Mindful Beings:
Visitors' Descriptions of Emotions, Intelligence, Consciousness, Creativity, and Mind

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Mind and Learning - Front-End Evaluation
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PURPOSE

This front-end evaluation is one in a set of studies performed to gauge visitors' preconceptions about the mind and different aspects of the mind. This study, in particular, looks at

1. how visitors describe
   a. emotions,
   b. intelligence,
   c. consciousness,
   d. creativity,
   e. and the mind,
2. which attributes visitors believe define an emotional, intelligent, conscious, and creative being,
3. and what attributes do visitors believe define a being with a mind?

Through this study, we hope to begin to characterize how visitors describe these mental qualities and to identify fruitful areas to explore in a Mind and Learning project.

METHOD

Visitors were recruited, as individuals or as pairs, from various parts of the Exploratorium including the area around PlayLab and the mezzanine near the Traits of Life collection.

Each visitor/visitor pair was asked 2 to 3 sets of questions. The number of questions each visitor responded to was determined largely by time constraints, with more than

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90% of the visitors answering 3 sets of questions. Each set of questions centered on an aspect of the mind that was discussed in the Mind and Learning Planning Team: *Emotions*, *Intelligence*, *Consciousness*, *Creativity*, and *Mind*.

For each question set, the visitors were asked to consider four different kinds of things: dogs, computers, human beings, and stuffed teddy bears. To help visitors remember, the evaluator held up a card with the words of the 4 items for the visitor to look at throughout the interview.

Each question set followed a similar pattern:

> Emotions
>
> In your opinion, do any of these have **emotions**?
> Can you tell me why you think <u>XXX</u> have **emotions?**
> Can you tell me why you think <u>YYY</u> do not have **emotions**?
> How would you be able to tell if something from another planet has **emotions**?
>
> Intelligence
>
> In your opinion, are any of these **intelligent**?
> Can you tell me why you think <u>XXX</u> are **intelligent?**
> Can you tell me why you think <u>YYY</u> are not **intelligent**?
> How would you be able to tell if something from another planet is **intelligent**?
>
> Consciousness
>
> In your opinion, are any of these **conscious**?
> Can you tell me why you think <u>XXX</u> are **conscious?**
> Can you tell me why you think <u>YYY</u> are not **conscious**?
> How would you be able to tell if something from another planet is **conscious**?
>
> Creativity
>
> In your opinion, can any of these **be creative**?
> Can you tell me why you think <u>XXX</u> can be **creative?**
> Can you tell me why you think <u>YYY</u> cannot be **creative**?
> How would you be able to tell if something from another planet can be **creative**?

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<u>Mind</u>

In your opinion, do any of these have **minds**?

Can you tell me why you think <u>XXX</u> have **minds?**

Can you tell me why you think <u>YYY</u> do not have **minds**?

How would you be able to tell if something from another planet has a **mind**?

DATA COLLECTED

We conducted a total of 42 interviews (N= 42) during the following days:

Date	Day
10/13/01	Saturday
12/20/01	Thursday
12/21/01	Friday
12/22/01	Saturday
12/26/01	Wednesday
12/27/01	Thursday
1/19/02	Saturday
10/12/01	Friday

The number of interviews for each set is as follows. (Recall that each interview consisted of at most 3 question sets.)

Aspect of Mind	Number of interviews
Emotions	26
Intelligence	25
Consciousness	26
Creativity	23
Mind	26

The visitors interviewed were mostly individual adults. We did not interview school groups:

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Aspect of Mind	Individual Adult	Individual Youth	Adult-Adult Pair	Youth-Adult Pair
Emotions	17	4	4	1
Intelligence	13	6	4	2
Consciousness	16	3	6	1
Creativity	13	5	4	1
Mind	16	3	6	1

RESULTS

Note that in the following the interviewed group is the unit of analysis. If the two visitors in a pair disagreed, they were encouraged to talk until they reached an agreement.

Emotions

Which has emotions?

Most visitors believed that humans and dogs have emotions but a computer and a teddy bear do not.

