

GROUP DYNAMICS IN SCIENCE TEACHING - IS IT EFFECTIVE?

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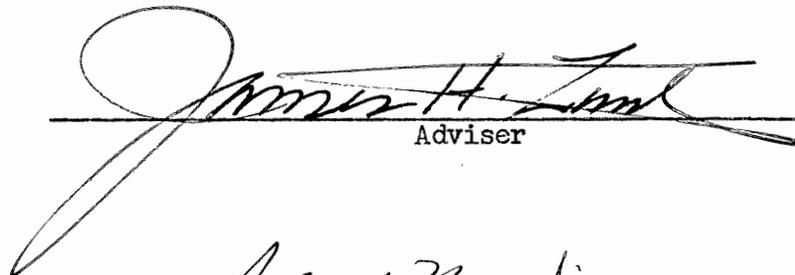
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I

INTRODUCTION

Ever since man began to teach man, he has been seeking for better ways to put his teaching over. He has invented and discarded, invented anew, and thus has gone through a process of weeding out the bad and retaining the good down through the centuries. As society changed in its folkways and mores, teaching tactics changed, even though the changes have consistently lagged behind. Thus, what was considered good teaching a hundred or two hundred years ago is frowned upon by many today as a completely misdirected approach, while many educators still cling to the "tried and proven" methods of the Aristotelians and Euclidean. As a result of the impact of what has been called "progressive education" by some, "experience teaching" by others, and "democratic group interaction" by others, just to mention a few, a terrific uproar has arisen as a result of the conflict between the advocates of this modern approach, and those who wish to adhere to so-called "authoritarian" lines. Classroom teachers have been caught in the middle of this confusion, wishing to do all within their powers to promote the best type of teaching, yet not knowing just how or where to turn. Therefore, while the educational philosophers parry with words over how our children should be taught, those who do the actual teaching continue to teach, as a rule, in the way they were taught, since that is the only way they know how to teach, and therefore is the easiest.

It is the teacher's duty, however, if he is to be worthy of his profession, to cast aside any personal views which may be based upon prejudice, and to explore the different theories that have been advanced and the experiments that have been performed with the thought in mind that if any of his techniques can be improved by another method, he will incorporate it into his teaching regardless of personal sentiment or comfort involved.

He needs to remove his attention from the multiplicity of details that might be averting his attention from the long range goal, and try to visualize what the final result of his teaching should be, trying then to teach so that that result may be achieved. Teaching techniques should therefore be evaluated in terms of the final results.

It is with this thought in mind, then, that the writer, as a teacher himself, wishes to take a critical look at one of the various later teaching techniques - that of group dynamics. This method will be explored, not as the method, but as a method, and, it is hoped, with a completely open mind. The intention will not be to try to sell or condemn group dynamics, even though the writer's attitude will doubtless be discerned, but to look at it as a teacher who is interested in improving his teaching. Some of the views of recognized educators, both pro and con, will be presented along with the results of experiments performed in connection with the subject, including the science field, and then the reader can draw his own conclusions as to the desirability of using group dynamics in his science teaching. No attempt will be made to give an exhaustive survey in a report of this nature. This report is by no means technical or authoritative. The principal aim will be to stimulate the reader of this report to do some

independent thinking of his own as regards his own teaching methods and to bring out the fact that teachers have a part in education as a dynamic, changing process, and will be the final judges of any new teaching techniques. If these thoughts can be impressed upon the reader, then the objective of this report will have been achieved.

II

THE DEVELOPMENT OF GROUP DYNAMICS

Historically, the term "group dynamics" was introduced by the late Kurt Lewin. Lewin felt that there were certain "structural properties of groups which could be analyzed objectively and measured accurately". Actually it is an outgrowth of Gestalt psychology.

The concept of instructor-versus student centered teaching is not a new one, although each time the controversy over the two has appeared in print it has taken a different name. During the middle '20's, largely under Dewey's influence, the problem was investigated by those who were concerned with what came to be called "progressive education". Since this movement arose largely as a revolt, it took some time for its principles to be succinctly stated. In time, however, it became clear that progressive education was concerned primarily with the way individuals met and solved problems, with the habits they developed in adjusting to their environment, and with the implications of these for democratic living.

The controversy finally ramified into "lecture method" versus "discussion method". The discussion method was felt to be more appropriate for a democratic society, since the proponents of this method believed that it encouraged reflective deliberation of problems. It was also believed that experiences in discussion were experiences in reflective thinking that could be observed and appraised in such a way as to stimulate growth. Therefore, in an era when educators held that it was more

important to teach students how to think, rather than what to think, the discussion method was thought to be superior.

Later the titles were changed to "instructor centered" versus "student centered" teaching. The controversy, however, remained the same, the instructor method still being more interested in course related material while the student centered approach remained primarily concerned with the development of the individual and emotional needs.

Later, Lewin introduced the concept of "interdependence of needs". The term "group dynamics" crept into the picture about this time. Other methods of defining group discussion techniques have been advanced by different educators. For example, the student centered instruction advocated by Cantor involves an active challenging of the students' positions. Here the instructor is an intellectual sparring partner. In the so-called Rogerian method the instructor plays a less active, less directive role.

Dr. Vaud Travis, Chairman of the Department of Education at Northeastern State College at Tahlequah, Oklahoma, has made intensive studies of the history and applications of group dynamics. He states in a letter to the author:

Perhaps one of the things that gave impetus (to the use of group dynamics) was the group therapy carried on by the Armed Services during World War II. When leaders of the world began formulating the United Nations Organizations, it became evident that some science studying the forces that were involved when two or more involved individuals were engaged in a common endeavor was necessary. This has resulted in a number of people giving much time and thought to this problem. Considerable experimentation has resulted.

