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EFFECTS OF NOISE ON READING COMPREHENSION

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The increased public interest in vocational education has caused an expansion in the vocational-technical programs in our secondary school systems. To meet the needs of these programs, new and larger facilities are being constructed and equipped with larger and more sophisticated equipment to help facilitate the learning process. With new facilities and equipment, one might expect to discover problems. One such problem is that the environment of the newer facilities is plagued with a level of noise pollution which more closely emulates that of industry rather than that of the traditional classroom.

Noise pollution is of sufficient severity that the United States Department of Labor (1972) outlined a specific set of standards establishing permissible durations of exposure time for different levels of sound intensity. The standards also specified that protection against effects of noise exposure be used when sound levels were found to be excessive.

Vocational education laboratories, old as well as new, have been found to have existing noise levels in excess of federal government standards. Wall and Jessee (1971), studying noise levels in 20 agricultural education laboratories in Virginia, found levels of noise above the permissible standard in nineteen of the 20 shops when shop equipment was running but not in the process of being used. Research by Bear (1969) and Shell (1972) has also documented that vocational agriculture laboratories very frequently operate with sound intensities in excess of the acceptable noise levels established by federal standards. With excessive noise levels having been documented as existing in vocational agriculture laboratories, a need exists to examine the effects of noise on the performance of students enrolled in vocational agriculture courses.

Purpose of the Study

The purpose of this study was to compare the effects of two different noise intensities on the cognitive performance of students.

More specifically, the study attempted to answer the following question: To what extent is the reading comprehension of students affected by increasing the sound intensity in the learning environment?

The following null hypotheses were formulated and tested at an alpha level of .05:

Ho_1: There is no significant difference between group mean scores on reading comprehension at different sound intensities.

Ho_2: There is no significant difference among the replications of the study for group mean scores on reading comprehension at different sound intensities.

Methodology

This study was conducted as a posttest-only control group experiment utilizing a 2 X 2 factorial design with replication in five locations. The design required random assignment of the students to two treatment groups in the six locations to provide for control of the external and internal threats to validity. The design with replication was selected to minimize the chance that differences might be attributed to or blocked by the variance in students by locations rather than to the variables selected for the study.

The population for the study consisted of all students enrolled in plant science classes in vocational agriculture during the 1977-7 school year in the State of Missouri. The study sample consisted of 94 high school students enrolled in plant science courses at six schools which were selected from the 234 schools offering vocational agriculture in Missouri by using a table of random numbers. Randomization by alternate placement from an alphabetized roster was used for assignment of the students to the control and experimental groups.

An instrument consisting of multiple choice items was constructed to measure student reading comprehension. A field test was conducted using the original instrument which consisted of 20 items with two plant science classes involving 25 vocational agriculture students. Data collected from the field test of the instrument were analyzed, with a Kuder-Richardson 20 value of 0.62 being obtained for the instrument.

Content validity of the instrument was established by the use of a committee of experts, with the members being asked to complete the reading assignment and then make a response as to whether or

not each item would measure the ability of students to read the project plan. The content validity was then verified by checking to see if the individual marked the item correctly and had given a positive evaluation for the item.

The instrument was reduced to ten items by interfacing the responses from the expert committee as to the content validity of each item and the item difficulty as statistically measured for the instrument. The instrument was then analyzed, using the responses from the field test, for those items that were chosen to be on the research instrument. The Kuder-Richardson 20 value for the revised instrument was 0.83.

The process of determining the kinds and levels of noise to be used, the methods of noise introduction and measurement, and the means of noise analysis required rather involved field work, consultation with sound experts, and a review of previous research. Methods described by earlier researchers, and considered by them as satisfactory, were also investigated and used as far as was possible. After a search of the literature, a field survey of noise levels present in one school was conducted. In conducting the field survey, noise levels were measured at different points in the vocational agriculture facility. A total of 90 measurements were taken. The noise levels found in the field test school were then compared with the noise levels reported for other schools by previous researchers. From the field work and the data from past research, the minimum and maximum noise levels which might be anticipated to occur within a school environment were determined. The hypothesized levels for the conditions of the present study were chosen as 55 decibels [dB(A)] for the control group and 110 dB(A) for the experimental group.

