

Chapter 10: The Effects of Sign Length, Letter Size, and Proximity on Reading¹

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Introduction

Educators from informal learning institutions have argued that the effectiveness of exhibit signs and labels greatly influences the success of the educational role of the facility (e.g., Fruitman & DuBro, 1979; Loomis, 1983; Mosca, 1982; Rabb, 1975; Serrell, 1979; Wilson & Medina, 1972). The task of designing effective signs is made difficult, however: (a) by the large number of factors (content, length, size, placement, use of illustrations, etc.) which interact to determine whether or not signs are read and understood, (b) by the lack of carefully gathered empirical data concerning the effect of these factors, and (c) by an attitude, common among label designers, that they know how to do their job regardless of the lack of empirical guidelines.

A few studies have experimentally manipulated the variables that are likely to control visitor reading of interpretive signs and labels. For example, Bitgood, Nichols, Pierce, Conroy, and Patterson (1986) showed that the number of words per label, the size of the type, and the position of the label in relation to other exhibit objects determined the percentage of visitors who read exhibit labels in a museum. In that study the total number of words presented was held constant, while the number of labels on which they were displayed was varied.

In another study, Borun and Miller (1980) varied the length of labels by presenting from one to five topics in each label. Labels with three, four, or five topics produced less learning in terms of test score gains than labels with one or two topics. In addition, as the number of topics was increased, the percentage of visitors reading the whole label decreased. Visitors tended not to read long labels, even though they expressed a preference for labels longer than those actually read.

As the above studies by Bitgood et al (1986) and Borun and Miller (1980) indicate, label length has been studied and it has been generally found that short signs are more frequently read than longer ones. However, the literature lacks parametric studies which attempt to map

out visitor reactions across more than two points on the dimension of label length. The current study attempted to provide this type of parametric analysis.

The current study examined three variables: (a) label length, (b) type size, and (c) position (or proximity) of the label. The number of words was varied from 30 to 240 in geometric increments (i.e., 30, 60, 120, and 240), and three values of type size (18-, 36-, and 48-point) were studied. Finally, the labels were positioned either on-path or off-path with respect to the visitors' usual circulation path through the exhibit area.

Method

Subjects

Subjects for this study were 5822 visitor groups which passed through The Predators building of the Birmingham Zoo during selected periods between August and December of 1987. Each group contained at least one individual appearing to be 13 years of age or older.

Procedure

All research was carried out in the entrance area of The Predators building in the Birmingham Zoo. The back wall of this room is covered with large pictures of predatory animals, and the wall to the left upon entering is entirely of glass, behind which visitors can observe leopards in a naturalistic setting. In this study, signs were displayed in this area on an easel, and visitors were unobtrusively observed to determine their reaction to them.

These signs, designed to serve as a general introduction to the facility, contained a composite of information about predatory animals which could be found at exhibits throughout the building. Since signs were selected in 30, 60, 120, and 240 word lengths, 8 short (30 words) blocks of text were developed, each describing something different about predators. These blocks were simply added to, or deleted from, the background as needed. Longer signs presented a greater number of topics than did short ones, and not just more words. All signs were of black text on a white background, and the background size of these signs was maintained at 24" by 30". Observations were conducted primarily on Saturdays and Sundays, since it was on these days that the traffic flow was moderately steady.

Data were collected under three conditions:

Study 1 examined the effects of signs of varying length: 30, 60, 120, and 240 words. These signs were presented for periods of one-half hour each, on a consistently rotated basis, varying the order of presentation each day. These signs, all in 36-point type (3/8 inch letter height) were placed 10 feet inside the entrance to the Predators Building, directly in the path of visitors. Visitor reaction was unobtrusively noted and recorded as to whether a chosen individual (for example, the first adult in each group through the door) from each group of visitors read the sign, and the length of time spent reading by those who did stop. In order to be counted as reading, the individual must have been stopped directly in front of the sign, faced toward and remaining visually fixed on it. In all, 1850 groups of visitors were observed in this manner in Study 1.

Study 2 involved the use of similar methods to determine visitor reaction to signs in a combination of type sizes and total lengths. Signs in 18-point (3/16 inch), 36-point (3/8 inch), and 48-point (1/2 inch) type sizes, and variations of 60 and 120 words, were presented. Again, half-hour rotations were maintained, and signs remained 10 feet inside the door. For this phase, however, data were collected differently in that any group member's reading incidence was recorded, rather than solely that of a chosen individual. This change in procedure attempted to include many of the visitors who read the signs, but were not the first adult who entered the building. A total of 3060 groups were observed in Study 2.