Dr. Travis began a serious study of group dynamics in 1946-47. At that time, he states, there were practically no published materials dealing directly with the subject. In 1951 he was asked to prepare a bibliography concerning group dynamics and found more than 400 books and periodicals dealing with the subject. This is an indication of the interest that has been taken in group dynamics in the past few years.

III

SOME OPPOSING VIEWS

Group dynamics has been attacked severely from many quarters. One has but to pick up almost any educational publication to see that quite a furor exists and seems to be presently at fever pitch. Robert Gunderson¹ states that:

Despite the fact that so-called dynamicists are assiduously engaged in doing things together, it is not entirely clear whatever they do.... The loose, if not indefinable, terminology of dynamics suggests the story of the American student who begged a German psychologist to translate the term Gestalt (from which group dynamics sprang) into English. Despairingly the professor exclaimed, "My heavens, sir, I can't even translate it into German."

Livingston Welch² states that the present behavior of the Gestalt psychologists "leads one to believe, no matter how untrue, that the Gestalt psychologists are more interested in maintaining a cult than in seeking psychological truths." Charles E. Spearman³ observed, "From these and other considerations there seems no escape from the conclusion that there is something somewhere rotten in the state of Gestalt psychology."

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1. Robert Gunderson, "This Group Dynamics Furor", School and Society, Vol. 74, Aug. 18, '51, pp. 97-100.
 2. Livingston Welch, "An Integration of Some Fundamental Principles of Modern Behaviorism and Gestalt Psychology", The Journal of General Psychology, Vol. 39, Oct. '48, p. 176.
 3. Charles E. Spearman, "The Confusion That is Gestalt Psychology", The American Journal of Psychology, Vol. 50, July, '49, p. 378.

An experiment by Morton Deutsch⁴ involving group dynamics has received much criticism. Deutsch set up ten sections of introductory psychology at Massachusetts Institute of Technology, using fifty students. Five sections were "oriented cooperatively and five were oriented competitively." Four observers were assigned to categorize student class participation, evaluating many different factors. Deutsch concluded:

It seems evident...that greater group...productivity will result when... members...are cooperative rather than competitive. The intercommunication of ideas...appear to be disrupted when members see themselves... competing for mutually exclusive goals. Further, there is some indication that competition produces greater personal insecurity...than does cooperation.

Gunderson⁵, in commenting on the experiment states that "it must be admitted that (Mr. Deutsch's) evidence is hardly more objective than the evaluations of his four observers - and, sadly enough, critical observers can be very subjective indeed."

H. J. Eysenck⁶ states:

Quite often the authors' data contradict their conclusions... The authors...as well as other Gestaltist writers who came before them, have failed to bring forward any objective evidence whatsoever...in favor of these allegedly "organismic" principles and their superiority.

Opponents of group dynamics conclude that: (1) group dynamics is based upon theoretical assumptions which are open to serious challenge; (2) much of the experimental work in group dynamics suffers from subjectivity, inadequately defined terminology, and the use of unprecise measuring instruments; and (3) the application of group dynamics to non-

4. Morton Deutsch, "The Effects of Cooperation and Competition Upon Group Process", Human Relations, Vol. 2, July, '49, pp. 199-231.

5. Gunderson, p. 98.

6. H. J. Eysenck, "Critical Reviews of Recent Books", The Journal of General Psychology, Vol. 41, July, '49, pp. 139-40.

laboratory situations has, in Gunderson's words, "produced weird manifestations, if not downright quackery."

So it goes. Hundreds of references can be found very readily in which criticisms are made of the group dynamics method, just as hundreds can be found which will exalt the method. These few references will serve, however, to demonstrate that group dynamicists have a long, thorny road ahead of them in convincing educators that group dynamics can profitably supplant the traditional teaching method. However, as was demonstrated in the previous section, and as will be demonstrated later in this report, those who go along with the idea of the dynamicist that psychologists in the past have been too engrossed in rat psychology and not sufficiently concerned with the psychology of people are continually increasing, though group dynamics still has not gained a great deal of a foothold in secondary schools and colleges across the country.

IV

WHAT IS GROUP DYNAMICS?

"Group dynamics is a pseudo science, or by some called a science that is concerned with action research into the laws and dynamics of the behavior of human groups." This statement by Derieux¹ seems to be a good definition with which to start a discussion of the nature of group dynamics. Historically group dynamics is based on the premise that we who live in a democracy should learn how a democracy operates by living and learning in a democratic atmosphere. It is opposed to the traditional method of teaching in that authoritarianism is replaced by democratic procedure. Group dynamics is a splinter from the Gestalt psychology that asserts that the student learns as an organismic entity, as opposed to faculty learning; that the dominant factor in his learning is his environment rather than an inherited I.Q. and personality; that learning is growth and development motivated by felt needs rather than obtaining information; that the philosophy should be that of living life at its best so that growth may continue as long as life as opposed to the philosophy that school is concerned with the preparation for adult living. Traditionally, the teacher has mastered enough subject matter to meet the needs of the pupils. Group dynamics places her on her own ingenuity since it involves pupil choice of problems, subject, of course, to

1. Janie Gilreath Derieux, "Principles of Group Dynamics", Journal of Teacher Education, Vol. 2, March '51, pp. 23-27.

teacher guidance. This entails teacher-pupil planning in a democratic atmosphere. By this type of planning the pupil feels that he has some say in what he will study, as indeed he does. Group dynamics proponents believe that a student will learn better when permitted to study in his chosen field insofar as is possible. Some principles of group dynamics, as outlined by Derieux² are:

(1) A group, in addition to being a collection of individuals, is an organic unity with a structure of its own, which has fundamental characteristics and trends regardless of occasional deviations.

