

DOCUMENT RESUME

ED 064 403

TM 001 651

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TITLE Use of the Semantic Differential in Describing a
Pre-School Environment.
PUB DATE 72
NOTE 12p.; Paper presented at the annual meeting of the
AERA (Chicago, Ill., April 1972)
EDRS PRICE MF-\$0.65 HC-\$3.29
DESCRIPTORS Analysis of Variance; Data Collection; *Educational
Environment; *Hypothesis Testing; *Preschool
Education; Rural Schools; *Semantics; Statistical
Analysis; *Test Reliability

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Teachers and assistant teachers (N = 32) from two rural counties in North Carolina rated five pre-school educational settings and one hypothesized ideal setting using a semantic differential in order to determine if the semantic differential could be used to reliably differentiate between pre-school educational environments. Five discrepancy scores (i.e., setting - ideal) for each semantic attribute were analyzed by a 2 x 2 x 5 complete factorial multivariate analysis of variance. It was concluded that the semantic differential did provide a basis for interpreting differences in perceptual attributes of educational settings and that these differences were related to the prior background of the subjects and data gathering environment. (Author)

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The characteristics of the educational environment must be considered in responsive environmental design inquiry and analysis. Studies carried out by Collins (1969), Lowenthal (1967), and Sanoff (1969, 1970) were concerned with the measurement of the perceived physical environments through the use of semantic differential. These studies have been based upon the assumption that the physical structure of the environment has visually discernible qualities which relate to the users of the (sample) "space," and that there are differences in various displayed physical settings that may be described from presentation of strictly visual cues. As the public awareness focuses on the need for child care and pre-school education, it is appropriate to recognize the physical needs and perceptual world of the child. It is through this perception that the designer may devise environmental design parameters which stimulate perceptual growth and development of children. Thus, the purpose of this study was to determine if the semantic differential would provide a framework for the measurement of elements of educational environments. Specifically, the objectives of this investigation were to determine whether or not the respondents could (1) differentiate between the sample environments and (2) to identify the perceptual elements which differentiated the sample environments.

METHOD

Sample

The most desirable evaluation of a child care environment would come from the primary user, the child; however, the measurement of the perception of children attending pre-school has not yet developed to the extent that reliable

¹ Paper read at the 1972 Annual Meeting of American Educational Research Association, Chicago, Illinois, April 4, 1972.

measures would be obtained. In contrast, the personnel who interact with the children in this environment--teachers and teacher's assistants--provide a notable sample group on whom designers, administrators, and various consultants may quite easily depend for active user perception. It is these individuals who also have the responsibility for designing and implementing child care programs within these environments.

Personnel from Operation Headstart programs in two rural counties in North Carolina provided the subjects for this investigation. The subjects were also distinguished by the environment in which ratings were obtained. In one county (Location I), the session was conducted in a small staff meeting room so that respondents had to use lap supports as a writing surface. In contrast, the subjects from the second county (Location II) completed the rating task in a large meeting room in a church while sitting at tables. Ratings were obtained from six teachers and 13 teacher's assistants in Location I and from seven teachers and six teacher's assistants in Location II.

Rating Procedures

The method of the semantic differential was chosen to describe the sample environments. An ad hoc list of attribute pairs was drawn from studies utilizing the semantic differential to describe environments and was empirically adapted to the objectives of this study. The resultant instrument had 18 attribute-pairs, which are listed in Table 1. Five physical settings of qualitatively different child care environments were selected for display. Each setting indicated some consistency of human activity in the context of the child care space, but each differed in the visually notable environment attributes--order, spaciousness, light quality, etc.

The subjects were shown color slides of the five settings in the same order. The five settings, as black and white reproductions, are given in

Figure 1. Each respondent independently evaluated each setting using the semantic differential while the setting was being shown. Ratings were also obtained for an imaginary "ideal" setting (no setting projected). All ratings were assigned a scale value of from one to five in accordance with procedures recommended for use with the semantic differential (Osgood, Suci, and Tannenbaum, 1957).

