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Modifying the Communicative Effectiveness of Fire Prevention Signs

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ABSTRACT: Two versions of a commonly used U.S. Forest Service sign ('America Needs Productive Forests') were tested on four adult special-interest groups in Butte County, California. Half the members were shown the regularly used sign; the other half, a modified sign that included the Smokey Bear symbol. Responses to questionnaires by both groups suggested that each sign had a different impact and meaning, and brought out different concepts.

Fire prevention signs can have different meanings to different people--even when the message is kept simple and short. In attempts to improve the effectiveness of its signs, the U.S. Forest Service assigned to the Pacific Southwest Station and to the California Region the task of evaluating

fire prevention signs and proposing changes. Some results of this investigation have already been reported.¹

The Southern Region staff had suggested that fire prevention signs might be improved by adding the widely used Smokey Bear symbol to existing fire prevention signs. To see if this change made any difference, we conducted a study using members of four adult special-interest groups in Butte County, California. Purpose of the test was to see if the change affected the sign's recall value, its meaning, and the activities suggested by it. Results were then compared with those from an earlier study done with University of Southern California students.

In the Butte County test, we found that the sign with the Smokey Bear symbol added resulted in greater recall as to the substance of the message. But it did not result in greater verbatim recall than the regularly used sign. And the two versions of the sign did not differ as to words mentioned most often as responses to the sign.

Methods

The USC Study was done with students in a laboratory situation. The hypotheses proposed were:

1. The content of fire prevention signs can be manipulated to increase the emission of fire-related concepts in responses.

¹Ruckel, Gail J., and Folkman, William S. Roadside fire prevention signs--standard and new designs compared. U.S. Forest Serv. Res. Note PSW-65. Pacific SW. Forest & Range Exp. Sta., Berkeley, Calif. 8 pp., illus. 1965.

Folkman, William S. Signing for the 'No Smoking' ordinance in southern California. U.S. Forest Serv. Res. Note PSW-71. Pacific SW. Forest & Range Exp. Sta., Berkeley, Calif. 8 pp., illus. 1965.

2. Symbols can be used to influence the verbal content of fire prevention messages.

3. Words and symbols can be combined to maximize emission of fire-related concepts.

4. Behavior, as evidenced by performance of a motor task, can be predicted from verbal data.

Researchers in the USC study reportedly found evidence in their work to support the first three hypotheses. But the number of students who took part was too small to provide statistical validity. No attempt was made to validate the fourth hypothesis.

The results of that study were suggestive, but there remained a need to determine to what extent student reactions resemble those of the general forest-using public.

Rather than use a variety of signs as was done in the USC study, we confined the test in Butte County to one sign and a modification of it (fig. 1). The sign tested was "America Needs Productive Forests." It appeared to be the least directive, if not somewhat ambiguous. Its use in the USC study had produced the widest range of "meanings" and one of the narrowest ranges of compliance-activities of any of the signs tested. When the Smokey Bear symbol was added to the sign, the resultant pattern of responses changed markedly. The range of "meanings" narrowed, but the references to fire and forest broadened. The range of compliance-activities broadened and included references to such specific activities as "break matches," "don't smoke," and others.

Four groups participated in the study. They included a Kiwanis Club, a Junior Chamber of Commerce, a Grange, and a women's club. The tests were given to each group during one of its regular meetings. The test itself required but a small part of the meeting time and the remainder was devoted to a presentation on fire prevention. Advance announcements of the program referred to the general subject of "Forestry." No specific mention of fire prevention was made until after the tests were completed.

Members of these groups were given a small picture of the sign, every other person receiving the modification. A free verbal response from each person was obtained relevant to the following basic questions:

1. What did the sign say? Give the exact wording, if possible.
2. What did the sign mean to you?
3. In specific terms, how would you comply with the message on the sign?

Each person also was requested to record his reaction to the sign to which he was exposed along the continua of the 22 bi-polar associative scales of the type developed by Osgood, et al.² This type of instrument has been considered highly promising in measuring meanings-- a crucial variable in communication. Dubbed the "semantic differential,"

²Osgood, C.E., Suci, G. J., and Tannenbaum, P.H. The measurement of meaning. 342 pp. Urbana: Univer. Ill. Press. 1957.

