Peer Discussion and Achievement

More than 50 years ago, John Dewey tried to persuade educators to turn classrooms into communities of democratic inquiry. As part of his Pedagogic Creed, he believed that education had failed by its neglecting the ". . . fundamental principle of the school as a form of community life" (Dewey, 1959, p. 23). He explained that we should look upon the learning process as an "experience" shared by student and teacher rather than a didactic situation where the teacher is a dispenser of facts. Interaction was what his "educative experience" was based on. Practical in intent, his principle implied as one of its educational goals the fostering of cooperative activity. Among educators this view has enjoyed a continuing dialectic with the belief that competitive situations are the more educational.

There is growing evidence, however, (Tjosvold, Marino, & Johnson, 1977; Johnson, Johnson, & Anderson, 1978; Johnson, Johnson, & Tauer, 1979; Johnson, Skon, & Johnson, 1980; Skon, Johnson, & Johnson, 1981) that the cooperative learning situation similar to that advocated by John Dewey is educationally superior to competition in the classroom. Based on the above research, it seems that cooperative versus competitive learning situations are more significantly correlated with better cognitive reasoning strategies and higher self-esteem.

Because the most extensive research on this subject has been published by Roger T. Johnson and David W. Johnson from the University of Minnesota, it is difficult to find current research on which their name does not appear. Thus, it is not exactly by choice that this paper presents five articles for discussion published by the same researchers. However, it is hoped that this paper will provide a thorough review of the position held by the major researchers in this field today.

The Johnsons' 1978 study which sampled the responses of 8,183 students from grades 4 to 12 in rural, suburban, and urban school settings in Minnesota has provided convincing data that support the hypothesis that cooperative learning is the better situation educationally. This study only measured attitude yet it serves as rationale for further research involving measures of achievement because of the size of its sample and the consistency with which cooperativeness was related to positive affect. This is important for positive affect has been significantly correlated with achievement.

The Minnesota School Affect Assessment (MSAA) was administered to all subjects to determine degree of cooperative, competitive or individualistic attitude as well as correlative attitudes towards school, teacher, peers, self, etc. As a result of the data collected, it was concluded that "Cooperativeness was consistently related to a broad range of positive attitudes toward school experience at all grade levels" (Johnson et al, p.183).

Of all the attitudes important for student success, intrinsic motivation, feelings of personal worth as a student, and perseverance are three which are most necessary. This study indicated that cooperativeness was significantly correlated with intrinsinc motivation. And competitiveness and individual work were not. However, competitiveness was related to extrinsic motivaiton and an external locus of control. This means that competitiveness is more closely tied to valuing external rewards and influences. This data may be especially important to those who work with adolescents -- an age group most influenced by peer pressure and extrinsic social rewards. Cooperativeness was more significantly related to feelings of personal worth as a student than either competitiveness or individual work. And in every measure of preserverance, cooperativeness was more significantly related than either of the other two.

This was a correlational study only and did not indicate causality among the variables. Johnson et al. cite this and other limitations of the study such as all the school districts were in Minnesota and all were self-selected. The study's significance lies in its sample size and scope of grades involved. It also, as has been noted, provides substantial support for later work which seeks to find a causal relationship between cooperative learning situations and higher quality cognitive strategies.

Thus, in 1979, Johnson, Johnson and Tauer, attempted to determine the effects of three different "Goal structures" --- cooperative, competitive and individualistic -- on student attitudes and achievement. Results from this study showed that cooperative learning promoted significantly higher achievement and consistently higher attitude scores than did the other two goal structures. When Johnson et al. talk of "cooperative goal structure," they mean to indicate a positive correlation that exists between one student's goal and another's goal. In other words, a learning situation in which ". . .when one student achieves his goal, all students with whom he is cooperatively linked achieve their goals" (Johnson et al., p.191). In competitive situations, student goal achievement is negatively correlated. That is, when one student achieves his goal, all others fail to achieve theirs. The structure of individualistic learning goals is one of independence. Student successes are totally unrelated to one another.

Their sample was adequate (n=69) and represented 4th, 5th and 6th grade students from a large urban school. Both attitude and achievement were measured. Student attitudes were measured by the Minnesota School Affect Assessment as was the case in their earlier correlational study. It measured the student's perception of his teacher's attitude towards him, his peer's attitudes toward him and personal self-worth as a student.

