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Finding Significance:  
Testing methods for encouraging meaning-making in a science museum

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**Abstract**

Many museums incorporate hands-on exhibits to engage visitors in activity and multisensory experiences. However, many visitors use such exhibits without reflecting on the significance of their exhibit experience and how it fits with their previous knowledge or everyday lives. In this poster session, we will present preliminary results of a study that compares two “exhibit enhancements” designed to foster such reflection. Specifically, we have enhanced an exhibit element by attaching a video screen that presented either Narrative Stories about the exhibit or Reflective Inquiries for visitors to try. We compared these with a standard version of the exhibit without video. So far, we have conducted such comparisons on two different exhibit elements that are found in many science museums, *Aeolian Landscape*, and *Touch the Spring*. For each version of each exhibit we are assessing the quality of visitors’ interaction with the exhibit, the connections they make between the experience and the rest of their lives, and the impact of the experience after a period of several months. To date, we have analyzed the quantitative questions from cued interviews with visitors immediately following their exhibit experience. Results from that subset of our data are mixed: at *Aeolian Landscape* the Reflective Inquiries seemed to enhance the exhibit more than the other versions in several ways, while no clear pattern has yet emerged at *Touch the Spring*. We hope to be able to report late-breaking analyses of some of the qualitative data at the poster session, to supplement our quantitative analysis. We also invite conference attendees to contribute suggestions for choosing a third exhibit element to study, and for creating more powerful exhibit-related narratives.

**Introduction**

At the Exploratorium one of our strengths is providing powerful, intriguing hands-on experiences for visitors; but we have not always given equal energy to helping visitors

make sense of those experiences—either through deeply processing the science behind them, or finding something personally significant in them. This is an issue not only at the Exploratorium; the American Association of Museums holds that one of the main challenges facing museums is the need to “focus on how they create meaningful experiences, empower lives, engage the senses, and help shape communities” (AAM 2000 Conference theme). Meaning-making was the subject of an entire issue of “The Exhibitionist” (Rounds, 1999) and has increasingly become a focus of attention and discussion in the museum community (e.g., Falk and Dierking, 2000; Hein, 1998; Roberts, 1997). Yet, as many authors point out (e.g., Silverman, 1999), we are only in the early stages of discovering the qualities of exhibits that enhance visitors’ abilities to find them meaningful.

In addressing these issues, some researchers and practitioners have proposed and tried techniques that might support personal meaning-making. These include facilitating scientific inquiry with open-ended exhibits and activity cards (e.g., “Construction Zone” at Indianapolis Children's Museum; “Investigate” at the Boston Museum of Science; “Experiment Bench” at the Science Museum of Minnesota), telling a culturally relevant personal narrative (e.g., Arizona Science Center), adding a “behind-the-scenes” profile on the ASTC Web page for traveling shows (Pollock, 1998), giving multiple perspectives (e.g., Silverman, 1999) and mentoring by a parent or other more knowledgeable person (e.g., Perry's dissertation work with “The Color Connection: Mixing Colored Lights”).

Although some methods have been proposed and tried in different settings, there has been a dearth of systematic studies of their relative effectiveness when applied to the same set of exhibits. In the present study, we added a video component to two Exploratorium exhibits, in an attempt to enhance visitors’ ability to have personally meaningful and memorable experiences at the exhibits. We compared two different types of video content, and assessed their impact on visitors’ interaction with the exhibit, visitors’ connections to other parts of their lives, and the long-term impact of the experience for visitors.

## **Methods**

To date, our study has compared three different experimental conditions at two exhibits. The two exhibits in the study were *Aeolian Landscape* and *Touch the Spring*. *Aeolian Landscape* is a contemplative exhibit involving sand that swirls around in a cylindrical chamber. Visitors may watch the sand dunes form and dissolve, see avalanches occur, and change the direction of the fan that blows the sand. In *Touch the Spring*, visitors reach out to grasp a realistic-looking spring, only to discover that it has no substance. In fact, the spring they see is only an image produced by a parabolic mirror. Visitors can explore the properties of the image with a flashlight, as well as reach into the exhibit to find the real spring inside. A third exhibit, yet to be determined, will also be included in the study.