Statistical Model

The use of multiple perceptual measures of the environment suggests that a multivariate analytic approach be used in the analysis of the data. To overcome the problem inherent in obtaining repeated ratings from the same individuals, the "ideal" rating obtained from each semantic attribute-pair was subtracted from the corresponding attribute-pair rating for each setting thus providing five discrepancy measures (i.e., setting minus ideal). For analysis purposes, these ratings can be considered statistically independent. While the main purpose of this study was to determine observed differences for the five child-care environment settings, it is, nevertheless, important to include the other factors which may affect the perceptions of a respondent. Thus, the statistical model provided for testing, independently, the effects due to rating location and child care role (i.e., teacher or teacher assistant) in addition to differences in setting. This resulted in the analysis of data according to a $2 \times 2 \times 5$ multivariate complete factorial design.

RESULTS

The multivariate and univariate output from the MANOVA procedure provide complementary approaches to the interpretation of observed differences in settings. The overall test provides an estimate of the reliability of the observed univariate tests. If the joint multivariate of an effect is observed

to be non-significant, then any univariate result is to be considered a result of sampling variation and thus should not be interpreted.

While the main focus of this study was oriented towards answering questions related to perceptions of settings, the major portion of this section will deal with the interpretation of differences among settings. The correctness of the decision to include the factors of role and location in the statistical model should be noted. An inspection of the overall multivariate test showed the main effects of location, role, and the resultant interaction to be significant (role: $F = 2.36$; $df = 18,123$; $p < .01$; location: $F = 314$; $df = 18,123$; $p < .01$; and role x location: $F = 3.70$; $df = 18,123$; $p < .01$).

The univariate tests for the effect of role indicated that the teachers perceived the projected environments to be more satisfying and dynamic, and, but possessing less variety, stimulation, invitingness, sensitivity, and pleasantness than did the teacher assistants. Significant differences were also obtained for the location-effect with individuals from Location II perceiving the settings to show more variety, spaciousness, sensitivity and unpleasantness. The significant interaction (role x location) indicated differential perceptions of settings across the semantic attribute-pairs of social-private, intimate-distant, simple-complex, and like-dislike.

Of the effects associated with setting, only the main effect was significant ($F = 1.91$; $df = 72,486$; $p < .01$). Means by setting and univariate tests of significance of between means differences for the eighteen adjective-pairs are presented in Table 1. Reliable difference in settings were obtained for four semantic differential attribute-pairs difference scores: spacious-constricted, intimate-distant, simple complex and ordered-disordered. A Tukey multiple comparison procedure showed that Settings 1 and 2 were rated significantly more restricted than the other three settings. Setting 5 was considered to be significantly more distant than Setting 4. Also, Settings 1,

2 and 5 were perceived to be more complex than Settings 3 and 4 while Setting 4 was significantly more disordered than Settings 1, 2 and 5 and Setting 3 more disordered than Setting 1. In general, this procedure suggested the similarity of Settings 1 and 2, and Settings 3, 4 and sometimes 5.

The use of difference-scores in this multivariate analysis also provides the test of the hypothesis that joint and separate attribute-pair differences for a setting and the ideal was zero. Results from the multivariate and the 18 univariate tests indicate that this hypothesis could not be supported. A further test was made for differences between the ideal and the five settings as a multivariate analogue of Dunnett's procedure; the results of this test showed that only three of a possible 90 comparisons could be shown to provide support for the above stated null hypothesis. Again, it must be concluded that the differences between the ideal and each of the settings overall and by attribute-pair were reliable.

DISCUSSION

The significant effect for location showed the respondents in the large meeting room (Location I) to respond that the settings in general were more spacious and had more variety than did the respondents who had to complete the rating tasks in the less than ideal conditions in Location II. A plausible explanation for this finding is that raters in the uncomfortable surroundings and having to use lap-supports to write on projected their lack of comfort to the rating task. Further, the significant univariate results which showed the teacher to differentially rate the settings than the teacher assistants is likely explainable in view of their additional expertise and competence in directing nursery activities. In contrast, there does not seem to be a reasonable explanation which will account for the observed significant univariate interaction effects.

An inspection of the photographs of room arrangements and children's activities in Settings 3, 4 and to some extent 5, show a clustering of furnishings, materials, and children in definable areas. Such areas can be recognized as an art area or dramatic play areas. Further, the children in these same settings appear to be cooperating with one another and helping themselves more, with less direction from teachers. In contrast, the Settings 1 and 2 seem to be distinguishable from the other three settings in terms of singleness of activities shown.

