EFFECT OF AIR CONDITIONING UPON ATTENDANCE AND ACHIEVEMENT OF A THIRD GRADE CLASS

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The purpose of this study was to determine what, if any, differences in attendance and achievement occur between two similar classes of third grade students when one classroom was air conditioned and the other was not.

Procedure

The population consisted of two classes of third grade pupils matched according to age, sex and achievement on the California Achievement Tests taken in April, 1960, when the pupils were in the second grade. Initially each class numbered 29 which dropped during the year to 26 in the air conditioned class and 23 in the non-air conditioned class. These final numbers furnished the data in Tables 1 and 2.

Otis Mental Ability Tests, alpha, short form, were given to the classes by their teachers on September 20. Median intelligence quotients were: air conditioned class, 108; non-air conditioned, 103; a difference of five IQ points.

The primary criterion in forming the two classes was their performance on the California Achievement Tests taken in the seventh month of the second grade. The difference between the battery medians of each class was half of a month of grade placement. The CAT battery median of the pupils who formed the air conditioned class was 4.05, the non-air conditioned class was 4.00.

Teachers were selected on the basis of similarity of past performance. In the judgment of supervisors the teachers, both women, showed essentially the same effect on students' achievement for the previous year. However, to compensate for differences between teachers they switched rooms at mid-year. One teacher had taught for eight years, the other for 23. One has an AB degree from Florida State University; the other holds a BCS from the University of Georgia.

The two rooms were on the second floor and west side of a 36-year-old building. The rooms were of standard, box-like dimensions, 22 by 28 feet. Sun screens across the windows of both rooms helped control the glare and heat of the afternoon sun. The rooms were not insulated, but the windows in the air conditioned room were made air tight.

The experimental room was equipped with a five-ton, recirculating Westinghouse package unit with self-contained blower. The air was constantly recirculated within the room. Any other air entering the room would have to come via leaks in the self-contained system. The unit was mounted at the front of the room about nine feet above the floor. Engineers adjusted the machine for a relative humidity of 55 per cent. This setting was not changed during the experiment. Periods during which the unit was used were fall and spring. The contracting engineer suggested a setting of 77 degrees on the wall thermostat. The teachers said that during periods of hot weather they followed the practice of setting the thermostat at 10 degrees below the outside temperature. No record was kept of the daily or hourly operation of the air conditioner.

The two throw-away air filters in the unit were changed only once during the year, in the last week of April, One engineer said that they should be changed every 60 days. Another said that they should be changed, when needed, after visual inspection every six weeks.

Analysis and Results

Findings are reported as tentative. The groups were small and were restricted to the third grade. Methods for obtaining and recording data were crude. No record of outside-inside temperature and humidity was kept. The setting of 55 per cent relative humidity on the unit was not verified regularly during the experiment. Causes for absence were those given by parents and relayed by teachers to the investigator. No regular medical examinations were made at the school of the children involved in the study. And no bacteria or pollen counts were made in the rooms.

A comparison of achievement gains of the two groups shows no significant difference. Table 1 shows that the two groups were approximately equal in the seventh month of the second grade when the California Achievement Tests were taken. About a year later a comparison of medians on the battery of achievement tests taken by the two groups shows the non-air conditioned class to have gained slightly more than the air conditioned class. This difference of .23 of a grade is not large enough to be significant. A technical report on the California tests lists the standard error of measurement equal to .2 to .4 of a grade placement on the reading, arithmetic and total language portions of the battery for sample population of 200 third grade pupils. In fact, the average of standard errors for reading, arithmetic and total languages is .23.

To determine if there were any significant differences between the groups with respect to speed of paper and pencil work the clerical speed and accuracy test of the Differential Aptitude Test battery was given by different administrators on October 26, 1960. Table 1 shows that the dispersion of scores as seen in the standard deviations was wider in the non-air conditioned class and that this class also was faster than the air conditioned class. However, the difference of 2.3 raw score points was not statistically significant.

Table 1

Attendance, Achievement and Attitude Data

Information	AC	Non AC	Diff.
Number	26	23	3
Boys	10	9	1
Girls	16	14	2
Average age (9/7/60)	8.4	8.5	.1
Median IQ (Otis Short Form--9/20/60)	108	103	5
CAT Battery Median 4/27/60 (GP)	4.05	5.00	.05
CAT Battery Median 4/5/61 (GP)	4.65	4.83	.18
Achievement Difference	.60	.83	.23
Days Absent--9/6/60--1/26/61	38.5	77.0	38.5
Contagious Diseases in % of days	75	88	13
Other Causes in % of days	25	12	13
Periods of Absence	26	27	1
Contagious Diseases	23	20	3
Other Causes	3	7	4
Days Absent--1/30/61--6/6/61	100.5	90.0	10.5
Contagious Diseases in % of days	68	67	1
Other Causes	32	33	1
Periods of Absence	23	42	19
Contagious Diseases	18-78%	31-74%	13
Other Causes	5	11	6
DAT Clerical speed and accuracy test--10/26/60			
Mean Raw Scores	34.4	36.7	2.3
Standard Deviation	5.3	6.9	1.6
Spelling Test--5/24/61--Means	34.5	36.2	1.7
Number Dictation and Addition Test	19.2	19.3	.1
Comfort Survey June 5, 1961--% responses to:			
"Next year I hope that I am in a room that is":			
Items 1-7 Cooler	14	28	14
Items 1-7 Just the same	72	34	38
Items 3+7 Quieter	14	34	20
Item 4 Friendlier	8	20	12

Two other pencil and paper tests were given by one test administrator via the school's inter-communications system which was activated for the two rooms at the same time. Purpose of giving the tests was to determine if there were any differences between the two rooms with respect to acoustics that might affect performance of routine school work. Accordingly a simple number dictation and addition test was given over the intercom. The class means were one-tenth of being identical.

