A COOPERATIVE STUDY OF THE ACHIEVEMENT EFFECTS ON THIRD GRADE STUDENTS CAUSED BY LENGTHENING THE SCHOOL DAY

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The purpose of this study is to determine and demonstrate the extent to which third grade students may be expected to gain in academic achievement by lengthening the school day one hour. Lengthening the school day is consonant with many proposals for increasing the amount of knowledge to be conveyed to children. The increased use of school facilities seems reasonable and practical. Instituting the study seemed to offer these benefits to Brevard County:

1. Economies in transportation.
2. Objective evidence of value in establishing the proper length of the school day.
3. Additional time for the teacher's use in meeting individual needs of the students.
4. A probable gain in student achievement at no additional cost.
5. A contribution to knowledge in this area.

Of the possible values which were recognized, the greatest may well be the value of the knowledge obtained. Despite recognition by various educational groups of the need for new knowledge in this area, research to date gives little indication that the answers have been found. Few studies have any objective data to offer in substantiating whatever viewpoint they espouse. A well organized study of the academic differences obtained by lengthening the school day could have important implications for future scheduling of elementary school classes.

Pilot Study

The testable hypothesis established for this study was that there would be "no significant difference in the academic achievement of third grade students who attend school for 6 1/2 hours each day and of third grade students who attend school for 5 1/2 hours daily, when the measures of academic achievement are standardized objective tests."

A pilot study was conducted during the 1960-61 school year to give insights into problems of increasing the length of the school day. This study involved 2,527 Brevard County students. The results suggested that elementary school hours might well be increased.

Several of the Brevard County Elementary Schools were changed to a 6 1/2 hour schedule instead of the usual 5 1/2 hours. No matching of schools was performed nor attempt to control the programs of any faculty. The size of the sample was considered large enough to allow for an assumption of equality between the characteristics of the students attending 6 1/2 hours and those attending 5 1/2 hours.

During the seventh month of school, standardized achievement tests were administered to 2,527 third grade students. The expected score was 3.7. The year before the same test battery administered to 2,300 students produced a median placement of only 3.6. However, 3.6 was the expected placement since the test was administered in the sixth month. Table 1 illustrates comparisons between the 1960 and 1961 medians.

Although the use of the median scores negates to some extent the confidence that can be placed in the above comparisons (since medians are unaffected by the size of the scores at either extreme), the over-all picture produced by results such as indicated in Table 1 was considered conducive to further experimentation under more carefully controlled conditions.

Experimental Population, Design and Procedures

This study was set up to measure the achievement effects of students of operating schools on a 6 1/2 hour day rather than a 5 1/2 hour day. The general assumption was that individual schools would utilize the extra hour in different ways. Therefore, the experimental treatment variable, the only variable specifically controlled or insured of being

Table 1

Comparison of Test Results, 1960 and 1961

Subject	1960		1961	
	Medians	Months Above or Below Expected	Medians	Months Above or Below Expected
Total Achievement	3.6		3.7	
I.Q.	103.1	+3	103.5	+3
Reading	3.7	+1	3.9	+2
Arithmetic	3.5	-1	3.8	+1
Language	3.4	-2	4.2	+5
Spelling	3.6	0	3.9	+2

different in this study, was the number of hours the third grade pupils attended school in the experimental schools.

The subjects for the study were drawn from the total population of third grade students attending four elementary schools in Brevard County. The participating schools were Pineda, Cambridge, Indialantic and Sea Park. Sea Park and Pineda organized their schedules on a 6 1/2 hour day and were considered the experimental population. Indialantic and Cambridge remained on a 5 1/2 hour day and were used as control groups. These four schools were chosen due to their nearness to each other, the similarity of the socio-economic status of the communities and the feasibility of close matching of individual students on the bases of I. Q. and past achievement scores.

A matched group technique was employed as the best method of determining what changes among the sample population could be attributed to the experimental variable. This technique was carefully prepared, within limits controllable by an action research study, to eliminate as much contamination and confusion in the interpretation of results as possible.

Since enough data were available to make an assumption that the matched groups were basically equal at the beginning of the experiment, the "after-only" experimental design was chosen. In the present experiment, the "N" represented the number of matched classes rather than

the number of students. Accordingly, classes not taught by the same teacher, but a total of twenty-two teachers (12 experimental and 10 control) were involved in the controlled and experimental groups. Thus, the total number of teachers served to minimize the possibility of differences appearing due to individual abilities or personalities. This design utilized no test at the beginning of the experimental period. The hypothesis was tested by measuring the achievement effects of the experimental variable (6 1/2 hour day) on the experimental classes and comparing the results with data obtained by administering the same standardized achievement test to the control classes who were limited to the present 5 1/2 hour day. Small group sample nonparametric statistical measures were then applied to the differences obtained in order to determine whether or not the results were due to chance factors.

