COOPERATION, PROSOCIAL BEHAVIOR,
AND ACADEMIC PERFORMANCE:
Experiments In the
Desegregated Classroom

Over the past several years, we have observed scores of classrooms any-
where from 30 days to three years after their schools were desegregated.
From these observations, we learned that desegregating a school system
does not necessarily mean integrating its students. Indeed, if we were to take
an aerial photograph of the playground or cafeteria at a recently desegre-
gated school, it most frequently would reveal a striking pattern, depicting
several discrete clusters of children gathered in their own ethnic groups.
Students in the classroom might be arbitrarily mixed — teachers often assign
seats alphabetically. But when the children get up to talk with their friends,
go outside to play, or sit down to eat, they tend to separate along ethnic lines.

This configuration presents quite a different picture than expectations
when the Supreme Court outlawed school segregation in 1954. At that time,
and for several years afterward, there was a great deal of hope that desegrega-
tion would produce true integration, reducing racial prejudice and increasing
the self-esteem and academic performance of minority children. But there is
little evidence that desegregation efforts have fulfilled any of these goals. In
this chapter, we will examine hypotheses to account for the apparent failure
and we will consider changes in the classroom structure and learning process
that we consider necessary to achieve those benefits. We will go on to
describe the “jigsaw” technique, an interdependent learning environment
that we developed and implemented in order to instill the values and skills of
cooperation in its participants. We also will report the findings and analyze

AUTHORS' NOTE: The term We will be used primarily in reference to a research team under
the direction of Elliot Aronson and whose personnel shifts from year to year and project to
project. Occasionally, it will be used to designate the authors of this essay. Research reported
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the methodology of the research we conducted to evaluate the method's success.

**RATIONAL AND EXPECTATIONS FOR DESEGREGATION**

In its landmark decision in *Brown v. Board of Education*, the Supreme Court held that segregation deprived minority group children of their rights to equal educational opportunities. The unanimous opinion argued that psychological barriers precluded schools from being "separate but equal"; the mere fact of segregation implied to the minority group that its members were inferior to those of the majority. This reasoning was based, in part, on the testimony of social psychologists. As Stephan (1978) has pointed out, their research helped establish the inferiority of segregated schools and their analyses outlined how this resulted in harms to minority students.

Stephan's description makes it clear that social psychologists perceived interethnic prejudice, minority self-esteem, and minority academic performance to be interrelated in a vicious circle. White prejudice against Blacks was seen as causing segregation. Being separated and deemed inferior lowered Blacks' self-esteem. Black students' expectations were reduced, hurting their academic achievement. This increased Blacks' prejudice as they turned out their frustrations onto Whites. This also reinforced Whites' prejudice as they attributed Blacks' poor performance to their abilities and as they felt and feared Blacks' hostility.

Several social scientists explained this sequence in an *amicus curiae* brief they filed in the *Brown* case. Furthermore, some of its coauthors and cosigners had been responsible for the findings underlying the model. Clark and Clark (1947) had given projective tests to children and concluded that discrimination, prejudice, and segregation harmed Black children's self-esteem. They found that Black children as young as three years old were already convinced that being Black was not a good thing, rejecting Black dolls in favor of White ones which they saw to be prettier and generally superior. The Clark's also stated that these feelings of inferiority led to resentment and hostility directed both inward against themselves and outward in heightened prejudice against Whites. A survey of social scientists conducted by Deutscher and Chein (1948) indicated that the Clark's conclusions were widely shared, 90% of the respondents agreeing that segregation had "detrimental psychological effects" on the group being excluded, even when facilities were equal. And several psychologists suggested that segregation set into motion a vicious cycle of negative self-fulfilling prophecies. Black children felt inferior and learned to expect failure and rejection. They lost motivation and tended to perform according to those lowered expectations. Segregation was thought to hurt members of the majority group, too. As they treated the minority with hostility, superiority, and aggression, their attempts to bring their actions into line with their concepts of justice caused Whites to intensify their hatreds and fears.

