An Experiment in Small-Group Learning

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MANY FORCES SEEK to dominate education today; however, the calls for accountability, relevance, and individualization seem so basic and practical that they cannot be ignored by a forward-looking profession. Basically, accountability seeks a systematic approach to teaching–learning, thereby indicating the effect of each variable on the totality called "school learning." Relevance calls for instruction that is meaningful and personalized for the learner.

The systems approach to teaching–learning is simply another way of seeking to bring together theory, research, and practice. Anyone who is systematic must use researched material as a basis for instruction or else research, himself, the spectrum of innovations suggested for classroom use. Individualized teaching–learning begins as teachers plan for small groups within the class. Thus, as we strive for the elusive goal of individualization, the need to research small-group patterns within the classroom becomes of prime importance.

In a study of college classes Gnagney (1962) compared groups taught by large-group and small-group modes and found no significant differences in achievement. Amaria et al. (1969) compared the achievement of pupils taught by the small-group mode and by independent study; they reported that the pupils in groups achieved more than those working independently. The achievement gain was more pronounced in the low and average pupil than the child of high ability. Again, we see slightly conflicting reports; however, in both studies pupils in small groups scored as well as or better than students in other modes, based on achievement scores.

The junior-high-school years are especially important for students, because peer acceptance is vital to the young adolescent. Unfortunately, much teaching at this level is achieved through the large-group mode, whereby students often remain alone as passive learners. Hence, one might ask if small-group procedures in the junior high school would lead to increased achievement, more positive student attitudes, and better peer relationships. Our research was designed to answer some of these questions.

Experimental Conditions

To guide this study, the following null hypotheses were constructed:

1. There is no significant difference in attitude toward seventh-grade life science between students who were taught by lecture–discussion (large-group mode) and students receiving instruction via discussion groups (small-group mode) as measured by *A Scale to Measure Attitude toward Any School Subject, Form A* (Remmers 1960) while statistically controlling for (a) pretest attitude scores, (b) IQ, and (c) pretest achievement scores.
2. There is no significant difference in achievement in seventh-grade life science between students who were taught by lecture–discussion (large-group mode) and students receiving instruction via discussion groups (small-group mode) as measured by a teacher-constructed achievement test while statistically controlling for (a) prestudy attitude, (b) IQ, and (c) pretest achievement scores.

The study took place in a large junior high school in St. Louis County, Missouri, which enrolled approximately 1,500 students, mainly middle class, in grades 7–9. The study was completed during the spring semester 1971. Two seventh-grade life-science classes taught by one instructor were randomly selected for the experiment.

The length of time spent studying the unit was three weeks. During the course of the study all classes received similar material; the only variable was the mode of teaching–learning, with the experimental classes in small-group discussions while the control class received the usual large-group lecture–discussion.

In the small-group discussions students were arranged into groups of eight or fewer. Daily, the teacher prepared a series of questions, which the group considered. After the small groups reached consensus, they reported back to the entire class. During the time spent in the small group the in-

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structor circulated throughout the room and was available as a resource person.

The design of the experiment was a pretest-posttest control group with random selection of intact classes (Campbell and Stanley 1963). The data were analyzed by means of computer program ANOVAR/360 to perform an analysis of covariance. Selected as covariates that might bias the posttest were pretreatment attitude, IQ, and prestudy achievement. IQ scores were obtained from the permanent record card of each student and reflect OTIS-group IQ scores as routinely measured within the district at the sixth-grade level.

Statistical Findings

Data concerning the scores on the attitude scale with adjustment for the covariates are presented in table 1. The adjustment of the group for pretest differences in attitude, shown in table 1, *A*, resulted in an adjusted *F* ratio of 2.89, which is not significant at the 0.05 level of confidence. Hypothesis 1a was not rejected. The prestudy attitudinal mean of the experimental class was 5.9; the control, 6.7. The adjusted posttest averages were 5.8 for the experimental students and 6.3 for the control students, which indicates a drop in attitude for each group. However, the greater drop, 0.4 of a point, was found in the control classes, and a drop of only 0.1 of a point occurred in the experimental group.

Table 1, *B*, presents the analysis of covariance data pertaining to the attitudinal criterion for the seventh-grade pupils, using IQ as the covariate. Adjusting poststudy attitude scores for the covariate resulted in an *F* ratio of 5.18, which is statistically significant. Hypothesis 1b was rejected: there was a significant difference in attitude between the groups following adjustment for IQ scores.

The experimental class had a mean IQ of 112.4; the controls averaged 109.9. Thus both classes were near the upper range of what is considered normal IQ (90–110). Adjusting the prestudy attitude scores for IQ resulted in an experimental average of 5.4 and a control mean of 6.7. Thus the control class had a significantly more favorable perception of the course than did the experimentals.

Table 1. Covariance analysis for seventh-grade life-science attitude scores.

Starred (*) values are significant at the 0.05 level of confidence; $F_{1,45} = 4.06$.

Source	*DF*	*MS*	*Adj.* F *ratio*
A. Covariate attitude pretest			
Between groups	1	4.030	2.89
Within groups	45	1.396	
B. Covariate IQ			
Between groups	1	19.960	5.18*
Within groups	45	3.851	
C. Covariate achievement pretest			
Between groups	1	20.004	5.59*
Within groups	45	3.580	

The analysis of covariance data for the subjects, using prestudy achievement as the independent variable, is found in table 1, *C*. Adjustment for the covariate resulted in an *F* ratio of 5.59, which is statistically significant. Hypothesis 1c was rejected: there was a difference in attitude between the two groups after adjusting for prestudy achievement.

