

# Visitors' Descriptions of Knowledge/ Belief Change

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# Mind and Learning - Front-End Evaluation Visitors' Descriptions of Knowledge/ Belief Change

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## PURPOSE

This report summarizes one of a set of front-end studies conducted as part of the Mind and Learning Planning Grant to begin to characterize how visitors describe their own learning process. The goal of this particular study was to get a sense of how visitors describe a change in their knowledge or in their beliefs, with a focus on what type of knowledge visitors described as changing and what visitors claimed was their source of knowledge and knowledge change.

## METHOD

### Data Collection

Visitor responses were collected over a 2 week period, from 12/22/01 to 1/2/02. Data were collected through a question and answer table that was placed unattended in the prototype area on the Exploratorium floor. A sign above the table encouraged visitors to complete the following sentences:

*When I was six, I believed ...*

*because ...*

*but I changed my mind when ...*

*because...*

in a looseleaf binder on the question and answer desk. We hoped that this format would encourage a range of visitor responses and would give visitors a chance to reflect, something that can be difficult to obtain in an interview where visitors may feel pressured to come up with a short and quick answer.

To provide some guidance for visitor input, we seeded the binder with responses from the Exploratorium staff. Also, three staff responses were posted above the desk to attract attention.

Visitor responses were collected at the end of most days. The original seeds were left in the binder to encourage visitors on subsequent days to contribute.

### **Data Corpus**

We collected 93 visitor responses. This count does not include visitor scribbles and other non-task related inputs (e.g., “Tania was here”).

### **ANALYSIS**

Visitors’ contributions were analyzed for common patterns in response. An initial coding scheme was developed aimed to capture key commonalities. This coding scheme was then applied to the complete data set. The coding scheme was refined with each iteration in order to minimize the number of miscellaneous items and to more clearly define and delineate between categories. I converged onto a rough coding scheme after 2 iterations.

## FINDINGS

The knowledge or beliefs that visitors wrote about can be broadly coded into 5 categories, shown in Table 1. Table 1 also provides examples for each category to better illustrate each coding category. Note that a visitor's response may fit into multiple categories.

**Table 1. Categories of Knowledge/ Beliefs**

Category	Count (out of 93 responses)	Example
Fact of world	53	V4: The sun lived behind the clouds. And it slept there when it was night, and then came out to play during the day. V30: In tooth fairy's
Self ability	22	V33: I could fly V51: That when I grew up I would know everything instantly.
Visitor-Object Interactions	17	V56: That the monster on it was going to eat me V24: If you ate a watermelon seed you would grow a watermelon in your tummy
Religious	5	V1: That you could walk on clouds and that Jesus was walking on them V40: In God
Visitor-People Relationship	1	V21: That there was no way my dad's friend + I could have the same birthday

Analysis of visitors' explanations of where their beliefs came from revealed different types of epistemological sources. Although there were no descriptions of the cognitive process of change, almost all visitor contributions identified a source for their beliefs. These epistemological sources can be separated into 8 categories. Each category, its definition and an example of visitors' responses are provided in Table 2.

**Table 2. Categories of Epistemological Sources**

<b>Category</b>	<b>Count</b> (out of 93 responses )	<b>Example</b>
Relationship – visitor mentions a key relationship (e.g. similarity) that leads her/him to believe something, or makes some connection between observed and hidden	26	V71: Albany Hill sunk into the bay every night and rose again each morning. There weren't any lights on the hill and I couldn't see it at night  V78: If I walked long and far enough I could touch the rainbow in the sky. It seemed so close and so big
Experience – visitor mentions a type of personal experience	23	V30: In tooth fairy's I kept getting presents  V59: There was a monster under my bed. My brother pushed me under there and there was a halloween mask under the bed.
Unknown – coder cannot make a determination	17	V33: I could fly. I could  V42: That 11 was an imaginary number. I could never remember it.
Authority – visitor is told information from an authority figure (e.g., parent, teachers)	11	V88: That from some cabbages blossomed little girls. My mother told me a story (fairy tale about it)  V11: That the pear trees on route 160 to the delta were cut flat on top by helicopters flying upside down. My dad told me that was how they made them so flat.
Desire / Disposition / Emotional Motivation – visitor indicates a desire to believe what s/he believes	6	V17: I might have superpowers just like superman. I thought if I wished for it to happen, it would  V67: That I would stay six forever. My mom wanted me to
Unknown – visitor indicates s/he does not know where idea came from	6	V65: Men were controlling stoplights (they would drink beer) and that Keebler Elf type things made my nose run. [picture of faucet inside of nose]. I'm not quite sure, it was just what I came up with.  V32: That when people grew up they turned into animals! I don't know why, I just did!