Desegregation was expected to break this cycle. Minority children, no longer separated and branded as second-rate, should show improvements in their self-esteem, expectations, motivation, and achievement. Feeling less frustrated and having more contact with Whites, their prejudice should decrease. Whites should reduce their prejudice as well, as they experience more interethnic contact and are denied the institutionalized sanction for their discrimination and hostility.

It would be oversimplistic to assume that these benefits would result automatically from desegregation. Certain preconditions must be satisfied to break the cycle and produce the advantageous effects on self-esteem, performance, and prejudice. Allport stated these prerequisites most articulately in his classic, *The Nature of Prejudice*, published in the same year as the Supreme Court decision:

Prejudice... may be reduced by equal status contact between majority and minority groups in the pursuit of common goals. The effect is greatly enhanced if this contact is sanctioned by institutional supports (i.e., by law, custom, or local atmosphere), and provided it is of a sort that leads to the perception of common interests and common humanity between members of the two groups [1954: 281].

Today, a quarter of a century after desegregation was begun, an assessment of its effectiveness is not encouraging. We have had to confront evidence that its effects are not inevitably better either for minority children or for White children, and it does not always bring racial peace. A good example of this evidence stems from an impressive longitudinal study, the Riverside project, conducted by Gerard and Miller (1975). They found, as we did, that long after the schools were desegregated, White, Black, and Mexican-American children tended not to integrate but to stay in their own ethnic groups. Moreover, anxiety increased and remained high long after desegregation occurred.

These trends are echoed in the majority of studies. The most careful, scholarly reviews of the research show few, if any, benefits (see St. John, 1975; Stephan, 1978). Even more distressing, there is some evidence of harms. According to Stephan's review, of 20 studies that measured the self-esteem of minority children following desegregation, none found a significant increase; on the contrary, in 25% of them desegregation was followed
by a significant decrease in the self-esteem of young minority children. Similarly, Stephan reported that the expected reductions in prejudice and gains in performance have not been demonstrated. Desegregation reduced the prejudice of Whites toward Blacks in only 2 of the 15 school systems studied, and the prejudice of Blacks toward Whites increased in almost as many cases as it decreased. Studies of the effects of desegregation on the academic performance of minority children also present a mixed and highly variable picture. Thus we reluctantly face the admission that the hopes that knowledgeable social psychologists pinned on desegregation may have been terribly naive.

OBSERVING THE DESSEGREGATED CLASSROOM

What went wrong? And how can it be corrected? In the early 1970s, our research team at the University of Texas at Austin had been doing laboratory research on the antecedents of interpersonal attraction. One of our interests was the problem of decreases in interpersonal attraction across ethnic groups that occurred as a result of desegregation. The outbreak of racial tensions and hostility that followed the desegregation of the Austin schools made the question a timely one to investigate. The fact that the schools were in a state of crisis encouraged a high-ranking administrator, who had earned his Ph.D. from Texas and had worked with the first author on research and as an associate in encounter groups, to call in our research team. We promised an investigation of the problem and began systematic observation and research in the classrooms. Though some administrators were a bit leery at first, the positive results of our initial pilot study reinforced the respect and trust that already existed to swing the doors open wide for us.

The most typical situation we observed in the elementary schools worked something like this: The teacher stands in front of the class and asks a question. Six to 10 eager students strain in their seats and frantically wave their hands, anxious to be called on to show the teacher how smart they are. Several others hide in their seats, eyes averted, trying to make themselves invisible. When the teacher calls on one student, usually one of those with their hands raised, looks of disappointment and dismay appear on the faces of the other eager students. The cringing students took relieved that the spotlight has passed them by, at least for the moment. If the fortunate student comes up with the right answer, the teacher nods and smiles approvingly, a great reward for the child. And an audible groan can be heard from his or her rivals, who apparently have been rooting for the child to fail so that they themselves might have the opportunity to demonstrate how smart (or how much smarter) they are.

