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A Comparison of the Effects of a Team Approach and a Conventional Approach on Achievement in High School Biology

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It is very easy to come by reports in support of almost any new practice in education. Teachers would rather report favorable results and journals would rather print them. It was the many published reports enumerating the advantages of team teaching that first interested us in a team teaching experiment.

At the time we started in 1964, we summarized 141 publications with team teaching in their titles. There are only a limited number of advantages and disadvantages that can be hypothesized for any particular practice. It was not surprising, therefore, to find that recent reports tend to merely reassemble what has been said before, usually with slightly different emphases. Since our study, over 500 titles have been listed under team teaching in the *Education Index*. Most of these are theoretical discussions of pure opinion.

Empirical evidence in support of the presumed benefits of team teaching is very scarce. There are many reports by teachers who have given team teaching a try, and liked it. These usually list more benefits for teachers than for students. Closer examination of the teachers as variables reveals that in all likelihood these same teachers would be equally successful with any method they chose. The variable elements of planning, intelligence, enthusiasm, hard work and a liking for kids make the difference.

We noted a lack of carefully designed and controlled studies and decided to try a team teaching experiment in high school biology. This paper reports the results of our efforts.

The purpose of our experiment was to determine whether team teaching or conventional instruction would produce higher academic achievement, as it is customarily defined. The study involved approximately 800 tenth grade biology students and 17 teachers in six different high schools in the Rochester, New York metropolitan area. It accomplished the basic purpose of the study which was to compare the two teaching methods, under controlled conditions, in several different schools, using a variety of students as subjects.

TEAM TEACHING was defined as an instructional situation structured through the cooperative efforts of two or more teachers, collectively responsible for planning, instructing, testing, grading, scheduling, disciplining and counseling an experimental group or class that would be three times as large as a conventional class in that school and meeting at least 40 times per year as a group, and at least 40 times per year in groups no larger than one-third the size of the total group.

CONVENTIONAL INSTRUCTION was defined as a teaching situation structured through the efforts of a single teacher and dealing with a conventional group or class of students that was normal for that school, or approximately one-third as large as the experimental group.

All teachers were fully certified and on tenure in their respective schools. There were five three-member teams, and one smaller school had a team of two. Except for one team that included a department head, the teams were composed of peers. Team structure was not imposed by the study, but was allowed to develop according to the needs and desires of each team, as they interpreted team teaching in their school. Team leaders were not designated nor were aides employed.

Achievement in biology was measured by the following:

1. Five locally developed unit tests, administered at the conclusion of study of each unit during the academic year.
2. A standardized state final examination, based on the state syllabus and administered at the end of the year.
3. The Nelson Biology Test, administered nine months after completion of the course.

The five unit tests and a biology pretest were cooperatively developed by the participating teachers and the university research team. The pretest was composed of items selected primarily for their ability to predict scores on the state final examination. The five unit tests were carefully developed to test the cognitive domain with emphasis on knowledge, comprehension, application and the higher order mental processes of analysis, synthesis and evaluation. The unit test topics were selected by consensus as being common to both the state syllabus and local courses of study. The topics were: Plants, Cell Physiology, Genetics, Human Body Systems and Evolution.

The subjects were all tenth grade biology students who in spring counseling sessions had been designated to be enrolled in the college entrance biology course. They were then randomly assigned to the experimental (team) group or to one of the control (conventional) groups. These assignments were impossible to maintain for several reasons, including pupil or parental objections, scheduling problems and counselor opinions regarding optimal pupil placement. These changes precluded a simpler statistical comparison of the two teaching methods.

The following tests were administered at the beginning of each year and were operationally defined as the control variables:

1. *School and College Ability Test*, Form 2A
2. *Sequential Tests of Educational Progress*, Reading Form 2A and Science Form 2A
3. *Biology Pretest*, Form J (Locally Developed)

Each teacher served as his own control, by teaching one control class while serving as a member of a team. To control for lack of random assignment, the data were treated by analysis of covariance. This technique uses information about groups to adjust for differences between them. It was not necessary to control for differences between schools, because data from each school were treated separately. In effect, this study was six simultaneous experiments.

Generalizing from the results of this study one must take into account the following limitations:

1. Only schools in the Rochester, New York, metropolitan area participated, and these schools may reasonably be considered above average in research orientation and in tendency to try out new ideas.
2. Only schools large enough to employ at least two teachers assigned full time to biology instruction were eligible to participate.
3. Only tenth grade pupils studying under the New York State Regents Syllabi participated. This is a college entrance level course.
4. Team leaders were not designated, except from within the teams, and teacher aides were not employed.

