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EXECUTIVE SUMMARY OF SUMMATIVE EVALUATION OF *THE UNIVERSE BY POWERS OF TEN* Exhibits in the Maryland Science Center And Montshire Museum of Science

Report for
Montshire Museum of Science
Maryland Science Center

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EXECUTIVE SUMMARY
SUMMATIVE EVALUATION OF *THE UNIVERSE BY THE POWERS OF TEN*

Prototype exhibits of *The Universe by the Powers of Ten* illustrated in three dimensions an exponential journey away from earth. The goal of this summative evaluation was to assess the educational impact of the exhibits and accompanying interpretive techniques, for both non-school and school samples in the Maryland Science Center and the Montshire Museum of Science. Two interpretive conditions were compared -- a printed handout and an explainer presentation. Further, the Montshire non-school sample experienced a third interpretive condition -- an audio tour.

What was appealing about the exhibit?

Reaction to the exhibit was very positive. Most visitors enjoyed:

- seeing the fiber optic effects and the lights;
- experiencing the universe from different vantage points;
- viewing the changing perspective of the powers of ten;
- comparing the relative sizes of the celestial bodies;
- locating the blinking lights to indicate their position in the universe;
- recognizing the immensity of the universe and our small size in it;
- using buttons at Maryland to light up particular parts of the exhibit.

Negative comments were infrequent but focused on:

- difficulty of reading the labels and the quantity of reading presented;
- static display quality of Montshire's exhibit;
- confusion about the vertical perspective as shown at Maryland
- confusion about where to begin looking at the Montshire exhibit.

Did visitors learn? How did visitors perceive their learning and the role of the interpretive materials?

Experiencing the exhibit and interpretive techniques aided visitors' understanding of the concepts of "galaxy," "light year," and "exponents." However, other specific effects of the interventions varied depending on the sample group and the museum.

Non-school samples

The findings revealed that adults at Maryland and Montshire who did not see the exhibits (control condition) did not differ in their mean scores on a 17-item comprehension measure. For those who saw the exhibit and experienced various interpretive techniques (print, explainer, or audio), comprehension results are listed below.

Maryland Science Center	Montshire Museum of Science
NO SIGNIFICANT DIFFERENCES were found in performance on the comprehension measure due to interpretive condition or subsample (male, female, teen).	WOMEN in the EXPLAINER condition significantly OUTPERFORMED women in the CONTROL and PRINT conditions on the comprehension measure.
MEN significantly OUTPERFORMED women on the comprehension measure in ALL conditions.	MEN significantly OUTPERFORMED women on the comprehension measure for CONTROL and PRINT conditions.

ADULTS and TEENS in PRINT and EXPLAINER conditions showed BETTER UNDERSTANDING of concepts of "galaxy," "light year," and "exponents" than those who did not experience an interpretive intervention.

WOMEN felt that PRINT handouts were USEFUL to understanding the exhibit.

A majority of visitors felt the PRINT condition REINFORCED what they already knew.

Adults in the EXPLAINER condition felt that they learned new information and the intervention was helpful.

WOMEN in EXPLAINER and AUDIO conditions showed BETTER UNDERSTANDING of concepts of "galaxy," "light year," and "exponents" than women who did not experience an interpretive intervention.

ADULTS felt that PRINT handouts were NOT USEFUL to understanding the exhibit.

A majority of visitors felt the PRINT condition DID NOT AID in learning new information.

Adults in the EXPLAINER and AUDIO conditions felt that they learned new information and the intervention were helpful.

Sixth Grade School Samples

The results revealed that students at Maryland and Montshire who did not see the exhibits (control condition) did not differ in their mean scores on a 17-item comprehension interview. For those students who saw the exhibits with interpretation, comprehension differences are indicated below.

Maryland Science Center

GIRLS in the PRINT condition significantly OUTPERFORMED girls in the CONTROL condition on the comprehension measure.

GIRLS in the PRINT condition showed BETTER UNDERSTANDING of the concepts of "galaxy," "light year," and "exponents" than girls in the CONTROL condition.

BOYS significantly OUTPERFORMED girls on the comprehension measure for the CONTROL and EXPLAINER conditions.

Montshire Museum of Science

NO SIGNIFICANT DIFFERENCES were found in student performance on the comprehension measure.

STUDENTS in PRINT and EXPLAINER conditions gave QUALITATIVELY DIFFERENT answers about concepts of "galaxy" and "universe" compared with the CONTROL.

BOYS significantly OUTPERFORMED girls on the comprehension measure for the EXPLAINER condition.

How long was interest maintained?

Adults who experienced the interpretive techniques tended to stay at the exhibit longer than those who did not have supplementary interpretation. The length of stay at the exhibits for the school students was preset at approximately ten minutes for both the print and explainer conditions.

In looking at differences in visit duration WITHIN each museum setting, the following was found:

Maryland Science Center

NO SIGNIFICANT differences were found in visit duration for MEN due to condition.

WOMEN in the EXPLAINER and PRINT conditions stayed significantly LONGER than women in the CONTROL condition.

Montshire Museum of Science

MEN in the EXPLAINER condition stayed significantly LONGER men in the CONTROL.

WOMEN in the EXPLAINER and AUDIO conditions stayed significantly LONGER than women in the CONTROL condition.

Comparison of visitor activity BETWEEN museums revealed the following:

- Within the CONTROL groups, men at Maryland stayed significantly longer at the exhibit than men at Montshire.
- For the PRINT or EXPLAINER conditions, durations at the two exhibits did not differ.

What did visitors attend to?

The viewing behaviors in response to the two exhibits were often different, as indicated below:

Non-school samples

Maryland Science Center	Montshire Museum of Science
Initial response to the exhibit was to gravitate to the panel of buttons and labels and begin a sequential left-to right viewing of the exhibit.	Initial response to the exhibit was to stand back and examine a broad expanse and then to sample sections that seemed most interesting.
In general, visitors studied the BEGINNING and END of the exhibit most.	In general, visitors studied the BEGINNING, END and VERTICAL PLANET sections most.
In the EXPLAINER condition, visitors looked at almost ALL of the boxes.	In the CONTROL and EXPLAINER conditions, visitors attended to more of the VERTICAL PLANET and END boxes.
WOMEN studied significantly MORE boxes in the PRINT and EXPLAINER conditions than in the CONTROL condition.	ADULTS studied significantly MORE boxes in the EXPLAINER and AUDIO conditions than in the CONTROL condition.
WOMEN made significantly MORE exhibit-related comments during the PRINT and EXPLAINER conditions than during the CONTROL condition.	ADULTS made significantly MORE exhibit-related comments during the EXPLAINER condition than during any other condition.
In the PRINT condition, a majority of ADULTS attempted at least one activity.	In the PRINT condition, a majority of WOMEN attempted at least one activity.
MEN in the CONTROL condition read a meaningful number of labels.	ADULTS read few labels in ALL conditions.

Sixth Grade School Samples

Maryland Science Center	Montshire Museum of Science
PRINT: Students attempted 0-2 activities. Students read NO labels. Students looked at MOST boxes.	PRINT: Students attempted 3-5 activities. Students read FEW labels. Students looked at HALF the boxes.
EXPLAINER: Students were ATTENTIVE. Students asked NO questions.	EXPLAINER: Students' ATTENTION VARIED. Students asked NO questions.