Behavior and Learning in a Zoo Environment Under Different Signage Conditions

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Introduction

Informational signage is an important medium for increasing the educational and recreational experiences of visitors at exhibitional settings. One of the strengths of settings such as zoos, museums, and industrial trade shows is their potential to offer individuals the enjoyment of learning. In spite of this potential, however, studies have shown that the majority of visitors do not read the exhibit labels (Brennan, 1977). Poor design, placement, terminology, delivery format, and inadequate content of labels and graphics are common reasons exhibits fail to communicate or to attract and focus unguided visitor attention (Screven, 1992).

Visitors' lack of interest in exhibit signage has lead zoo and museum planners to increasingly select an interactive approach to the presentation of information, in addition to traditional two-dimensional display panels. Since most visitors are not drawn to text initially, it is important that interpretive labels include features that will attract and motivate visitors to read them. Screven (1986) found that visitors are primarily interested in looking at, manipulating, touching, and using an exhibition as a context for socializing and they will not invest limited time if they cannot tell that the information will be worth their time.

Investigations have shown that a learner's activities vitally influence what is learned (Rothkopf, 1970). Rothkopf's concept of mathemagenic activities breaks down learning into distinct classes of orientation, object acquisition, and translation and processing. It was found that through careful planning of motivational techniques and arrangement of text, learning can be enhanced. The mathemagenic learning model lends support to the potential effectiveness of interactives and the use of questions in label design. Hershberger (1964) provides further evidence that more effective

learning takes place when text offers opportunities for self-evaluational responding (question/answer self-testing).

There exist a number of manuals for the design and evaluation of exhibit labels, e.g. *Making Exhibit Labels: A Step By Step Guide,* (Serrell, 1983); *Knowing When Exhibit Labels Work: A Standardized Guide For Evaluating And Improving Labels,* (Bitgood, 1987). Though the use of interactive labelling has become widespread, Bitgood (1989) suggests there is a general lack of empirical evidence to support claims of effectiveness of these designs on visitor behavior. The study described here was designed to provide such data, and to research further the benefits of interactive learning devices for informal settings. This project is similar to that of Sanford and Finlay (1988) in that it addresses the content, presentation, and location of exhibit signage,. However, the primary goal of this experiment was to test the effectiveness of the flip card question-answer system in label design.

The Lion exhibit at the Milwaukee County Zoo was chosen due to the easy reading level, poor presentation and virtually inaccessible location of its label. Initial observation of this popular exhibit revealed that few visitors actually looked at the existing label. The purpose of this study was to measure the effects of sign placement and design on visitor behavior and learning. It was hypothesized that changing the placement of the label to a more visually accessible location would increase the number of visitors who noticed the sign and subsequently learned more. It was also hypothesized that modifying the format of the label to be physically interactive without changing the content of the text would increase visitor learning, as well.

Methods

Subjects

Two hundred subjects were chosen from the visitor population in or near the Feline House. There were an approximately equal number of males and females, all estimated to be over the age of 15.

Procedures

The Lion exhibit consists of a glass, rectangular-shaped structure protruding from the building so that the visitors may view the animals up close from three sides. The existing informational label had white lettering on a black background, was illuminated from behind, and was located approximately eight feet from the ground on a wall next to the exhibit. For the study, two poster board mock-ups of the existing sign were created. These mock-ups were placed on easels at a 90 degree angle from one another, in the front and center of the exhibit. The mock-ups matched the existing label in text and dimension, but differed from it in that they had black lettering on a white background. In addition, the word "Lion" was placed in large letters at the top of the new label, instead of at the bottom as

on the existing label (see Figures 1 and 2). Behavior and learning measurements were then taken with this arrangement, described as Condition 1.

