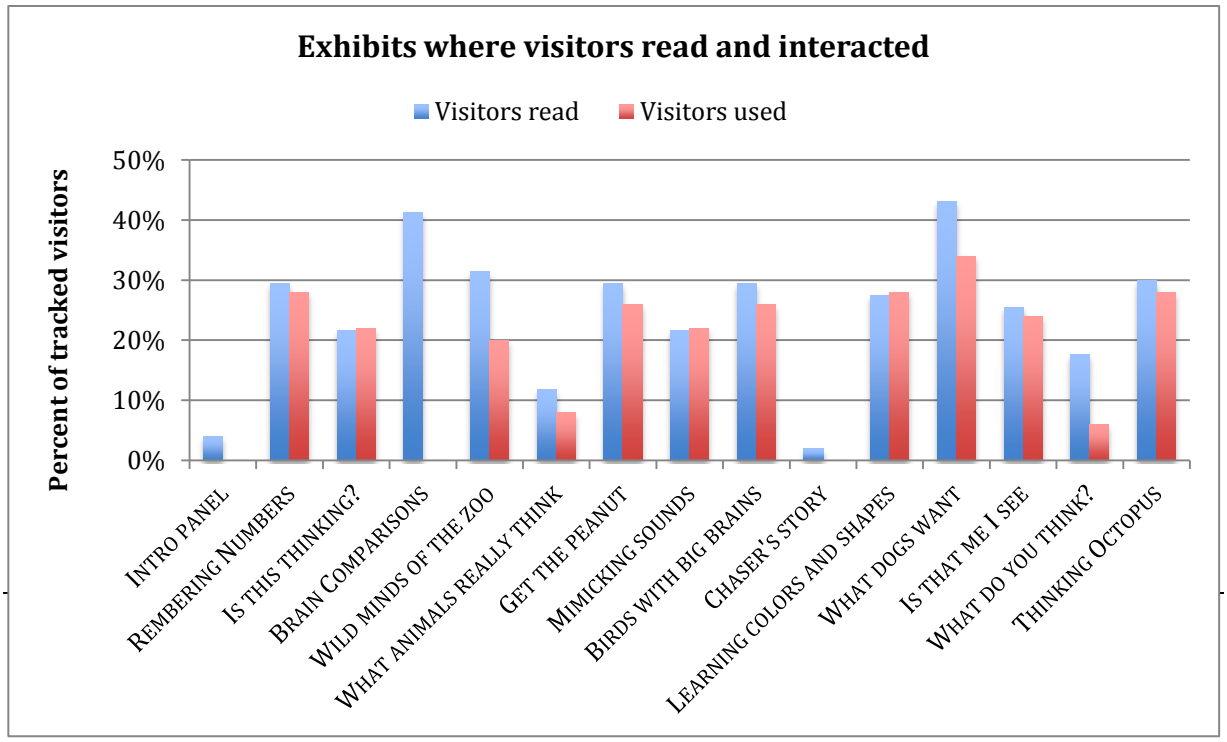
The exhibit elements that enticed visitors to read followed the pattern of stops—the ones that attracted visitors tended to interest them enough to read at least some of the text. Likewise, when an interactive was included in an exhibit, visitors tended to use it. Most visitors who watched others interacting with an exhibit tried it themselves. Some of the tracked visitors watched other members of their group use a computer but didn't actually use it themselves (typically parents watching their children). Figure 5 illustrates visitors reading and interaction behavior at exhibits.

Figure 5. Exhibits where visitors read and used interactives

According to Figure 5, *Wild Minds* visitors appear to have read labels about as often as they used interactive exhibit components. A caveat is necessary here: it is difficult for data collectors to discern if a visitor is looking at a screen or reading nearby text or both. The two panels with no screen or objects—the *Introductory Panel* and *Chaser's Story*—were the least used exhibits. *Brain Comparisons,* with no screen or interaction but featuring life-like brain specimens, was one of the exhibits where visitors read most frequently.

Interview Findings

One-third of the OMSI exit interview respondent sample (34%) was visiting OMSI for the first time, another third consisted of infrequent visitors (not for many years, every few years or once a year), and the last third could be considered frequent visitors (visiting twice or more times per year).



Wild Minds at the Oregon Zoo was simultaneously available for OMSI visitors to see. Only 19 of the 67 respondents (28%) said they had been to the Oregon Zoo within the past three months (when *Wild Minds* was on exhibit), and only 5 of the 19 visitors remembered seeing information or presentations about animal intelligence at the Zoo.

Main Idea

To find out what OMSI visitors thought *Wild Minds* was about, we asked them to describe it to someone who hadn't seen it. Virtually all the respondents (93%) provided a description of the exhibition, but about half were quite general—"interesting," "educational," "interactive," "about animals," "about nature," "science," "wildlife"—and half mentioned "intelligence" or "thinking" (see Table 1). A number of visitors (16%) mentioned the comparison of human and non-human animal intelligence. In hindsight, asking visitors to "describe the exhibition to someone" may not have been the most effective way to find out if they understood what it was trying to convey.

Table 1. How would you describe this exhibit to someone who has never seen it before? N=67

Descriptions	#	%
Animal intelligences, thinking	21	31%
Interesting, educational, fun, interactive	18	27%
Animals compared to human thought/intelligence	11	16%
About animals, what they do	8	12%
About nature, science, wildlife	5	7%
No answer	5	7%

As the quotes below suggest, respondents' age did not affect their ability to grasp the main ideas.

Visitor Quotes re: intelligence and thinking

Interesting, hands-on—[it was about] whether animals can think and reason. (Female, 8–12 years)

Interactive computers, about observing nature and relating different levels of thinking to humans and animals. (Male, 35–54 years)

About minds. Humans are like other animals…. (Female, 13–17 years)

General, but relevant

Pretty amazing, very interactive, very educational, answers a lot of questions you might have before watching the videos. (Female, 25–34 years)

To further probe visitors' awareness of the exhibition's communication goals, we asked if anything had surprised them. More than two–thirds of the interview respondents (70%) said "Yes," something in the exhibition had surprised them. The most surprising exhibit component was *Get the Peanut,* though visitors occasionally confused the species performing the surprising behavior (chimpanzees and orangutans).

Table 5. Did anything surprise visitors?

Surprises	#	%
Get the Peanut and *Remembering Numbers*	10	21%
Self-recognition (dolphins)	8	17%
Exhibition setup	8	17%
Comparative brain sizes	7	15%
Learning Numbers… (Alex the parrot)	4	8%
Problem solving (crow)	4	8%
Octopus thinking	3	6%
Other	2	4 %

Visitor Quotes

The numbers and orangutan, the short term memory being so good. (Male, 13–17 years)

I was surprised to learn about how dolphins can see themselves in mirrors and enjoy it. (Female, 18–24 years)

There were so many things that chimps can do—their brain is just like ours. (Female, 8–12 years)

I was surprised to see the crow using tools to get food out of a tube. (Female, 35–54 years)

The octopus—how it changes shape and mimics things. (Female, 55-–69 years)

Reminded Visitors of Prior Experience

When asked if *Wild Minds* reminded them of something they had seen or experienced before, more than half the respondents (55%) said that it did, and most of them provided an example. Table 2 illustrates the types of things visitors were reminded of, followed by quotes from the interviews. One-third of the responses referred to things visitors had seen on TV, the Internet or in live performances. A similar number of responses cited exhibits at museums, zoos, or aquariums. Some of the visitors who were reminded of live animal displays in other museums assumed that *Life Lab* was part of *Wild Minds.* The exhibition made a few people think of lab work (principally visitors who had seen the brain dissection demonstration and worked in labs or were taking biology in school), and some visitors were reminded of their pets—presumably recognizing cognitive abilities similar to those highlighted in the exhibition. Many respondents spoke about their pets in other interview contexts as well.

One older couple was reminded of their trip to Australia where they saw a lyrebird: "[The exhibition was] very worth seeing, we primarily saw the lyre bird part so we can't say much more."

Table 2. What *Wild Minds* reminded visitors of N=33

Reminded people of…	#	%
Shows—live, on TV, on the Internet	11	33%
Things I saw at the zoo, aquarium other museums	10	30%
Things at work, in the lab, in school	6	18%
Pets	4	12%
Other	3	9%

Visitor Quotes

Mirror and dolphins—I saw a video in 4-H. (Female, 13–17 years)

Yes—only things I've read about or seen on the Internet. (18–24 years)

[Reminded me about] how animals get food and play with toys—I saw it at the zoo. (Female, 35–54 years)

Dog barking [reminded me that] friends have dogs and we're always trying to figure out what they mean. (Female, 8–12 years)

Most and Least Favorites

Visitors had a variety of favorite exhibit components (four respondents said the part they liked best was watching their children in the exhibition). Interview respondents' number one favorite exhibit component was *Remembering Numbers,* where visitors could compare their short-term memory to a chimpanzee's, followed by *Brain Comparisons*. The relative sizes and complexity of the plastinated brain specimens in *Brain Comparisons* fascinated visitors. Tracking and timing outcomes indicated that the exhibit components that drew visitors were *Brain Comparisons* and *What Dogs Want*; and *Remembering Numbers*, with its engaging interactive, held visitors' attention for the longest time.

Table 3. Visitors' favorite exhibit components

Favorites	#	%
Remembering Numbers (Chimp)	14	21%
Brain Comparisons	9	13%
Octopus	6	9%
Is this thinking?	6	9%
Life Lab	5	7%
Lyrebird	5	7%
What Dogs Want	5	7%
Is this me I see? (Dolphin)	5	4%
Get the Peanut	1	2%
Learning colors…numbers (Alex the parrot)	1	2%
Demo/presentation	1	2%
Everything	6	9%

Table 4 summarizes visitors' reasons for choosing a favorite exhibit. Responses indicate that visitors' favorite components were those that demonstrated how animals think, and how smart they are, e.g., the chimpanzee that outperformed humans on a short-term memory task. *Life Lab* and demonstrations were some respondents' favorites, reinforcing the notion that although not part of *Wild Minds,* visitors perceived those programs as part of the animal intelligence story. Table 4 is followed by examples in visitors' own words.