(2) An individual and the group to which he belongs have similar characteristics and are mutually interdependent.

(3) Through social measurement the structure of a group of persons, as well as its opinions, attitudes and interpersonal relations, may be determined and expressed in quantitative terms.

(4) By practice in a variety of roles better patterns of behavior are experienced and eventually integrated into the spontaneous roles taken in real life situations.

(5) Democratic leadership is an art and a skill that may be acquired.

(6) Democratic leadership arises from the group and is responsible to the group.

(7) Democratic leadership is open to any member of the group who has a contribution to make and skills to offer.

(8) In a democratic group every member has the potential power as well as the obligation to make a contribution to the work of the group.

(9) It is through total participation that the maturity of a group may be achieved.

2. Ibid., p. 25

(10) Communication is a vehicle that conveys concepts, not mere verbalisms, through a variety of media.

(11) The attitudes and behavior of individuals and of groups of individuals may be changed by a slow, continuous process.

(12) It is knowing that one belongs where one wants to belong that brings security, stimulation, and success.

(13) It is through the give-and-take of association with others that the zest for living and learning takes place.

Group dynamics measures the pupil's structure and the structure of a group and attempts to put him in the right group. It points out the skills needed to maintain his status in the group. It encourages participation. It teaches the art and skills of leadership.

Threading through every sentence that has been written is the overall idea that group dynamics has as its goal, not the learning of subject matter alone, but subject matter plus learning how to be a good citizen in a democratic society. It helps the student feel that he "belongs". By rubbing elbows with the crowd, by the give and take of associational living, by communicating his ideas to others, by speaking out when things are not going satisfactorily, all show the student how to rise up and be a leader when his abilities and talents meet the needs of the moment.

Ben S. Morris³ says:

In spite of the status accorded (to education) in words, there is indeed little enthusiasm for it, either among children or adults. What is learned in school is rapidly forgotten - in many cases this is perhaps just as well - and no enduring attitude to life remains as a substitute for forgotten knowledge. Everywhere there is a feeling that "education" is an alien culture imposed from above, which has little, if any, relation to the needs of the people and the problems of life.

3. Ben S. Morris, "Education and Human Relations", Sociometry, Vol. 3, (1947), pp. 44-45.

It is this that group dynamics seeks to overcome. The more meaningful we make our studies, the more will be learned. Our children are not to be apathetic; they are to participate. They are to be leaders to the full measure of their abilities. This may be their heritage if we as teachers learn to apply the right principles.

V

RECENT RESEARCH IN GROUP DYNAMICS

General Research Outside The Physical Science Field

In recent years, a great amount of research has been done concerning the effectiveness of different teaching techniques. Comparisons have been made between all and conclusions have been drawn by many. The conclusions, naturally, have not been the same. Of the work that has been done, the writer has been concerned only with that comparing the group dynamics method with traditional (a very loose term) practices. Out of the mass of information available the following facts have been weeded. The first experiments reported are general, covering many subjects in the educational field. They give the opinions of those researchers concerned as to the overall effectiveness of group dynamics. Later in the section, results of experiments conducted in the science field will be outlined. At the end of the section the results of questionnaires that were sent out by the writer to science teachers across the country will be given. The results of these questionnaires, by no means conclusive, will, it is hoped, give an indication of the extent that group dynamics has permeated science teaching.

McKeachie¹, states that:

We...teachers...too often...look upon the classroom as a place in

1. Wilbert J. McKeachie, "Anxiety in the College Classroom", Journal of Educational Research, Vol. 55, Oct. '51, pp. 153-60.

which a teacher utilizes the laws of learning to present material for students to absorb. . . . We become concerned about the personal characteristics of the teacher, neglecting the role he plays in the classroom and his interpersonal relationships with his students.

He then suggests that anxiety is one of the factors which may influence classroom performance since, as he states:

The student who looks toward the front of the classroom sees personified in his instructor the grades which will determine whether he can remain in school, enter graduate school, or obtain a good position upon graduation. It seems reasonable to suppose that he enters the classroom with some anxiety, for grades represent a major gateway in his path toward his major vocational and social goals. In this situation the instructor is the gate keeper. He can determine whether or not the student passes.

In this connection an experiment was performed by McKeachie and Guetzkow in order to compare three methods of teaching. The experiment was carried out in a general college psychology course in which the students met in large sections once a week and in small sections of thirty to thirty-five twice a week. The small sections were under eight graduate students, each of whom taught three sections, using each method in one section for one term.

The discussion method was used first. The instructor acted as chairman, summarizer, stimulator, and informant. Maximum student participation in discussing rather broad questions was encouraged. Once a month an essay test was given.

The second method was called the "studytorial". In this class the instructor disseminated books containing additional readings in the general areas being studied. While students were given the same assignment sheet as students in other sections, they were encouraged to proceed at their own speed. They utilized the class periods reading from outside sources which the instructor brought in or in consulting the instructor. In these consultations the instructor attempted not simply to solve the students' problems, but to help him see how he could solve them for him-

self. Four-week, mid-term, and final examinations were given the students in the lecture sections, but no tests were given in the small sections, although two written reports on subjects of interest to the individual were required.

The third method, or "recitation method", consisted of the instructor giving a brief lecture summarizing the main points of the assignment. He also might present a demonstration. However, most of the period was spent in asking specific questions and grading the responses. Once a week a quiz was given.