	Dog	Computer	Human	Teddy Bear
Yes	23 (88 %)	1 (4 %)	26 (100 %)	0 (0 %)
No	2 (8 %)	24 (92 %)	0 (0 %)	25 (96 %)
Maybe	1 (4 %)	1 (4 %)	0 (0 %)	1 (4 %)

(N=26)

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Characteristics of emotional beings

The following lists some of the explanations that visitors gave for attributing emotions to one type of thing but not another[*]:

- Is alive
- Has social interactions
- Can react to surroundings
- Born with emotions
- Can feel and sense

Intelligence

Which is intelligent?

Again, most visitors believed that humans and dogs are intelligent. However, whereas a small minority believed that computers may have emotions, 44% of the visitors interviewed were either unsure or believed that computers have intelligence.

	Dog	Computer	Human	Teddy Bear
Yes	21 (84 %)	8 (32 %)	25 (100 %)	0 (0 %)
No	3 (12 %)	14 (56 %)	0 (0 %)	24 (96 %)
Maybe	1 (4 %)	3 (12 %)	0 (0 %)	1 (4 %)

(N=25)

Characteristics of intelligent beings

Visitors mentioned the following characteristics of an intelligent being[*]:

- Has its own thoughts
- Able to learn
- Is alive
- Can solve problems

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[*] This lists responses mentioned by over 15% of the visitors interviewed.

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Consciousness

Which is conscious?

A majority of the visitors believed that humans and dogs are conscious beings. However, computers and teddy bears are not.

	Dog	Computer	Human	Teddy Bear
Yes	20 (77 %)	1 (4 %)	26 (100 %)	0 (0 %)
No	4 (15 %)	22 (85 %)	0 (0 %)	26 (100 %)
Maybe	2 (8 %)	3 (12 %)	0 (0 %)	0 (0 %)

(N=26)

Characteristics of conscious beings

Visitors identified the following characteristics as indicative of a conscious being*:

- Is alive
- Reacts to environment
- Is born with consciousness
- Is aware of surroundings
- Has a mind and can think

Creativity

Which is creative?

Most visitors indicated that humans and dogs can be creative. As for intelligence, computers seem to sit on the blurry line between being creative and not being creative. Teddy bears, most visitors felt, are not capable of being creative (on their own).

	Dog	Computer	Human	Teddy Bear
Yes	17 (74 %)	10 (43 %)	23 (100 %)	3 (13 %)
No	4 (17 %)	11 (48 %)	0 (0 %)	20 (87 %)
Maybe	2 (9 %)	2 (9 %)	0 (0 %)	0 (0 %)

(N=23)

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* This lists the more popular aspects mentioned by over 15% of the visitors interviewed.

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Characteristics of a creative being

Visitors mentioned the following qualities as defining a creative being[*]

- Does something on its own
- Makes things
- Thinks and is intelligent
- Solves puzzles

Mind

Which has minds?

Most visitors said that humans and dogs have minds. Half of the visitors also believed that computers have something akin to a mind.

	Dog	Computer	Human	Teddy Bear
Yes	24 (92 %)	13 (50 %)	26 (100 %)	1 (4 %)
No	2 (8 %)	9 (35 %)	0 (0 %)	24 (92 %)
Maybe	0 (0 %)	4 (15 %)	0 (0 %)	1 (4 %)

(N=26)

Characteristics of beings with minds[*]

The following lists the characteristics of things with minds:

- Have free thought / free will
- React
- Are alive
- Can learn
- Make decisions
- Have brains (The mind is the brain)

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SUMMARY

- All visitors believed that humans have all five qualities: *Emotions*, *Intelligence*, *Consciousness*, *Creativity* and *Mind*. Alternatively, with a few exceptions, visitors did not believe that teddy bears had any of these qualities. These two types, humans and teddy bears, can represent opposite ends of a spectrum of things that have and do not have minds and mental qualities.

- Many people believed that dogs are like humans in that they do have emotions, intelligence, consciousness, creativity, and a mind.