In setting up this design, the principals of the participating schools decided to refine whatever results were obtained by matching up two pairs of schools as sub-projects of the over-all study. This enabled individual schools to be matched more closely on socio-economic characteristics than was possible in the larger project. This sub-matching paired the Experimental School, Sea Park, with Indialantic as its control, and it further matched Cambridge as the control of the Experimental School, Pineda. These sub-group matchings made possible a certain refinement of the over-all study. The testable hypothesis was still to be accepted or rejected according to comparisons made between the total scores of all experimental and control groups.

Procedures

The methods or procedures followed in administering this experimental design were as follows:

1. At the beginning of the experiment, the principals of the four participating schools met with the Director of Research for Brevard County to plan the selection of the sample, matching procedures, control of variables, and means of evaluating the project.

2. The sample population was divided into two control and two experimental groups by purposive methods using criteria thought to be important for the planned research. Control Group I was paired with Experimental Group I and Control Group II was paired with Experimental Group II

for purposes of individual study between schools. However, both control groups were matched against both experimental groups for over-all study purposes.

3. Control Groups I and II were assigned a 5 1/2 hour schedule (traditional schedule for Brevard County) in which all formal student instruction would take place. At the same time teachers of Experimental Groups I and II were allotted 6 1/2 hours to instruct their pupils. The schedule was to be maintained for seven months or from September to April.

4. All teachers participating in the experiment were allowed to instruct their classes by conventional methods. This means that each teacher or faculty was allowed to teach by his or her normal method or by the method which would have been used if the experimental study had not been performed. Any changes made were free from control or planning by the project as a whole.

5. At the end of the seventh month, the elementary battery of the Stanford Achievement Test was administered to all groups.

6. Sub-study statistical and subjective comparisons were made between Control Group I and Experimental Group I and between Control Group II and Experimental Group II.

7. As the final method of accepting or rejecting the testable hypothesis, the Mann-Whitney U-Test was performed on the results obtained by combining both experimental group scores. This test was designed to give the significance of the difference between the resulting two groups.

8. At the completion of the statistical analysis, conclusions were drawn and recommendations given for utilization of the results of the study.

Test Results and Analysis of Data

Complete achievement test data were obtained on all students in the twenty-two control and experimental groups and only those groups are included in the statistical analysis. Of these sample groups of

students, 12 were in the experimental and 10 in the control groups. With reference to the sub-study analysis, five experimental classes at Pineda Elementary School were matched against five control classes representing Cambridge Elementary. The other sub-study compared seven experimental classes at Sea Park Elementary with five control classes at Indialantic Elementary.

Achievement by Students at Pineda and Cambridge

In order to provide a sound basis for practical inference, the hypothesis of this study, derived from the major study hypothesis, was formulated in the null form. It stated that there would be no significant difference in the academic achievement of third grade students attending Pineda Elementary for 6 1/2 hours each day and of third grade students who attend Cambridge Elementary School for the conventional 5 1/2 hours daily, when the measures of achievement are standardized objective tests. This hypothesis sought to determine if the means of the correct answers for the experimental groups at Pineda were greater than the means of the correct answers for the control groups at Cambridge. All groups used the same test.

The mean scores for the experimental classes were 26, 33, 37, 37, and 46. The control group mean scores were 34, 34, 35, 35, and 44. The Mann-Whitney U-Test was performed utilizing the above-mentioned test scores. This resulted in a U value of 12. Based upon the sample size of both N_1 and N_2 equaling 5, the probability of the differences obtained being significant was found to be 50 in 100. This indicates that there was no significant difference between the achievement of the two groups; therefore, the null hypothesis was not rejected.

Achievement by Students at Sea Park and Indialantic

The hypothesis implied for sub-study comparisons between Sea Park and Indialantic was identical to that stated for Pineda and Cambridge. This hypothesis also sought to determine the significance of the mean differences found between test results of the experimental school, Sea Park, and the control groups at Indialantic. Again all groups used the same test.

Mean scores for the seven experimental groups were 51, 39, 43, 41, 39, 42, and 43. Control group means were 44, 40, 41, 31, and 41.

Again, the Mann-Whitney U-Test was performed and resulted in a U value of 12. In this sub-study N_1 was 5, while N_2 was 7. Based upon this new sample size, the probability of the obtained differences being significant was 78 in 100. This did not meet the required significance level of 5% for rejection of the null hypothesis.

