# Currents

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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

# Outdoor Exploratorium: Formative Evaluation
# **Currents**

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## PURPOSE

To determine

- What did visitors do at the exhibit
- What visitors found interesting/ not interesting
- What did visitors think it's about
- What questions did visitors have about what they experience

## METHOD

- The prototype was mounted along the railing next to the bay, as shown in Figure 1 and Figure 2.
- An evaluator sat and observed visitors as they used the exhibit and approached them for interviews as they were leaving the exhibit. The interview can be found in Appendix A.
- We observed and interviewed people between 11:30 am – 4:30 pm on Thursday, June 9, and between 11am – 4:30 pm on Sunday, June 12.

**Figure 1. Prototype Location**

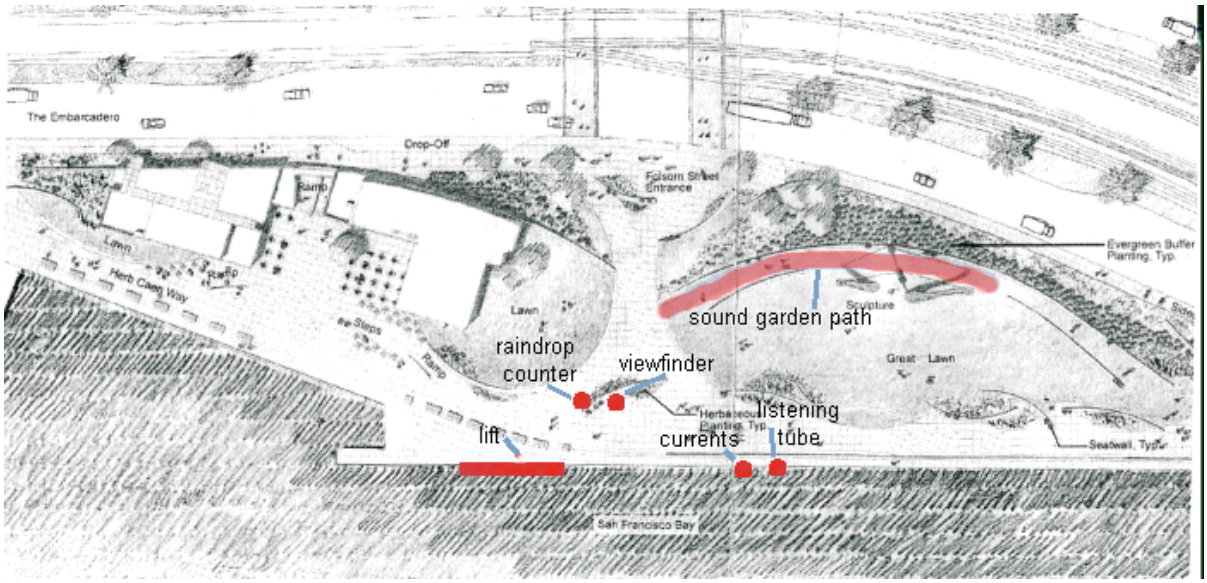


**Figure 2. Prototype Setup**





## DATA CORPUS

- N=20

| Group Type | Count (out of 20) |
|---|---|
| Individual adults | 9 |
| Adult peer group | 8 |
| Individual teenagers | 2 |
| No information | 1 |

## RESULTS

What did visitors do at the exhibit?

- A majority (14/20) of the people who stopped at the exhibit moved the handle to complete (or break) the electrical connection
- Some (6/20) visitors used the label to oriented themselves to the exhibit (i.e. to help them figure out what to do and expect)
- Some (4/20) visitors looked over the railing to see the rest of the exhibit
- A few (3/20) visitors were confused about what to do

  Group9: Well, I read the word "lever," but it took me a while to find the lever because there wasn't a tag on it.

  Group10: I didn't know if I was supposed to move the lever. It was running so I thought it was already on.

  Group4: I was tempted to try it but then I thought maybe it wasn't working. [Q: "Why?"] Well, I didn't see anyone else using it.
- A few (3/20) visitors had trouble making the connection

  Group2: (2) Yeah! It worked. Though, the balls should be touching at both contact places--I wasn't sure it was on for a moment.

  Group3 –[Note: She was a very short woman, so maybe it was hard for her to know if she had pushed it far enough.]

  Group5: (2) It worked! I touched it and then it didn't quite touch so we fiddled, and then it went on.