A second set of poster board mock-ups was the placed in the same location. These new labels contained the same information as the first set, but in this case it was presented in a question and answer interactive flip card format. The new interactive labels contained pictures of a lion and a lion's head in the upper left corner of the mock-ups with a speech bubble rising from the lion's mouth. In the speech bubble the leading question "Do You Know..." was written in large red letters. Each flip card contained a question on the front and a short answer on the board underneath. The questions were asked in first person form, and each was taken from a sentence or part of a sentence of the original sign (see Figure 3). Behavior and learning measurements were also taken during this arrangement, described as Condition 2. Behavior and learning were also measured with no manipulation of the exhibit (*Pre-test*) to provide a comparative baseline.

Behavioral Measures

Visitor behavior was measured in terms of attracting power, holding time, and holding power, as visitors were recorded unobtrusively with a stopwatch. Attracting power is the percentage of potential label viewers who actually looked at the label, or:

$$\text{Attraction (ATT)} = \frac{\text{Actual Viewers}}{\text{Potential Viewers}}$$

Holding power is the percentage of time that visitors spent looking at the label compared to the time required to read the label. The required time was determined by averaging five individual timed readings on each label prior to the execution of the conditions. This formula can be depicted as:

$$\text{Holding Power (HP)} = \frac{\text{Time Spent}}{\text{Time Required}}$$

Holding time is the average time spent actually looking at the exhibit. Each of the three conditions (Pre-test, Condition 1 and Condition 2) had 40 subjects— twenty for holding power and holding time, and 20 for attracting power, for a total of 120 subjects.

Learning

Visitor learning was determined by giving randomly-chosen subjects a questionnaire and asking them to complete it without visual reference to the exhibit or mock-up labels. The questionnaire was constructed prior to the pre-test, and was derived from the information on the original exhibit label.

It was revised until randomly-chosen individuals with no exposure to the exhibit signage performed at a level of less than 30 percent correct. This survey contained the following questions:

1. In Early historic times, the range of the lion included_____.
   a) Asia b) South America c) Europe d) North America

2. It takes ___swipes of a lion's paw to bring down a 600 pound zebra.
   a) 1 b) 2 c) 5 d) 7

3. How many animals do lions kill for food per year?
   a) Less than 20 b) 20-30 c) 50-60 d) More than 60

4. Lions eat animals killed by other animals.
   a) True b) False

There were 20 learning subjects in each condition (Pre-test, Condition 1 and Condition 2) and an additional 20 subjects were asked to complete the questionnaire before they entered the Feline House (No Exposure). This provided a total of 80 learning subjects.

Results

Behavior

Table 1 shows the large increase in attracting power which was discovered by comparison of Pre-test behavior to Condition 1 behavior, and a 15% increase from Condition 1 to Condition 2 behavior. Holding power also showed an increase in seconds from Pretest to Condition 1 and from Condition 1 to Condition 2. The 113% reading in Condition 2 indicates that visitors spent more time at the flip system mock-up than actually needed to read the text. Holding time also increased through the different conditions.

Table 1
Performance Measures Under the Various Conditions

	Pre-test	Condition 1	Condition 2
ATT	5%	80%	95%
HP	6%	98%	113%
HT	75.3 sec.	103.7 sec.	127.8 sec.

Learning

The mean number of correctly-answered questions for each condition is displayed in Figure 4. An increase was found between each condition, but because of the small number of questions involved in the survey, comparative t-tests were calculated to determine whether there were any significant learning differences (see Table 2). Areas found to be significant are displayed in bold and all comparisons except No Exposure vs. Condition 1 were at the .001 level. The remainder of the t-tests found no significant results.

Table 2
Comparative T-tests Between the Various Conditions

	No Exposure	Condition 1	Condition 2
Pre-Test	p≤.05	p≤.05	**p≤.001**
Condition 1	**p≤.01**	—	**p≤.001**
Condition 2	**p≤.001**	—	—

Discussion

The results of this study offer support for the use of interactive flip systems as a teaching tool in informal settings. The t-tests indicate no significant differences in learning took place between the existing backlit label (Pre-Test) and the black-on-white label placed at the front of the exhibit (Condition 1), although both attracting power and holding power increased tremendously. Seventy-five percent more visitors were attracted to the new label and they spent nearly all of the required reading time looking at it. The novelty of the mock-ups and new placement in the natural movement pattern of the visitors may have contributed to the increases found in attracting power and holding power. With these increases and non-significant differences in learning levels, the ineffectiveness of the existing label design is most evident.