A list of 50 spelling words from the Stanford Achievement Series, elementary battery, was read slowly over the intercom system. This time the non-air conditioned class attained an average raw score 1.7 points higher than the air conditioned class. This is not significant.

During the first semester (September 6--January 26) the number of days pupils from the air conditioned room were absent was 38.5. Three-fourths of this lost time was attributed to colds according to parents' notes to the teacher. Vague reasons such as "not feeling well," "sickness," "headache" and "upset stomach" were given to account for the remainder of the time. Six pupils out of the 26, or 23 per cent, accounted for the 75 per cent of time lost from colds.

Over the same period the number of days pupils were absent in the typical room was 77, double the number in the air conditioned room. Contagious diseases, it is believed, were the cause of 88 per cent of the days absent; however, a protracted illness of just one or two children in this small sample can produce a disproportionate amount of illiness for one room. For example, one child in this room was absent 19 days from virus upset stomach during a mild epidemic in early winter.

A comparison of absences in the two rooms during the first semester shows that the periods of absence are approximately equal in number but that the duration of absence is at a ratio of 2:1. This unbalanced ratio may be accounted for by a protracted illness of a small number in the typical room. Further comparisons of absenteeism between air conditioned and non-air conditioned classrooms may show the effect of individual variations upon a group average.

The number of days of absence during the second semester was 100.5 in the air conditioned room and 90 in the non-air conditioned room. A comparison of probable causes of lost time due to contagious diseases or other causes as reported by parents shows no real difference. Information about causes of absence during the last two weeks was not available and is not included.

A comparison of the two rooms with respect to the periods of absence shows almost twice as many in the typical room as in the non-air conditioned room. As can be seen in Table 1 absenteeism from contagious diseases judging by notes from parents are 78 per cent in the air conditioned room and 74 per cent in the typical room.

The two rooms differed with respect to the number of pupils in each class accounting for days absent due to contagious disease. Though the per cent of days absent due to contagious disease were nearly equal between the rooms (68 vs. 67 in Table 1), fewer children fell ill in the air conditioned room. Seventeen pupils or 73 per cent of the typical room accounted for their days of absence due to contagious disease and 13 pupils or 50 per cent of the experimental group accounted for the time lost from contagious disease in the air conditioned room.

An eight-item questionnaire was given to the two classes and to a third-grade class not in the experiment, located in another building at the school. Seven items attempted to elicit desires for a change to a cooler room "next year" or for no change "next year." In each of the seven items pupils were asked to draw a line under "one of the words that tells us the kind of room you'd like to be in next year." Five of the items contained four suggested responses and two had five possible responses. Each item contained "cooler" and "just the same." Additionally, in two items "quieter" was also listed and "friendlier" in another item.

Consistently the pupils in the air conditioned class express a preference for "just the same" next year. Table 1 shows an average of 72 per cent. An average of 34 per cent of the non-air conditioned pupils in the control room wanted the room "just the same." And in the third grade class not in the experiment only 17 per cent wanted their room "just the same" next year.

A similar 2:1 ratio was noted for proportions who wanted their rooms "cooler" next year. In the air conditioned room, 14 per cent wanted it "cooler." In the control class 28 per cent wanted a "cooler" room next year. The proportion in the other third grade was 25 per cent.

The preference of the air conditioned class for things to remain "just the same" appeared in other items.

Table 2

Items that Discriminate between the Groups in Per Cents

Item	AC	C1	C2
Just the same	72	34	17
Cooler	14	28	25
Quieter	14	34	42
Friendlier	08	20	54
Brighter	16	59	77
Prettier	16	31	59

The significance of these differences has not been determined. However, the differences do indicate that the children in the air conditioned room want things kept the way they are and that the children in the other rooms have various degrees of dissatisfaction with various aspects of their environments.

Though the teachers were not polled on their likes or dislikes, they said that they enjoyed working in the air conditioned room. For the first time in years, one did not have her usual winter cold, she reported.

Summary

Over a school year one third-grade classroom was air conditioned. Another containing pupils of similar age, sex and achievement level was not air conditioned. Teachers exchanged rooms at mid-year. Differences between the classes with respect to achievement in reading, arithmetic, language and clerical speed and accuracy were not significant. No significant difference in acoustic level as related to classroom work could be detected.

Tentative findings are that in the first semester the typical room exceeded the experimental room in the amount of absence believed due to contagious disease, but that the number of periods of absence due to contagious disease were approximately equal between the two rooms.

During the second semester the two rooms were approximately equal in the per cent of days absent believed due to contagious disease, but the frequency of absence due to contagious disease was nearly twice as much in the typical room as the air conditioned room. Also fewer children fell ill in the air conditioned room.

Large differences appeared between the two classes with respect to their expressed opinions about their future rooms. Twice as many in the air conditioned room as in the typical room wanted their room to be "just the same next year."