The treatments in the study were: Narrative video, Inquiry video, and Baseline (no video).<sup>1</sup> Each of the video enhancements was comprised of four brief video clips, in which four different speakers talked about the exhibit in some way. In the Narrative enhancement, each speaker shared a personal story that related to the exhibit, such as how it was built, recollections of related experiences, and tales of imagination sparked by the exhibit. For example, a woman in one of the Narrative clips at *Aeolian Landscape* imagines herself inside the miniature environment of the exhibit: “I see myself about an inch tall, and I think, oh, wait a minute - I'm either in a desert or I'm in a snowstorm. Which is it? Are my toes frostbit or am I gonna drop on my knees and scream for water?...”

The Inquiry enhancement employed the same four speakers, but each provided visitors with an activity (including imagining or remembering) that invited them to investigate the exhibit more deeply. For example, one of the clips asks visitors to consider where the small avalanches of sand start: “Some people think it starts at the top, some think the bottom, and some think the middle. What do you think?...” The inquiry activities were different from those found in the label and were distinct from one another. The baseline version had only the standard text label.

To determine whether our different treatments had a differential effect, we used a variety of methods to gather data. First, we employed *cued interviews*, recruiting visitors to use the exhibits and then interviewing them immediately afterward. Three to four months later, we conducted *follow-up interviews* with those same visitors by telephone. We also *observed uncued* visitors to assess their interaction with the two exhibits under more typical circumstances.

The cued interviews focused on how visitors interacted with the exhibit and videos, and how they linked their exhibit experience with the rest of their knowledge and life-experiences. We asked visitors to tell us about associations or ideas that came to mind when using the exhibit, to explain their understanding of the main idea behind the exhibit, and to share with us anything they had tried to figure out when using the exhibit. We also asked visitors semi-structured questions<sup>2</sup> about how well the exhibit got them thinking, feeling, and using their imagination. The last part of the interview asked visitors in the Inquiry and Narrative treatments about the video enhancements: Did the videos seem to improve the exhibit? Were they the right length? Was the number of clips about right? In general, the cued interviews focused on the interactions visitors had with the exhibit and their personal learning at the exhibit.

The number of visitors who participated in the cued interviews is shown below in Table 1.

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<sup>1</sup> All three versions employed the written label that normally accompanies the exhibit.

<sup>2</sup> Semi-structured questions employed a combination of forced-choice (Likert-scale) and open-ended formats. A typical question would ask visitors to rate their agreement to a statement and then talk about their reason for choosing that particular rating.

**Table 1. Number of visitors included in cued interview study.**

<b>Version</b>	<b>Number of Visitors at Aeolian Landscape</b>	<b>Number of Visitors at Touch the Spring</b>
<b>Baseline</b>	60	60
<b>Inquiry</b>	60	60
<b>Narrative</b>	60	60
<b>Total</b>	180	180

The follow-up interviews, conducted three to four months after the initial museum visit with about one-third of the participants from the cued interviews, were designed to assess visitors' recollections of the exhibit and videos, and the degree to which they had made further connections to the exhibit outside the museum context. The follow-up interview, implemented over the telephone, employed open-ended questions.

In the observational study, we unobtrusively watched visitors as they used the two exhibits, recording time spent and number of video clips viewed. The same three treatments were used as in the cued interview study: Baseline (no video), Inquiry video and Narrative video. The goal of the observational study was to measure the degree of visitor interaction with each exhibit in a more realistic context, where visitors are not aware of being studied.

### **Project status**

At this stage of the project, we have completed the cued interviews and observational studies at both *Aeolian Landscape* and *Touch the Spring*, but have not yet completed the follow-up interviews. We have analyzed only the quantitative responses from the cued interviews, and are still coding the open-ended responses. Hence, the results reported here will include only part of our dataset. We hope to be able to present some of the qualitative data at the poster session, to supplement our quantitative analysis.

### Preliminary Findings (quantitative interview data)

In general, the quantitative results suggest that the Inquiry version of the *Aeolian Landscape* exhibit is more well-received by visitors than the Narrative or Baseline versions. Visitors in the Inquiry condition reported that the video helped them think about the exhibit and extend the ideas beyond the museum. The Inquiry group was also more likely to state that the videos improved the exhibit than the Narrative group. At the *Touch the Spring* exhibit, our data reveal less of a clear pattern. Visitors in the Narrative version felt that the videos "took them beyond the museum" more than visitors in the other versions. However, the Inquiry version visitors reported that the exhibit better helped them talk to their children about the exhibit.