It might be thought that the discussion method would be less popular than the recitation method, since the instructor was placed in a less authoritarian role and required him to frustrate the students' dependency needs. The study-torial method also put each student on his own. In the recitation method, the student could not let assignments slide as he might in a discussion or study-torial session due to periodic quizzes and examinations.

At the beginning of the semester students were given brief descriptions of the three methods and asked to rate them in order of preference. At that time the recitation and discussion methods were approximately equally preferred with study-torial less preferred, but by the end of the semester, recitation was the preferred method.

On a 120 item multiple choice final examination the mean scores were in the same order as the preferences with students in the recitation sections scoring significantly higher than those in the tutorial sections. The mean scores for the recitation group lay between the scores for the other two methods.

This experiment indicates that the student who is worried about a

grade in the course resists any effort to deter him from his accustomed goal. He has a strong need to achieve and he thinks of reading assignments and passing tests as achievement. Maier has shown that a frustrated person is not an effective problem solver. One of the principal contentions of group dynamicists is that authoritarian type teaching tends to frustrate students and develop anxiety as a result of the atmosphere in which they study.

In an experiment by Bovard², students were met in small sections for all three class meetings each week. Two methods were tried. First, the class was emphasized as a group. Questions were referred from one student to another by the instructor. Decisions were made by the class as to assignments, tests, and the system of grading to be used. Even class parties were arranged. At first the instructor provided structure and support, but as rapidly as possible the class was weaned from its dependence on the instructor and encouraged to function democratically.

The second method followed the traditional question-answer technique. Questions were asked by both students and teacher. Students were given very little chance for any interaction.

Periodic checks were made in both classes as to the progress being made toward goals. In the group dynamics classes, one member of the class would often evaluate the discussion and point out progress in working together as a group.

Since many psychologists suggest that the insecure person does not want to depart from usual behavior patterns, and does not want to stand

2. Everett Bovard, "The Development of Outcome Measures of Teaching Procedures Leading to Group Cohesion", Ph.D. Dissertation, Univ. of Mich., 1949.

alone, it was expected that a student in a traditional class would maintain a close relationship between his own attitudes and his perception of group norms.

In the group dynamics class the students could express themselves freely without fear of punishment. Even deviant suggestions were accepted by the teacher and the group. At the end of the semester correlation between members' attitudes and perceived group norms were significantly lower in the group dynamics class than in the traditional class.

As to learning, on final exam scores there was no significant difference between students in the two types of classes.

The film "Feeling of Rejection" was shown to each class and class discussions were recorded, the teacher taking no part. Two clinical psychologists, Dr. Hutt and Dr. Miller, evaluated the discussions. Neither of them knew anything of the nature of the classes involved. In evaluating the group dynamics class the following observation was made by Dr. Hutt:

This group is sensitive to the expression of feelings, types of mechanisms used to deal with conflicts and the varied and interrelated aspects of behavior of the heroine. Most of all I'd like to comment on the marked degree of interaction and spontaneity of the group.

The other psychologist, Dr. Miller, said: "Better insight. Discussed realistic, not abstract, words. This group seemed to be less frightened by the film and could take it more seriously and less defensively than the other."

Of the traditional class, Dr. Hutt said: "This group is insecure, aggressive, and formalistic. Little insight is shown by (most) members into the underlying dynamics. Major concern is with descriptive symptom, elucidation and non-sociological considerations."

These two classes had the same assignments, the same tests, had even

covered the same topics in class, but a different type of learning seems to have resulted.

An excellent report is given by Robbins³ of an experiment with college classes consisting of graduate students and college juniors and seniors, all in the same course. Although this report is somewhat lengthy, I feel that it will be worth reporting rather fully.

The aim of the experiment was to discover what impact three kinds of social climates would have on a college class as a whole and on individuals in the class. The three climates were (1) democratic, (2) laissez faire, and (3) autocratic. A list of characteristics of each were drawn up as a guide for promoting each type of social atmosphere. The aspects of each are given briefly here.

Democratic: (1) Aims decided by group. Alternatives suggested, advice given, not dictated, by teacher. (2) Students choose own work partners freely. (3) Teacher remained a participant in discussion. (4) Decisions of group always honored. (5) Appointments between students and teacher were many. (6) All papers promptly returned. (7) Ample time given for project presentation, discussion, etc. Teacher participated only as another class member. (8) Students took no tests, but dates when papers were due were clearly set and kept. (9) Project marks carefully tabulated and reported.

Laissez Faire: (1) Aims not clearly defined. (2) No help given to students in organizing or selecting partners. (3) Teacher remained detached from group. (4) No set office hours, appointments put off. (5) Slow or no return of papers. (6) Project presentation not carefully

3. Florence G. Robbins, "The Impact of Social Climates Upon a College Class", School Review, Vol. 60, May, '52, pp. 275-84.

planned. Teacher sat apart in back of room, no comments pro or con. (7) Questions evasively answered or ignored. (8) Tests allowed to "slide", and then taken if wanted outside of class or while members were giving projects. (9) Infrequent reporting of marks to students.

Autocratic: (1) Aims, procedures dictated by teacher. No consideration given to student participation. (2) Teacher insisted on delegating both people and tasks to be done. (3) Teacher detached, defensive, if decisions were questioned. (4) Earlier decisions of groups in democratic phases reversed by teacher. (5) Appointments made at convenience of teacher only. (6) Teacher announced papers would not be returned. No comments, just marks. (7) Teacher gave only sharp, destructive comments on projects, remained aloof. (8) Form and time of tests changed from that chosen by class during democratic phase, and one extra test added at "last moment". (9) Frequent reporting of marks, twice inaccurate, with refusal to check.