How interesting did people find the experience?

| Interest Rating | Count (out of 20) |
|---|---|
| Interesting | 5 |
| Somewhat Interesting | 13 |
| Neutral | 2 |
| Somewhat Not Interesting | 0 |
| Not Interesting | 0 |

- What was interesting about the experience
  - It shows that the Bay can provide power (5 groups)

    Group1: It's interesting, the idea you can just use the tide to move the fan; that you can just put metal in there and move something.

Group6: That there's ambient electricity available that you can power a motor with.

Group7: It's pretty cool how the text describes how the Bay generates energy.

Group10: Because I didn't realize there was that interaction between the salts and the metals. It's great.

Group12: That you can use the sea to generate electricity.

- It demonstrates a practical application, particularly harnessing nature (4 groups)

  Group3: But eco-friendly systems can be invented, which is great!

  Group15: Because I'm interested in the use of wind, and use of nature in general, a lot.

  Group17: Because it's kinda practical with a small example of real life. A simple example of something I had no idea was there.

  Group19: I've studied this sort of thing in college--so I really like seeing something theoretical made into practical application.

- People were curious about the exhibit and what it does (4 groups)

  Group5: (2) The shape: What is that? What does it do?

  Group8: At first I saw it spinning and wanted to see how it works

  Group11: The way it changed when you move the handle.

  Group16: Basically how it looks

- It is hands-on (3 groups)

  Group13: Being able to change between the two states; operate it.

  Group14: Hands-on showing how the bay interacts directly with the exhibit.

  Group18: (1) It's tactile--that you can do something to demonstrate the concept makes it interesting.

- It's something novel along the Embarcadero (2 groups)

  Group16: didn't expect it here.

  Group20: It breaks up the walk and gives kids and adults alike something to do.

- What was ***not*** interesting about the experience
  - It's hard to understand (3 groups)

    Group2: (1) I started thinking about the rods and how it's a HIDDEN experiment, because you can't SEE the rods under the water. So kids might not get it.

    Group3: I'm not a scientist so I don't know too much about it. I don't understand that one [Currents] as much

    Group9: Because of my eyes, I didn't read the thing beyond the first sentence.

  - It is not engaging enough (2 groups)

    Group1: it doesn't do MUCH, so it's not a "5."

Group18: Visitor (2) Just kinda there--description not very interesting--needs picture.

- There's not enough information, or depth of information (2 groups)

  Group4: I guess for people that don't know about currents, it's interesting (implies that it's not interesting for people who already know the material).

  Group19: It's really good for general audiences, but I'd also like to have more technical information--about exactly what's going on in the water.

- One group would have liked additional ways to explore the phenomenon (1 group)

  Group7: What would be really interesting would be if the poles were further apart. Just to make it more obvious. But would it work? Maybe not.

What did visitors think was the point of the exhibit?

- It's about harnessing nature (11 groups)

  Group1: I only looked at the one thing, but I'd guess that it's about alternative energy.

  Group3: How the forces of nature can affect your everyday life; and how we can tap that to make cheaper energy.

  Group5: (1) Displaying how nature can be used to do things.

  Group10: Maybe different ways you can utilize natural things for energy. Maybe we could put it to good use somewhere else?

  Group12: That the beach is a powerful thing--natural resource that can generate power without using up resources.

  Group13: Gee, the interaction between nature and machinery. To see how we interact and can use nature.

  Group15: Put in very simple terms that this simple examples could be adapted for practical uses. All this free water could be used for our benefit.

  Group16: About clean energy and regenerative energies

  Group18: (1) Think about alternative energy sources.

  Group19: How to generate electricity without petrol or nuclear--using nature, what's already...

  Group20: How the natural world we live in provides a lot of technology; we depend on things readily available in the natural world.

- The Bay is an electrical component (5 groups)

  Group2: (1) Just that electricity and components that make it work are not as foreign as one might think.

  Group6: Maybe how "The Bay is a giant battery"?

  Group7: I think it's a pretty good explanation. I think it's trying to show how 2 dissimilar metals can create electricity. How batteries work.

Group8: That the salts and metals just, like, interacting in the bay makes the bay a giant battery.

Group11: The water has some kind of electricity.

- It's about currents, but not necessarily electrical currents (2 groups)

  Group4: I'd say, where the currents are, and why.

  Group9: The power of wind currents--and all you have to do is plug it in!

- It uses the natural world to demonstrate scientific principles (2 groups)

  Group14: That the natural environment has some links to technology that we can demonstrate through hands-on things like this.

