

Magnetic Labyrinth

Joshua Gutwill

May 2005

THIS IS **NOT** A DEFINITIVE FINAL REPORT

FORMATIVE evaluation studies like this one often:

- **are conducted quickly**, which may mean
 - small sample sizes
 - expedited analyses
 - brief reports

- **look at an earlier version** of the exhibit/program, which may mean
 - a focus on problems and solutions, rather than successes
 - a change in form or title of the final exhibit/program

Magnetic Labyrinth Formative Evaluation

Version 1

May 7, 2004

Goals

Given a shortage of evaluation resources, the main goal was to obtain baseline holding time and interview information at Magnetic Labyrinth.

Summary of Findings

The average holding time at the exhibit was 1.9 minutes. This is higher than the mean holding time for any of the Planned Discovery exhibits we have tested so far. The maximum time spent by any group was 6.7 minutes.

Methods

We videotaped visitors at the exhibit for four hours on 3/28/04. From the tapes, we coded the holding time for 40 visitor groups, 10 from each hour of tape, while they used the exhibit.

We also interviewed 10 adult visitors as they exited the exhibit area. We asked them about their experience with the exhibit and why they left the exhibit. (See *Detailed Findings – Interview data* for specific interview questions and responses.)

Detailed Findings – Videotape data

Holding time

The holding time data are shown in Table 1 below.

Table 1. Holding time results in minutes

Mean	St Dev	Median	Maximum
1.9	1.3	1.6	6.7

The distribution is shown in Figure 1 below.

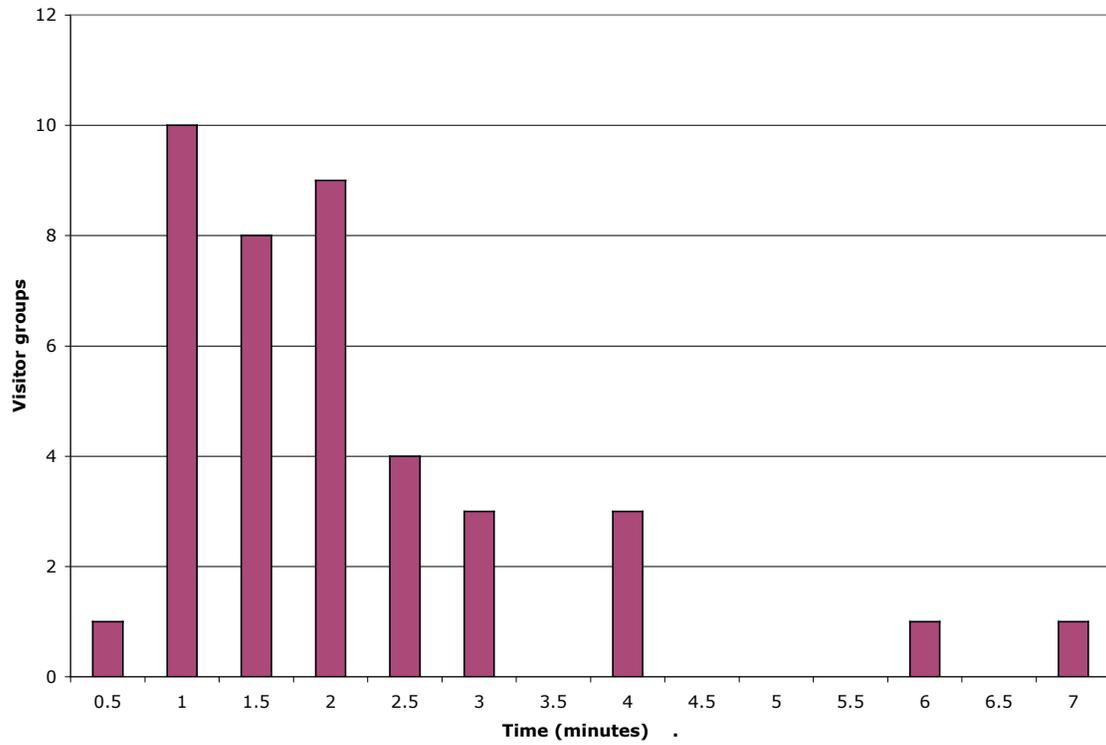


Figure 1. Holding time distribution.

It was beautiful / unique / cool

Forced

Interview choice Engage long answer

- | | | |
|---|---|--|
| 2 | 3 | It was engaging because it is so unique, you don't see anything like that anywhere else. the unique shapes, very different. |
| 5 | 4 | (She was pretty reluctant to talk - her husband gave his response too) M - because of the pretty shapes F - it was easy to use |
| 6 | 4 | It was mesmerizing. To do different things with shapes. To bring it (the shapes) along. |
| 8 | 4 | Because it was cool. The liquid had metal in it, it had all these little patterns. |
| 9 | 3 | It was cool. I like the different shapes. |
| 1 | 2 | The strength of the magnet can make it look like a maze. |
| 3 | 3 | Well, it is well done and it is nicely presented. |

Required some effort and patience

- | | | |
|----|---|--|
| 4 | 4 | I don't know. It required some attention, some effort - not instant gratification. You can see the stages of the changes in the shapes. Some (exhibits) you just press the button, and the wonder is over. |
| 10 | 4 | You wanted to have a try at it. See what shapes you can make. |

It didn't do much

- | | | |
|---|---|---|
| 7 | 1 | It didn't do as much as other exhibits. |
|---|---|---|

Question 2: Was there anything frustrating about using the exhibit?