Once the noise levels had been selected, it was necessary to specify the kind of noise to be used and the method of introducing the noise into the classroom. To provide a basis of comparison with existing research, it was decided to use a naturalistic noise which might be anticipated in the typical agricultural mechanics laboratory. The noise chosen for the experiment was the noise of an operating radial arm saw, void an operator. This particular noise was chosen because the saw is used to a great extent in the instruction of the plant science classes. The method in which the noise was introduced into the study was by making a tape recording of an operating saw and playing it during the experimental study. The recording was amplified to produce a steady intensity of either 55 dB(A) or 110 dB(A) at the center of the working station around which the students were completing the reading task. The noise was produced and amplified by using a cassette tape recorder, a 130 watt amplifier, and two 10-inch speakers. A noise meter was used in setting and monitoring the noise levels.

A pilot study was conducted before collecting the research data. The pilot study involved using 16 students enrolled in a plant science class of vocational agriculture. Minor alterations in procedures and printed materials were made prior to the beginning of the collection of data.

The students involved in the research at each of the six schools were randomly assigned to either a control or experimental group. Once divided into the two groups, the students were administered a reading task which involved answering questions relating to a shop project plan. Group 1, the control group, was administered the reading task in an environment with a noise intensity of 55 dB(A). After Group 1 had completed the assignment, Group II, the experimental group, was administered the same reading task in an environment with a noise intensity of 110 dB(A).

The null hypotheses for the study were analyzed using a two-way analysis of variance. The assumptions of the technique which must be met in order to justify the use of the analysis of variance were satisfied. Two of the three assumptions were satisfied by random selection and assignment of the sample. The Bartlett's test of homogeneity was conducted on the data which documented that the variance of the subgroups was homogeneous. The hypotheses were tested at an alpha level of .05.

Results

Data for analyzing the reading scores consisted of the percentage of correct responses made by each student on the reading test. The reading comprehension mean group scores are presented by replications in Table 1.

Analysis of variance was used to test the significance of differences among the mean scores on reading comprehension as reported in Table 1. The results of the analysis of variance are reported in Table 2. The obtained F value for the experimental study was 34.33, which constituted evidence for rejection. Therefore, hypothesis Ho_1, there is no significant difference between group mean scores on reading comprehension at different sound intensities, was not supported.

Analysis of variance was also used to test the significance of difference among the replications in the study to determine the effects of noise on reading comprehension group mean scores. The obtained F value for the study was 1.44, which was less than the 3.96 required for significance as was reported in Table 2. Therefore, hypothesis Ho_2, there is no significant difference among the replications of the study for group mean scores on reading comprehension at different sound intensities, was supported.

Table 1

SAMPLE SIZE AND MEAN SCORES OF READING COMPREHENSION BY GROUPS

Test Center	Control Group-55dB(A) Mean	N	Experimental Group-110dB(A) Mean	N
School 1	62.50	8	45.00	8
School 2	65.71	7	43.33	6
School 3	60.00	7	34.29	7
School 4	59.00	10	46.67	9
School 5	55.71	7	40.00	8
School 6	74.44	9	47.50	8
Total	62.90	48	42.80	46

Table 2

ANALYSIS OF VARIANCE RESULTS FOR THE DATA INVOLVING THE EFFECTS OF NOISE ON READING COMPREHENSION

Source	SS	dF	MS	F	Critical* Value
Replications (Schools)	1954.97	5	390.00	1.44	2.33
Noise Intensities	9319.49	1	9319.49	34.33*	3.96
Interaction	653.24	5	130.65	0.48	2.33
Within	22259.94	82	271.46		
Total	34187.64	93			

*Alpha = .05