On a few occasions the teacher bypasses the volunteers and calls on one of the students who is trying to avoid being called on. The child may not know the answer, might be very nervous speaking in front of the class, or, in the case of Mexican-Americans, could have trouble with English. It is an uncomfortable moment. The student feels put on the spot. His classmates get impatient waiting for his response and want to show off their own superiority. They might snicker or even verbally insult the intelligence or the accent of the respondent. The teacher is also in an uncomfortable position. He or she wants to give attention to the child, but does not want to subject him to ridicule or embarrassment. Therefore, these occasions are few and far between. The teacher and student forge an unwritten agreement. The child becomes anonymous and avoids getting caught stumbling over an answer, and the teacher, in turn, does not call on him. By ignoring him, however, the teacher has, in effect, written him off. The message that the other students get, and that the child in question almost certainly comes to believe, is that he must be stupid and not worth bothering with.

Our observations made it clear that this classroom game is fiercely competitive and that the stakes are high. The kids are competing for the attention and approval of an important person in their world, as well as for status and grades. The process does not encourage friendliness and understanding among any of the children, who are led to view one another as foes to be heckled and vanquished. This state of affairs exists in most classrooms— even segregated ones. Desegregation adds racial tensions and exacerbates prejudices in this already volatile atmosphere of one-upmanship and resentment.

How might this situation be rectified? One does not need to look far. Let us return to Allport's prediction: When sanctioned by authority, equal-status contact in the pursuit of common goals will produce beneficial effects. Social psychological research has demonstrated the importance of each of these preconditions.

SANCTION BY AUTHORITY

Local authorities have differed in their willingness to accept and their efforts to enact desegregation rulings. Some localities were quick to implement the Brown decision, but in many areas there has been resistance and a policy of gradualism has been adopted.

The firm support of local authorities is important for desegregation to positively affect people's values, as the theory of cognitive dissonance predicts. Research has demonstrated that children who believe that they must
eat a vegetable they dislike will convince themselves it is not so bad (Brehm, 1959), and that women who expect that they must work intimately with a particular person will emphasize her positive qualities (Darley and Berscheid, 1967). This "psychology of inevitability" explains that if I do not like you but I know that you and I will inevitably be in close contact, I will reduce the tension arising from these conflicting cognitions by convincing myself that you are not as bad as I had previously thought.

Studies of the process and effects of desegregation have supported this reasoning. Pettigrew (1961) has shown that desegregation proceeded more smoothly and with less violence in those districts where integration had the support of a forceful leadership. Clark (1953) discovered that immediate desegregation was much more effective than gradual desegregation. But, as we have seen, accomplishing desegregation smoothly does not, in and of itself, produce all of the beneficial effects that were hoped for. Even where authorities clearly sanction desegregation, in most cases variables such as self-esteem and prejudice do not necessarily change for the better. While sanction by authority may be a necessary prerequisite, it is not sufficient for desegregation to produce those benefits.

IN PURSUIT OF COMMON GOALS

Deutsch (1949) performed seminal research exploring competitive and cooperative relationships. He specified the critical difference between competition and cooperation to lie in the consequences of the interaction between two or more people: With competition, they have different outcomes; with cooperation, individuals share the same outcome. In competitive interactions, if you win, I lose. If we cooperate, when you win, I win, too. Deutsch suggested that this would influence the feelings between the participants, with people in competition inclined to be suspicious and hostile while people who cooperate would tend to be more concerned with each other's welfare. He tested these ideas in his college classrooms by inducing some students to compete for individual grades and having others work together for group grades. As he predicted, the latter groups showed more coordinated efforts and displayed greater friendliness and attentiveness than the competitive ones.

While Deutsch's work helped define the conditions that encouraged competition and cooperation, a series of experiments on group conflict by Sherif and his colleagues discovered a means to transform a competitive environment into a cooperative one. Sherif explained that their working hypotheses were that when two groups have conflicting aims—i.e., when one can achieve its ends only at the expense of the other—their members will become hostile to each other even though the groups are composed of normal well-adjusted individuals. There is a corollary to this assumption...just as competition generates friction, working in a common endeavor should promote harmony. It seemed to us, considering group relations in the everyday world, that where harmony between groups is established, the most decisive factor is the existence of "superordinate" goals which have a compelling appeal for both but which neither could achieve without the other [1956: 56].

