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ABSTRACT

The author reviews the research conducted on dyadic interaction and its role in the development of creative thinking and problem solving. Earlier research has shown that children at a certain stage prefer to work alone rather than with other children. However, empirical data have shown on the whole that dyadic interactions result in better performance on creativity tests and other similar measures. There seems to be an egocentricism present in a child which gradually disappears, partially or fully, as the child grows older. Age studies have shown this transition period to be around six years old. Creative abilities and problem solving abilities are shown to increase when mild degrees of stresses are introduced in a situation. The author points out that dyadic interaction does not always function. In one study, dyads showed considerably less group cohesiveness on ego-involving problems. (PS)

DYADIC INTERACTION IN CREATIVE THINKING AND PROBLEM SOLVING

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The role of dyadic interaction and problem solving has never been treated more than superficially. Historically, its importance has been shrouded by a preoccupation of the personal mystery approach to creative achievement and more recently by arguments concerning the relative superiority of group versus individual creative thinking and problem solving.

Glimpses of dyadic creativity appear in at least three ways in the history of creative achievement: (1) in the experiences of famous dyads such as Wilbur and Orville Wright, Marie and Pierre Curie, Charles and William Mayo, William and Karl Menninger, Richard Rogers and Oscar Hammerstein; (2) in the highly creative individuals who interacted dyadically with a series of different persons -- like Thomas Edison, Benjamin Franklin, Sigmund Freud, and Michelangelo; and (3) great teachers who through dyadic interaction triggered in several of their students ideas that resulted in breakthroughs and discoveries -- teachers like Sigmund Freud, Sir Frederick Banting, and Kurt Levin. The dyadic encounters out of which creative achievements have been born seem to have been of two types. One involves conflict and the other, harmony. In dyadic conflict, the new idea comes as a resolution between two opposing ideas or sets of ideas. The conflicting ideas have imperfections and confrontation between their proponents triggers an idea closer to the "truth" than either of the conflicting ideas. The other type of dyadic creativity has been described aptly by Henry A. Murray (1964) as being like "two people singing a duet and making up the music as they go along" (p. 639).

Today, some of our most promising educational ideas require dyadic creativity for their successful operation. Yet their widespread implementation seems to be limited by this very lack of skill in dyadic creativity. I would include among these ideas such practices as team teaching (teacher-teacher dyads), individualized teaching (teacher-pupil dyads), and peer teaching (pupil-pupil dyads). In some instances, each of these practices has produced brilliant successes, but their replications have not always been successful. My hypothesis is that the failures are in general failures in dyadic creativity.

What Does Educational Research Tell Us?

While we do not have educational research adequate for testing this hypothesis, let us turn briefly to what educational research can tell us about dyadic creativity and problem solving.

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My first awareness of the importance of dyadic creativity struck me back in 1959 and 1960 (Torrance, 1963) when I was doing research with elementary school children in groups of five. In group after group, what usually resulted were two groups of two children with one child left alone. This was especially true in the fourth, fifth, and sixth grades. Although a few pairs emerged in the second and third grades (the youngest level I was studying at that time), most of the children at this level worked alone. By the sixth grade, some groups functioned as groups, but only in schools where considerable practice had been given in group learning activities.

My first experiments in dyadic creativity were outstandingly successful (Torrance, 1970, 1971). In five different classes in introductory educational psychology I replicated the finding that individuals working in dyads are more fluent, flexible, and original in their thinking than are individuals working alone under standard testing conditions. Let me summarize briefly one of these experiments, one designed to test the additional hypotheses that students working in dyads would experience more stimulation and enjoyment than those working alone.

The subjects of this experiment were 100 college juniors and seniors (74 females and 26 males) and were assigned randomly to the experimental and control conditions. In the experimental condition subjects were instructed to sit together and to call out their responses as they wrote them, to hitchhike on one another's responses, but not to repeat one another's responses. In the control condition subjects were administered the test tasks under standard conditions (Torrance, 1966). The Ask-and-Guess Test of the Torrance Tests of Creative Thinking (Form A) was used as a warm-up task and the Product Improvement Test of this same battery was the test task. A set of 10-point rating scales was used to obtain self-ratings of feelings of stimulation, enjoyment, and originality of expression. All measures of creative thinking and all four self-ratings were significantly higher for individuals in the dyads than for their peers under standard conditions.

My attention turned then to the lower end of the educational continuum, the preschool. I was wondering if kindergarten children had emerged enough from their egocentrism to be sparked by one another. Thus, I replicated the basic experiment with a sample of 46 kindergarten children using the Mother Goose Problems Test (Torrance, 1970). All testing was of course done orally with the examiners recording all responses. Here the examiners could observe the extent to which children hitchhiked on one another's ideas. It became obvious that many excellent opportunities for hitchhiking were passed up as a result of obvious egocentric preoccupations, but there were instances in almost every dyad when some hitchhiking occurred. Apparently the sparking of ideas that occurred through this dyadic interaction was sufficient to produce a statistically significant difference in originality.

Although it was obvious that a few of the children obtained en pleasure in working alone with an adult and persisted to unusual leng...s all examiners expressed the impression that in dyads the children had mor fun and were willing to work at the task longer than when working alone. This same impression had been dominant in our earlier experiments with college students. One of my students, Robert D. Towell (1970), using my "What Can It Be?" test with five-year old children in Headstart, tested the persistence hypothesis and replicated my findings on number of responses and originality of responses.