The prestudy achievement mean for the experimental class was 35.2; the average for the control pupils, 33.5. Adjusting attitude scores for these means resulted in the experimentals averaging 5.4 and the controls 6.7. Thus, once again, the significant scores favored the control students.

Data concerning the scores on the teacher-constructed achievement test are presented in table 2. The adjustment of the group for pretest attitude resulted in an *F* ratio of 1.29, which is not significant at the 0.05 level of confidence. Hypothesis 2a was accepted: there was little difference between the groups.

Adjusting achievement for pretest attitude resulted in a mean of 70.9 for the experimentals and 65.8 for the controls. Thus the experimental students, on an adjusted basis, outscored the controls, but not to a significant degree.

Table 2, *B*, presents the analysis of covariance data pertaining to the achievement criterion, using the IQ scores as covariate. Adjustment resulted in an *F* ratio of 0.02, which is not significant. Hypothesis 2b, that of no difference between groups, was accepted.

Table 2. Covariance analysis for seventh-grade life-science achievement scores.

None of the values is significant at the 0.05 level of confidence; $F_{1,45} = 4.06$.

Source	*DF*	*MS*	*Adj.* F *ratio*
A. Covariate attitude pretest			
Between groups	1	300.467	1.29
Within groups	45	232.212	
B. Covariate IQ			
Between groups	1	2.586	0.02
Within groups	45	142.956	
C. Covariate preachievement			
Between groups	1	16.269	0.14
Within groups	45	5205.777	

The controls scored 68.1 when their mean was adjusted for IQ, compared with the experimental pupils' average of 68.6. The particular learning accrued by the 48 students involved in this study was not biased by their IQ scores.

The analysis of covariance data for the subjects using pretest achievement as the independent variable is found in table 2, *C*. Adjustment in the posttest resulted in an *F* ratio of 0.14, which is not statistically significant. Hypothesis 2c was not rejected.

Adjusting the experimental class for prestudy knowledge resulted in a mean of 68.9, and the control average was 67.8. Thus the experimental students learned slightly more, but the difference was not large enough to be significant.

Conclusions

The study suggests that seventh-grade students normally taught by the lecture–discussion method preferred the continuance of this mode, judging by the comparison of their attitude with that of students placed in small groups for the first time during the spring of the year. When attitude was controlled for IQ and prestudy achievement, the controls' attitude was significantly higher than that of the experimental students, with significance at the 0.05 level of confidence.

Achievement scores for the two groups were similar; however, the experimental students' mean achievement was higher than that of the control pupils when adjusted for IQ or preachievement or preattitude, or for combinations of these factors.

It appears that the spring of the year is too late to begin using small groups with seventh-grade science pupils. Apparently the students feel secure, at this time, with the lecture–discussion (large-group) mode. However, slight cognitive benefits accrued to the experimental classes; and this suggests that use of the discussion (small-group mode) earlier in the school year might result in more learning.

It should be noted that the average attitude in the experimental class was negative (below 6) toward the course, but the control class exhibited a positive attitude toward science. One might ask whether or not the negative attitude in the brighter experimental group was a result of prior teaching–learning; and one might suggest that the large-group mode used prior to the study was having a deleterious effect on students' affective perceptions of science. Because the experimental attitude dropped less than that of the controls during the study, the unit under consideration apparently lent itself to small-group considerations.

Much further research is needed on small-group learning in the seventh-grade. However, we may conclude that this type of presentation results in slightly improved cognitive learning and in a significantly lessened attitude toward science. The fact that it was the spring of the year before the instructor departed from the large-group mode of presentation suggests that teachers need to vary presentations during the first semester. The experimental students seemed more negative toward the lecture method than the controls, who had a slightly lower IQ; this suggests that teachers must delicately balance the selection of learning mode if they are to improve both cognitive achievement and student attitudes toward science in the seventh-grade.

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Attack on Environmentalists

While it becomes increasingly apparent that the nation faces significant energy problems in the years ahead, it is important that we do not let the environment become the whipping boy for those problems. Environmental considerations are a part of our energy difficulties, but only a part. Other factors include poor planning by both government and industry, oil import quotas, price regulation, gas curtailment, international considerations, and failure to make adequate investments for research in new energy sources and technologies.

Many of us have a very strong impression that there is a well-organized campaign afoot to propagandize the public into believing that our environmental concerns have been overstated and oversold and are the cause of major economic and energy problems. This is hot air—pure and simple. The public should be alert to this campaign and recognize it for what it is: simply an effort to slow down or avoid getting on with the job of cleaning up pollution. It is a fear campaign that seeks to capitalize on the anxieties and uncertainties of the public concerning our energy problems.

From an editorial in
Environment Midwest
(EPA publication)

Substitute for Wolf Fur

Congressman William Whitehurst (R., Va.) protested against a proposed Defense Department contract that would have produced 277,502 parka hoods lined with wolf fur. He was joined by humane and conservation groups in his objections. As a result, Whitehurst was able to announce that Army tests had shown that untreated, undyed, acrylic synthetic fur is an adequate alternative. "The synthetic fur is expected to reduce the cost of each hood by nearly $4, resulting in a savings of $1,100,000 on a contract such as this one," Whitehurst said.