In organizing the project operationally, it was decided that the initial year should be devoted to planning and test development; the second year would provide for a trial run of all procedures, including data collection; data for analyses would be collected during the third year; and the actual analyses would be accomplished in the fourth. Monthly meetings of the research team and the cooperating teachers were scheduled throughout the first three years, and summer planning sessions of two weeks each for the individual teams were also scheduled.

Eight high schools were invited to participate, and six of them joined the study. All were of a similar size, except for one smaller school in a suburban district. One was a city school, four were in large suburban districts and one was in a smaller suburban area. One school was in a district with two high schools.

In each school the team was comprised of those teachers assigned exclusively to the teaching of biology. There were five three-member teams and one two-member team. Three of the participating schools had no personnel changes over the life of the project, while one had a single change at the end of the planning year, and two had changes of a single teacher in the final year of the project.

None of the schools had facilities specially designed to accommodate team teaching. All had one or more rooms suitable for meetings of the entire team-taught group. The auditorium, cafeteria, double length classrooms and a specially designed lecture room were employed in various circumstances.

Of 147 analyses of covariance dealing with differences attributable exclusively to experimental and control groups (ignoring differences attributable to sex), only 10 F-ratios were found to be significant beyond the .05 level, and three of the differences favored conventional groups. Thus, slightly less than seven percent of the performed tests were significant—about what might be expected on a chance basis—and less than five percent of the differences were in favor of team taught groups. Aside from any practical considerations, the superiority of one instructional method over the other appears to be impossible to defend on statistical bases.

We had also assumed that achievement of pupils in all schools and in both instructional situations would show improvement over the life of the project. With extra planning time, with teachers criticizing each other, with jobs and topics being assigned to the teacher with greatest competency, with group meetings for teachers from all schools, it seemed reasonable to expect that all teaching would be improved and that this improvement would be reflected in the achievement test scores of the involved pupils. It was distressing to discover that pupils who studied biology in the first year of data collection did better than pupils in the second year, and the advantage was statistically significant for both groups and both sexes.

The results of this study indicate that neither method is superior for producing higher academic achievement as it is customarily defined. Teachers and administrators who wish to employ either method may do so with some evidence that academic achievement will not be lower than if the other method is used. But they will have to defend their selection of teaching method on bases other than that it will produce higher achievement in students.

If neither method is superior academically, then the other advantages of team teaching cannot be overlooked. Opinions of teachers participating in this study confirmed some of the previously reported advantages. It should be noted that these advantages are for *teachers* and not for students.

Practical in-service education occurs in team meetings and planning sessions. The give and take of such sessions was reported to be stimulating and encourages teachers to keep up-to-date in the field. Participating in the team is a practical and successful way to induct new teachers into the school sys-

tem. Marked initial success and very few problems were reported by both the new teachers and their colleagues.

Team structure makes efficient use of teacher talent. In this study only the subject matter competencies of teachers were exploited. Competencies in such roles as lecturer, lab-teacher, test-writer and others were not exploited; in fact, role specialization is inhibited by subject matter specialization.

Pressure of the group stimulates better teacher preparation and was noted especially with reference to the large group presentations. On the negative side, there is tendency for teachers to prepare for the other teachers and to ignore the needs, interests and attention span of the students. A maximum attention span of 30 minutes was observed for lectures.

Audio-visual aids were used more efficiently but not more effectively. Films are easier to obtain and schedule for a single showing in a large group. But teachers are less likely to stop the film for questions or to reshow important portions of it. Film previews may be made by one member of the team while another member has the large group. Transparencies and other aids may be prepared by the teacher not with the larger group.

Team structure permits grouping and regrouping, but it also requires appropriate facilities and administrative assistance. The physical problems associated with changing schedules and shifting room assignments bother both teachers and students.

Recognition of outstanding teachers due to team structure was not observed. A leader developed in each team and was necessary for smooth functioning, but his abilities were not necessarily recognized outside of the team. Teacher recognition and flexible scheduling seem to be more closely related to administrative practice than to team structure and operation.

Flexibility of scheduling, especially with use of the large group, releases time that may be used for planning, curriculum development, counseling, test preparation and other activities, but this time gain is offset by time spent in team sessions devoted to scheduling, grouping, planning sequences, teacher assignments and in-service help to beginning teachers.

Considering data made available by this investigation, it is not possible to support any claim that team teaching is superior to conventional classroom methods of instruction as an organizational pattern. It may be more useful or gratifying to the teachers involved (though even this could not be supported by data); but, whatever the benefits, they are not reflected in measurable student achievement, as this study viewed it.

As a method of staff utilization, team teaching may have, in given situations, certain practical advantages relating to planning, curriculum development, scheduling, the best use of facilities and the in-service training of teachers. These may or may not be of benefit to students.