Comparing Condition 1 with Condition 2 (flip label), attracting power, holding power, and learning all increased when flips were used. Intrinsic motivators incorporated in the flip card system mock-ups (graphics and leading question) and novelty of the labels may have been a factor in the behavioral findings, but the significant differences found in learning points directly to the new interactive format. Only one visitor in Condition 2 did not achieve a perfect score on the questionnaire.

Holding time at the exhibit did increase with each new condition, but it is difficult to say if this was a result of the new mock-up labels. By subtracting the mean time spent at the label from the mean time spent at the

exhibit, it can be seen that visitors spent approximately nine seconds longer in Condition 1 than in the Pre-Test and approximately eight seconds more in Condition 2 than in Condition 1. Other factors such as the activity level of the animals and outside weather conditions were not measured and may have had an effect on these increases.

In analyzing this study, the relevance of the findings to the concept of learning must be approached cautiously. While visitors appeared to learn more during certain conditions, whether they retained the information for more than a short period of time must still be determined. Because of the short period of time between viewing the exhibit and completing the survey, it may be that answers were based on simple recognition, rather than on long-term retention. However, it does appear that information gain increased with the utilization of an interactive label design. The results do not fully support the first hypothesis that learning would increase significantly as a function of the relocation of the existing label to a more visually accessible location. The results do, however, strongly support the second hypothesis that learning would increase with implementation of a new interactive format.

The experimenters noted through casual observation that adults would quiz themselves and children who accompanied them when using the interactive labels. Group behaviors were also noted, such as verbal encouragement, cheering when the correct answer was given, and searching for more interactive material to use after completing the questions. Perhaps the most interesting of all observations were the lines that formed in front of the flip card labels while visitors waited to use them.

Interactive learning devices cannot be expected to bring instantaneous improvement upon installation. Like any other facet of exhibit design they may require fine-tuning, and must be evaluated to determine their role in an exhibit's overall effectiveness, as well as to provide empirical evidence for future development.

References

Bitgood, S. C., (1987). *Knowing when exhibit labels work: A standardized guide for evaluating and improving labels.* Technical Report #87-90. Jacksonville, AL: Center for Social Design.

Bitgood, S. C., (1989). Deadly sins revisited: A review of the exhibit label literature. *Visitor Behavior, 4* (3), 4-13.

Brennan, T., (1977). Typical zoo visitor social group behavior. *American Association of Zoological Parks and Aquarium Annual Proceedings,* 106-116.

Hershberger, W.A., (1964). Self-evaluational responding and typographical cueing: Techniques for programming self-instructional materials. *Journal of Educational Psychology, 55,* 288-296.

Rothkopf, E. Z., (1970). The concept of mathemagenic activities. *Review of Educational Research, 40*(3), 325-335.

Sanford, J., & Finlay, T., (1988). The effects of exhibit signage on visitor behavior. *Nineteenth Annual Conferences of the Environmental Design Research Association, 19*, 243-257.

Screven, C. G., (1992). Motivating visitors to read labels. *ILVS Review: A Journal of Visitor Behavior. 2*(2), 183-211.

Screven, C. G., (1986). Exhibitions and information centers: Principles and applications. *Curator, 29*(2), 109-137.

Serrell, B., (1983). *Making exhibit labels: A step by step guide.* Nashville, TN: American Association for State and Local History.