They tested these hypotheses experimentally by setting up a series of boys' summer camps. In the 1954 camp at Robber's Cave, they separated the boys into two groups, the Eagles and the Rattlers. They engaged the groups in competitive interactions, such as tournament games. This led to aggressive and hostile actions between them. After being defeated in a game, the Eagles discovered and burned a banner left behind by the Rattlers. Retaliation was swift, as the Rattlers seized the Eagles' flag the next morning.

The antipathy between the groups was pervasive. Even benign interactions between them became opportunities for insults and confrontations. Social events such as movies or meals increased the conflict, indicating that repeated social contacts between opposing groups do not necessarily reduce the friction between them.

Then Sherif and his associates created a number of urgent situations to test their corollary, that working in a common endeavor should promote harmony between the groups. For instance, they staged a breakdown in the camp's water supply. Members of both groups volunteered to help search for the problem in the water line. They worked together to successfully discover the difficulty and correct it. The superordinate goal replaced their competitive aims and compelled the groups to cooperate. Sherif reported that while the old attitudes were not dispelled immediately, after a series of cooperative efforts the groups displayed less friction between them and more liking and friendships among their members.

EQUAL-STATUS CONTACT

A demonstration by Elliott (1970) with her third graders exemplified the impact on children of being assigned to an inferior status. She told her class one day that brown-eyed people were more intelligent and better people than those with blue eyes. The brown-eyed students, though in the minority, would be the "ruling class" over the inferior blue-eyed children. They were given extra privileges as the blue-eyed kids were "kept in their place" by such
restrictions as being last in line, seated in the back of the class, and given less recess time.

Elliott noticed that within a very short time, the blue-eyed children began to do more poorly in their schoolwork and became depressed and angry. They described themselves with more negative words. And the brown-eyed children grew mean, oppressing the blue-eyed children and making derogatory statements about them.

To show the irrationality of prejudice, the next day in class the teacher announced that she had lied, that it was really blue-eyed children who were better. The patterns of discrimination, derogation, and prejudice quickly reversed themselves. Finally, Elliott debriefed the children by talking with them about being the targets of prejudice and about the need to empathize with others. Several similar studies have replicated this scenario and process with other populations of subjects.

While this illustrates the effects resulting from a lack of equal-status contact, an analysis by Cohen suggests a method to cultivate its presence. She reasoned that even in environments which apparently allow equal-status contact, biased expectations for the groups could sustain the superior position that one of them enjoys. She explained that both groups might believe that one group's dominance is caused and justified by its competence. And she suggested that a temporary exchange of majority and minority roles is required as a prelude to reaching equal status, in order to reverse these often unconscious expectations.

One of her studies (Cohen and Roper, 1972) corroborated her analysis. Black children were taught how to build radios and how to teach others to do so. Then a group of White children and the newly trained Black children viewed a film of themselves building the radios. This was followed by some of the Black children teaching the Whites how to construct radios while others taught a Black administrator. When all of the children were joined into small groups, equal-status interactions were found only in the groups where Black children had been teaching the Whites. The other groups showed the usual white dominance.

While these experiments and other social psychological investigations have underlined the significance of fulfilling these prerequisites in order to achieve the advantages expected from desegregation, our observations of the elementary school classrooms indicated that few of them were being met consistently. Institutional sanctions sometimes were lacking. In some communities, desegregation proceeded forcefully and smoothly, but in other localities there is still great resistance. Many citizens have protested angrily against busing, and some local authorities have acquiesced to court rulings only reluctantly.

Though Allport speaks about sanction by authority on a governmental level, it is relevant to the classroom process as well. In the classes we visited, the types of cooperative interactions necessary to promote prosocial behaviors among the children usually were not conformed by the teacher. They prohibited conversations between students during class, viewing them as distractions for the students involved and as interruptions to the class. They preferred to deal with the children individually, turning their attention to and rewarding one respondent at a time.