Table 4. What did visitors like about their favorite parts of the exhibition? N=57

What visitors like about favorites..,	#	%
It showed how animals think, how smart animals are	24	42%
It was interactive	12	21%
Fascinated by brain sizes, comparisons	10	18%
It was interesting, unusual, cool, amazing	8	14%
Personal reflections	7	12%

Visitor Quotes

[*I liked*] Is this thinking? *because there were multiple animals displayed, it was cool to see how they solve problems.* (Male, 18–24 years)

…Remembering Numbers*: realizing that chimps are that smart, and can do that puzzle so well.* (Female, 13–17 years)

[*It was*] *very interesting to see how animals figure stuff out.* (Male, 8–12 years)

Dolphin brain; I was amazed at how it was so large proportional to their size. (Male, 25–34 years)

Was there anything in *Wild Minds* that visitors did not like? A few visitors said there was not enough to *do,* too many screens to just *watch*— one person commented, "Especially for young kids;" and another, "Too much just watching on the screens and not enough doing."

Two people objected to the exhibition's location adjacent to the display of fetuses—"Really inappropriate for kids to see," and, "Luckily the kids just had a little brother but generally I'm not sure that stuff is age appropriate, they should have signs [warning people about it]."

A few people thought the videos should be longer (e.g., dolphins) or that there should be more about some of the species' abilities. A couple of people said they were not interested in one or another of the exhibit components.

Effects on Visitors' Thinking and Action

Many interview respondents commented on the exhibition's effect on their perception of animals (see

Table 6). Many of the comments showed surprise that animals actually thought, and had emotions or feelings. Clearly these people became aware that humans were *not* the only species with higher-level cognitive abilities. Fifteen people (11%) said that the exhibition would have no effect on their thinking about animals.

Table 6. How *Wild Minds* affected visitors' thinking about animals

Effects on thinking	**#**	**%**
Animals are smarter than I thought	21	16%
Increased respect for animals, has new perspective	14	10%
[Didn't realize that] animals feel emotions	3	2%
Compares them with humans	2	2%
Other	2	2%

Visitor Quotes

Makes me think that they are smarter than everyone thinks. (Female, 8–12 years)

It opened my mind about how I view animals in terms of their ability to solve problems. Never thought about them that way. (Female, 25–34 years)

[My thinking about them is] completely different now, [after seeing] what all they can do. (Male, 13–17 years)

[I have a] bigger appreciation of some of the similarities with people—you think about chimps but not birds. (Male, 55–69 years)

If the exhibition affected the way visitors *think* about animals, might they *do* anything differently? Most of the responses suggested that visitors would apply what they learned to interaction with their pets. Other than "Have more respect for animals," the exhibition (or the question posed) did not elicit any thoughts about conservation or preserving biodiversity. Just one person said, "Take better care of the environment." Twenty people said they would not do anything differently.

Table 7. Visitors will do the following as a result of seeing *Wild Minds* N=67

Do differently…	**Count**	**Percent**
Pay more attention to pets	19	33%
Be more aware, teach other people	11	19%
Will remember they are smart	3	5%
Have more respect for animals	1	1%
Don't know	1	1%
Other	2	2%

Visitor Quotes

I will listen to [my dog's] barks more carefully and try to understand her more. (Male, 55–69 years)

I will go tell others the interesting facts learned today. (Male, 25–34 years)

This is important, it makes you think: should we be looking at animals differently? A zoo gives challenges—we have an obligation [and a] responsibility to animals in zoos. (Female, 55–69 years)

When commenting on how *Wild Minds* might affect their thinking about animals, some visitors focused on animals' similarity to humans. When visitors were asked specifically if they noticed anything similar about the way humans and animals think, the vast majority (95%) said they did. Some of their comments suggested that humans have a responsibility to preserve animal species *because they are so much like us*. Did this notion of human and animal cognitive similarity lead visitors to make the connection to a shared evolutionary history? More than one-fourth of the responses inferred this concept, for example, "We are animals too." Table 8 summarizes respondents' explanation for the similarity between human animal thinking.

Table 8. Human and animal cognitive similarities

Similarities	**#**	**%**
Learning strategies, adaptation, trial and error	16	31%
We are animals too, evolution, structure	14	28%
We all have the same survival needs	12	24%
Social needs	4	8%
Created by higher power	2	4%
Other	2	4%

Visitor Quotes

Animals might be smarter than humans actually. Intuition, instincts—humans are animals too and we all have those same instincts. (Female, 25–34 years)

Humans are threatened by things in their space too, we communicate, we scream, dogs bark, we care for our young. (Female, 25–34 years)

We think how we would survive, find ways to survive and protect our young. Evolution. (Female, 13–17 years)

…We're all part of an evolving chain on this planet (we supposedly are at the top but as I grow older I believe that less and less). (Female, 70+ years)

Two creationists commented on their perspective of animal intelligence:

> *I believe we are all created by the same being, so we are all made to think and grow because of that higher being*. (Female, 25–34 years)

> *Amazing, how God created such variety: the wide range of creations, surprising abilities, and mental capacities.* (25–34 years)

Discussion

Wild Minds at OMSI attracted and held visitors' attention effectively. While the majority of visitors were not diligent according to Serrell's "51% Solution" criterion: more than half should have used more than half of the exhibit components[2], data show that 8 of the 14 exhibit components attracted more than 1 in 3 visitors, and 11 of the 14 attracted at least 1 in 4. The average number of exhibits visitors stopped at was more than 4.5 (32% of the exhibition), and a few people stopped at 10 and 12 components. Some exhibit components that interview responses suggested had the greatest impact on visitors (*Remembering Numbers* and *Get the Peanut*) could be used or watched by only 1 to 3 visitors at a time, and tended to hold their attention for the longest times. Because there was only one computer to interact with (e.g., *Remembering Numbers*) or one small screen to watch (*Get the Peanut*), relatively few visitors could use it (31% of tracked visitors each component).

This raises the issue of "attracting power" versus "holding power." *Remembering Numbers* features a video illustrating the chimpanzee's keen short-term memory, and an interactive that lets visitors test their short-term memory and compare it with the chimp's. The component held visitors' attention longer than any other components—an average of 4.35 minutes—and *Get the Peanut* held visitors attention for almost 3 minutes, indicating that both have very strong "holding power." *Brain Comparisons* has strong "attracting power" (51% of tracked visitors stopped at it), but held their attention for just over half a minute (weak "holding power") because it does not require much time to look at five plastinated brain specimens. Because visitors stayed so long at *Remembering Numbers* and *Get the Peanut*, fewer visitors could use them (31% of the tracked sample at each component). Another exhibit element, *What Dogs Want,* has both attracting and holding power: almost 50% of tracked visitors stopped, and although it did not engage visitors as long as *Remembering Numbers*, it held their attention for just over 2 minutes on average—longer than most of the other *WM* components.

In general, exhibit components with moving images (videos) tend to attract visitors' attention, and interactive exhibits tend to hold their attention. *Is this thinking?*, a highly interactive summary of the exhibitions' main themes, attracted only 27% of the visitors, but held their attention for a relatively long time—almost 3 minutes on average. This exhibit featured both a video and an interactive component, but its location behind *Brain Comparisons* (close to the exhibition's outer limits) was not conducive to attracting visitors.

At 1,800 square feet and an average time of 9 minutes, visitors moved through the exhibition at an average of 200 square feet per minute, a very good "Sweep Rate" for a science center exhibition, according to Serrell's analysis (Serrell, 1998). For purposes of comparison, McNamara (2005) noted in her summative evaluation of *Amazing Feats of Aging* at OMSI: "Based on an approximate area of 3,000 square feet, average time spent by adult visitors at OMSI (five minutes) translates to a Sweep Rate Index of 600."[3] Inverness Research Associates' evaluation of OMSI's *Moneyville*, a 6,000 square-foot exhibition, found that visitors spent almost 25 minutes[4], resulting in a "Sweep Rate" of 240, similar to *Wild Minds*.

Impact

Wild Minds at OMSI succeeded in conveying its communication goals that align with the *Framework for Evaluating the Impact of Informal Science Education Projects*.

Understanding and awareness

Visitors who saw the displays, interacted with components, and participated in presentation or demonstration programs came away with a greater understanding that non-human animals have cognitive abilities—they can think, solve problems, make and use tools, remember—sometimes they use them to greater effect than humans.

> *The chimpanzee and peanut exhibit—I was surprised about how many kids couldn't get it. It made me want to try with my son.* (Male, 35–54 years)

It was not as clear that visitors gained a more *scientific* conception of how a variety of animals—including humans—think. A few people saw the science in the exhibition—but the exhibition made them think about their kids and pets more than scientists and scientific research. The following quotes mention science, but do not specifically refer to research about animal cognition.

> *Pretty impressive, a lot of thought has gone into it; this exhibit is a little bit of*

[2] Serrell, B., *Paying Attention: Visitors and Museum Exhibitions,* Washington DC: American Association of Museums, 1998.

[3] McNamara, P. *Amazing Feats of Aging Exhibit: A Summative Evaluation Report,* 2005.

[4] Inverness Research Associates. *Moneyville Exhibit: A Summative Evaluation Report,* 2004.

everything having to do with science. (Male, 35–54 years)

Amazing, wonderful, really cool, sciency, fun. Makes you think more than the downstairs area [of the museum]. (Male, 55–69 years)

The exhibition made visitors aware of how a variety of non-human animals think, but this awareness did not extend to humans. Humans were the "gold standard" for visitors. It surprised and amazed them to learn that animals could think and perform tasks as well as or better in some cases than humans. Animals were deemed intelligent primarily in comparison to humans.

Understanding and awareness of animal and human similarities led a few visitors to see a shared evolutionary trajectory. Several people commented, "We are animals too," pointing out that we share the need to survive, care for young, and have social needs like communication.