Achievement was measured by a teacher-made test which consisted of 15 items of increasing complexity based on material covered during the five classroom sessions. It was administered on an individual basis to all students in all conditions on the 5th day of the experiment. During the classs sessions, the three groups were given the task of learning geometry, a previously unknown subject for all students. The same material was presented to all 3 groups each day, and each of the three teachers taught the same class every day. The only difference in the presentation was the goal structure. The cooperative group worked on a problem as a community. Subjects were told that it was necessary for every child to understand the problems. As a way of checking, one student was randomly

selected each day to solve the problem. Praise was offered to the group as a whole for correctly solved problems. The competitive group worked daily for 1st, 2nd, and 3rd places and the teacher praised only the winners. Those who worked individually, proceeded at their own pace and were praised for each completed problem. Since there were 3 teachers, it could be said that the classes were subject to different teacher influences thus contaminating the data. However, the figures show very little variance among the three conditions as regards teacher attitude towards students. Apparently all three teachers were perceived as similarly caring

The most significant data collected by this study was on achievement. While the data clearly showed a higher correlation between cooperation and positive affect than between either of the other two goal structures, the greatest support for cooperative situations came from the figures on achievement. And while a student in the cooperative group might perceive himself as having .18 more worth as a student than a student in the competitive group, when achievement was measured, there were greater discrepancies among the three goal sturctures. That is, the difference in achievement between cooperation and competition was 4.50. The difference between cooperation and individual work was 5.29.

Since the achievement test was taken individually, it might have been hypothesized that the individual group would be biased towards the final test because they had been most familiar with individual work on the problems. But this was clearly not the case. They still had the lowest achievement scores. And even though the cooperative group had no experience in individually solving the problems, their scores reflected higher achievement than did either of the other two groups. Thus, it seems that the cooperative learning situation fostered significantly higher achievement than did either the competitive or individual work group.

As if spurred on by these findings, two subsequent studies, Johnson, Skon and Johnson (1980) and Skon, Johnson and Johnson (1981), measured the effects of the three goal structures on problem solving abilities and the acquisition of cognitive reasoning strategies. Both studies measured adequate samples (1980, n=45) and (1981, n=86). But since the two samples are so similar, it would be possible to generalize their findings to the combined n=131 which increases the significance of the data.

Both studied samples of first grade students who had been designated as either high, medium, or low ability and all groups contained an equal distribution of ability levels. Both samples were from middle to low income groups, and similar instruments were used to measure cognitive abilites. All subjects were given the same three goal structures as were given in the 1979 study.

It is not known why such a young sample (+–6 yrs.) was used to measure some cognitive abilities which, according to many theorists, are not likely to be evident until much later in development (+–11 yrs.). However, some of the problems to be solved were very concrete in nature such as learning the concept of triangle. Two of the more difficult tasks were categorizing super- and sub-ordinate classes of things and structuring math operations from verbal informaiton. But, it is also possible to view the use of first graders in such a study as a way to control for maturational differences. Since, according to stage theory, none of these subjects are likely to be on the verge of qualitatively leaping into formal operational thought, any achievement in these abilities could not be accounted for by maturational readiness.

Thus, based on their and others' (Deutsch, 1949; Laughlin, 1973; Davis, Laughlin, & Komorita, 1976; Slavin, 1977) past research, it was hypothesized that cooperation among students versus competition or individual work would promote higher achievement in problem-solving abilities (Johnson et al., 1980). Students were asked to perform three problem-solving tasks:

1. Spatial reasoning measured by the Rasmussen Triangle; Task; color all possible triangles (18) in a diagram with repeating triangle designs.

2. Math reasoning; task: structure math operations from verbal material.

3. Categorization; task: categorize and retrieve information.

The results of the test clearly indicated that the cooperative learning situation promoted significantly higher achievement on all three measurements than did competition.

This research was also undertaken to determine possible influences on any problem-solving success of the cooperative group. The three suspected influences on successful work included: use of higher quality strategies; low and medium ability students benefiting from interaction with high ability students, and increased incentive due to peer support and encouragment.

The first suspected influence was confirmed by the scores on the tests. The cooperative group's scores were significantly higher than the scores of the other two groups. They did use superior cognitive strategies in deriving their answers. The second suspected influence was not confirmed. The high ability students in the cooperative groups consistently scored higher than other high ability students in the other two groups. It seems likely that the researchers are correct in perceiving this to mean that group interaction provided some kind of "new insights" into the most effective problem-solving strategies for the high ability students.