The children clearly do not pursue common goals. One student's success is another's missed opportunity. As we described, if Mary knows the answer but the teacher calls on John, Mary probably hopes for John to make a mistake so she can show her knowledge. She is disappointed if he answers correctly. The students who often answer incorrectly or who do not even raise their hands to compete probably envy and resent their more successful classmates. They might put them down as teachers' pets or seek some kind of revenge through physical aggression against them on the playground. The successful students, for their part, often hold the less successful children in contempt, calling them "dumb" or "stupid."

This competitive process interacts with the lack of equal-status contact to wreak a special hardship on ethnic children. Many of the minority students originally attended schools where the atmosphere and facilities were not conducive to high academic achievement. Some have difficulties with English. Following desegregation, they are forced to compete with Anglo children who are usually better prepared and more accustomed to the competition. Their disadvantages are made more salient, the situation virtually guaranteeing a decrease in relative, if not absolute, performance. An additional burden is furnished by some teachers who are overtly prejudiced, their classrooms displaying clear differences in the students' status that are correlated with their ethnicity (see Gerard and Miller, 1975). These factors are almost certain to exert a negative effect on self-esteem as well as on feelings of friendship across ethnic lines.

After just a few days of observation, it became increasingly clear to members of our research team that students learn more than the content of the material explicitly taught in the classroom. The medium is the message; they learn implicit lessons from the process as well. We came to realize that it would be greatly advantageous if, in addition to acquiring specific skills and information, children could use the classroom to experience productive ways of relating to others and to develop a reasonable and positive view of themselves as people. But it appeared that the traditional classroom structure imparted a very different message. The children learned to obey the rules. They viewed their classmates as competitors for a limited resource,
the approval of the teacher. They perceived the teacher as the sole source of information and reward in the classroom and recognized that the payoff came from pleasing her by giving the correct answer—the one which the teacher had in her head.

INTERDEPENDENT LEARNING: THE JIGSAW METHOD

Our observations and our reasoning led us to the conclusion that the basic classroom structure would have to be changed so that children could learn to like and trust each other. While desegregation might be a necessary first step toward getting students of different races together, it clearly was not enough. We felt that it was crucial for teachers to encourage cooperative interactions among the children. In order to concretize such interactions, it would be helpful to transform the classroom’s competitive goal structure into a cooperative one. Such a structure should be accompanied by an emphasis on the need for participants to work together and to treat each other as resources. We wanted to replace individual aims with superordinate goals for the group and to utilize reciprocal peer teaching between students in order to foster equal-status contact.

This reasoning led us to hypothesize that interdependent learning environments would establish the conditions necessary to achieve the benefits previously expected to occur as a function of desegregation. Toward this end, we developed a technique for classroom instruction that attempted to incorporate the beneficial features of cooperation and peer teaching into the highly structured atmosphere of the traditional classroom (see Aronson et al., 1975; Aronson et al., 1978). We dubbed the process the “jigsaw” method, for reasons which will soon become obvious.

In this technique, the students are placed in small learning groups consisting of five or six participants. They might meet in these jigsaw groups for about an hour a day, to learn one subject, while following their usual routine the rest of the time. Each student in the jigsaw group is assigned one portion of the day’s lesson and is responsible for teaching that segment to the other members of the group. Since the other members have no other access to this information, without which they cannot put together the entire picture, interdependence is established for them to learn the complete lesson.

For example, suppose the students are to learn the biography of Eleanor Roosevelt as part of a unit in social studies. The teacher would arrange the biography so that it consisted of six paragraphs of approximately the same length. Each child would be given one paragraph. The first paragraph would be about Eleanor Roosevelt’s early childhood; the second, her young adulthood; the third, her years as a wife and young mother; the fourth would be about her husband’s paralysis and her role in his quest for the presidency; the fifth, her years in the White House; the sixth, after World War II, about her coming into her own as a world political figure, her work for the United Nations, and so on. Thus, each learning group would have within it the entire biography of Eleanor Roosevelt, but each individual child would have no more than one-sixth of the story. In order to learn “Eleanor Roosevelt,” the students would have to master their paragraph, teach it to the others in their group, and listen closely to each of the participants.