Human brains and animal brains are practically the same—all have synapses, neurons etc. Because we are animals, evolutionarily we have similar origins. (Male 35–54 years)

Similar to front-end research findings (Fraser et al, 2010), summative interview respondents had not thought much about animal intelligence as such, though they were familiar with examples in popular media and experience with pets. *Wild Minds* was able to dispel misconceptions uncovered in front-end research. Visitors came away understanding that animals have cognitive abilities previously believed to exist only in humans—they think, use tools, solve problems, and communicate—and that these abilities are not a product of instinct or training. In contrast to front-end research findings, visitors saw similarities between animal and human thinking, and inferred an evolutionary relationship. As a teenage girl said, "We are animals too; we…find ways to survive and protect our young. Evolution."

Engagement and interest

Interviews demonstrate that visitors' interest in the topic of animal cognition increased, but did not show that visitors had much interest in the results of scientists' work on the topic. OMSI visitors of all ages were keenly interested in the comparison of animal brains, and their differences and similarities to human brains.

How much smaller other animals' brains are and how they work. (Female, 13–17 years)

We were talking about the brains and how interesting they were. I was surprised the dolphin brain is so similar in size to the human brain. (Female, 35–54 years)

It makes you think about their abilities. (Female, 8–12 years)

Attitude

The exhibition made visitors think differently about animals. Some visitors said they might treat their pets with more respect, e.g., making more of an effort to understand their dog's bark, referring to the *What Dogs Want* exhibit component. This affective response included awareness that animals can feel emotions.

The idea that they might be able to feel emotion. (Female, 55–69 years)

I won't make the assumption that it is just black and white for animals—they do have a higher level of thinking. (Female, 18–24 years)

Behavior

It was unclear from the interviews whether increased respect for animals, as complex cognitive beings with emotions, would lead to conservation behaviors. Apart from treating their pets differently, little was said about preserving animals in the wild.

I will probably play with my dog differently now that I know my dog can think a lot. (Female, 18–24 years)

We are animals too—why should we feel superior? We have responsibility to preserve and appreciate. (Female, 55–69 years)

Skills

Just a few visitors' comments suggested that they might apply scientific observation skills to learn about animal and human cognition. One example might be the man who planned to test *Get the Peanut* with his children. Another said she would try some of the ability tests with her pets. A man who also saw *WM* at the Zoo said, "I will do more research about animals" (Male, 35–54 years).

Wild Minds at the Oregon Zoo

This part of the summative evaluation focuses on the Oregon Zoo visitors' response to seven interpretive panels installed in various locations within the Zoo's 64-acre site. Before interviews could be conducted, it was necessary to screen potential respondents to ascertain whether they had seen any of the *Wild Minds* panels, and if so, which one(s). Many of the pre-*WM* Zoo labels discuss the unique abilities and intelligence of specific species, thus we found that simply asking visitors if they had seen any information about animal intelligence did not suffice. We developed a visual aid—a composite of all the signs—to help respondents remember our target panels (see Figure 6).

Figure 6. Composite of Oregon Zoo *Wild Minds* signs

As an incentive to participate, visitors were offered two free admission passes to OMSI. Besides the

incentive, we hoped to encourage Zoo visitors to experience *Wild Minds* at OMSI.

Findings

OMSI staff conducted interviews from June 15 through 25, 2012, using the same protocol used in the OMSI exit interview. Some 50 individuals, visiting with family and friends, were interviewed; ages ranged from 8 to over 70 years old. As Table 34 indicates, the refusal rate was high. It is always difficult to convince tired visitors that they should stop and agree to an interview when they have already decided it is time to leave. But after exploring 64 acres of stimulating displays with live animals on a hot summer day, we could only persuade 1 in 3 intercepts (32%) to participate. Close to half of all the people we intercepted (45%) did not remember seeing a *Wild Minds* sign.

Table 34. Refusal and Acceptance rates

Refusal/acceptance rates	Count	Percent
All refusals	115	68%
Did not remember seeing panels	76	45%
Accepted	54	32%
Total	169	100%

The Zoo exit interview respondent sample is a mix between frequent and infrequent visitors. Twenty-three respondents (43%) said they were Oregon Zoo members.

Each *WM* sign contained information about specific cognitive abilities and the animals that exhibit them. Each sign also reminded visitors to "Look for more *Wild Minds*" signs in the Zoo, and "To learn more about *Wild Minds*, visit OMSI." In addition, small stand-alone signs (pictured left and right below)

were placed at various locations reminding visitors "To learn more about *Wild Minds* visit OMSI (OMSI logo)." These "reminders" were intended to augment the shared visitation goals (OMSI signage included suggestions to visit the Oregon Zoo).

Estimates of the respondents' time spent in the Zoo indicated that most of the them spent the greater portion of the day there. Two people said they spent between 1 and 2 hours; 23 people (43% of the sample) estimated from 2 to 3 hours, and 29 people (54%) said they spent more than 3 hours in the zoo. Table 35 summarizes the *Wild Minds* panels that interview respondents remembered seeing.

Interpretive Panels at the Zoo

The *Introductory Panel* (pictured right) is large, with three double-sided panels radiating from a central column. It was placed near the Penguin Fountain at the intersection of several pathways, but not in conjunction with a particular species.

Remembering Numbers (sign pictured left) features a chimpanzee solving number memory games—apparently outperforming humans. The interactive computer had to be indoors—away from the elements and close to an electrical outlet—which unfortunately was a relatively dark location at some distance from the live primates. The similar display at OMSI was very popular, but the Zoo location did not draw visitors to it.

Is That Me I See? discusses self-recognition, which the sign describes as a "highly developed kind of thinking." To date, scientists find that "only dolphins, apes, elephants, and magpies share this ability with humans." The sign (pictured right) depicts images of a human baby, a dolphin, and an ape. The sign is located near the elephants' enclosure, but does not feature an image of an elephant. The size of the animals' pen would suggest that a relatively small sign, without an obvious reference to elephants, could be overlooked.

Tool Use depicts three animals that use tools—chimpanzees, New Caledonian crows, and otters. The display (pictured right) was located close to the otter enclosure, but when the otters are active, they could upstage any static display.

Vocal Learning (sign pictured left) was placed inside the Aviary. It is about communication by song and sound, and includes images of a songbird, lyrebird, dolphin, and elephant.

Play (sign pictured right) was installed near the *Wild Dogs* enclosure. It compared wild and domesticated dogs.

There is no octopus in the Oregon Zoo, which could have sparked visitors' interest. Placed near the Kelp Tank, but without a "thinking octopus" to look at, the sign (pictured left) had little meaning for Zoo visitors.

Table 35. Panels Respondents Remembered

Wild Minds Panels	Count	Percent
Introductory panel	27	50%
Play	24	44%
Remembering Numbers at a Glace	17	32%
Tool Use	11	20%
The Thinking Octopus?	11	20%
Is That Me I See?	11	20%
Vocal Learning	7	13%

Main Ideas

Once we determined that a visitor had seen one or more *Wild Minds* signs, we asked the participant to describe the information as she would to a friend. Some 30% of visitors who had seen a sign could describe something they remembered. The most frequent answer was non-specific—"Information on animals." Fewer than 10% said they saw information about "How animals think." The following comments indicate that visitors paid close attention to the panel about *Play* in the *Wild Dogs* enclosure:

> Wild Dogs—*[I learned] why they are called wild dogs, their Latin name.* (Female, 55–69 years)
>
> *Distinct sounds animals have to communicate with each other.* (Male and female, 25–34 years)
>
> *About why animals and pets have playful activities, and how it relates to what they do in the wild.* (Male, 25–34 years)

One person volunteered, "Animals and humans are similar in some ways."

When asked if the information they saw reminded them of something they had seen before, several people said that it did and described it: five people said it reminded them of "another exhibit," one person said it reminded him of "things on TV (e.g.,*Wild Kingdom*)," one said "My pet's behavior," and one person had seen *Wild Minds* at OMSI.

Fewer Zoo than OMSI visitors were surprised by something they saw (20% and 70% respectively). Two Zoo visitor comments were off topic and three were not specific.

Table 36. Surprising items

Surprises	**Count**
Animals' appearance and/or behavior	3
Self-recognition	1
Octopus	1
Activities for primates	1
Animals think	1
New information (general)	1
Irrelevant comments	2
Total	10

Visitor Quotes

> *I didn't know they think.* (Female, 25–34 years)
>
> *All the puzzles and activities [for primates].* (Male, 18–24 years)
>
> *Wild dogs don't bark.* (Female, 55–69 years)
>
> *That dogs and cats can't see themselves in the mirror.* (Male, 35–54 years)

Might this experience learning about animal cognition affect how visitors think about animals in the future? Twelve respondents (22% of the sample) provided answers.

Table 37. Effects on visitors' thinking about animals

Effects	**Count**
Made connection to something else	6
More empathy	2
Fun, interesting	2
They are similar to humans	1
Thinking not instinct	1
Total	12

Visitor Quotes

I am able to understand it more and compare it to what I am learning college. (Female, 35–54 years)

You think it's DNA or instinct but it is actual thoughts. (Female, 25–34 years)

Pressing on, we asked visitors if there was anything they might do differently after seeing the information in the *Wild Minds* interpretive panels. Five respondents said they might, specifically: four people said they would be more empathetic towards animals and one person said she wanted to learn more about the topic.

Visitor Quotes

I will be more empathetic. (Male, 55–69 years)

I will feel more constructive when I am interacting with pets and animals, I will increase the variety of activities. (Male, 25–34 years)

Visited OMSI

Fourteen respondents (26%) visited OMSI some time during the three months preceding the interview, and eight (15%) remembered seeing something there about animal intelligence. Of those who had not visited OMSI, the vast majority (86%) said they were interested in going to see an exhibition about animal intelligence at OMSI. One person said she would not because "OMSI is too

expensive" (even though we had given her free passes).