This and other studies (e.g., Laughlin, 1973) served as rationale for Skon, Johnson and Johnson's 1981 study which hypothesized that cooperation among students promotes better reasoning strategies. Based on successful past data, the researchers reasoned that:

> One explanation for the superiority of cooperation is that the academic discussion within cooperative learning groups promotes the discovery of higher quality reasoning strategies (Skon et al., 1981, pp. 83-84).

Their hypothesis was confirmed by the data. The cooperative group scored higher than the other two on six out of eight measures for the three tasks. The tasks were similar to those used in the 1980 study. And as in the 1980 study, all students participated in afternoon training sessions for the tasks and were tested the following morning on same.

The math-story problems and the categorization and retrieval tasks were identical in kind to the earlier study. The new measurement here was a test for understanding metaphor by measuring paraphrasing ability and quality of explanation of meaning. (e.g., The leaves danced in the wind. Could you say this another way and can you explain what it means?) This type of reasoning skill is usually designated as a higher level or more formal operation. And since, the math problems and categorization problems were also considered to be the more difficult tasks for this age group, the data gathered from this research could be especially significant -- not only in support of cooperative learning but also in light of the popularity of stage theory (Piaget, 1963) which has held that cognitive reasoning abilities develop naturally and cannot be "produced" by educational stimulation.

However, the data clearly shows that the cooperative goup performed the tasks significantly better than either of the other two. The data also seems to indicate that children as young as six can display some types of cognitive reasoning strategies which had previously been thought to emerge much later in cognitive development. Based on this study, the researchers concluded that discussion with one's peers and not the ability of the members of the group promotes higher cognitive reasoning.

The 1980 study concluded that cooperative groups seems to achieve more because they use higher cognitive strategies in solving problems. The 1981 study sought to determine why. That is, "Why do the students in cooperative groups display higher cognitive reasoning skills than those in competition with one another?" The answer seems to lie in the dynamics of cooperative peer "discussion."

Skon et al. explains that " . . . peer exchange within cooperative learning groups promoted the acquisition of the intersectional classification skills needed to paraphrase and explain metaphors . . ." (p. 90). This task was probably one of the more difficult tasks for this age group and can compare favorably with the type of higher reasoning skills that are associated with formally structured thinking. Thus, it seems that the peer discussion format is one variable which seems to be causally linked to the acquisition of higher reasoning strategies among elementary school children.

Research (Tjosvold, Marion, & Johnson, 1977) which explored student attitude toward methodology, was hoping to find that student attitudes were more positive towards the interaction induced by inquiry teaching than towards the didactic approach. Again they worked with 4th and 5th graders. The sample was adequate (n=80) and represented students from a small town environment. Two goal structures, cooperative and competitive and two types of teaching situations, inquiry and didactic were tested. Three student-teaching situations, inquiry and didactic were tested. Three student-teachers from the University of Pennsylvania taught either the inquiry or the didactic classes. There were 16 groups. Each had an hour's lesson in which inquiry or didactic teaching was used. Then the students were given a questionnaire which asked the students to rate on a 3-point scale: 1) the teaching method, 2) the teacher, and 3) amount of perceived peer support. While the data did support the hypothesis that the cooperative group would rate the inquiry method higher than they rated the didactic method, the support was not overwhelmingly in favor of the inquiry method.

These findings are supported by the 1980 study as well, which measured problem-solving strategies and also measured attitude toward methodology. After testing for problem-solving ability, the subjects were asked how much they liked the way they worked. There were no significant differences among the responses of the three groups. Apparently, they had all liked their own situations equally well. Achievement was not measured, however. The non-preference of the inquiry method over the didactic teaching can be explained in various ways:

1) The students were not exposed to both situations and then asked to compare. Had this been done the results may have been different.
2) The didactic groups were exposed to new and interesting material. Had they been taught a tired old curriculum in this manner, the results may have been less favorable for the didactic situation (Tjosvold et al., 1977)
3) Student-teachers of the didactic groups, knowing they would be rated by the students, unconsciously were more supportive than they would have been otherwise.
4) The ambiguity of the inquiry situation produces anxiety in students who need to have a right and wrong answer. (Tjosvold et al., 1977)
5) The teachers who used the inquiry method were not skilled enough at it to make it "work" in the classroom. Teaching using this method demands far more skill than does the other.