Achievement by All Experimental and Control Groups

The testable hypothesis for the major study of this project, and the one designed to determine the truth of the assumptions concerning the longer school day, stated that "There is no significant difference in the academic achievement of third grade students who attend school for 6 1/2 hours each day and of third grade students who attend school for 5 1/2 hours daily, when the measures of academic achievement are standardized objective tests."

This hypothesis combines all experimental classes into one group and all control classes into one group for the purpose of determining whether or not mean differences found between the achievement of the groups have any significance. As indicated in the two sub-study tests, all groups were administered the same test. Mean scores for the experimental groups were 51, 39, 43, 41, 39, 42, 43, 26, 33, 37, 37, and 46. Control group means were established as 44, 40, 41, 31, 41, 34, 34, 35, 35, 44. The Mann-Whitney U-Test was performed on these results and the complete analysis was as follows:

1	2	3	4	5	6	7	8	9	10	11
26	31	33	34	34	35	35	37	37	39	39
E	C	E	C	C	C	C	E	E	E	E

12	13	14	15	16	17	18	19	20	21	22
40	41	41	41	42	43	43	44	44	46	51
C	C	E	C	E	E	E	C	C	E	E

E-Score (N_2=12)	Rank	C-Score (N_1=10)	Rank
26	1	31	2
33	3	34	4
37	8	34	5
37	9	35	6
39	10	35	7
39	11	40	12
41	14	41	13
42	16	41	15
43	17	44	19
43	18	44	20
46	21		
51	22		
	R_2=150		R_1=103

$$U = N_1N_2 + \frac{N_2\ (N_2 + 1)}{2} - R_2 = (10)\ (12) + \frac{12\ (12 + 1)}{2} - 150$$

$$U = 120 + \frac{156}{2} - 150 = 120 + 78 - 150$$

$$U = 198 - 150$$

$$U = 48$$

$$N_1 = 10$$

$$N_2 = 12$$

$$U = 48$$

The critical value of U for an $N_1 = 10$ and $N_2 = 12$ for significance at the 5% level is 29. That is, if a U-score is obtained that is equal to or less than 29, the null hypothesis can be rejected at the 5% level of significance. However, since this study indicated a U-value of 48, we must accept the testable null hypothesis of no difference between the experimental and control groups.

Summary, Conclusions and Recommendations

Summary

The purpose of this study was to obtain data to test the null hypothesis which was set up regarding the extent to which third grade students may be expected to gain in academic achievement by lengthening the school day one hour. Four Brevard County Elementary Schools (Pineda, Cambridge, Indialantic and Sea Park) were chosen for the experiment. Pineda and Sea Park were chosen as the experimental schools and furnished 12 classes of third grade students. Indialantic and Cambridge furnished 10 classes of students to act as control groups.

The only treatment variable specifically controlled in the study was the number of hours the third grade pupils attended school. All experimental classes met 6 1/2 hours each day while control groups met the conventional 5 1/2 hours. A matched group technique was employed in picking the control and experimental schools. Factors considered were past performances and socio-economic environment. The sample population included classes of students rather than individuals; each class was taught by a different teacher on the assumption that the number of teachers would negate any contamination produced by individual teacher effectiveness.

An "after-only" experimental design was employed that provided no test at the beginning of the experimental period. All groups were administered the same achievement test at the end of the study. A nonparametric statistical test, the Mann-Whitney U-Test, was applied to the mean scores of the achievement test results and revealed that there was no statistically significant difference in the achievement of the experimental and control groups. Thus, the null hypothesis was not rejected.

Conclusions

Although this project was not considered basic research due to the inadequacy of the sampling technique and the lack of control over certain experimental variables, it does appear that the findings of the study indicate strongly that the time factor alone will not produce additional learning on the part of students. It is possible that significant results might be obtained if there were careful reorganization of each teacher's program to coincide with the increased time and if additional

information were presented that could not be included in the 5 1/2 hour day.

Further emphasis should be placed upon the fact that only third grade students were used in the experiment; therefore, the results would not be indicative of any other group of students, particularly students in the secondary schools. The small size of the sample increased the difficulty of obtaining significance. Parametric statics were not employed because not all assumptions required for their use could be met. However, the results do have practical significance for the schools involved and can be made general through adequate replication and evaluation in future action studies.

Recommendations

The writer would recommend continued study of this general problem. Such study should provide a wider sampling both geographically and over grades, more sophisticated techniques, and for the manipulation of such additional experimental variables as organization of school day, teaching method, and amount of information presented.