Discussion

Great effort went into choosing species for *Wild Minds* to satisfy a number of criteria. Exhibit developers sought diversity in species type. They reasoned that most people's prior experience had led them to believe that chimpanzees and dolphins are intelligent, but probably not that crows are intelligent. Portrayals of intelligence had to be supported by accredited scientific research and had to support the four dimensions chosen for the project: Solving Problems, Communication, Using Tools, and Recognizing Self. Furthermore, interpretive material had to make the point that scientists are not sure that *all* complex behaviors are actually a product of cognition (e.g., the octopus mimicking its background environment might be hard-wired).

The dual program will travel to several urban areas' science centers and zoos, and the interpretive panels at these partnering sites must coordinate. While science centers do not need current exhibits on display to support *Wild Minds,* the same is not true for participating zoos: visitors should be able to see the animal depicted in a zoo *Wild Minds* panel. If a zoo does not own an example of an animal depicted in a panel (as occurred with the octopus in Portland) that is a dilemma. Unlike a standalone exhibit at a science center, the impact of a zoo installation is dependent on seeing a live animal.

Why did so few Zoo visitors notice *WM* panels? Many of them do not refer to specific species on display because they are not part of the collection, a detriment that the science center-zoo collaborative model did not appear to foresee. Live animals are tremendously appealing—people visit zoos to see them, and when a live animal is included in a museum exhibition, it draws crowds of visitors. As Beverly Serrell's research shows, if an interpretive label does not give people information about something they can see, it is not likely to hold visitors' attention, or even be noticed in the first place[5]. This is true in museums with static displays, but even more important in living collections.

The effect of multiple exhibit components—many of them interactive—arrayed in a confined area has the effect of concentrating a message as it did at OMSI. Zoo displays were spread out over a vast area, making it difficult—if not impossible—for visitors to grasp a coherent theme. The disparity between a concentrated and diluted message delivery system, unfortunately rendered the Zoo's *WM* installation less effective. OMSI's exhibition organization was not perfect: it was open to adjacent exhibitions, allowing visitors to drift in and out, making it difficult for visitors apprehend *Wild Minds* as a discrete exhibition. Nonetheless, the impact on visitors' cognitive and affective realms was very different at the two institutions.

Zoo visitors gained respect and concern for animals in the wild and at home. They empathized with zoo animals' confined existence. Zoo visitors said:

> *I felt bad about animals in captivity*. (Male, 18–24 years)
>
> *The development of some animals is similar to us.* (Female, 35–54 years)

The Partnership: Institutional Perspective

The science center-zoo collaboration itself was an experiment: the two Portland institutions had never before worked together on a project. While there are bound to be challenges when doing something for the first time, senior staff in each institution said they learned a great deal from working with the other. A zoo representative mentioned meeting and getting to know colleagues at OMSI, and finding out about how they go about planning and installing exhibits.

OMSI and Zoo managers in several departments have committed to ongoing collaboration. One of the most successful aspects of the collaboration, according to educators and volunteer managers, was the cross-training and sharing of personnel. A number of volunteers from each institution continue to enjoy working at both sites. The two education departments started conversations about other partnership possibilities. The first project to come out of those conversations was a collaborative summer camp for junior high school students, which focused on exhibit design.

Communication was the most difficult aspect of the collaboration—inter- and intra-institutional communication could have been more effective. Stakeholders at all levels needed to meet face to face at the beginning of the project to establish communication guidelines, and due to staff changes, some of these personal connections were lost or had to be reestablished. One of the partners suggested that access to "cloud" sources might help all players to be on the same page regarding schedules, staffing, meetings and such.

A senior Zoo staff member recognized what this evaluation suggests—the *Wild Minds* installation at the Zoo was not as compelling as it could have been. This person cited the need for managers to be able to communicate about the collaboration to their own staff so that they could understand how to support it. Perhaps the partnership could have also been marketed more effectively to Zoo and OMSI audiences.

Presentations and Demonstrations

Education managers at both OMSI and the Oregon Zoo developed ancillary programs to enhance the

[5] Serrell, B., *Exhibit Labels: An Interpretive Approach*. Walnut Creek, CA: Alta Mira Press, 1996.

impact of *Wild Minds* on visitors. Five programs were selected for evaluation by each institution. The programs were designed to travel to exhibition venues, thus developers hoped to use evaluation findings for formative purposes—to review and perhaps revise them. Descriptions and learning goals read like Lesson Plans because they are quoted directly from written activity sheets.

OMSI Presentation Findings

OMSI educators developed nine ancillary programs to enhance *Wild Minds* learning objectives. Program overviews and results of the five presentation evaluations follow.

Presentation 1: Bowerbirds

Bowerbirds are pigeon-sized birds found in Australia and New Guinea. They are unique in that they build structures not for nesting but for attracting mates. These structures can be elaborate and contain items both natural and manmade.

Presenter questions: What if bowerbirds lived in your area? What would they collect? If you were a bowerbird, what your bower look like?

Visitors will use items available to build a bower while learning about these birds and the cognitive abilities that go into building a successful bower. Visitors can flip through a binder to see bowers built at other sites.

Topics: Building/Making

Time: 5 minutes–15 minutes

Findings:

Sixteen OMSI visitors (12 females, 4 males) voluntarily participated in the activity and responded to a brief self-administered survey about the experience.

Did anything about this activity remind the participant of anything she or he had seen or experienced before? Most said the content was completely new for them (see Table 9).

Table 9. Familiarity of presentation

How familiar	Number of participants
Completely new	10
Somewhat familiar	5
Very familiar	1

Table 10. Age range of participants

Age range	Number of participants
8–12	4
18–24	1
25–34	2
35–54	7
55>	1

Table 11. What topics did the demo cover?

Topics	Number of Participants
Bowerbird nest building	8
Creativity	5
Bowerbird thinking, intelligence	4
Attracting a mate	3
Bowerbirds	3
Nest is not for living	1
Other	5

"Other" includes: *Found objects that is important to people* *Nature is a thing* *Help the kids* *Environment* *Birds live in a nest*

Table 12. Topics by age

Topics	Number of Participants			
	8–12 years	18–24 years	35–54 years	55> years
Creativity	1		3	1
Bowerbird nest building	2	2	3	1
Attracting a mate			3	
Bowerbird thinking, intelligence	2	1	1	

Table 13. Main idea of presentation

Main idea	#
How bird build a nest	6
Bowerbirds are smart, intelligent	3
Nests is a mating technique	3
Creating	3
Not for living	1

Visitor Quotes:

How birds build a nest
How to make a nest.
Birds use shiny objects and pretty much anything to build nests.
I learned that no two nests are the same.
Bowerbirds make weird nest.
How the birds nest, how they are built etc.
Use materials at hand to create a nest, like the bird would.

Bowerbirds are smart, intelligent
The intelligence of these birds.
That birds are smart.
The bowerbird needs to think to complete.

Mating behaviors
How the mate is getting attracted.
The attractions of females.
That birds use nests as a mating technique.

Creating
Kids can "create" with almost anything.
They want shiny things.

Nest not for living
I learned that this bird just builds nests instead of laying eggs in it.

Table 14. How might this presentation change what the participant will do in the future?

Changes	#
Care about conservation, nature	8
Craft projects (nest building)	3
Learning, understanding	3

Visitor Quotes:

Care about conservation, nature
Care more about what I do outside, not littering etc.
Pay attention to nests, how to build a campfire.
More likely to have bowerbird conservation project.
Less littering.
I know more about birds; encourage me to love nature more.
I will leave birds' nests alone.
Appreciate nature (birds); respect environment.

Building
Can save items from our recycle bin for kids to "play" with; easy activity to do while we camp this summer.
Perhaps different materials for more variety.

Learning, education
Video of birds building a nest; possibly an old deserted nest for the "live" show.
Pass information on to a friend.
Understand bowerbirds better.

The youngest participants related bowerbird nest-building to creativity and intelligence, but not to attracting a mate. This may be OK and age appropriate. All participants took away at least the "building/making" topic cited in the description, and most related this to higher orders of intelligence or creativity.

Eight participants said they had visited the Zoo in the past few months; two said they remembered seeing something about animal intelligence; one person said they had seen a demo at the Zoo—*"about animal brain/memory and their intelligence levels."*

Presentation 2: Food Caching

Description:
Visitors will interact with a tabletop, natural-like setting with sand, rocks, mock trees, and toys. Visitors will hide food tokens, do another activity, then come back and find it.

Educator's question: Could they find it right away? *Variations:* hide multiple tokens of different values; try to fool a partner with "fake hides."

Topics: Spatial Awareness and Memory, Deception

Time: 5–10 minutes

Findings:

Fifteen OMSI visitors (12 females, 3 males) voluntarily participated in the activity and responded to a brief survey about their experience.

Table 15. Familiarity with topic

Familiarity	#
It was completely new	6
I was somewhat familiar	6
I knew everything	3

Academic background for respondents who "knew everything": one had some college, one less than high school, and one was a 3rd grader.

Table 16. Topics the presentation wanted visitor to learn about

Topics	#*
How animals hide food, using landmarks, mapping, caching	9
Animals & food, finding/hiding food	6
Memory	5
Change/environment/habitat	3
Animal intelligence/behavior	3
How the brain works	2
Other	2

*Numbers add up to more than 15 because more than one topic was mentioned by visitors

All 15 participants mentioned at least 1 relevant topic; 7 people mentioned 2 topics; 3 people mentioned 3 topics (though some were repetitions of one of the others).

Visitor Quotes:
Animals using landmarks.
Saving/storing food.
Basics of food caching.

Table 17. Main items visitors learned

Learned	#
How animals hide and find food, caching	10
Other	3
No answer	2

Visitor Quotes:

How animals hide and find food

Squirrels and crows hide food and use landmarks to find it.
Hiding food for survival.
Difficulty of remembering buried food locations.
What animals did with their food to store it and find it.
How the brain remembers (or doesn't) remember where we put things and how to remember landmarks and directions.

Other
It was great for the kids to see the world from the perspective of an animal.
That the brain is important to your body.
How scavengers find food.

Questions visitors wished had been answered in the presentation:

What else does the hippocampus do (for child and adult learning)?
Longer list of animals that cache food, images of the cached food.

How do you think this presentation might change what you do in the future?