- Computers presented an ambiguous case; many people believed that they had neither emotions nor consciousness. However, 50% of the visitors believed that computers have something akin to a mind and more than 30% of the visitors believed that computers can be intelligent and can be creative.

    This finding points to a potentially fruitful area to explore. Because computers are difficult to categorize for people, programs or exhibits that look at whether or not computers have these qualities can be one way of encouraging visitors to further explore and refine their ideas of what is the nature of intelligence, creativity, and mind.

- Over 50% of the visitors believed that only living things can have Emotions (15/26) and Consciousness (10/25). But, less than 30% of the visitors believed that only living things can have Intelligence (6/25), Creativity (0/24) or a Mind (7/25). It seems that some aspects of mind are still closely tied to life but others are not. Perhaps this too can be an interesting line of pursuit as we begin to define our themes for the Mind and Learning project.

- Visitors' definitions/ explanations can be vague and inconsistent. That is, they apply one set of criteria to humans but another set to computers. Comparisons across different types of living and non-living things may help visitors formulate a more integrated picture.

OTHER IMPRESSIONS

- Visitors thought the questions were challenging. They remarked on the questions' difficulty but seemed engaged with the interview:

> V10: That's an interesting question
> V11: Sh*t, that's a hard one
> V17: This is an interesting conversation

This suggests that visitors may be engaged in these types of questions and issues.

- Comparison may help elicit differences and refine definitions. More specifically, there are some indications that comparison between dogs and humans tends to bring out differences in degree

> [when asked about intelligence]
> V4: same as humans … not the same range as human but they can
>   learn
> V42: [dogs are] not as intelligent [as humans]

Alternatively, comparison between humans and computers tends to brings out quality differences; this is likely because some visitors believe that humans have mental qualities that computers do not:

> [when asked about emotions]
> V4: [computer is] set up to do things but cannot adapt.

> [when asked about creativity]
> V8: Humans are the most, dogs in a way. Computers, it's the people
>   behind the program.

- The 'obvious' choice does not tend to elicit explanations. Some visitors are even surprised that the evaluator would ask why they believe humans have certain qualities and teddy bears do not.

> [when asked why he said humans are creative]
> V7: because they are.

> [when asked why he thinks humans have emotions]
> V29: We are human beings and we have emotions.

> [when asked if teddy bears have emotions]
> V31: teddy bears are just stuffed

One possible way to engage visitors in asking questions about the nature of mind is to present examples of things that *challenge* their expectations about what does and does not have a mind.

- Visitors may have experiences and personal observations that they can draw on to think about what is a mind. For example, some of the visitors described experiences with family and pets:

> [when questioned about emotions]
> V1: When I read my 4 year old a story, she cries. When she
>   watches Dumbo and the baby is taken away, she cries.
>
> [when questioned about creativity]
> V18: Our German Shepherd figured out how to unlatch the gate
>   and also knows when a lock is on. It only tries when there's no
>   lock.
>
> V9: I don't have a teddy bear but I have a stuffed bunny and a
>   blanket. They're soft and I like to cuddle with them

- Otherwise, visitors also based their definitions on:
  - Behavioral characteristics

> [when describing emotions in dogs]
> V1: Sometimes it [our dog] pees on itself; it's so happy.

  - Other qualities

> [when describing emotions in computers]
> V1: Emotions are not predictable.

  - Physical makeup

> [when explaining why dogs and humans have emotions]
> V13: [They] have brains.

Exhibits about the mind, may build on or challenge these types of definitions that visitors already have.

RECOMMENDATIONS

The following lists and summarizes the suggestions mentioned earlier in this document.

- Consider designs that encourage or make use of comparisons

- ▪ Consider designs that allow visitors to observe others (either other species or technologies) or themselves. Some visitors already come to the Exploratorium with prior observations and interests in their own pets and in their own children.
- ▪ Consider challenging visitors' definition with demonstrations of Artificial Intelligence. Computers seem to sit at the fuzzy boundary of what do and do not have minds.

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