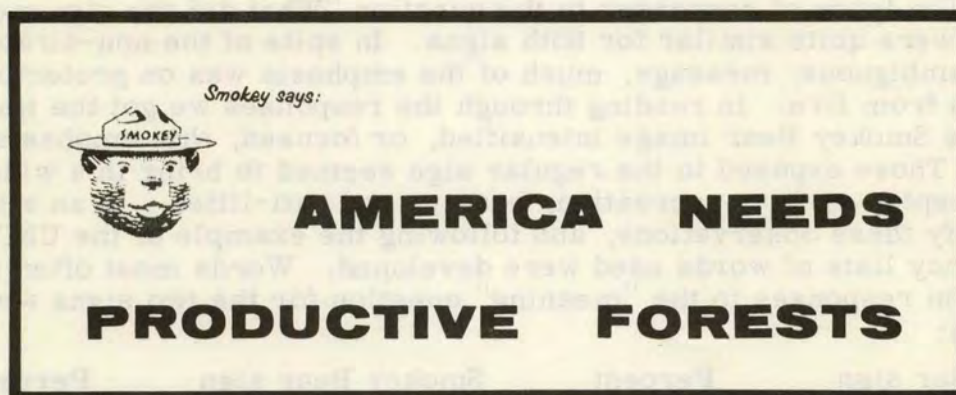
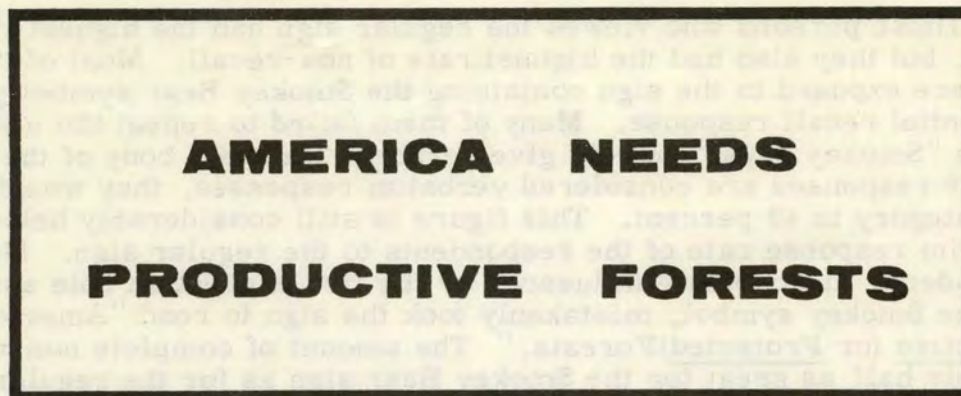


Figure 1.--Two versions of a fire prevention sign were tested on four adult special-interest groups in Butte County, California.

the instrument provides a multi-dimensional measure. This provision is of particular importance in that much research in communication has found that the effects a message may have vary not only in single ways, but involve several different attributes at once.

Results

Usable responses were obtained from 143 persons--69 having been exposed to the original sign and 74 to the sign containing the Smokey Bear symbol.

Responses to the question "What did the sign say?" were as follows:

	Level of recall ^{1/}		
	Verbatim	Substantial	Non-recall
	(percent)		
Sign seen:	- - - -	- - - -	- - - -
Regular sign	59	18	23
Sign with Smokey Bear symbol	21	68	11

^{1/} A chi-square contingency test was applied to the data. The computed value of χ^2 was 6.04. The 95 percent level of χ^2 for 2 degrees of freedom is 5.99.

Those persons who viewed the regular sign had the highest rate of recall, but they also had the highest rate of non-recall. Most of those who were exposed to the sign containing the Smokey Bear symbol gave a substantial recall response. Many of them failed to repeat the low-keyed phrase "Smokey says," but did give verbatim the main body of the message. If these responses are considered verbatim responses, they would raise this category to 48 percent. This figure is still considerably below the verbatim response rate of the respondents to the regular sign. Many respondents, undoubtedly influenced by the fire prevention role associated with the Smokey symbol, mistakenly took the sign to read "America Needs Protective (or Protected) Forests." The amount of complete non-recall was only half as great for the Smokey Bear sign as for the regular sign.