I will be more aware of my hippocampus, noticing details when I am going places and looking for things; my "ah-ha" moment: the brain is like other parts, the more you use/exercise it the healthier it is and it grows (even in adults) and perhaps help postpone symptoms of Alzheimer's. Also, an exhibit of brain development stages, each part of the brain, what it does and exercises for different parts of the brain; learning about the neurotransmitters and their balance, what it looks like when they are imbalanced. (Female, 25–34 years)

Being aware of surroundings; take care; respect for animals and [their] struggles. (Female, 18–24 years)

Most participants understood that animals employ spatial awareness to hide their food and remember where they cached it. Just a few respondents noted that the animals were attempting to deceive potential "thieves."

Table l8. Age range of participants

Age	#
8–12	4
18–24	1
25–34	6
35–54	3
55>	1

Table 19. Highest level of Education

Education level	#
In middle school	3
High school degree	1
Some college	2
College grad	7
Some post grad study	-
Post grad/professional degree	2

Presentation 3: Hard-wired or Thinking? (Puzzle Box)

Imitation and Improvisation: Demonstrate to visitors how to do a puzzle. Add more steps then necessary to complete the puzzle. Did the visitor copy you or did they eliminate the unnecessary steps?

Topics: Hard-wired Behaviors, Learned Behaviors

Time: 5 minutes each

Findings:

Fifteen OMSI visitors (10 females, 4 males, 1 missing data) voluntarily participated in the activity and responded to a brief survey about the experience.

Did anything about this activity remind the participant of anything you had seen or experienced before? Most said the content was completely new for them (see Table 20).

Table 20. How familiar were you with topic?

How familiar	#
Completely new	9
Somewhat familiar	5
Very familiar	1

Table 21. Age range of participants

Age range	#
8–12	5
13–17	
18–24	1
25–34	3
35–54	4
55>	1

Table 22. What topics did participants think were in the demo?

Topics	#
Human cognition	7
Animal cognition	4
Puzzles/problem-solving strategies	6
Socialization	2
Memory	2
Similarities/differences between human and primate	5
Other	1

"Other" includes: *To know about animals speak*

Table 23. Main idea

Main idea	Number
Different problem-solving strategies, imitation vs. improvisation	6
Chimps improvise	4
Humans learn from imitating	2
Other	3

Visitor Quotes:

Humans and chimps have different problem-solving strategies
Humans are more subject to social learning and less likely to improvise than chimps (Male 35–54 years)
Chimps do not learn the same way we do. (Female, 25–34 years)
How to get something out of a box. (Female, 8–12 years)
Minds work in many ways. (Female, 8–12 years)
Steps to solve the puzzle. (Female, 35–54 years)
To think out of the box more OR to not even consider the box. (Female, 55> years)

Chimps improvise
Monkeys have better problem solving. (Female, 18–24 years)
That chimps take short cuts, that they don't follow a demonstrations. (Female, 25–34 years)
That younger chimps are more likely to try new ways to solve problems. (Female, 25–34 years)

Humans learn from imitating
Humans rely on each other for problem solving, especially while young. (Female, 35–54 years)
People most often do what other people do. (Male, 8–12 years)

Other
About my child.
Many ways to speak to animals.
Memory differences.

Table 24. How might this presentation change what the participant will do in the future?

Changes	#
Re-think my problem-solving strategies	5
Will try with kids	2
Will try with animals (pets)	1
Don't know	1
It won't	1
No answer	3

Visitor Quotes:

Re-think my problem-solving strategies
Think before you act. (Female, 8–12 years)
Look at puzzles differently. (Female, 8–12 years)
It might make me look for other ways to do things. (Female, 25–34 years)
I'll look more for the most basic (and obvious) answer. (Female, 55> years)
I think you should go with your own ideas. (Male, 8–12 years)

Will try with kids
Ask children to attempt more puzzles/gadgets/tools that have moving parts. (Female, 35–54 years)
I will use this concept in my daycare. (Female, 25–34 years)

Will try with animals (pets)
I'm going to study my guinea pig. (Female, 8–12 years)

Questions the presentation raised:

All of the different possibilities for this difference in problem solving. (Female, 55–69 years)
Maybe having another test to help show the points. (Female, 18–24 years)
I wonder if you could not use the hooked end? (Male, 8–12 years)

Seven participants said they have visited the Zoo in the past few months; two remembered seeing something about animal intelligence; one remembered, *"It was about food but I don't remember specifically"* and the other said it was *"Rat training in the life science lab."*

Most of the participants recognized that chimps and humans have different problem-solving strategies. The activity helps participants (including children ages 8–12) understand that to solve problems, humans follow instructions (imitate) while chimps improvise to find the most efficient route to the reward.

Presentation 4: Rat Maze/Training

This can work for science centers or zoos. Demonstrations will show how to train animals (especially rats) and the importance of the steps involved.

Educator's questions: What can we learn about cognitive abilities through training? *Variation***:** Mazes can be introduced for inquiry purposes with visitors; for instance: How fast can a rat run a maze? How long until they forget? How will the trained rat compare to the untrained?

Topics: Animal Training, How animal training fits with cognition, Mazes, Spatial Awareness

Time: 10 minutes

Findings:

Fifteen OMSI visitors (10 females, 5 males) participated in the activity and responded to a brief survey about the experience.

Did anything about this activity remind the participant of anything you had seen or experienced before? Most said the content was completely new for them (see Table 25).

Table 25. How familiar were you with topic?

How familiar	#

Completely new	7
Somewhat familiar	7
Very familiar	1

Table 26. What topics did participants think were in the demo?

Topics	Number
Rats/animal training/reward	13
Rat/animal intelligence	5
Studying rat/Animal behavior	3
Other	1

Visitor Quotes:
Rats/animal training/reward
When your pet does something good you give them a treat.
Positive reinforcement.
How to achieve a desired behavior in rats.
Training via reward.
How to achieve a desired behavior in rats.

Rat/animal intelligence
How smart rats are.
Intelligence of animals.
Rat thinking.

Studying rat/Animal behavior
Understanding rat behavior.
Pavlov's experiment.

Other
How to handle rats.

Table 27. Main idea

Main idea	#
Learning/training/positive reinforcement	7
Rats are smart	2
Other	3

Learning/training/positive reinforcement
Positive reinforcement is important and how we learn. (Female, 35–54 years)
Positive reinforcement training. (Female, 35–54 years)
Rats learned with reward systems/positive reinforcement. (Male, 35–54 years)

Rats are smart
How smart a rat can be. (Female, 8–12 years)
Rats are smart and trainable. (Male, 35–54 years)

Other
Why they are used as the proverbial "lab rat." (Female, 13–17 years)
How to handle rats.
Rats like food.

How might this presentation change what the participant will do in the future?
Use more rewards when I want my children to develop certain desired behaviors. :)
Treat animals special; now you know how smart they are.
Might make it easier to train a certain animal, such as rats.
It won't, it just reinforced what we learned.
Help training my dog.

Questions the demo raised:

How can we change the rat's behavior?

Seven participants said they have visited the Zoo in the past few months; two remembered seeing something about animal intelligence; one remembered *"I was at a 'member night' at OMSI and the Zoo had their rats,"* and another said, *"The animals had their own toys like ice and plastic toys for polar bears."*

Table 28. Age range of participants

Age range	Number
8–12	3
13–17	
18–24	2
25–34	1
35–54	9
55>	

The topic "Animal Training" was conveyed effectively. Most participants of all ages recognized the value of positive reinforcement in training—for both animals and children! Few visitors commented on the relationship of how animal training fits in with cognition. The topic "Mazes, Spatial Awareness" was not mentioned by any of the 15 participants. If this is one of the presentation's desired impacts, it should be made more explicit.

Presentation 5: Brain Dissection

Staff will dissect a sheep's brain and allow visitors to explore different parts. Gloves can be provided in case visitors want to feel the brain. The focus of the dissection will be to highlight different areas of the brain used for different cognitive abilities as well as to compare animal's brains.

Topics: Brain structure and function comparison

Time: 10–15 minutes

Findings:
Sixteen visitors (12 females, 3 males, 1 missing data) responded to a survey about their experience.

Table 29. Familiarity with topic

Familiarity	Number
It was completely new	2
I was somewhat familiar	13
Very familiar	1

Table 30. Topics the presentation wanted visitor to learn about

Topics	Number*
Brain function	11
Parts of brain	9
Sizes of brains	5
Comparing different animals' brains	5
Brain texture, color	3
Memory	3

*Topics add up to >15 because more than 1 topic mentioned by visitors

All 16 participants mentioned at least 1 relevant topic; 5 mentioned 2 topics, 5 mentioned 3 topics, and 1 participant mentioned 4 topics.

Visitor Quotes:

Parts of Brain and Brain function
Clear distinction of the parts of the brain and what it's used for.
Each part of the brain does different things.
The parts of the brain and what they're called.
The brain stem processes the things we don't have to think about.
How and where memory is stored.
There's a place in the brain that helps you remember where everything is; animals that have more room to navigate have more of the big part under the brain that helps you move (like a dolphin); a brain is sticky; there's a protection thing that goes over your brain.

Comparing Different Animals
Animals that have more room to navigate have more of the big part under the brain that helps you move (like a dolphin).
Differences in brains of different animals.
The difference in animal's brains.

Size
The size of each region.

Texture
Brains are spongy.
How the brain felt….

Table 31. Main things visitors learned

Main idea learned	Number*
Parts of brain do different things	8
Comparison of animals' brains	5
Where memory is stored	2
Texture of brain	2
Brain size	1
Other	2

*A few participants cited >1 main idea

Questions Visitors wished had been answered in the presentation:

More real life scenarios of how parts of brain are used.
[What's] the purple things on the brain?
What each animal is better at.

How do you think this presentation might change what you do in the future?

Made me want to learn more about the brain
I already want to learn more about the human body.
[I will] recognize each animal's daily needs and encounters that affect brain development.
[I will] look for more info about the brains of different species.
More variety of brains.