Study 3. Since it was hypothesized that the amount of effort required of those visitors who wished to read signs might have a moderating effect on the importance of the previously studied factors, the last study concentrated on differences in length of signs and size of type, as influenced by placement of the signs 20 feet from the entrance of the facility (approximately 10 feet from traffic flow). Sixty-word signs in 18-point and 48-point type were alternated in the off-path location, as were signs of 60 and 120 words in 36-point. Data were collected on 912 groups in a manner identical to the first two studies.

Analytic Procedures

For each of the interpretive signs which was displayed, the percentage of visitors passing by at that time who stopped and read was determined. This figure is commonly referred to as a measure of a sign's "attracting power." The statistical significance of this attracting power was determined with Chi-Square analysis. Also of interest was the length of time spent by those who did stop to read signs, indicative of a sign's

"holding power." However, rather than simply comparing average reading durations, these were divided by the number of words in each sign, resulting in a time-per-word figure. Time-per-word was analyzed with Analysis of Variance (ANOVA). The significance level $p \leq .05$ was used in all cases. Results were calculated with the StatView 512+ (BrainPower, 1986) computer program on a Macintosh computer.

Study #1

Results

Attracting power. As shown by Table 1, there was a general decrease in attracting power of the signs as the number of words increased. Signs of 30 words resulted in 15.15% readers; 60-word signs had 14.88% readers; 120-word signs, 11.33%; and 240-word signs, 9.73%. Despite the systematic reduction in visitor stopping as the number of words increased, Chi-Square analysis found no significant difference among the attracting powers of the signs containing 30, 60, 120, and 240 words.

Holding power. Reading time can be examined in at least two different ways: (a) mean reading time, and (b) reading time-per-word. Mean reading times for the four conditions in Study 1 were 5.62 seconds at 30 words, 10.01 at 60 words, 16.18 seconds for 120 words, and 26.25 seconds for 240-word signs. In order to control for the total number of words, the average total reading time was divided by number of words in the sign (see Table 1). The 30-word signs received an average of .19 seconds of reading for each word, the 60-word signs received .17 seconds-per-word, the 120-word sign, .14 seconds-per-word, and the 240-word sign, .11 seconds-per-word. ANOVA of time-per-word found the progressive loss of reading time per word accompanying the increase in sign length to be significant [$F = 6.89$; $df = 3, 219$; $p \leq .05$].

Discussion

Consistent with predictions derived from the literature, overall label length was found to influence visitor reading. However, contrary to a number of studies (Robinson, 1930; Hodges, 1978; Serrell, 1981; Bitgood, Nichols, Pierce, Patterson, & Conroy, 1986; Bitgood, Patterson, Benefield, & Thompson, 1987) there was no statistically significant effect in terms of attracting power despite the fact that the percentage of visitors decreased from 15.15 in the 30-word condition to 9.73 in the 240-word condition. Statistically, the major effect of number of words in this study was on the reading time per word. The greater the number of words on the sign, the less reading time per word. It appears

that visitors read a smaller and smaller proportion of the label as the number of words increase.

There are several possible reasons why the attracting power results did not achieve statistical significance. Studies by Robinson (1930), Hodges (1978), and Serrell (1981) appear to have confounded their findings by manipulating more than one label factor simultaneously. These studies may have obtained a larger effect because of the contributions of other variables in addition to number of words per label. The study by Bitgood, Nichols, Pierce, Patterson, & Conroy (1986) did not actually reduce the number of words presented, but merely divided large signs into three smaller ones. They therefore assessed visitor reaction to the presentation of label information in smaller "chunks," rather than to labels containing fewer words and less information. It is possible that label reading is determined to a large extent by the surrounding context (i.e., the number and spacing of other visual stimuli) rather than by the number of words alone. Whether this methodological difference actually influences visitor reading is not known and will require further study.