The types of responses to the question "What did the sign mean to you?" were quite similar for both signs. In spite of the non-directive, if not ambiguous, message, much of the emphasis was on protecting the forests from fire. In reading through the responses we got the impression that the Smokey Bear image intensified, or focused, this emphasis somewhat. Those exposed to the regular sign seemed to bring in a wider range of concepts, such as recreation, beauty, and anti-litter. In an attempt to objectify these observations, and following the example of the USC study, frequency lists of words used were developed. Words most often mentioned in responses to the "meaning" question for the two signs were as follows:

<u>Regular sign</u>	<u>Percent reporting</u>	<u>Smokey Bear sign</u>	<u>Percent reporting</u>
1. Forest(s)	66.7	1. Forest(s)	97.3
2. Fire(s)	37.7	2. Fire(s)	32.4
3. Careful(ly)	26.1	3. Careful(ly)	29.7
4. Should	23.2	4. Protect(ion)	27.0
5. Trees (lumber)	20.3	5. Trees (lumber)	27.0
6. Protect(ion)	18.8	6. Should	21.6
7. Recreation	15.9	7. America	18.9
8. Need	13.0	8. Produce(tive)	18.9
9. Produce(tive)	13.0	9. More	13.5
10. Use	10.1	10. Need	13.5
11. Keep	10.1	11. Prevent(ion)	13.5

The three most frequently used words in both lists are the same: (a) "Forest(s)," (b) "Fire," and (c) "Careful(ly)." It is only among the words used less often that the differences show up. On the basis of the lists, "Protection" and "Prevention" would seem to be stressed more by the people responding to the Smokey Bear sign.

Many respondents had difficulty answering the question "In specific terms, how would you comply with the message on the sign?" This difficulty was, no doubt, largely related to the character of the sign's message. Some wrote that they found the approach so general that they could not respond to it in specific terms. Most people, regardless of the sign seen, said they would be careful with fires, or said something

similar. Outside of this theme, those few responding to the regular sign mentioned such exhortations as "keep a clean camp," "don't cut down young trees," and so forth. The range of compliance activities recorded by those exposed to the picture of Smokey Bear was narrower. But it included references to specific fire prevention activities, such as "break matches," "careful with smokes," and so forth.

"Forest(s)" and "Fire(s)" were again the most often mentioned words in the responses to both signs. The word "Fire" increased in relative frequency, however, being used about the same number of times as "Forests." In the responses to the earlier question, the word "Forests" was used two to three times as often as the word "Fire." Words most often mentioned in responses to the comprehension question were as follows:

<u>Regular sign</u>	<u>Percent reporting</u>	<u>Smokey Bear sign</u>	<u>Percent reporting</u>
1. Forest(s)	52.2	1. Forest(s)	40.5
2. Fire(s)	52.2	2. Fire(s)	37.8
3. Careful(ly)	20.3	3. Careful(ly)	24.3
4. Prevent	20.3	4. Use	16.2
5. Protect	15.9	5. Keep	10.8
		6. Protect	10.8
		7. Put	10.8

The analysis of the semantic differential scales showed that the regular sign was most closely associated with the concepts "Green," "Forest," "Mountain," "Good," "Future," and "Tree"--in order of closeness of association (table 1). The responses to the Smokey Bear sign added the concepts "Pleasant," "Safe," and "Familiar" to the original list of closely associated terms, while dropping "Mountains" and "Future."

The concept pairs "Static-Dynamic," "Mild-Intense," "Child-Adult," "Me-They," and "Colorful-Colorless" were considered neutral or not applicable by the people exposed to the regular sign. The addition of the Smokey Bear symbol resulted in the sign being considered somewhat more colorful. It also increased the connotation of the concept "Me" for the sign. The theme of the Smokey Bear campaign--"only you can prevent forest fires"--may be responsible for this finding. We might have expected a shift toward the concept "Child" as the appeal of Smokey is generally considered to be directed to the juvenile level. This did not happen, however. The slight change experienced was actually toward the "Adult" end of the scale.³

Discussion

Although no difficulty in administering the tests to student groups was reported, we experienced considerable difficulty in administering the tests to the groups cooperating in the Butte County study. The

³Because of the small size of the sample, the above changes are not great enough to be considered statistically significant. They are reported for their suggestive value only.