Each group started with the "democratic" atmosphere. Three weeks later the first experimental group was shifted sharply to the laissez faire atmosphere, and then, three weeks before the end of the term, was again shifted to an autocratic atmosphere. The second experimental group started with the democratic procedure, but maintained it for five weeks, whereupon it was shifted to the laissez faire climate until the end of the quarter. The third group carried out the democratic atmosphere throughout the quarter. Study materials were held constant for all. The first group contained 35 students, the second group 22, the third group 30.

All three groups started out democratically, determining their procedures and goals themselves. Day after day there were not more than one

or two absences. Students who were absent explained why, though not asked to do so.

There was much movement in the rooms during class with laughter and relaxed interchanges between students. Groups of from three to twelve students collected around the instructor's desk and in discussions of their own at the end of the period. Lively issues, not "vaporous" opinions were discussed during class. Students appeared in the instructor's office frequently. Even indifferent students and antagonistic students thawed out gradually. In the purely democratic atmosphere the relaxed, happy feeling prevailed throughout the term. On the appraisal sheet, students were gratifyingly commendatory.

On the day the laissez faire atmosphere started, the teacher came to class just as the bell rang, gave little or no comment, no directions and left with the sound of the bell. By the third day students themselves came to class late and almost no one tried to engage in discussion after class.

The committees which had contained active and able participants now were not enthusiastic and spontaneous, even though they consisted of students, many of whom had been on the earlier ones. The hour dragged; the students yawned; some slouched in their seats. Others read other lessons or caught up on correspondence. The decline was amazing. All became indifferent. Absences became frequent. One committee came to class in so disintegrated a fashion that after twenty minutes it folded and the class filed out silently.

The day of the beginning of the authoritarian atmosphere the teacher walked in quickly, rapped on the desk for order, and rebuked the students for their "noisy and uncouth behavior", recent poor work, and general

attitude. The effect was like a dash of cold water. No one said a word but there were looks of amazement on the students' faces as they sat up straight. Orders were issued concerning a test. Reports of projects were severely criticized. These reports were on the same level as those that before had been rated high.

On the third day the teacher walked in late. There was a subdued, angry hum all over the room. The teacher rapped sharply for attention - a gesture completely unnecessary under the democratic phase. The class came to attention at once. In a committee report a student on the committee who had earlier been indifferent, but who under the democratic climate had become cooperative, now became belligerent and discourteous.

At the close of the hour the students "boiled" out of the room. The instructor, who formerly had come to the front of the room after class remained at the rear.

The mark for the committee was given back early, but one whole step below the actual mark. As the import of the mark sank in, strong emotions were evident in the faces of the committee members. One girl, in sympathy with the wronged students, gasped. Others sat woodenly, as though unbelieving. No one questioned or commented in the classroom that day.

Two days later the students asked that the teacher recheck the marks to make sure they were right. The teacher agreed to check, but failed to report back. Again the subject was brought up and this time the teacher remarked that the tabulator had never been known to make a mistake, and the issue was closed. The intense anger and frustration in their faces and voices were further evidenced by their knocking two chairs against the wall, dropping a book, and banging a door.

By the middle of the second week the entire class atmosphere was

changed. Few students smiled as the teacher arrived; fewer came by to chat; chance encounters were stilted, highly formal exchanges. Committee reports began to lack spontaneity. The earlier security and comfortable feeling of the students were gone. Students became desperate, began to dig deeper to try to satisfy the teacher, but later they said they did not feel that they learned more or would remember more later.

Near the close of the quarter the sections were reminded that a final appraisal sheet was to be turned in anonymously by students. In the class that maintained a democratic atmosphere there was just one paper less than students. In the laissez faire class, only one third were turned in - a nice commentary on laissez faire policies. In the class that finished on an autocratic note it was evident by the congregation of about ten students in the middle of the room, that something was about to happen. Then a member of the class presented a letter from the class, listing ten grievances, including: (1) all papers should be read and returned promptly; (2) time should be provided for testing during class hours; (3) students should be made to feel free to visit the teacher's office; (4) teacher criticism of projects should be both affirmative and negative; (5) democratic procedure should be consistent throughout the course. It was signed, "The Class".

In conclusion, Robbins states that: (1) behavior differences are not entirely due to individual differences, social climate being of paramount importance; (2) a person's relation to the group and his status within it are among the most important factors in his mental and social security; (3) an individual's personal social aspects of living are suggested and delimited, if not determined, by whatever freedom of movement the group affords him, not only in relation to immediate action, but in terms of planning for future action.

Research in the Physical Science Field

The applications of group dynamics to subjects not in the physical or natural science field have been discussed briefly. The questions now arise: Can group dynamics be used in the teaching of general physical science, chemistry, biology, physics, and related sciences? If this is not feasible, is it advantageous, i.e., will more learning take place in a group situation than in a purely lecture-demonstration situation? How would one go about instituting group dynamics? How would progress be measured?

To these and other questions it is hoped that a partial answer may be given. It must be admitted that experiments of this type in the physical science field are not numerous. As has been mentioned before, the results of questionnaires sent out to science teachers across the country with the intentions of finding out the extent to which group dynamics is being used in the classroom insofar as science teaching is concerned, what each teacher thinks of group work, and related questions will be given. The results of experiments which have been conducted in comparing the group and lecture methods will also be given.