The significant results obtained from the tests of differences between settings provide an answer to the questions posed by the objectives of this study. The significant multivariate result does suggest that respondents can reliably distinguish between different child-care environments while the univariate test results indicated which perceptual elements as measured by the semantic differential attribute-pairs differentiated the sample environments.

Attributes of environmental settings such as intimacy and simplicity provide information to the architect/designer for use in the conceptualization of a desirable child-care setting. The use of the semantic differential to describe contexts such as child-care settings herein may be helpful in developing a model for use in design. Following this type of approach, it is possible to incorporate the qualities perceived as desirable or worthwhile in an already designed environment into the schemes of new environments.

This particular study is considered by the authors to be a first cut, an attempt to see if the approach to measuring environments is viable. The present study was limited by the necessity of using available photographs of child-care settings and subjects who were willing to cooperate. The experimental situation can therefore be considered as providing results obtained from representative samples of subjects and stimuli. It will be necessary to

repeat this study paradigm with a random sample of child-care personnel in order to demonstrate the generalizability of the results. Further, it would seem necessary to validate the importance of dimensions by systematically varying level of attributes in settings; for example, an arrangement of children could be shown in child-care settings with many versus a few different activities, many versus few objects in view, and large space in use or not in use.

Comment on Statistical Analysis Procedures

Previous studies utilizing the semantic differential have used numerous univariate procedures and multivariate procedures to analyze resultant data. The univariate approaches generally use a "t test" or analysis of variance to analyze independent variable differences in semantic differential adjective-pairs (attribute-trait) scale values or a simple summation of adjective pair scale values. The D^2 distance measure of Mahalanobis has been used by many to determine clusters of concepts (see for example, Kerlinger, 1964, pp. 573-576). The present analysis approach seems to be superior to the above two approaches in that it provides a single data analysis procedure which simultaneously provides a determination of the significance independent variable affects test for the repeated presentation of concepts to be tested. While the principal focus of this study in describing the setting was on the individual attribute-pairs, it would have been possible to actually test for the clustering of settings through a multivariate multiple comparison of weighted canonical means.

CONCLUSION

The results described above do support the contention that the semantic differential can be used effectively to differentiate between pre-school

classroom settings. This approach would seem to have promise for providing individuals responsible for designing the physical classroom with standardized measures of perceptual reactions to physical environments. Significant role, location, and role x location effects also indicate that a person's prior experience and the testing environment are associated with responses to the semantic differential.

In conclusion, this exploratory study into the use of the semantic differential does indicate that the architect/designer responsible for designing a classroom can use the semantic differential so as to provide an index of different environments which may be incorporated into a single classroom.

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Table 1. Means for Attribute Pairs by Setting and Control and Results of Univariate Significance Tests Between Settings and Ideal Differences Effect