Table 1.--Semantic differential scale scores for the two fire prevention signs, adult respondents, Butte County, California

Concept pairs	n=	Scale scores ¹		Difference ²
		Regular sign (69)	Smokey Bear added (74)	
Pleasant-Unpleasant		5.22	6.12	+ 0.90
Active-Passive		4.97	4.94	- .03
Beautiful-Ugly		5.13	4.99	- .14
Definite-Uncertain		5.30	5.32	+ .02
Powerful-Weak		5.04	4.80	- .24
Good-Bad		5.80	5.90	+ .10
Large-Small		4.87	4.78	- .09
Water-Fire		4.90	4.70	- .20
Familiar-Strange		5.28	5.73	+ .45
Bush-Tree		2.40	2.54	+ .14
Safe-Dangerous		5.51	5.99	+ .48
Colorful-Colorless		4.49	5.00	+ .51
Obvious-Subtle		5.61	5.23	- .38
Forest-Field		6.06	6.34	+ .28
Mild-Intense		4.29	4.16	- .13
Me-They		4.48	4.72	+ .24
Simple-Complex		5.54	5.50	- .04
Green-Red		6.07	5.97	- .10
Child-Adult		3.62	3.22	- .40
Static-Dynamic		3.83	3.93	+ .10
Future-Past		5.72	5.73	+ .01
Mountains-Level		5.86	5.62	- .24

¹Scales were scored arbitrarily on a 7-point scale, ranging from right to left. On the first scale, for example, a respondent who rated a sign at the extreme left (Pleasant) end of the continuum would be given a score of 7 on this scale. A rating at the extreme right (Unpleasant) end would be given a score of 1. A rating in the center (neutral or unapplicable) was scored 4.

²Differences are not statistically significant, using the 't' test of significant difference between arithmetic means.

detailed somewhat involved instructions were confusing to some participants. Consequently, the number of partially completed or unusable returns was quite high. By and large, younger people in this present study experienced little difficulty, but older persons were less successful.

Recall rates for the regular sign are essentially identical in the two studies. The USC report gives 60-percent verbatim response, 17 percent substantial recall, and 23 percent non-recall for this sign. It did not report the recall rates for the sign with the Smokey Bear modification.

In the current study, the recall responses would seem to indicate that two antithetical factors in sign design were operative. Other studies had shown that the simpler roadside signs with short (3 words or less) messages were recalled much more effectively than more complex, wordy signs.⁴ The addition of the Smokey Bear symbol apparently increased the complexity of the sign enough as to reduce its verbatim recall value. The familiarity of the symbol, however, did seem to serve as a clue by which the respondents could at least recollect the general theme of the presentation--even if they could not repeat it verbatim.

⁴Ruckel and Folkman, *op. cit.*

The lists of word frequencies from the responses to the question "What did the sign mean to you?" from the USC study starts off similarly, with "Forest(s)" and "Fire" appearing in about the same proportionate frequencies as in this study. But then, "Need(s)" appeared in third place in both lists in the USC study, while it appears in only one of the lists in this study--far down the list at that. As in the present study, "Careful(ly)" and "Protect(ion)" were also near the top of the Smokey Bear sign list. However, "Prevention" appeared further up the list of the regular sign than it did on that of the Smokey Bear sign.

The USC students appeared to have the same difficulty the Butte County respondents had in answering the question "In specific terms, how would you comply with the message on the sign?" The range of specific content and action words related to compliance was narrow. The USC report concluded that this factor, when taken along with the vocabulary elicited by the other questions indicated that this particular sign had a wide range of meanings, but engendered little in the way of specific cues for action or compliance. This is particularly apparent when the responses to this sign are compared with the responses to the other signs they studied.

The extent to which Californians bring in a fire prevention connotation to such a general sign message as "America Needs Productive Forests" was evident. Fire prevention programs appear to have produced a rather high degree of awareness of fire danger. That Californians live in an obviously hazardous environment may contribute to this awareness. However, the obviousness of the hazard is only apparent to those who have been sensitized to it.

The student responses to the semantic differential scales were quite similar to the responses of the adult groups. The concepts students most closely associated with the regular sign were "Forest," "Green," "Future," "Tree," and "Definite." The Smokey Bear modification brought in the concepts "Familiar," "Good," and "Pleasant," as it did in the current study.

Although the adult groups had a rather strong tendency to register responses at the extremes or at the neutral central position on the scales, the students were more apt to use all seven positions on the scales, thus indicating more subtle distinctions.

Conclusions

The scale of the present study did not provide a definitive answer to all of the questions we hoped it would settle. However, the general areas of agreement found between this and the USC study suggests that, with some degree of caution, the major findings of the latter study can be expected to apply to a more general public.

Precise methods of manipulating the various components of a fire prevention sign have not been developed. It should be apparent, however,

that the "meaning" of a sign is not a specific given entity. Words (and other symbols) have both connotative and denotative aspects. If improving the effectiveness of fire prevention signs is to be put on a more objective basis, these multidimensional factors must be better understood.

The Author

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