Personalize the information
How to always exercise your brain no matter how old you are.
Knowing how to exercise different parts of your brain; know how to instruct kids to wear. protective headgear to protect different brain functions.
Take care of my brain so I can keep my memory for when I get old.

Relate to school work
It added a visual to the information I learned in my intro psychology course last term in school.
To know more about the brain for school science.

Other
It was just cool.
I like the live person.

Table 32. Age Range

Age	Number	Percent
8–12	5	31%
18–24	4	25%
25–34	1	6%
35–54	5	21%
Missing	1	6%

Table 33. Education

Education	#	%
In middle school	4	25%
High school degree	2	13%
Some college	6	38%
College grad	2	13%
Some post grad study	1	6%
Post grad/professional degree	1	6%

Recommendations for OMSI presentations:

- Remind visitors that scientific experiments demonstrate that animals are "smart" on their own, not just because they have been trained. Furthermore, the fact that they can be trained is, in itself, an indication of intelligence.
- Front-end research conducted to develop *Wild Minds* compared the scientific literature on animal intelligence with the public's awareness and understanding. *Wild Minds* exhibits are organized into four categories of intelligence:

  Solving Problems

Communication

Using Tools

Recognizing Self

It would be helpful if presenters directed visitors to areas of the exhibition where they could see other examples of those categories of intelligence/thinking: *Remembering Numbers* and *Get the Peanut* for "Problem Solving," *What Dogs Want* for "Communication," "Using Tools" in *Using Tools*, and "Recognizing Self" in *Is this Me I See?*.

- Presenters could reinforce the collaboration with the Oregon Zoo by mentioning that visitors can see and learn more about animal intelligence there, e.g., "Look for *Wild Minds* signs at various locations in the Oregon Zoo."

Portland Zoo Presentations Findings

Zoo educators developed 17 participatory programs to enhance *Wild Minds.* Five programs (described below) were selected to test their effectiveness in conveying themes of animal intelligence. Programs were informal and not on a fixed schedule. They were available to visitors who passed by and were presented by zoo educators according to staff availability.

Presentation 1. Animal Culture: Social learning and observational behavior

This activity took place at two locations: in the Primate building (near *Mandrills* or *Chimpanzees*), and right outside the Vollum Aviary. A volunteer educator taught a visitor to solve a puzzle and then asked the participant to model the problem-solving behavior to teach another visitor. Certain primates and birds engage in this type of learning behavior.

Fifteen visitors participated in the activity (10 females, 5 males) ages 11 to 60 years old.

Only one in three participants understood that this activity was supposed to show visitors that people

Primates	18
Birds	2
Octopus	1

Participant Characteristics

Ten participants were female and 5 were male.
Six participants were ages 11–16; 9 were adults, 24–60 years old.
The children had completed grades 5–10; three adults had some college background, 4 were college graduates, and 1 had an advanced degree (this person said "don't know" about main idea).

Oregon Zoo visits

First time	3
Not for many years	3

and some animals learn how to solve a problem by watching and copying each other. Four people thought it was about thinking and figuring things out on one's own. Five had other irrelevant interpretations.

Table 38. Activity is supposed to show people…
N=15

Shows	Count
Teaching and learning from others	5
Thinking, intelligence, figure things out	4
Other	5
Don't know	1

Visitor Quotes:

Teaching and learning from others
We can teach generation after generation. (Female, 44 years)
How people show others how to do it. (Female, 16 years)
How animals train other animals. (Female, 45 years)

Thinking, intelligence, figure things out
How smart animals are. (Female, 11 years)
How to figure out things logically. (Female, 59 years)
Coordination and reasoning. (Male, 45 years)

Other
Puzzles can be easier than we think. (Male, 11 years)
How animals move in the wild. (Male, 36 years)

Which other animals share this ability?

Research has shown that meerkats, octopus, quail, rats, apes, hummingbirds, ravens, horses, and European robins share social learning cognitive skills. All participants said they knew of other animals that behaved like this.

Animals that utilize social learning according to participants

Mice, rats	2
Elephants	1
Dogs	1

Once every few years	2
Once per year	1
Twice per year	6

Three respondents visited OMSI during the 3 months previous to the interview; none of them remembered seeing something at OMSI about animal intelligence.

Ten of those who had not been to OMSI in the past 3 months said they would like to go see an exhibition there about animal intelligence.

Fourteen participants said the activity was fun; one said, "not much fun."

Presentation 2: Tool use: Opening oysters with rocks

This activity took place at the *Sea Otter* exhibit and focused on how otters use rocks to crack the shells of food items—oysters. Zoo staff demonstrated how otters use a rock to crack shells and invited participants to do the same but using a hard-shelled nut instead of a mollusk (pictured below).

Sixteen children (9 females, 6 males, 1 missing data), between 7 and 12 years old, participated in the activity.

All participants grasped the basic ideas of this activity.

Table 39. Activity is supposed to show people… N=16

Shows	Count
How otters use tools	8
Otters are like us/we are like otters	4
Otters are smart	1
Other	3

Visitor Quotes:

How otters use tools

[It's supposed to show people] how otters use tools and education to help people learn more about otters. (Male, 11 years)

Sometimes it's really hard to open up nuts with your fingers. Otters use rocks to open them up. (Female, 9 years)

Otters are like us

That we are like otters in a way; we can do stuff like [an] otter. (Female, 9 years)

How otters break stuff. How they do it like we do. (Male, 9 years)

Otters are smart

That otters are very smart and they can crack things open. (Female, 9 years)

Other

Otters keep hands together and smash the rock down. (Female, 8 years)

How sea otters open up shells to eat. (Female, 9 years)

How otters use their hands to crack things. (Female, 7 years)

Which other animals share this ability?

Ten participants stated 13 animals they thought used tools. Research has found that otters and seagulls use tools to break mollusk shells.

Animals that use tools, according to participants

Primates	8
Elephants	2
Raccoons	1
Penguins	1
Lions	1

Participant Characteristics

Nine participants were female, 6 were male, and 1 was missing data.
All participants were between 7 and 12 years old: elementary and middle school students.

Oregon Zoo visits
(Data only available for 6 of the participants)

Once a year	2
Twice per year	3

Seven respondents visited OMSI during the 3 months previous to the interview; 3 remembered seeing something at OMSI about animal intelligence.

Six of those who had not been to OMSI in the past 3 months said they would like to go there and see an exhibition about animal intelligence.

All participants said the activity was fun.

Presentation 3: Spatial Awareness: Finding the correct path through a maze

The activity took place next to the *Naked Mole Rats* and *Egyptian Spiny Mice* exhibits. Volunteer educators gave Zoo visitors a paper maze and asked them to solve it. Discussion centered on the animals' ability to find their way through a maze to reach food, and whether the shortest path is always the best path through a maze.

Sixteen people participated in the activity (8 females, 8 males): 13 children 5–10 years old, and 3 adults ages 17, 18, and 42. The majority understood what it was supposed to show.

Table 40. Activity is supposed to show people… N=15

Shows	Count
Animals can solve mazes	4
Animals are smart	4
Compare human and animal intelligence	2
Other	3
Don't know	3

Visitor Quotes:

Animals can solve mazes

That animals can solve mazes. (Male, 10 years)

If you can get through the maze; sense of smell would help the animals to solve the maze. (Female, 10 years)

Animals are smart
Animals are smart; they can figure things out. (Female, 8 years)
How that animal is a good thinker. (Male, 8 years)

Compare human and animal intelligence
To see if you are smarter than a mouse. (Male, 42 years)
If you are smarter than the animals. (Female, 17 years)

Other
Show different animals. (Male, 5 years)
How elephants live. (Female, 8 years)

Which other animals share this ability?

All participants said they knew of other animals that behaved like this. Research has shown that the animals that share this cognitive skill (the ability to solve mazes) are rats, mice, squirrels, pigeons, and spiders.

The animals visitors named that are able to solve mazes differed somewhat from the research.

Rodents (mice, rats, rabbit, hamster)	9
Spiders	5
Primates	3
Snakes	2
Humans	1
Beavers	1

Participant Characteristics
Eight participants were female and 8 were male. Twelve participants were ages 11–10; 9 were 17–42 years old.

Oregon Zoo visits

First time	5
Not for many years	4
Once every few years	6
Twice per year	1

Four respondents had visited OMSI during the 3 months previous to the interview; 2 remembered seeing something at OMSI about animal intelligence.

Eight of those who had not been to OMSI in the past 3 months said they would like to go see an exhibition there about animal intelligence; 2 said "maybe."

Fourteen participants said the activity was fun; 1 said "not much fun."

Presentation 4: Foraging: Cooperative rope pulling

This activity took place at the *Elephant* exhibit (pictured right) replicated an experiment researchers have done with elephants. It consisted of a simple cardboard box and a piece of string that was threaded through it. The box contained food—a plastic piece of fruit. Participants were told that they could only use "their trunk" to pull the box toward them, i.e., one hand. Unless two participants cooperated, each pulling one string, they could not reach the food.

Animals that can solve mazes according to visitors

Kangaroos	1
Tigers	1
Ants	1
Ferrets	1
Birds	1

Eighteen Zoo visitors completed the activity and evaluation; 13 were children between 5 and 12 years old, 5 were adults.

Even the youngest participants understood the main ideas of this activity—elephants use teamwork; they are intelligent.

Table 41. Activity is supposed to show… (N=18)

Main idea	Count
Teamwork	8
Animals are smart	5
Don't know	2
Foraging	1
Misunderstood	1
No answer	1

Visitor Quotes:

Teamwork
Elephants use teamwork. (Male, 5 years old)
How elephants cooperate with other elephants. (Male, 10 years)

Elephants use teamwork. (Male, 8 years)

Elephants are smart
How elephants can think. (Male, 8 years)
How intelligent animals can be. (Female, 35 years)

Smart and teamwork
Elephants use teamwork; they are very smart. (Female 12 years)

Foraging
How elephants get food with trunks. (Female, 9 years)

Misunderstood

Primates	4
Wolves	2
Humans	1
Hyenas	1
Rhinos	1
Koalas	1

Participant Characteristics
Ten participants were female and 8 were male.
Eleven participants were between 5 and 12 years old: elementary and middle school students.
One participant had some college; 3 were college graduates; 1 had an advanced degree.