  Group17: Utilizing nature and science in the practical world. The world revolves around science.

What did visitors become curious about at the exhibit?

- Alternative energy sources (5 groups)

  Group1: I like the idea that there's electricity available in the Bay... I was at the environmental conference here a while ago and I like the idea of alternative energy, so that's interesting.

  Group5: (2) renewable energy.

  Group6: I had questions about wave power/hydro power and wondering how they were connected.

  Group15: Two things: Possible uses of wind, and positive uses of tidal and current actions.

  Group17: The idea that water can conduct energy; can REALLY be harnessed.

- Other variables at play (3 groups)

  Group4: Maybe where the currents are most.

  Group10: More curious about what salt does.

  Group12: Yes, where's the bigger version? The whole bay should be used.

- How much power the Bay can supply (2 groups)

  Group5: (2) Can you run a boat with this if you had a big one? (1) No, you'd need a string of them. (2) So how MANY of them would you need?

  Group6: How many volts is it? Less than 12?

- What the final exhibit will be like (2 groups)

  Group3: I would be willing to go and see the real exhibit when it's up and find out more.

  Group4: I'd like to try it once it was working.

- The Exploratorium (2 groups)

  Group14: More about Exploratorium

Group16: what's behind this? State museum?

- How it works (1 group)

  Group11: What makes it turn--just when you touch the other side.

- Nothing in particular (8 groups)

**SUMMARY**

- A majority (14/20) of the people who stopped at the exhibit moved the handle to complete (or break) the electrical connection between the Bay water and the fan.
- However, a few visitors were confused about what to do at the exhibit and had difficulties closing the circuit because the contacts can become misaligned with repeated use. In addition, a few visitors were not sure what to do at the exhibit, in part because the instructions assume that device is *off* when visitors first approach the exhibit. Two possible solutions are: *the instructions may be rewritten to take into account the different initial states of the exhibit, or the exhibit may be redesigned to reset to the off state after a certain time.* Also, a few visitors were not sure that they could or should touch the exhibit. Creating an appropriate context for hands-on and minds-on exploration will be a challenge for not only this exhibit but also any hands-on exhibit at a remote location, outside the immediate Exploratorium context.
- On average, visitors found the exhibit *somewhat interesting*; about half of the people responded to the idea that the Bay can provide energy and can be an electrical battery. Furthermore, 8 visitor groups reported becoming more curious about some aspect of the subject content. These findings are encouraging and points to the potential of this prototype in fostering deeper content inquiry.
- However, visitors also thought the exhibit experience could be improved. For example, a few (3/20) visitors thought the presentation of the subject material was hard to understand and (2/20) wanted more content information (2/20). We will, therefore, need to
  - *Better communicate the scientific principles behind the exhibit and*
  - *Provide those who are already familiar with the basic principle additional avenues of inquiry.*
- In order to help identify additional avenues of inquiry that visitors are interested in exploring at this prototype, we asked visitors what they became more curious about as they used the exhibit. We found that visitors wondered about alternative source of energy. In addition, people had questions about the different variables possibly at play at the exhibit, including how *location* affects the current, how the *size* of the body of water affects the amount of power generated, how the *distance between the rods* and the *salts* affect power. Visitors were also interested in finding out how much power the Bay can provide; one group, in particular, became curious about how may batteries, connected in series, would be needed to power a boat.

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## APPENDIX A

### *Observations*

Note anything of interest. In particular, make note of the following:

1. Did they touch the exhibit? Where?
2. Did they complete the circuit? (That is, did the indicator go on?)
3. Did they look at the indicator?
4. Did they try turning it on and off?
5. Other observations…

### *Questions*

1. How interesting did you find that experience? Would you say that was …

| Uninteresting | Somewhat Uninteresting | Neutral | Somewhat Interesting | Interesting |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

2. What made it _____ for you?
3. Can you tell me what you tried doing at the exhibit?
4. Can you tell me what happened at the exhibit? Did the exhibit do anything?
    a. Did that surprise you?
    b. [if YES] What's surprising about it?
5. Did the exhibit make you curious about anything? Anything in particular about the bay? Anything you would like to know more about?
6. Does this exhibit remind you of anything else you've experienced or seen before?
7. I know that there's very little information about the exhibit, but can you make a guess as to what this exhibit is about? What do you think the exhibit designer is trying to show or tell you with this exhibit?