John N. Ward¹ conducted an experiment concerning group study versus the lecture-demonstration method in a physical science class. His problem was to compare the relative effectiveness of the two methods of instruction in achieving two objectives of general education: (1) recall

1. J. N. Ward, "Physical Science Instruction for General Education College Students", Journal of Experimental Education, Vol. 24, March '56, pp. 197-210.

and recognition of facts, principles, and symbols, and (2) more understanding of implications of facts and principles of pertinent reading material and of problem situations. Ward states:

Stimulating tendencies are often revealed in ... group studies, and further research seems clearly implied, especially for the student population in general education science course situations, where members of the classroom group commonly lack backgrounds of science or mathematics experience or interest, and are often present in the group only because it is required of them for reasons which they are unprepared to recognize or accept as meaningful. If group methods could stimulate such students to formulate objectives which were meaningful to them, and to plan and pursue pertinent activities, evaluated by themselves in terms of their objectives, then in addition to subject matter, concomitant learnings might well take the direction of scientific behavior toward all evidence and assumptions, including personal and social relationships.

In designing his experiment, Ward utilized randomization, replication, and local control as much as possible. The following null hypotheses were adopted: (1) There is no difference between the subject matter achievements of college students who undergo instruction in physical science for general education by either the lecture-demonstration method or a group method. (2) There is no difference on recall-recognition type test items. (3) There is no difference on more understanding type items.

In Ward's experiment the students were non-science majors enrolled in a general science course as a required part of the basic curriculum. Ward was the only instructor for both methods. In both classes, the same subject matter topics were scheduled in the same sequence through the semester. In the lecture-demonstration method the topics were always treated in class by the instructor only while in the group method the topics were treated by the group of students with the instructor, and only when the whole group decided to do so and selected its areas of treatment within the topic as scheduled for consideration by the instructor. In both classes the same visual aids were presented, with the difference that in the lecture-demonstration method these aids were arbitrarily inserted into the classes by the

instructor according to his opinion as to their appropriate values, while in the group method they were presented to the classes only if the group decided that they would be valuable. In both classes the same reading assignments were made from the same textbook, with the difference that under the lecture-demonstration method the readings were "required", while under the group method they were "suggested".

The lecture demonstration method was based upon certain assumptions, some being that (1) course objectives were the same for all students, (2) course subject matter should be selected by the instructor, (3) classroom activities should be determined by the instructor in order to motivate and stimulate learning, and (4) evaluation of each individual student's achievement in the course was the responsibility of the instructor, and should be made on the basis of scores attained on valid and reliable measuring instruments. In other words, the instructor was the active subject, the students passive listeners. Student attendance was required at all class meetings, which began with a review of key points of the required assignment, including terms and symbols, following with explanations, demonstrations, etc. The instructor continually attempted to express to the students his own attitudes concerning potential values to them of the material he has selected.

The assumptions of the group method were that: (1) objectives should be developed by the whole group during the course, as both products of, and stimuli to, learning, (2) subject matter for study during the course should be selected by the instructor as an expert for consideration by the whole group, (3) classroom activities, with relative emphases on subject matters, should be decided by the whole group in order to motivate and stimulate learnings, and (4) evaluation of each individual student's achievement should be made by the student himself, in order to render his own developed

objectives, his emphasized studies, and his resulting learnings most meaningful to him. Thus in this method the responsibilities and opportunities for the development of objectives, subject matter emphases, classroom activities, and evaluation of achievement became those of every member of the class group. The instructor continually attempted to stimulate student opinions of their reactions to the course material and method with emphasis on precision and clarity in verbalizations. He also continually attempted to express his recognition of and respect for their individual differences in backgrounds, interests and abilities. He maximized student opportunities and responsibilities for generating their own criteria for value judgments and meaningfulness, and their own activities for satisfying those criteria, while minimizing student opportunities to satisfy passively any criteria arbitrarily imposed on him alone.

After analyzing the results obtained, Ward concluded:

Since the group method resulted in longer retained more understanding type of learning, and also in greater expression of individual differences in such learning on the part of the upper sub-group of the students ... the group method should be employed when it is desired to produce greater expression of individual differences or more understanding type of learning of subject matter among the most capable students.

Since the lecture-demonstration method resulted in greater expression of individual differences in longer-retained, more-understanding type of learning on the part of the lower sub-group of students,... the lecture-demonstration method should be employed when it is desired to produce greater expression of individual differences on more-understanding type of learning of subject matter among the least capable students.

Since the lecture-demonstration method resulted in greater expression of individual differences in longer retained recall-recognition type of learning on the part of the lower three quarters of the students, therefore the lecture demonstration method should be employed when it is desired to produce greater expression of individual differences in recall-recognition type of learning of subject matter among the less capable students, both methods being of equal value for achieving such objectives in the case of the most capable students.

In connection with experiments performed in group dynamics, note will be taken of one performed by the writer in a class in general science.

No conclusive results can be offered by any means, since by any standards for conducting experiments this "experiment" would hardly qualify as such. The experiment was undertaken in order to observe some effects of using group dynamics, not for any record, but merely out of personal interest. The observations are, it is believed, worth reporting, since they are first hand.

A sophomore class of 42 students in general science, which up to that time had been taught in the traditional method, was divided, sociometrically, into six groups. Each group was given the opportunity to study in any one of the twelve units in the textbook, not being particularly confined to the text. In addition, each group was assigned a project dealing with any area of science that it would like to work on.

At first, teacher guidance was very much in demand. Since this was the first contact the pupils had had with this type of study, no one knew where to start or how to proceed. However, after the teacher discussed the objectives with each group and group leaders were chosen, the work began to flow a little more smoothly. Projects were chosen and for the first time during the years students could be observed going to the library in search of material and writing letters to other sources for information. Oddly enough, in very few instances in which the instructor dropped in on a group did he find them off the subject.