The interaction which occurs during a didactic session (teacher-student; student-student) is vey limited. However, both types of interaction increase greatly in an "inquiry" situation for the teacher is trained to promote the student's verbal interaction in discovering new ideas and concepts. Still, the focus of this method is one of teacher-guided inquiry and is not the same as pure peer discussion with the teacher as passive onlooker as was the case in the later studies. This was the type of interaction which promoted achievement. Thus, the type of interaction promoted by the inquiry method is not the same qualitatively as the interaction promoted by peer discussion. Also, competition can arise in the inquiry situation but the cooperative goal structures tested by Johnson and Johnson were carefully controlled for any competition whatsoever. Thus, we can see how the Tjosvold et al. data might still support the idea of peer discussion as the optimal educational situation while indicating that the students displayed no appreciable difference in attifutde towards the didactic and inquiry methods of teaching.

The inquiry method was probably what John Dewey had in mind as a cooperative learning situation. And, it is probably superior to didactic teaching as regards achievement. But this remains to be seen. It would seem a natural comparison to make and at this juncture a comparison of didactic teaching, inquiry teaching, and cooperative peer discussion with regards achievement in reasoning strategies might be indicated. If the

inquiry method proves better than didactic it might be because it approximates in some way the peer discussion situation in that it promotes more interaction among students. For, it is the interaction among peers through cooperactive discussion without teacher direction that seems to hold the most promsie for fostering higher achievement among elementary school children. Perhaps the inquiry method could be seen as a better facilitator of peer discussion than didactic teaching. Perhaps all three situations need to occur in an "educative" environment, but based on this research it seems clear that the goal of classroom instruction (at least some of the time) should be the fostering of cooperative peer discussion in problem-solving situations.

This research lends support to the position that cognitive development can be accelerated educationally. The cooperative groups out-performed the individuals working alone on almost all tasks. Thus, if cooperation had not been introduced to the students, and all worked on these problems as individuals as is the norm in elementary schools today, data collected on their performance would indeed indicate that first grade students are not "ready" to do reasoning problems. But the scores of the cooperative groups deny this is so. Earlier work done by Jerome Bruner, 1960, and Burton White, 1972, (in Clarizio, 1981) proponents of educationally accelerating cognitive development, is supported by this research.

Both first grade groups were performing tasks normally thought to be reserved for older children (Piaget, 1963). And, while a proponent of produced readiness, Bruner had also confirmed the "Piagetian timetable" by his theory that the "form of presentation" must "fit" the student's level of development (in Clarizio et al., 1981). Perhaps Bruner's acceptance of Piagetian stages can be understood as a function of the "best" form of presentation having not yet been discovered. Bruner and Piaget were observing reasoning behavior in children who had not been given the opportunity to interact in cooperative peer discussion groups. Perhaps this is the "form of presentation" that is needed.

Also, in an environment that leaves the child to develop in a non-artifically stimulated way, e.g., an homogenous agrarian society, perhaps development would seem uniform among children; that is "synchronous" (Flavell, 1981, p.2) or stage-like, among different children residing in the same locale. Flavell, (1981) meanders between a stand for the homogeneity of children's thought and the opposite stand for age-group heterogeneity. For, researchers are seeing reasoning tasks being performed by children at younger ages. It makes them doubt the validity of stage theory. But children in this country today are constantly bombarded by different amounts and kinds of external stimulation; some of which is educative and some of which is not. In today's world if we see any homogeneity of thought among age-groups it might be due to the strong natural disposition to develop "co-currently" as was suspected by Piaget (Flavell, p. 2).

Thus, it might be said that any heterogeneity or non-stage-like mental behaviors evidenced through current research is a result of the stimulation of our technological society. Some children have been better stimulated than others; hence, heterogeneity. Children still may go through definite stages but perhaps the development of the higher stages can be optimally stimulated to serve the child at younger ages. This supports accelerated development and stage theory alike.