Eight respondents had visited OMSI during the 3 months previous to the interview; 2 remembered seeing something at OMSI about animal intelligence.

All those that had not been to OMSI in the past 3 months said they would like to go see an exhibition there about animal intelligence.

Fifteen15 participants said the activity was fun; 2 said not much fun.

Presentation 5: Conceptual Thinking: Discrimination between pictures

The activity took place in the Primate building. A Zoo volunteer asked participating visitors to close their eyes while the educator spread out a variety of pictures. The visitor was asked to open his or her eyes and find the picture the educator named. Discussion focused on how long it takes to find the right picture and how animals discriminate between objects to meet a goal.

Seventeen people participated in the activity (10 females, 7 males); 7 adults ages 17–43, and 10 children 6–13 years old.

The majority of participants understood what this activity was supposed to show people—that monkeys are able to discriminate between objects very fast. Seven of the 17 participants liked the competitive aspect of the activity—the competition between humans and monkeys.

Table 42. Activity is supposed to show people… N=17

Shows
Compares animals and human abilities (competition)
How fast you can think
Thinking, recognition
Other
Don't know

Visitor Quotes:

Compares animals and human abilities (competition)
Comparisons in reaction times between monkeys and people. (Female, 17 years)
Monkeys can think just as fast as humans. (Male, 11 years)

How fast you can think
How fast you can remember/think/react; to test your cognitive thinking. (Male, 31 years)
Test reaction time. (Female, 17 years)

Thinking, recognition
Cognitive thinking. (Male, 43 years)

Other
Seek and find game. (Female, 6 years)

The majority of participants understood this activity.

Which other animals share this ability?

Fourteen participants said they knew of other animals that behaved like this. The animals that research has shown share the ability to discriminate between objects or pictures are monkeys and pigeons.

The animals visitors named that are able to solve mazes differed somewhat from the research.

How adult elephants help their children. (Female, 11 years)

Which other animals share this ability?

Sixteen participants said they knew of other animals that forage cooperatively. In addition to elephants, research suggests that apes, monkeys, hyenas, rats, and rooks engage in cooperative foraging behaviors.

Animals that exhibit cooperative behaviors, according to participants

Birds	1
Mouse	1
Giraffe	1
Dogs	1
Octopus	1
Dolphin	1

Animals that can discriminate between objects	
Monkeys	7
Primates, apes	5
Dogs	4
Cats	3
Mice, rats	2
Octopus	1

according to visitors	
Dolphins	1
Lions	1
Sea otters	1
Bears	1
Sea lions	1
Humans	1

Participant Characteristics
Ten participants were female and 7 were male.
Seven adults ages 17–43 and 10 children 6–13 years old.
The children completed grades 1–8; the 17-year-olds were high school graduates; 1 adult had some college; 1 was a college graduate; 2 had advance degrees.

Oregon Zoo visits	
First time	1
Once every few years	8
Once a year	2
Twice a year	6

Four respondents had visited OMSI during the 3 months previous to the interview; 2 remembered seeing something at OMSI about animal intelligence.

All of those that had not been to OMSI in the past 3 months said they would like to go see an exhibition there about animal intelligence. All participants said the activity was fun.

Zoo Program conclusions and implications

Four of the five activities conveyed their main ideas effectively. Only "Animal Culture: Social learning and observational behavior" left visitors confused. It seems that the puzzles themselves took certain stage rather than the behaviors of teaching and modeling problem solving. Participants recognized intelligence and cognitive abilities were needed, but did not see the connection to social learning, learning though observation, and copying—the primary ways humans (and some other species) learn.

Conclusions and Implications

Wild Minds had substantial impact on public perception of non-human animal cognition. The science center exhibition configuration, with its concentrated multimedia components, was a more effective medium for delivering content than was the dispersed signage scattered about the Zoo. It might behoove future zoo venues to adopt a more centralized approach if possible—perhaps arraying the interpretive panels in some central location rather than attempting to link each one to a specific species on display.

The findings also suggest that there is a relatively steep learning curve for institutions that have never before collaborated to communicate effectively at all staff levels—from senior management to "boots on the ground." With pre-established communication procedures in place, partnering institutions could implement a more integrated approach to program planning, installation, message delivery, and promotion/marketing, thereby maximizing educational impact. Overall, partners seem to agree that it was a positive experience. As one said, "I would encourage others to use the opportunity to get together and think outside the box about other ways resources can be shared."

Appendix 1. Demographic Data

OMSI Exit Interview Respondents

Table 43. Frequency of OMSI visits

Number of OMSI visits	Count	Percent
Never been here before	23	34%
Not for many years	11	16%
Once every few years	4	6%
Once a year	6	9%
Twice per year	12	18%
Three times or more per year	11	16%

Table 44. Gender

Gender	Count	Percent
Male	24	36%
Female	41	61%
Missing data	2	3%

Table 45. OMSI members

Member of OMSI	Count	Percent
Yes	12	18%
No	55	82%

Table 46. Age distribution

Age	Count	Percent*
8–12 years old	10	15%
13–17 years old	5	8%
18–24 years old	4	6%
25-34 years old	15	22%
35–54 years old	23	34%
55–69 years old	8	12%
70+ years old	1	2%
Missing data	1	2%

*Percents add up to >100 due to rounding

Table 47. Children in household

Number Children <18 years in household	Count	Percent*
None	28	42%
1	9	13%
2	20	30%
3	6	9%
4 or more	4	6%

Table 48. Education

Highest level of education completed	Count	Percent*
Less than high school	11	16%
High school degree	5	8%
Some college	10	15%
College graduate	6	9%
Some post graduate study	14	21%
Post graduate/professional degree	15	22%
Missing data	6	9%

Five respondents said they had Hispanic heritage.

Table 49. Ethnicity

Self-described heritage (as per census categories)	Count	Percent
White	55	82%

Asian	5	8%
American India/Alaskan Native	1	2%
African American, Black	0	0%
Decline to answer	2	3%
Missing data	4	6%

OMSI Presentation/Demonstration Participants

Table 50. Gender N=74

Gender	Count	Percent
Female	56	76%
Male	18	24%

Table 51. Age distribution N=75

Age	Count	Percent
8–12 years old	21	28%
13–17 years old	3	4%
18–24 years old	8	11%
25–34 years old	12	16%
35–54 years old	28	37%
55–69 years old	2	3%
70+ years old	1	1%

Table 52. Number of Children in household

Number Children <18 years in household	Count	Percent
None	11	14%
1	14	18%
2	34	45%
3	6	8%
4 or more	10	13%

Table 53. Education

Highest level of education completed	Count	Percent
Elementary and middle school	18	25%
High school degree	7	10%
Some college	16	22%
College graduate	22	30%
Some post graduate study	1	1%
Post graduate/professional degree	9	12%

Table 54. Ethnicity N=73

Self-described heritage (as per census categories)	Count	Percent
White	53	73%
Asian	11	15%
American India/Alaskan Native	1	1%
African American, Black	4	5%
Native Hawaiian, Pacific Islander	1	1%
Other	3	4%

Table 55. Frequency of OMSI visits

Number of OMSI visits	Count	Percent
Never been here before	12	16%
Not for many years	7	9%
Once every few years	8	11%
Once a year	7	9%
Twice per year	6	8%
Three times or more per year	35	47%

Table. 56. OMSI members

Member of OMSI	Count	Percent
Yes	41	54%
No	35	46%

OMSI Timing and Tracking Subjects

Table 57. Tracked Sample's Gender

Gender	Count	Percent
Female	25	49%
Male	24	47%
Missing	2	4%

Table 58. Tracked Sample's Age

Age	Count	Percent
Elementary school	17	33%
Middle School	3	6%
Elementary and Adult pairs	2	4%
High school	2	4%
Adult	21	41%
Missing	6	12%

Eleven of the adults were with children ages **in grades** K through middle school; 10 were adults visiting without children.

Oregon Zoo Exit Interview Respondents

Table 59. How often visitors typically visit Oregon Zoo (N=54)

Visit Frequency	Count	Percent*
First time	10	19%
Not for many years	3	6%
Once every few years	2	4%
Once per year	14	26%
Twice per year	6	11%
Three times or more per year	19	35%

* Total >100 due to rounding

Table 60. Gender

Gender N=81	Count	Percent
Male	34	42%
Female	47	58%

Table 61. Age Distribution

Age	Count	Percent
8–12 years old	7	13%
13–17 years	3	6%
18–24 years	5	9%
25–34 years	15	28%
35–54 years	18	33%
55–69 years	5	9%
70+ years	1	2%

Table 62. Number of children under 18 in household

Number of children	Count	Percent
None	16	30%
1 child	15	28%
2 children	13	24%
3 children	6	11%

4 children	3	6%
5 or more children	1	2%

Table 63. Highest level of education completed (N=51)

Education	Count	Percent
Less than high school	6	12%
High school degree	7	14%
Some college	10	20%
College graduate	14	28%
Some post graduate study	3	6%
Post graduate/professional degree	11	22%

Total >100% due to rounding

Ten respondents (19%) said they had Hispanic heritage. Respondents described their ethnicity as follows (categories used by the US Census):

Table 64. Respondents' self-described heritage

Ethnicity	Count	Percent
American Indian/Alaskan Native	3	6%
Black/African American	3	6%
White	42	78%
Native Hawaiian/Pacific Islander	2	4%
Other	1	2%
Declined to answer	3	6%

Total >100% due to rounding

Table 65. Visited OMSI within 3 Months Previous to Interview N=80

Visited OMSI	Count	Percent
OMSI yes	27	34%
OMSI no	53	66%

Nine (33%) remembered seeing something at OMSI about animal intelligence
Forty-seven (89%) said they would like to see it.

Seventy-eight of 82 participants found the activities fun; 4, not much fun.