One group decided to study the effects of vitamin deficient foods on rats. By the very next day one of the boys of the group had made cages, the rats had been bought, and information was being sought that would help out in the project. Similarly, the other groups chose projects and began to work on them. These included making a rough model of the solar system, a terrestrial telescope from a kit, a model farm wired for

"electricity", and a portable weather forecasting unit.

Let it be said that some of the projects proved to be too difficult for some of the groups and were not finished. Others were finished. But whether they were finished or not, the groups were given their first sustained contact with group interaction in the classroom.

Since the school required letter grades to be given, each group would report to the class when it had finished a unit of work. Tests were given only on those points brought out in which the complete class was in attendance. After the report was given the teacher would add any remarks that he felt were necessary, with a question and answer period following in which the reporting group and the teacher answered questions. This class meeting was held on an average of once a week.

At the end of the experiment the students were asked their opinions regarding the effectiveness of group dynamics. They were almost unanimous in their choice of group dynamics over the traditional method of teaching.

There were, of course, faults to be found. One group in particular was composed mainly of those who had done very little in traditional class work. They continued to play off. Those who were in the group that desired to work requested, and were granted, transfers.

There are no statistics comparing the learning of subject matter in the two types of teaching, but it is felt that much value came from the experiment in the form of increased sense of responsibility, creativeness, planning, and learning to work together, in addition to the science learned.

In order to determine to what extent group dynamics is being used in science teaching, seventy questionnaires, which, it is to be admitted, is a small sample, were sent out to high school teachers across the nation,

each being chosen at random. An even smaller return was received. However, since the objective was not to prove anything, but to gather information, the results of the questions will be given.

Of the 30 questionnaires returned, seventeen of the teachers of biology, math, chemistry, physics, and general science reported that they used the group dynamics method either along with lecture or exclusively. Methods of choosing the groups included sociometric grouping, placement by I.Q., group vote, teacher appointment, and alphabetical placement.

In answer to question four in the questionnaire, "What do you consider the major weaknesses of the method you are now using insofar as developing an interest in science and putting it over are concerned?", teachers using group dynamics methods listed poor leadership in groups, loafing by some, and lack of equipment for demonstrations.

Those using the lecture type of teaching listed as weaknesses lack of interest, poorly prepared lesson plans, monotony, being tied to the text, too little time for demonstrations, and the passive role played by the students.

In answer to question five, "Are your students permitted to substitute their own experiments other than the ones listed in the lab manual or textbook, when applicable?", eight of the seventeen using the group dynamics method replied "yes".

Nine of these teachers report that the groups do not study the same area simultaneously, but are permitted great variation in the areas.

One of the problems in teaching by group dynamics is that one concerning the feeling of inadequacy prevalent among students when first subjected to group work. Since it is a new experience for them, they are usually at a loss as to how and where to start, and how to proceed, once started. This is the time that a resourceful teacher is needed.

I. What science do you teach?

<u>Course</u>	<u>Jr. High</u>	<u>Fr.-Soph</u>	<u>Jr.-Sr.</u>	<u>Approximate No.Stu./class</u>
1.				
2.				
3.				
4.				
5.				
6.				

II. In general, do you use the lecture method, group dynamics, or both in your instruction, other than in laboratory experiments.

III. Did you ever try any other teaching technique, other than the one you are now using? If so what type?

IV. What do you consider the major weaknesses of the method you are now using, so far as developing an interest in science, and putting it over are concerned? Of the ones you formerly used?

V. Are your students permitted to substitute their own experiments other than the ones listed in the lab. manual or text book, when applicable? Are all experiments performed under direct teacher supervision?

VI. If you use the group dynamics method:

A. On what basis are the groups determined (sociometric grouping, intelligence quotient, etc.)?

B. How are the group leaders chosen?

C. How much freedom are the students allowed in choosing their areas of study.

D. Do the groups all study the same area simultaneously?

E. How do you overcome the feeling of inadequacy usually prevalent (Where do we start, and how do we proceed) among groups at first?

F. Do you find quite a lot of uninterest and "playing off" in your groups?

G. How far do you go in guiding the groups in their work; e.g., do you have certain days of the week set aside for the whole class to come together for discussion?

H. Do you have adequate space for group work?

I. What have you found to be good motivation factors in using group dynamics?

J. Compare the group dynamic, dynamic-lecture, and lecture methods (lecture method will include class discussion types) as to which stimulates the most interest, and above all, which causes the student to learn the most science in your classes.

K. What is the overall opinion of your students regarding the benefits of group work?

L. Add any additional comments you care to make concerning science teaching techniques. Any help you can give will be greatly appreciated.

M. What is the address of the school where you teach?

Some methods used in overcoming the situation are, as listed by the teachers: (1) actually doing the work for the students until they become oriented, (2) using an abundance of library materials, (3) holding discussions with one group at a time, (4) giving concise instructions at first and pointing out that all procedures are not the same, and (5) letting the students outline all steps to be taken, with aid from the instructor.

Another problem arising in the use of group dynamics is that one of "playing off" which students have ample opportunity to do if they so desire. In response to the question "Do you find quite a lot of uninterest and 'playing off' in your groups?", responses ranged from "none", and "some, but not a lot", to "no more than is found in other teaching methods". Not one teacher reported this as a major problem.

Methods used in guiding groups in their work varied. However, most of the teachers indicated that days were set aside for the class to come together and hear reports. In some instances the reports were mimeographed for the whole group. In some instances however, only a report of progress is made.

One of the great impediments to group work in many schools is lack of space in which to work. However, less than half of the teachers reported lack of space for group work.