Another possible contributor to the smaller-than-expected effects with number of words may be the placement of the signs with respect to exhibit objects/animals. The Egyptian mummy exhibit at the Anniston Museum, used by Bitgood, et al (1986), in their label study, is encountered by the visitor near the end of his/her tour through the facility, rather than at the entrance as was the case in the current study. It is possible that visitors are impatient to see exhibits when they enter a building and do not take time to read interpretive material until after they encounter the exhibits they came to see. In addition, the predator signs in the current study were competing with live animals, while the mummy signs were competing with inert mummy cases.

The decrease in reading time per word found in the current study was attributed to visitors reading a smaller and smaller proportion of the label as the number of words increased. However, since there may be a "warm up" time required of readers of all signs, it is possible that longer signs show a progressive decrease in time-per-word as the visitor warms up during sign reading. To rule out this possibility, we collected data that contradicts a possible "warm-up" effect. In a sample of individuals who were asked to read every word of various length signs at a normal rate, there was a very consistent multiplicative increase of reading time as the sign's length increased. As a result, the mean time-per-word of these test subjects was nearly identical, with a range of .23 to .24 seconds-per-word for signs of from 30 to 240 words. To illustrate this, Table 1 presents a comparison of control subject reading time vs. zoo visitor

reading time. These results strongly suggest that readers of longer signs are, in fact, reading less of the sign.

This consistent and significant deterioration in seconds spent for each word in the sign has definite implications for the ability of interpretive labels to educate. While a great deal more research is needed in the area, this finding suggests that increasing the amount of material included in a sign may actually result in a smaller percentage of it being read (and consequently a smaller percentage of the material being learned). Borun and Miller (1980) demonstrated that visitors learned less when four or five topics were included on the sign than when only one or two topics were present.

Study 2

Results

Table 2 summarizes the results of Study 2. The percent of visitors stopping (attracting power) and the reading time per word (holding power) are listed for the three type sizes.

Attracting power. There were statistically significant differences in attracting power for both number of words and type size. A higher percentage of visitors read the 60-word signs (31.91) than read the 120-word signs (22.55) [$X^2 = 36.34, p < .001$]. For the 120-word condition, there was also an increase in the percentage of readers as the size of type increased ($X^2 = 6.36, p < .05$).

Holding power. ANOVA of reading times found no significant differences between the holding powers of the various signs.

Discussion

The major finding in Study 2 was the effects of type size: there was an increase in reading by visitors as the type size increased, particularly in the 120-word condition. Although this effect was statistically significant, it did not approach the magnitude of difference that was observed in the study by Bitgood et al (1986) in which an increase in type size increased the percentage of readers by 15 percent. The less-than-ideal conditions of this study (e.g., placement of signs so that they competed with live animals) may be responsible for the difference in findings.

Study 2 also found a significant difference between the 60- and 120-word conditions. As expected, more visitors read the shorter sign. The

percentage of readers were higher than in Study 1 because of a change in the recording procedure. During the first study only the first member of a group to enter the exhibit building was chosen for recording. This method of recording missed a considerable number of readers. In Study 2 any member of a group who read was monitored.

Study 3

Results

Study 3 assessed the result of displaying signs of different type size in the off-path condition. As in the previous studies, no significant differences in either attracting or holding could be attributed to changes in type size.

Attracting power. Similar to the results of Study Two, signs of 120 words brought a decrease in the percentage of visitors who stopped, compared with those of 60-word length. This reduction in attracted readers, however, was found not to be statistically significant by Chi-Square analysis at $p \leq .05$.

Holding power. ANOVA of time-per-word figures found that the shorter reading times which accompanied longer signs in 36-point type size (.18 seconds per word at 60 words, and .13 seconds per word at 120 words) to be large, but not significant at $p \leq .05$.

As noted in Study 2, it was hypothesized that signs located on-path were being read by visitors, regardless of manipulation, because they could be seen easily in any condition, and little effort was required of those who wished to read. If this was the case, then it seemed likely that factors such as type size could play an important role in the effectiveness of signs placed some distance from traffic. This issue of a sign's ability to attract readers, regardless of the extra effort required, can be conceptualized as its "drawing power," while its ability to attract readers when it is placed in traffic is an indication of "stopping power." To test these ideas, signs were placed off-path in Study Three, to see whether differences attributable to changes in type size or sign length would become more prominent. However, consistent, but less than significant, differences were found only in attracting and holding between signs of 60 and 120 words. While there also appears to be a deleterious effect of increasing word length, the lack of significant effect due to type size is puzzling, especially since it was presumed that type size would become a factor as signs were placed farther from visitor traffic.