Finding the magnet was difficult

- | | | |
|---|---|---|
| 1 | no | no. I couldn't find the magnet at the beginning, but that is just me. (I told him we had been hearing that people initially couldn't find the magnet and he felt much better) |
| 2 | | At first I couldn't find the magnet, I was about to give up and I looked underneath and there it is. [Anything else?] no. |
| 6 | | |
| 5 | F - no M - finding the magnet initially | |

It has a slow pace

- | | | |
|----|--|--|
| 10 | | You couldn't make it go faster. It did it at its own pace. |
|----|--|--|

Nothing frustrating

- 3 no
 4 not for me.
 7 no.
 8 no.
 9 Not really.

Question 3: Can you sort of go over with me what you tried at the exhibit and what you were thinking while you using it?*The patterns reminded me of creatures and mazes*

- When I moved it around, it looked like a furry creature, a porcupine.
 1 [and anything else you were thinking about?] not really
 I was imagining different creatures. It was my nephew's idea, he said, "aunt denise"...(trails off). The movement, how it would separate. It was dancing. The movement of the shape, it was like that. (points to the
 6 confused sea exhibit)
 I was thinking of a swarm of fish, it turned into worms when you went the other way, I didn't like that, so I made it go the other way. I wanted
 10 pretty patterns, but I couldn't make them pretty.
 I was thinking what the different shapes look like. My husband was saying that it was like a pen. We were thinking of different ways to interpret what we were looking at. (the girl chimes in) Ways to make
 4 little shapes with one thing.
 9 The different shapes, like a little maze.

I was exploring the properties of the fluid and magnet

- I was thinking, what is in it? What is in it that makes it react to the
 2 magnet. What is different about that vs. other fluids.
 I was trying to see what effects the magnet would have - nothing
 3 beyond that.
 M - I tried changing the motion to see what speed had to do with it. F -
 5 we got color.
 I was trying to find the magnet. [and once you found the magnet,
 anything that you tried or were thinking about?] I was trying to make
 7 the material move. It didn't move all that much.
 I moved the magnet and the liquid followed. I moved it fast and it
 8 thinned out and I saw bits of red and yellow.

Question 4: Was there anything else you wondered about or wanted to know while you were using the exhibit?

What is it? How does it work?

- 1 I was wondering, how the magnet makes it look like a maze. [Anything else?] no
- 3 I didn't read the signs (the label) - does it say what it is? [The fluid is called Ferrofluid] (he goes over to read the label) Oh, it is suspended in oil. I didn't read that.
- 4 I wondered what the liquid was - it looked like black ink. Like some of the Chinese work we'd seen this week.
- 6 he (the nephew) asked what it was....I am a teacher and I was thinking, do I really know? how would I say this is my own words? "it is iron oxide suspended in oil" Is it car oil that is making it black or cooking oil?
- 9 I was trippin' - how does it work? [can you say a little bit more about that?] How does it do what it does?

What if there were more magnets or colors?

- 2 I wondered about if there was a bigger one (he means a bigger sample) and if you had more than one magnet - could you separate the fluid? what if there was more than one color (of the fluid).

No / Don't remember

- 5 F - not really, just the different shapes. (I think she means that they were just noticing the different shapes)
- 7 Not really.
- 8 Not really.
- 10 You should have asked me what I was over there. I've forgotten.

Question 5: We're interested in finding out what makes visitors move on from one exhibit to another. Thinking back on it, what was it that prompted you to move on to the next exhibit?

Intrinsic to the exhibit

- 1 It wasn't that exciting like I said on the other page (he is making reference to choosing "somewhat engaging" as the response to the first question.
- 9 It was getting boring.

Extrinsic to the exhibit

- 3 I wanted to let me son try it.
 Actually, I was looking for this one (pulley table) and a family was there - I was intrigued, so I sat here. [and what made you move from here (magnet) to here? (gravity powered calculator)] She (the girl in her visitor group) wanted to sit down, otherwise I'd still be there. My seat
- 4 was usurped. (she returns to the exhibit after our interview)
 F - to see what the guys were up to (her two sons had moved to gravity
- 5 powered calculator). To give another person a chance.
 Someone came and he said, "can I have a turn?" and we had just sat down and I was thinking, I want to use it. Normally I would give it up, I am a teacher. Then later someone was standing waiting, so I thought,
- 6 "I'll give it up."
 Because my husband called me. it was time to move on. You cannot
- 10 spend as much time as you want at each one.

Both intrinsic and extrinsic

- 2 I was....(trails off) I had done as much as I could do. This one looked interesting as well. (pulley table)
 It wasn't doing enough. Been there, done that. I was ready to move on
- 7 to the next one.

Don't know

- 8 (thinks for a long time) I don't really know.

Conclusions/Recommendations

Based on this limited initial evaluation, the exhibit seems to be promoting APE in most visitors. The average holding time (1.9 minutes) is longer than the mean holding time for the Planned Discovery exhibits we have studied so far. Moreover, most of the visitors interviewed said they left the exhibit for reasons that were extrinsic to the exhibit, rather than intrinsic to it. This suggests an open-endedness characteristic of APE exhibits.

In addition, interviewed visitors seemed engaged in thinking about the patterns they made, likening them to animals or other shapes.

However, while the mean holding time was somewhat prolonged, the maximum holding time for any group was only 6.7 minutes. Compared to other APE exhibits, this maximum time places Magnetic Labyrinth in the bottom half of the APE exhibits, and suggests that the exhibit might benefit from offering visitors more ways to explore and engage with the phenomena.

The interviews also revealed that half the visitors wanted to know more about what the fluid is and why it interacts with the magnet to produce patterns. This suggests that more effort be made to help visitors interpret the phenomena. (Of course, this must be done carefully, so as not to suggest a Planned Discovery cycle of use, where visitors use, question, read and leave.)

Acknowledgements

I would like to thank Nina Hido for collecting and analyzing the data in this study. This material is based upon work supported by the National Science Foundation under Grant number 0087844. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