Stupidity / Intelligence – visitor attributes knowledge to intelligence (or level of intelligence assumed for a particular age)	5	V98: That weight and mass were the same thing.. Americans are stupid  V22: In santa. I was six of course!
Mass Media – visitor mentions television or movies as influencing their beliefs	3	V95: That if you were on a falling piece of rock, you could live if you waited till the last second before it hit the ground and jumped. I saw Wiley Coyote do it  V8: The future would be cooler than now. Cool movies, I guess.

Analysis of visitors' explanations of why their beliefs or knowledge changed revealed a similar set of epistemological sources with only one difference: some visitors attributed their belief or knowledge change to learning a topic or academic discipline with no further elaboration. Again, although there were no descriptions of the cognitive process of change, most all visitor contributions identified a reason for their belief change. These are tabulated in Table 3 along with a brief explanation of each category and corresponding examples.

**Table 3. Categories of Epistemological Sources for Learning**

Category	Count (out of 96 responses)	Example
Experience – visitor mentions a type of personal experience	45	V82: I thought I had a monster under the bed. I saw shedded hair under my bed. I changed my mind when I was cleaning my room. I found out they were just dog hairs  V83: Grown ups were born knowing all they do and that they never were children (They were also born that size). Nobody talked about being a kid and some people had the attitude they know it all. I changed my mind when I looked at the growth chart on the wall and I put together an album of baby pictures I couldn't be the only person with these experiences

Unknown – coder cannot make a determination or visitor did not respond	17	<p>V94: That there was a boogie man after me. I changed my mind when I just stoped believing I guess</p> <p>V40: In God. He is the only God. I changed my mind when He came. He is really a God who is in Heaven</p>
Realized – visitor indicates s/he realized a fact (e.g., one that contradicts what s/he believed)	13	<p>V7: In monsters I heard noises in the night when I was in bed. I changed my mind when I was older and I ralised that it was my mum or dad or sister _ brother</p> <p>V70: That if you were standing in the south pole, then you would be upside-down and all the blood would rush to your head [picture of earth]. I had a globe and it seemed to make sense. I changed my mind when I realised that gravity pulls into the center of the earth and the universe has no top or bottom</p>
Authority – visitor is told information from an authority figure (e.g., parent, teachers)	12	<p>V12: Airplanes scratched the sky – (cortroils) The cortroils made the sky look scratched. I changed my mind when I haven't ... okay my mom finally told me it was airplane exhaust. She knows everything</p> <p>V35: Eating a fruit seed would cause a plant to grow on top of my head. Mom said so. I changed my mind when My science teacher taught us about digestion</p>
Learned subject – visitor indicates s/he learned a subject (often a school subject)	7	<p>V95: That if you were on a falling piece of rock, you could live if you waited till the last second before it hit the ground and jumped. I saw Wiley Coyote do it. I changed my mind when In high school because I took physics</p> <p>V97: Every time I couldn't see part of the moon that it was a shadow from the earth It was like any other shadow and the earth is bigger than the moon so I thought the shadow was like shadows from air planes and birds which get bigger (and kites). I changed my mind when I took astronomy class in 14<sup>th</sup> grade. I saw that the moon was not always behind the earth.</p>

Desire / Disposition / Emotional Motivation – visitor indicates an emotional motivation for learning or believing	2	<p>V1: That you could walk on clouds and that Jesus was walking on them. I thought that they were solid. . I changed my mind when I learned through science that it's not true, but I still like to think the same thing It makes me comfortable</p> <p>V11: That the pear trees on route 160 to the delta were cut flat on top by helicopters flying upside down. My dad told me that was how they made them so flat. I changed my mind when I spent many nights wondering how the helicopter could fly upside down and not crash I was worried about the poor pilot!</p>
Stupidity / Intelligence – visitor attributes knowledge to intelligence (or level of intelligence assumed for a particular age)	2	<p>V84: That if I ate chicken too fast, pictures of chicken legs would show on my eyeballs. My grandma has an accent and it sounded like she said this would happen. I changed my mind when Duh! Uh. Duh!</p> <p>V98: That weight and mass were the same thing. Americans are stupid. I changed my mind when I went to high school. I'm not stupid</p>

A few visitors described being uncertain of belief change; that is, they expressed some doubts as to whether their thinking had truly changed: 5% (5/93) were uncertain, 2% (2/93) admitted that their belief had not changed, and 80% (74/93) did not describe any doubts. (The coder could not make any determination from 12% of the visitors' responses.)

### OVERALL COMMENTS

This study suggests that visitors can describe instances of learning, or knowledge change, from their lives. It also indicates that visitors have different ideas of where knowledge comes from and reveals a very small bit about possible epistemological stances visitors may hold. Since epistemological stances influence people's ideas of what makes for successful pedagogy, these findings might give us a very preliminary sense of the kind of instructions and experiences visitors expect to have in order to learn.

Also, it is interesting that few visitors talked about how difficult it is to actually change their own beliefs. Yet, research on conceptual change or belief change indicates that changing one's mind is not always a straightforward process. It might therefore be interesting and surprising to visitors to discover the tenacity of their own beliefs.

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