Motivation factors connected with group work were found to be: (1) group reports, (2) feeling of freedom in the group, (3) opportunities for students to study areas of their own choosing, (4) variety; i.e., opportunity to depart from the usual day to day class discussions, (5) abundance of reading material, (6) student experiences, (7) well selected topics, (8) preliminary class planning, and (9) competition between groups.

The teachers were asked to compare the group dynamic, dynamic-lecture, and lecture methods of teaching, as to which stimulates the most interest, and, above all, which causes the student to learn the most science in the science class. The following quotations are some of the answers. "The group method is an excellent learning situation, but only on some units." "No one is best." "Most interest is shown in the group method. More factual knowledge is gained from lecture type teaching." "They learn more by the lecture method." "The lecture method is best suited for our school at this time." "Group work is best. Class discussion is excellent. But a good balance of both is better than either alone."

Other teachers merely circled "dynamic-lecture" as the best method. Another teacher, who is doing a master's thesis on group dynamics, is performing an experiment in his chemistry class, using group dynamics solely. He is reserving his opinion, pending the outcome.

As to which method the students like best, the answer is almost 100% "group dynamics". Students prefer the group work due to reasons listed above, including freedom to work, a relaxed atmosphere, variety, and various other reasons. One teacher says, "They often surprise me with the excellent work they do."

As can be seen there is a sharp division among teachers as to which is best, but the general consensus seems to be, from additional comments received, that the dynamic-lecture type of teaching is best, since it features the advantages of both techniques.

VI

SOME SUGGESTIONS FOR INSTITUTING GROUP DYNAMICS

In case any science teacher reading this report is interested in trying the group dynamic technique, William Zimmerman¹ suggests ways to get started. He states that there is only one way for a person to learn whether he can use group work successfully in his classroom - try it. If he is successful, says Zimmerman, he will discover that through group work he can better provide for the wide range of differences among his pupils. Some tips for initiating group dynamics are as follows:

1. Ask yourself these questions: "Can I picture myself as a resource person, group member, group leader, group moderator, consultant, supervisor, evaluator, observer, helper, counselor? Will I feel comfortable in filling these roles?"
2. Your pupils should understand your role and their roles in the group situation.
3. A period of orientation is necessary for the students, orienting them to what (you think) is going to happen. Let the pupils help plan.
4. Have faith in the youngsters. There may be discipline problems, or those who are going to school only because they have to. Talk with them privately. Win their confidence.
5. Be realistic, but not apologetic about informing your pupils of

1. William A. Zimmerman, "Have You Tried Small Group Work in Your Classes?", The Clearing House, Vol. 31, September, '56, pp. 42-44.

the requirements (state, board of education, etc.) within which you all must operate.

6. Let your principal or department head know what you are trying to do. Keep him informed. Invite him to observe the groups.

7. If another teacher in your school has used group work successfully, share your experience with him. Have him visit the class, and visit his, if invited.

8. Have some sound basis for forming groups. If you plan to use grouping in a skill area use diagnostic test results, or if in a content area, use pupil interests, results of sociometric tests, etc.

9. When grouping in an interest or content area, remember that the class should agree upon methods and standards of work, places to work, materials with which to work, and definitions of group responsibilities.

10. Each group must have a definite place to work.

11. Each pupil should have a responsible job, and understand his job as well as the responsibility.

12. Be prepared to make available to the groups a wide variety and range of instructional materials.

13. Avoid demonstrating that one group is slower or faster than another in skill areas.

14. Make continuous and co-operative evaluation. Have progress reports. Discuss difficulties with group members.

15. If things aren't running too smoothly, don't get discouraged and don't give up. Discuss your situation with your class. Consult your supervisor.

16. Don't think that group work will cure your discipline problems. It might be necessary to deal with certain class members.

17. To keep groups co-ordinated, try using a co-ordinating or steering committee to provide for intercommunication between groups.

18. Records of group progress should be kept. It is advisable to have a group recorder.

19. Your students should know when their job should be done and their report due. There should be an agreement upon deadlines.

20. Be prepared to discuss your group work with colleagues who take an opposing view calmly and objectively.

21. Avoid stereotyping. Maintain flexibility. It might be wise for certain students to change groups.

22. Finally, stop talking about group work and try it!

VII

CONCLUSION

As was stated in the introduction, it will not be the writer's aim to draw a conclusion about such a debatable question as to whether group dynamics is better than other methods of teaching. However, from the information that has been assembled, a few observations can be made.

1. Group dynamics can be used with a large measure of success, according to educators quoted.
2. The best situation, although not the only one, in which to use group dynamics seems to be the one in which the class is made up of higher I.Q. individuals, who can adapt themselves to the situation.
3. The technique of combining group dynamics with lecture-demonstration teaching seems to be the most desirable.
4. In addition to subject matter learning, democratic interaction, which is inherent in a group dynamics situation, is of great value to the pupils in that they are putting democracy into action in working with others. Leadership traits are thus developed in those who have the capacity to be leaders.
5. Interest is usually maintained longer due to the fact that the students are engaged in the work as active participators, not as passive bystanders. In instances in which the students are working in areas of their own choosing, interest is naturally high.
6. There is less anxiety in the group dynamics situation concerning grades.

7. Group dynamics can be used in the science field, especially in courses where intense specialization is not required.

8. As a final observation, it is believed that group dynamics, if used wisely and timely, has its place in the teaching of science and can very profitably supplant in certain cases, or subsidize in others, lecture-demonstration teaching. It must not be accepted as the only way to teach, but as a way to teach, and will, it is believed, pay great dividends if it is given a fair trial.

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