In both my study and Towell's, the children had been approaching their sixth birthday and had been exposed to kindergarten type experiences for six or more months. I wanted to know more about the age limitations of these findings -- at what stage do children emerge enough from egocentrism to permit them to gain satisfaction from working in dyads and to be sparked ideationally by another child. Thus, Roger Peters and I (1972) set up an experiment, using a construction task with children in a day care center. Twenty-six children (5 each at ages 2, 3, 4, and 5 and 6 at age 6) were administered the construction task both singly and in randomly constructed same sex dyads. Dyadic interaction had the overall effect of increasing the number of blocks used but not the amount of time the children spent on the task. Only the six- year olds, however, spent more time in dyads than alone. The 2, 3, 4, and 5 year-olds apparently got greater satisfaction from working alone and being the sole center of attention of an examiner than from dyadic interaction.

Robert M. Brown (1972) replicated the basic study with a few emandations with high school students. One difference in his procedure and mine was that he did not prohibit individuals in dyads from repeating the responses of their partners. Since a time limit was imposed, time was wasted in recording these repeated ideas. Thus, I was not surprised that Brown found no differences in the productions of his experimentals and controls.

Some of the earlier studies of dyadic creativity were conducted by Fred Fiedler (1961, 1962). He developed equations for estimating dyadic creativity from measures of the individual creativity of members of each dyad. He demonstrated that individual creativity is an important determiner of dyadic creativity. He found that attitudinal heterogeneity leads to high group creativity when the dyads are homogeneous in abilities but to low creativity when dyads are heterogeneous in abilities. He explained his findings in terms of stress theory. In other words, heterogeneity in ability creates stress within a dyad and when the additional stress of heterogeneity in attitude is superimposed, the stress becomes too great to be handled constructively and performance remains the same or deteriorates.

Altman and Haythorn (1967) also invoke stress theory to explain dyadic problem solving in a study of the effects of social isolation and group composition. They concluded from a series of careful experiments that mild degrees of stress appear to enhance problem solving performance, whether the stress derives from the situation or from group composition characteristics.

Combining or adding separate sources of stress does not lead to further enhancement of performance but is associated with a leveling off or impairment of problem solving performance. The isolation stress degraded performance of individuals in isolation but enhanced performance in dyads in isolation.

Almost no attention has been given to ways of training dyads for creative thinking and problem solving. In training students and teachers in creative problem solving, I usually use dyads for all skills practice, such as training in the rules of brainstorming. While I have not validated this procedure empirically, I have the distinct impression that it is more effective than it would be individually or in larger groups. This kind of training may be regarded as a mild stressor. The support that one finds in a dyad enables its members to cope more constructively with the demands of the training. Groups of larger size would add other stresses that would absorb energy that might otherwise be used in problem solving.

We do have an experiment on the effect of group cohesiveness and training upon creative thinking by Cohen, Whitmyre, and Funk (1960). Their problem-solving groups were dyads. Only on ego-involving problems were there differences among dyads and then only in originality. The cohesive-trained dyads performed significantly better than all other groups. Even with untrained subjects, the cohesive dyads performed significantly better than the nominal groups.

One would expect that the renewed interest in kinesics would provide information useful in facilitating dyadic creativity. Even the most recent text I have been able to locate in this field (Scheflen and Scheflen, 1972) is void of clues concerning this possibility. Major attention is given the regulatory nature of creativity but the emphasis is on controlling rather than freeing. Kinesics is certainly one approach to training for dyadic creativity and problem solving that "cries" to be explored. Initially, useful clues might be obtained by comparing the kinesics of dyads that perform better than predicted with those of dyads that perform more poorly than predicted. From this information, training experiments might possibly be designed.

In summary, the evidence from research indicates that dyadic interaction can facilitate creativity and problem-solving. It is not yet clear what factors determine whether the use of dyads will be facilitative. Thus far, the following factors are suggested by research evidence: (1) psychological development beyond the egocentric stage; (2) mild stress whether in the form of group compositional heterogeneity or situational variables such as isolation or increased motivation or challenge, (3) ego-involving problems, (4) group cohesiveness, and (5) training.

What Are the Classroom Applications?

While my students and I have made many classroom applications of dyadic interaction in learning situations involving creativity and problem solving, we have not validated these practices experimentally. Successful experiences have been reported in the literature by Goldschmid (1971) at McGill

University and by Scott (1971) at the University of Georgia.

Goldschmid uses the term "learning cell" and has tested his procedure in a variety of disciplines in college classes. He offers two options or variations of his plan. In one option, both partners read the same assignment. The aim here is to create in the classroom and between two students an intensive dialogue which serves to check on and deepen the understanding of the reading as well as to exchange additional ideas and information pertaining to the chosen topic. One key element of this plan is the questioning planned in advance by each partner. In the second option, the two partners in the learning cell do different assignments as, for example, when the reading list is too long for each student to be able to read each item. Thus, this option is appropriate for learning new material during a class period. While Goldschmid reports that the learning cell idea has been successful, he and his associates have found that in the beginning students lack some of the communication skills necessary for successful learning. Training, practice, and guidance are necessary. Goldschmid reports that students in the learning cell option in a psychology course excelled students in three other options (seminar, discussion, and independent study) on an essay examination and on morale. Their course ratings were also more favorable.

Scott (1971), in the introductory course in educational research at the University of Georgia, found that students working in dyads excelled their peers working under other arrangements in the quality of their critiques of research articles.

It seems quite possible that dyadic interaction might be useful not only in college and university teaching but at the elementary and secondary level and might also enhance the effectiveness of such educational innovations as team teaching, individualized instruction, and peer teaching.

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