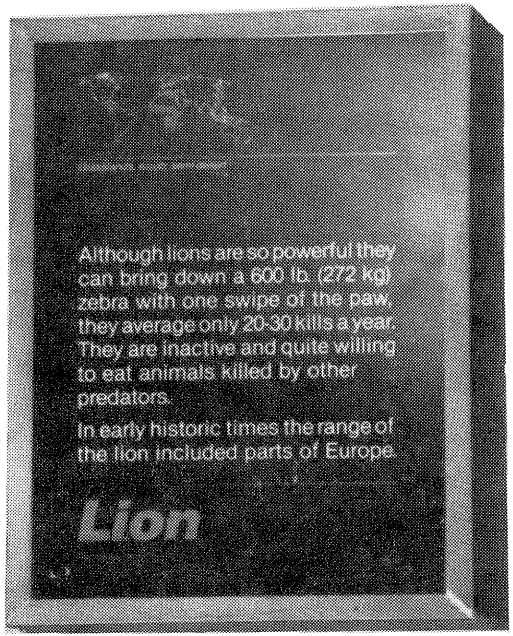

Figure 1
Existing Exhibit Label.

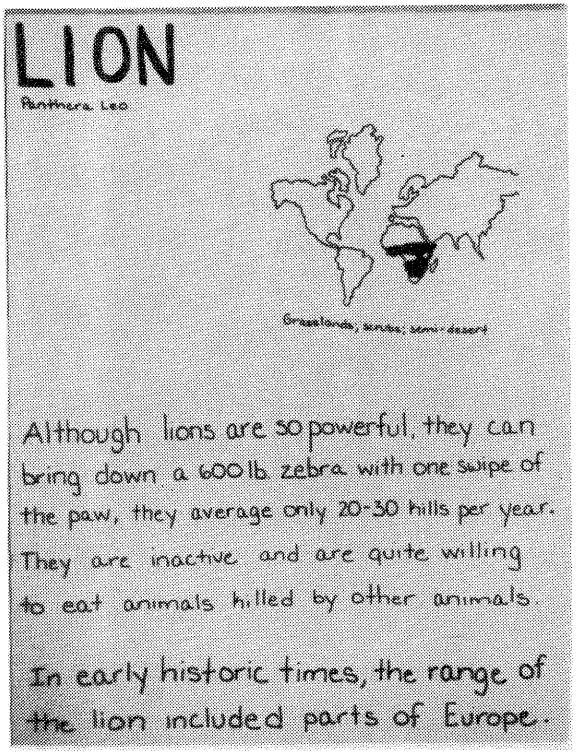

Figure 2
Condition 1 Mock-Up: Replica of Existing Label.

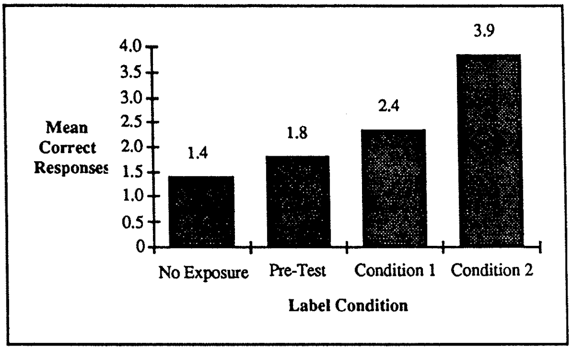

Figure 4
Mean Number of Correctly-Answered Questions

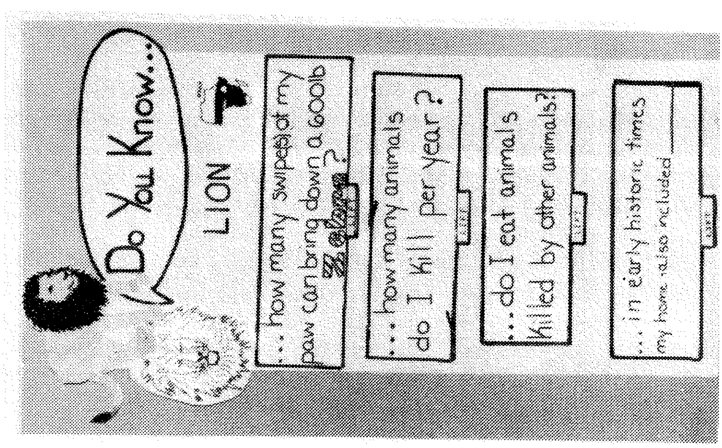

Figure 3
Condition 2 Mock-Up: Flip-System Interactive Label.