



Exploring Measurement - Ruler

Formative Evaluation

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THIS IS A FORMATIVE EVALUATION 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

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Background

Science Museum of Minnesota visitors were invited to participate in the NanoDays activity Exploring Measurement - Ruler on Thursday, August 7 and Saturday, August 9, 2008. This activity uses a paper ruler and scissors to demonstrate the small size of a nanometer. In addition, this activity aims to show that cutting a piece of paper into a nanometer-sized sliver using scissors is impossible.

Sixteen visitors, aged eight and older, completed a self-administered survey after doing the activity. The “n” value for each question is reflective of the number of visitors who responded to that question. Visitor demographic information is available at the end of the report.

Results and Discussion

Activity Objectives

The Exploring Measurement: Ruler Activity has one big idea and one learning goal.

- Big Idea: A nanometer is a billionth of a meter.
- Learning Goals: Scientists use special tools and equipment to detect and manipulate tiny, nano-sized particles.

After participating in the activity, visitors were asked what they thought the activity was trying to show. Responses were coded into themes (all responses are included in the appendix).

Visitor responses were coded into three themes. Half (50%) of the visitors thought the program was explaining the size of a nanometer, and another three-tenths (29%) thought it was about measurement. A few visitors could not remember what the activity was trying to convey or gave responses that did not make much sense. See below for all responses.

Program Main Ideas (n=14)

50% (7) Size of a Nanometer

- How big a nanometer was.
- How small the measure of a nanometer is.
- How very small a nano was. I think maybe a picture of some nano robots or microscope stuff would be good. My kids didn't know the term nano.
- How small the nano world is.
- How small a nano is.
- How small a nano-measurement is, you can be told how small, but to see it is something else altogether. Very interesting.
- What a nano is.

29% (4) Measurement

- It was trying to show us how to cut it smaller.
- How small can measurement get?

- Measurement!
- Very small measurement.

14% (2) Other

- That it is possible to cut a nano without a microscope.
- Not really for an adult but interesting for a child. (Didn't respond to question)

7% (1) Don't Know

- I don't know.

Based on visitor responses, the activity was successful at conveying the size of a nanometer (Big Idea), but unsuccessful at conveying that scientists use special tools and equipment when working at the nanoscale (learning goal). Half of the visitors mentioned something about the size of a nanometer, although no one specifically defined it as a billionth of a meter. No one talked about the tools and equipment used to work at the nanoscale. There were four visitors that talked about measurement but didn't talk about it in terms of the nanoscale.

Relation to Nano

Visitors were asked how the activity related to nano. Only half of the visitors attempted to answer this question, and only two of those answering were able to share how the activity was connected to nano. These visitors said that it related to nano due to sharing “the definition of how small it is” and that it “demonstrates the size of nano.” Other respondents shared the responses below, all of which did not explain how the activity was related to nano:

- You can cut the piece of paper smaller.
- Measurement.
- ?
- I don't know. [3]

Visitor Interest and Enjoyment

Nearly half of the visitors (44%) found the Measurement activity “interesting” and one quarter found it “very interesting.” Over half of the visitors (53%) thought the activity was “enjoyable,” and another two fifths thought it was “very enjoyable.” See Tables 1 and 2 in the appendix for a layout of interest and enjoyment of the activity.

Ease of Understanding the Activity

Over half of the visitors thought the activity was easy to understand. Six visitors offered reasons for finding the activity difficult, including that the activity and purpose was not explained well enough for them. Visitors explained what they found difficult:

- Did not know what we were doing!
- What he was talking about.
- It was hard to understand.
- The cut.

- Tell us what we will discover before we started cutting. More background on "nano-scale".
- What is half of [?]

None of the visitors had any follow-up questions they wanted to ask about what they did or saw during the activity.

Visitor Demographics

Visitors shared a strong interest in science, with over three-quarters (77%) rating their interest between 6–10 on a 10-point scale.

Over half of the visitors who completed a survey (62%) were male. All visitors were in groups made up of adults and children (children being 17 years of age or younger). Nearly half of the visitors were children between 8 and 12 years of age.

Appendix

Tables

Table 1: Visitor Interest (n=16)

	Percent of Visitors
Very interesting	25%
Interesting	44%
Somewhat interesting	25%
Not interesting	7%

Table 2: Visitor Enjoyment (n=16)

	Percent of Visitors
Very enjoyable	40%
Enjoyable	53%
Somewhat enjoyable	7%
Not enjoyable	0%

Table 3: Ease of Understanding (n=16)

	Percent of Visitors
Easy	56%
Somewhat easy	19%
Somewhat difficult	19%
Difficult	6%

Table 4: Visitor Ages (n=13)

	Percent of Visitors
8-12	46%
13-17	0%
18-21	0%
22-29	8%
30-39	23%
40-49	15%
50-59	0%
60+	8%