Oregon Zoo Activity Participants

Table 66. Gender N=81

Gender	Count	Percent
Male	34	42%
Female	47	58%

Table 67. Age Distribution N=81

Age	Count	Percent
8–12 years old	52	64%
13–17 years	8	10%
18–24 years	4	5%
25–34 years	4	5%
35–54 years	10	12%
55–69 years	3	4%
70+ years	-	-

Table 68. Highest level of education completed (N=78)

Education	Count	Percent
Elementary & middle school	53	68%
High school	7	9%
Some college	5	6%
College graduate	9	12%
Some post graduate study	-	-
Post graduate/professional degree	4	5%

Three people were Oregon Zoo members.

Twenty-seven people (34%) had visited OMSI within past 3 months; 8 of them remembered seeing something about animal intelligence there.
Forty-eight of the participants who had not yet visited OMSI said they were interested in going to see an exhibition about animal intelligence at OMSI, 2 said no, and 2 said maybe.

Appendix 2. Instruments

OMSI Wild Minds Exhibition Visitor Feedback

Hi, my name is_____. I am helping OMSI find out what people think of this exhibition. I'd like to ask you a few questions—it will only take about 15 minutes. Would you be willing to help us? If yes, "thank you" and continue. If no, "Thank you, enjoy the museum."

1. **Did anything in this exhibit remind you of anything you have seen or experienced before?**

2. **How would you describe this exhibit to someone who has never seen it before?**

   <probe> What do you think this exhibit is about?

3. **What was your favorite part of the exhibit? Why?**

   <probe> Why? What did you like about it?

4. **What was your least favorite part of the exhibit? Why?**

   <probe> Why? What didn't you like about it?

5. **Was there anything that surprised you? __Yes __No *if yes*, What was it?**

6. **How did your experience with these exhibits affect how you think about animals?**

   <probe> Can you tell me more about that?

   <probe> Do you have a pet? Y/N. If yes, what is it?

7. **Is there anything that you might do differently now that you have seen this exhibit?**

8. **Is there anything similar about the way humans and animals think? Yes No**
   If yes, what?

   Why do you think that is?

9. **How often do you typically visit the Oregon Museum of Science and Industry?**

I've never been here before	Not for many years	Once every few years	Once per year	Twice per year	Three times or more per year

10. Are you a member of OMSI? Yes ☐ No ☐

11. Are you? Male ☐ Female ☐ Prefer not to answer ☐

12. What is your age range? 8–12 ☐ 13–17☐ 18–24 ☐ 25 –34 ☐ 35–54 ☐ 55–69 ☐ 70+ ☐

13. Please circle the number of children under 18 living in your household

None 1 2 3 4 5 6 7 or more

14. Please select the highest level of education you have completed

2012 Grade completed: _____	Less than high school	High School degree	Some college(1–3 years)	College graduate	Some post graduate study	Post graduate/ Professional Degree

15. Do you have Hispanic or Latino heritage Yes ☐ No ☐

16. Which of the following best describes you (select all that apply)

American Indian/ Alaskan Native	Black/African American	Asian	White	Native Hawaiian/ Pacific Islander	Other	Decline to Answer

17. Have you visited the Portland Zoo in the past 3 months? Yes☐ No☐

If yes, do you remember seeing information and/or presentations there about animal intelligence? Yes☐ No☐

If yes, what do you remember?

----------✂----------✂----------✂----------✂----------✂----------

One of the things that we are interested in with this project is learning how it impacts people after they have left this institution. We would like to get in touch in a couple of months to see if there is anything that you remember from today. May I have your contact information so that we can get in touch with you in a couple of months? Please note, your name and contact information will not be connected to the responses you made to this survey or used for other purposes beyond this follow-up survey.

Name _____ Email_____

OMSI Visitor Presentation Feedback

Thank you for volunteering to complete this survey. Please complete all parts of this survey

1) How familiar were you with the information in this presentation (*This means before they saw it)***:**

☐ Completely new ☐ Somewhat familiar ☐ Very familiar ☐ I knew everything.

2) What topics do you think this presentation wanted you to learn about? (Please list as many as you can think of in the boxes below this question).

3) What was the <u>main</u> thing you learned from this presentation?

4) What questions do you wish had been answered in the presentation?

5) How do you think this presentation might change what you do in the future?

6) Please circle how often you typically visit the Oregon Museum of Science and Industry:

I've never been here before	Not for many years	Once every few years	Once per year	Twice per year	Three times or more per year

7) Are you a member of the Oregon Museum of Science and Industry? Yes ☐ No ☐

8) Are you? (please circle) Male Female Prefer not to answer

9) What is your age range? 8–12☐ 13–17☐ 18–24 ☐ 25–34 ☐ 35–54 ☐ 55–69 ☐ 70+ ☐

10) Please circle how many children under 18 live in your household

None 1 2 3 4 5 6 7+

11) Please select the highest level of education you have completed

2012 Grade completed _____	Less than high school	High School degree	Some college (1-3 years)	College graduate	Some post graduate study	Post graduate/ Professional Degree (Masters, PHD, JD)

12) Do you have Hispanic heritage Yes ☐ No ☐

13) Which of the following best describes you (select all that apply)

American Indian/ Alaskan Native	Black/African American	Asian	White	Native Hawaiian/Pacific Islander	Other

14) Have you visited the Oregon Zoo in the past 3 months? Yes No

If yes, do you remember seeing information and/or presentations there about animal intelligence? Yes☐ No☐

If yes, what do you remember?

Date:_____ Presentation: _____

Oregon Zoo Wild Minds Visitor Feedback

Hi, my name is _____. We're asking visitors for their opinions about some of the exhibits you might have seen. Did you notice any of these signs with information or see any presentations about animal intelligence or "Wild Minds" [show composite image of signs]?

<if yes, proceed > < if no, terminate with> "Thank-you for coming."

I'd like to ask you a few questions—it will only take about 5 minutes. The information you provide is anonymous. Would your family group be willing to help us? [We can offer you 2 free tickets to OMSI for your time]. No☐ Yes☐

1. Which of these signs (show pictures) do you remember seeing? *<Check off exhibits mentioned below; do <u>not</u> read to visitor>*

☐ WM Introduction	*☐Primates/Chimps*	*☐Bird communication*
☐Otters tool use	*☐Elephants*	
☐Octopus	*☐Wild dogs*	

Please describe the information you saw:

2. **Did anything in the signs or presentations remind you of anything you had seen before? Yes☐ No☐ If yes, what was it?**

If visitor doesn't remember anything from the* Wild Minds *info, go to demographic data.

3. **Was there anything that surprised you? __Yes __No If yes, what was it?**

4. **How did your experience with this information affect how you think about animals?**

<probe> Can you tell me more about that?

5. **Is there anything you might do differently now that you have seen this information?**

6. **About how much time did you spend at the zoo today?** ☐ between 1 & 2 hours ☐ 2–3 ☐ >3 hours

7. **How often do you typically visit the Oregon Zoo?**

I've never been before	Not for many years	Once every few	Once per	Twice per year	Three times or more per year

8. **Have you visited OMSI in the past 3 months?** Yes ☐ No ☐

If yes, did you see anything there about animal intelligence? __yes __no *If yes*, What was it?

***If no*, are you interested in seeing an exhibition about animal intelligence at OMSI?**

9. **Are you a member of the Zoo?** Yes ☐ No ☐

10. **Are you?** Male ☐ Female ☐ Prefer not to answer ☐

11. **What is your age range?** 8–12☐ 1 3–17☐ 18–24 ☐ 25–34 ☐ 35–54 ☐ 55–69 ☐ 70+ ☐

12. **Please circle the number of children under 18 living in your household**

None 1 2 3 4 5 6 7 or more

13. **Please select the highest level of education you have completed**

2012 grade completed _____	Less than high school	High School degree (12th grade)	Some college (1-3 years)	College graduate	Some post graduate study	Post graduate/ Professional Degree (Masters, PHD, JD.)

14. **Do you have Hispanic heritage** Yes ☐ No ☐

15. **Which of the following best describes you (select all that apply)**

American Indian/ Alaskan Native	Black/African American	Asian	White	Native Hawaiian/ Pacific Islander	Decline to Answer

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We are very interested in learning how this program might impact people after they leave the Oregon Zoo. We would like to get in touch with you in a couple of months to see what you remember today's experience. May we have your contact information to help us with a follow-up survey in a couple of months? Please note, your name and contact information will not be connected to the responses you made to this survey

First Name _____ Email_____

Thank you for your time and your ideas!

Oregon Zoo Demonstration Feedback

Date:_____ Demonstration: _____

1. What do you think this activity is supposed to show people?

2. Can you think of any other animal that _____

3. Was it fun or not much fun? __Fun __Not much fun

4. How often do you come to the zoo?

   __First time __Once every few years __Once/year __2-3 times/year __> 3 times

5. __Male __Female

6. Age: _____ Grade completed: _____

7. Have you been to OMSI in the past 3 months? __Yes __No

   If yes, do you remember seeing an exhibition about animal intelligence? __Yes __No

   If no, do you think you will go see the exhibition at OMSI? __Yes __No

OMSI Visitor Tracking

Date_____ **Time**_____ **Research Initials**_____ **Observation #**_____ **Crowd Level:** Light Medium Heavy
Demographics of Individual Observed: **Gender**: Male Female **Age**: Elm Middle HS Adult
Group Demographics: # of Adults_____ # of Children_____ **# of Approximate Age of Children:** Infants to K_____ Elementary _____Middle _____HS_____

Installation Element Name	Order (#)	Start Time	# of other Visitors	Pause ✔	Stop ✔	Sit ✔	Read ✔	Observe Others Using ✔	Interact with element/ Watch Video ✔	End Time	Comments
1 Intro Panel Wild Minds											
2 Remembering #'s at glance											
3 Is this thinking?											
4 Brain Power											
5 Wild Minds of the Zoo											
6 What Animals Really think											
7 Get the peanut Problem											
8 Mimicking sounds from the environment											
9 Birds with big brains											
10 Chasers Story											
11 Learning Colors and shapes											
12 What dogs want											
13 Is this that me I see											
14 What do you think											
15 Thinking octopus											