These data might also explain the connection Flavell (1979) sees between metacognitive thought and achievement and positive affect. Metacognitive thought, or the ability to self-monitor thought, allows one to choose. It allows choice of the better alternative thought or action. Metacognition allows us to view choice clearly. Perhaps, peer group discussion facilitates metacognition better because the other's viewpoint is readily available through discussion and immediate feedback ("I agree with. . .", etc.) on one's own perspective is also immediately available in discussion format.

It seems that when it came to "explaining" the metaphor, the high ability cooperative group had the highest score and the individual medium ability group had the lowest. The connection between achievement and language facility is one which both Margaret Donaldson (1979) and Vygotsky (1962) make, and is supported by this data. It should be noted that the low ability students seem to have been adversely affected by the cooperative discussion format. This could reflect a self-esteem problem and would hold implications for the classroom teacher if further data supports this tendency.

Much new research refutes classic Piagetian stage theory which looks askance at the idea of 'artifically' developing cognition. Piaget called this idea the "American Question' (see Elkind, 1975, p. 543) and held, it seems, that the idea of "hurrying" the process was something we 'should' not do as much as 'could' not do. Equilibrium and balance are integral to his thought and it shows here in his bias towards natural readiness. Whether his theories are proven right or wrong, it might be wise to heed, in general, Piaget's disparaging the idea of hurrying cognitive development. Can we be sure that an immature emotional set is capable of working in a balanced way with the greater awareness that earlier cognitive and metacognitive development will produce? Flavell (1979) cities possible maladaptive outcomes if metacognitive "monitoring" is used "non-selectively" (p. 910). This might occur more often among children or those who have not yet emotionally matured. Research journals are filled with studies on the deleterious effects of pushing children too hard, too soon.

The effects of peer discussion have yet to be fully explored. It is encouraging to see data support a hypothesis shared by many educators and scientists. But, it is more encouraging to see data support a really new concept in "teaching method", for education has yet to discover the optimal learning situation. Cooperative peer discussion could be it.

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REFERENCES

Clarizo, F., Craig, R., & Mehrens, W. (1981) *Contemporary Issues in Educational Psychology*. Boston Allyn and Bacon, Inc.

Davis, J., Laughlin, P., & Kormorita, S. (1976) The social psychology of small groups: cooperative and mixed motive interaction. In M. Rosenzweig & L. Porter (eds.) *Annual Review of Psychology*. Palo Alto, Calif.

Deutsch, M.A. (1949) A theory of cooperation and competition. *Human Relations*, 2, 129-152.

Dewey, J. (1959) *Dewey Education*. New York: Teachers College Press.

Donaldson, M. (1979) *Children's minds*. New York: Norton & Co.

Elkind, D. (1975) Perceptual development in children. *American Scientist*, 63, 533-541.

Flavell, J. (1979) Metacognition and cognitive monitoring. *American Psychologist*, 34, 906-911.

Flavell, J. (1981) On cognitive development. *Child Development*. 5, 1-10.

Johnson, D., Johnson, R., & Andersin, D. (1978) Student cooperative, competitive, and individualistic attitudes and attitudes toward schooling. *Journal of Psychology* 100, 183-189.

Johnson, R., Johnson, D., & Tauer, M. (1979) The effects of cooperative, competitive, and individualistic goal structures on students' attitudes and achievements. *Journal of Psychology*, 102, 191-198.

Johnson, D., Skon, L., & Johnson, R. (1980) Effects of cooperative, competitive, and individualistic conditions on children's problem-solving performance. *American Educational Research Journal*, 1, 83-93.

Laughlin, P. (1973) Selection strategies in concept attainment. In R. Solso (Ed.) *Contemporary issues in cognitive psychology*. Washington, D.C.: Winston/Wiley.

Piaget, J. (1963) *The origins of intelligence in children*. New York, W. W. Norton.

Skon, L. Johnson, D., & Johnson, R. (1981) Cooperative peer interaction versus individual competition and individualistic efforts: effects on the acquisition of cognitive reasoning strategies. *Journal of Educational Psychology*, 3, 83-92.

Slavin, R. (1977) Classroom reward structure: an analytical and practical review. *Review of Educational Research*, 4, 633-650.

Tjosvold, D., Marino, P., & Johnson, D. (1977) The effects of cooperation and competition on student reactions to inquiry and didactic science teaching. *Journal of Research in Science Teaching*, 14, 4, 281-288.

Vygotsky, L. (1962) *Thought and language*. Cambridge M.I.T. Press.