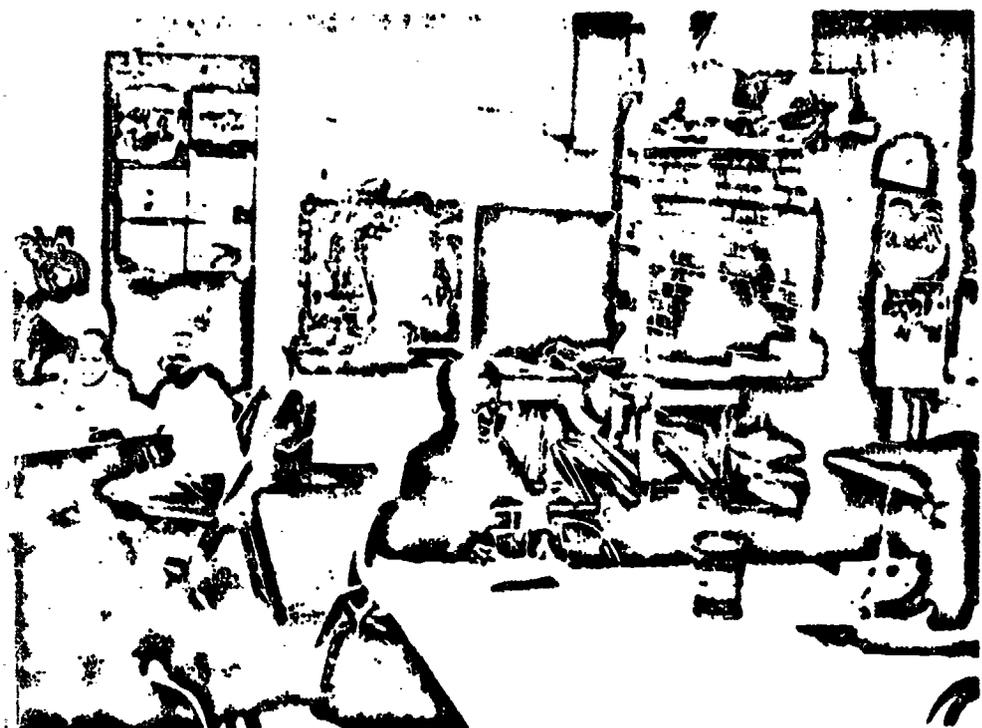
Attribute Pair	Ideal	Setting					Tests of Significance ^a			F (4,112)
		1	2	3	4	5	MS (Setting)	MS (Error)		
1. Happy-Sad	1.13	2.34	2.91	2.41	2.47	2.47	1.66	1.31	1.27	
2. Pleasant-Unpleasant	1.09	2.44	2.31	2.09	2.44	2.53	0.81	1.39	0.58	
3. Novel-Compon	2.44	3.44	3.19	3.00	3.00	2.91	1.32	2.87	0.46	
4. Clear-Ambiguous	1.19	2.88	2.75	2.34	2.56	2.68	1.59	1.69	0.94	
5. Relaxed-Tense	1.16	2.00	2.22	2.75	2.03	2.59	3.92	1.89	2.07	
6. Satisfying-Frustrating	1.25	2.56	2.78	2.41	2.44	2.88	1.74	1.88	0.93	
7. Variety-Monotony	1.09	2.38	2.40	2.34	2.53	2.03	0.53	1.35	0.39	
8. Spacious-Constricted	1.19	3.69	3.44	2.31	2.28	1.75	17.52	1.84	7.54 ^b	
9. Dynamic-Static	1.72	3.22	2.84	3.03	2.78	2.72	0.74	1.42	0.66	
10. Social-Private	1.59	2.69	2.56	2.31	1.97	2.56	2.32	1.70	1.36	
11. Intimate-Distant	1.91	2.41	2.44	2.53	2.38	3.31	5.05	1.82	2.78 ^c	
12. Simple-Complex	1.34	2.34	2.91	2.22	2.06	3.03	5.65	1.95	2.90 ^c	
13. Stimulating-Depressing	1.13	2.90	2.81	2.41	2.59	2.78	1.92	1.46	1.32	
14. Interesting-Boring	1.06	2.69	2.72	2.41	2.56	2.59	0.60	1.56	0.39	
15. Inviting-Uninviting	1.06	2.88	2.88	2.62	2.50	2.75	1.34	1.71	0.79	
16. Sensitive-Insensitive	2.06	2.97	3.00	2.56	2.94	2.66	1.06	2.92	0.36	
17. Ordered-Disordered	1.44	3.59	3.22	2.31	2.06	3.19	13.57	1.87	7.26 ^b	
18. Like-Dislike	1.00	2.88	2.78	2.33	2.50	2.91	2.30	1.76	1.31	

^a Tests of Significance for setting effect based on differences between setting rating & ideal rating.

^b Significant at the .01 level.

^c Significant at the .05 level.