At both exhibits, the Inquiry group visitors felt that the number of video clips was appropriate, while the Narrative group visitors often felt that there were too many clips. Most visitors in both groups stated that the length of the clips was "about right," though

the actual running time for the Narrative clips was longer than the time for the Inquiry clips at both exhibits. This suggests that the length of the clips may be appropriate to the type of clip. However, visitors preferred seeing fewer Narrative clips. Perhaps the overall time was too long, or perhaps visitors wish to hear only a few stories but prefer to try several inquiry activities.

The holding time data for the cued interviews suggest that the Inquiry version was slightly stronger than the others at keeping visitors engaged with the exhibits. Although Inquiry group visitors spent less total time than the other groups at the two exhibits, they actually spent more time when the running time of the video clips is subtracted from the total. This “adjusted” holding time is the time that visitors voluntarily spent interacting with the exhibit itself, apart from watching or listening to the videos (which they were specifically asked to do). Table 2 shows the results of the quantitative questions at the two exhibits. For the time data and Likert scale data, we employed an Analysis of Variance (ANOVA), with two-tailed post-hoc tests among groups.<sup>3</sup> In the final question reported, “How was the number of clips: was it too few, too many, or about right?”, we used a Chi-squared test of independence. Any difference reported is significant at the .05 level.

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<sup>3</sup> ANOVAs may only be performed on normal distributions. To transform the holding time data from right-skewed to normal distributions, we took the logarithm of each data point and used the log data in the ANOVAs.

**Table 2. Quantitative results from cued interviews.**

	<b>Aeolian Landscape (Contemplative)</b>	<b>Touch the Spring (Hands-on)</b>
<b>Holding time (total)</b>	No group differences	Narrative > Inquiry > Baseline
<b>Holding time (adjusted)</b>	Inquiry & Baseline > Narrative	Inquiry > Narrative
<b>Exhibit was “interesting”</b>	No group differences	No group differences*
<b>Exhibit “got you thinking”</b>	Inquiry > Baseline & Narrative	No group differences
<b>Exhibit “got you feeling”</b>	No group differences	No group differences
<b>Exhibit “engaged your imagination”</b>	No group differences	No group differences
<b>Exhibit “took you beyond the museum”</b>	Inquiry > Baseline	Narrative > Inquiry
<b>Video/label “helped you talk to your children”</b>	No group differences	Inquiry > Narrative
<b>Videos improved exhibit</b>	Inquiry > Narrative	No group differences
<b>Videos contained “right” number of clips</b>	Inquiry > Narrative	Inquiry > Narrative

\*Note: Responses to the question “How interesting was the exhibit?” at *Touch the Spring* showed means above 4.6 (on a scale from 1 to 5) for all three video versions, suggesting a ceiling effect at that exhibit.

## **Discussion**

Although it is too early in the analysis to draw broad conclusions about the three treatments, we were surprised that the Narrative treatment has not yet emerged as a strong enhancement, even compared with Baseline. Some of the aspects of our Narratives have been dictated by our research design; for example, we use actors so that all versions of the video include the same four people. It may be that the actors are not skilled enough to make the personal stories truly compelling. On the other hand, if we believe that good stories are powerful tools for enhancing visitors’ meaning-making, then we would hope that much of the power would remain even when the stories are told by actors. Our experience with Exploratorium “floorwalks,” interactive tours led by senior staff members, leads us to believe that it is possible to transform a short, shallow experience into something profound, just with the addition of a live “talking head,” and without the

need for high-tech effects or fast-changing multimedia displays. Yet, so far we seem to be failing to distill the power of these floorwalks into a series of Narrative video clips. Perhaps we have not found stories that are compelling enough, or our format for telling the stories is faulty, or perhaps the medium of videotape simply cannot convey the power of a story as well as a live, interactive human being.

We expect to have a clearer picture of our findings when our analyses of the open-ended data and the follow-up study data are complete. We also have one more exhibit to include in the study, offering us the opportunity to test the link between type of exhibit and effectiveness of enhancement. We have not yet chosen that exhibit nor created the enhancements to accompany it.

We are still looking for ways to make our Narratives more compelling, and welcome any suggestions from colleagues. We hope that museum professionals with ideas or suggestions will visit us at our poster session during the AAM 2002 Annual conference in Dallas.

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