Study 2 vs 3: On-Path vs. Off-Path

Comparisons were made between results obtained in Studies Two and Three in order to determine the effects of placing signs away from the usual visitor circulation path. The following results were found:

- On-path signs received more visitor stops than off-path signs for all sign comparisons.
- 60-word signs produced a higher percent of stops than 120-word signs.
- 60-word signs in 18-point type attracted 30.79% on-path, and 19.78% off-path. 60-word signs of 36-point type brought 30.72% readership on-path, and 20.49% off-path; while 60-word signs of 48-point type received 34.04% readers on-, and 25.09% readers off-path.
- The sign of 120-word length showed 23.39% attracting on-path, decreasing to 16.42% off-path. (Figure 4 offers a comparison of on-path vs. off-path attracting power of signs containing 60 words).

Chi-Square analysis showed the loss of attracting power which accompanied off-path placement to be statistically significant for 60-word signs [$p \leq .05$]. For 120-word signs, however, the difference in on-path and off-path attracting power approached, but did not attain significance.

ANOVA of time-per-word figures between the two positions showed that there was a significant overall increase for signs in the off-path position [$F = .0013$; $df = 2, 699$; $p \leq .05$]. There was also a significant interaction between position and type size [$F = 3.798$; $df = 2, 699$; $p \leq .05$]. The interaction between position and type size for 60-word signs can be seen in Figure 5, as time-per-word for on-path signs increases slightly as type size is increased. Time-per-word for off-path signs, however, can be seen to display an inverse relationship with type size, decreasing as the size is increased from 36- to 48-point.

Obviously, the proximity of a sign to normal traffic flow influences the way in which visitors react to it, since the attracting power of most signs drops significantly when they are placed ten feet from traffic. Two possible reasons for the lower attracting power of off-path signs are: (a) visitors didn't notice signs placed farther from their usual circulation path, or (b) visitors weren't willing to make the effort to read signs requiring them to go out of their way. In addition, for 18-point and 36-point type, those visitors who were willing to make the effort to read the off-path signs were likely to read more than visitors who read the 48-point type.

One can only speculate on why this result was obtained. It may be that the criteria used to consider a visitor as reading were responsible for this apparent inconsistency. Since a person was required to be stopped in front of a sign to be counted as a reader, he or she may have actually been able to begin reading off-path signs of 48-point type while still approaching, resulting in shorter recorded reading times. Various other criteria of "reading" may need to be tried in order to determine whether or not this is the case.

Conclusions

The study did not produce clear results concerning the effects of number of words per sign, size of type, and position of sign. The entrance of the exhibit house was probably not the best place to conduct this study since it was difficult to get visitors to stop and read. Although we did not obtain the clear results we had hoped for, the findings clearly show that the three variables studied were important.

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Footnote

- ¹The data for this chapter were part of the first author's master's thesis in psychology at Jacksonville State University.
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Table 1**Visitor Reading as a Function of Number of Words**

	Number of words			
	30	60	120	240
Percent of visitors stopping	15.15	14.88	11.33	9.73
Read time (sec) per word - visitors	.19	.17	.14	.11
Read time (sec) per word - control	.24	.23	.23	.24

Table 2

Results of Study 2
Size of Type and Number of Words

Percent of visitors stopping:	Size of Type			
	18-pt	36-pt	48-pt	Avg
60-word condition	30.79	30.72	34.04	31.91
120-word condition	17.11	23.39	24.23	22.55
Read time (sec) per word:				
60-word condition	.13	.13	.15	
120-word condition	.11	.14	.12	

Table 3**Study 3 Results - Off-path
Size of Type**

	18-pt	36-pt	48-pt
Percent of visitors stopping:			
60-word condition	19.78	20.49	25.09
120-word condition	—	16.42	—

Read time (sec) per word:

60-word condition	.18	.18	.14
120-word condition	—	.13	—

Table 4**Comparison of On-path and Off-path****Percent of visitors stopping:****Size of Type**

	18-pt	36-pt	48-pt
On-path condition	30.79	30.72	34.04
Off-path condition	19.78	20.49	25.09

Read time (sec) per word:

On-path condition	.13	.13	.15
Off-path condition	.18	.18	.14