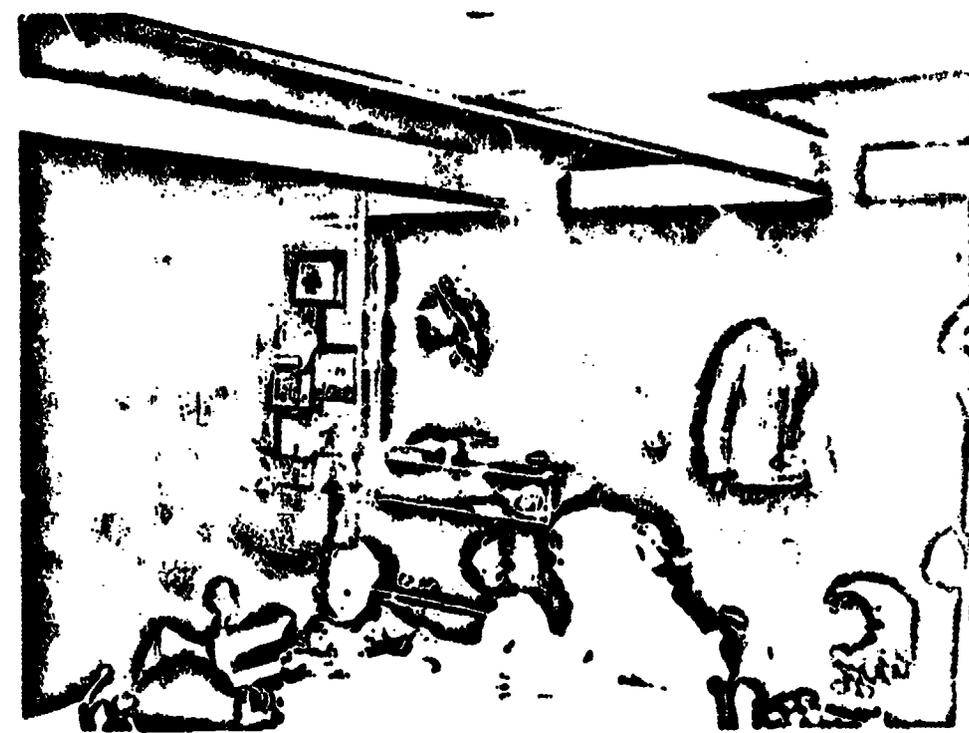
SETTING 1



SETTING 2



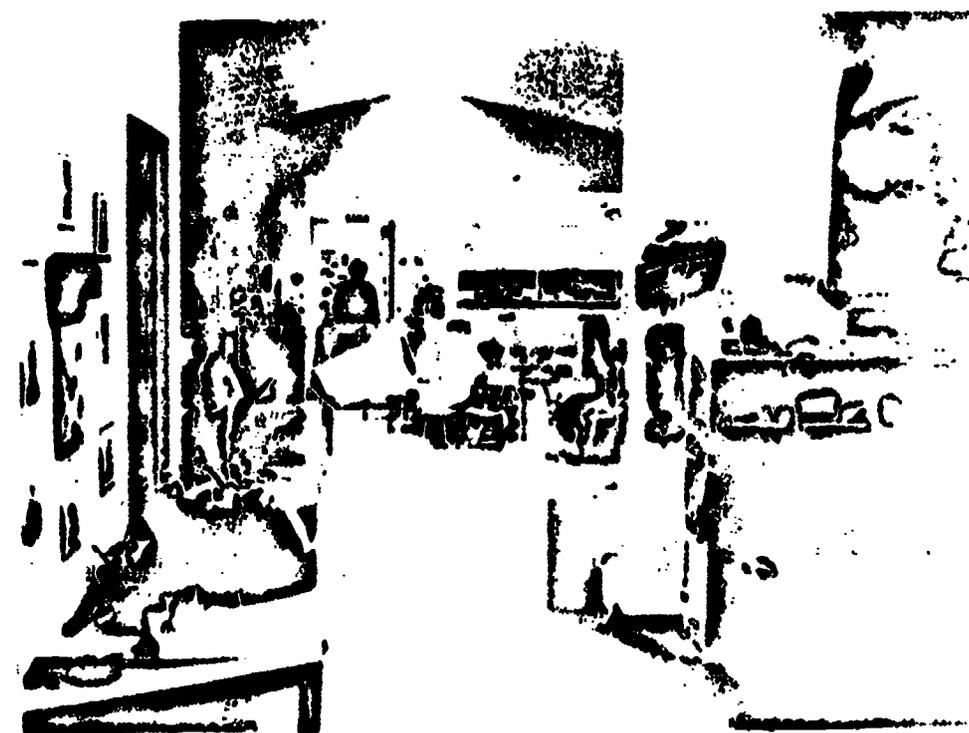
SETTING 3



SETTING 4

FIGURE 1. Black and White Reproductions
Of Projected Child Care
Settings.

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SETTING 5