Each student first would take his or her paragraph, read it over a few times, and then join his or her counterparts from the other groups. For instance, if Julie is given Eleanor Roosevelt’s White House years, she would consult in a counterpart group with Ted, Pam, and Juan, each of whom is a member of a different jigsaw group and who have also been given that portion of the biography. They could use each other as sounding boards and as consultants, to be sure that they had understood the important aspects of that phase of Eleanor Roosevelt’s life and to rehearse their presentations to their jigsaw group. This procedure enables the poorer readers to get assistance in learning their section of the material, and it encourages the more advanced children to assume a teaching role.

A short time later the children would return to their six-person jigsaw groups to teach their parts of the biography to one another. The teacher would inform them that they would have a certain amount of time to communicate that knowledge to each other and that they would be tested on the whole life of Eleanor Roosevelt. Though each student will be evaluated individually, clearly they would have to depend on one another to learn all of the material. The process is highly reminiscent of a jigsaw puzzle, with each student possessing a single vital piece of the larger picture.

The children must work together and teach each other. It is a situation in which students are reinforced for helping one another. In addition, the jigsaw structure demands that the students utilize one another as resources rather than depending on the teacher as the sole provider of information, a state of affairs that is the hallmark of traditional education. In this situation, the only way a child can be a good learner is to begin to be a good listener and interviewer. The students also reward each other instead of allowing the teacher to be the major source of reinforcement in the classroom.

When left to their own resources in such a situation, the children eventually learn to teach and to listen to each other. They come to two important realizations: First, none of them could do well without the aid of every other person in the group and, second, each member has a unique and essential contribution to make.
The jigsaw technique is not a loose, "anything goes" situation. On the contrary, it is highly structured and very demanding. The structure induces children not only to imitate and model skills of group dynamics and social interaction, such as listening carefully and asking good questions, but also requires them to integrate these skills cognitively in their interactions with fellow group members. Indeed, group process receives explicit consideration as the members spend the last few minutes of their meeting reviewing how their group proceeded and suggesting improvements.

What is the role of the teacher in this cooperative process? Instead of being primarily a lecturer and provider of substantive information, the teacher now assumes the role of facilitator of group process. He or she keeps close watch on the functioning of the jigsaw groups and intervenes on occasion in order to enhance constructive group interactions. The teacher still maintains the task of planning the particular curriculum and adapting the material to the jigsaw format. (For specific details and examples to implement this method in the classroom, see Aronson et al., 1978.)

It should be noted that problems may arise when the jigsaw technique is introduced. Cooperation does not occur smoothly or all at once; old, competitive habits die hard. Moreover, not all students easily adapt to a cooperative classroom. For example, some students, because they are extremely poor readers, have great difficulty in holding their own. Others, because they are extraordinarily shy or antisocial, prefer to work alone. With the aid of a little ingenuity, though, the teacher often finds ways to turn some of these difficulties into strengths.

The experience of a Mexican-American child in one of our groups serves as a useful illustration. We will call him Carlos. Carlos was not very articulate in English, his second language. Because he was often ridiculed when he had spoken up in the past, over the years he had learned to keep quiet in class. He was one of those students we discussed earlier who had entered into an implicit contract of silence with his teacher, opting for anonymity and she calling on him only rarely.

While Carlos hated school and was learning very little in the traditional classroom, at least he was left alone. Accordingly, he was quite uncomfortable with the jigsaw system, which required him to talk to his groupmates. He had a great deal of trouble communicating his paragraph, stammering and hesitating. The other children reacted out of old habits, resorting to insults and teasing. "Aw, you don't know it," Susan accused. "You're dumb, you're stupid. You don't know what you are doing."

One of the researchers, assigned to observe the group process, intervened with a bit of advice when she overheard such comments: "OK, you can tease him if you want to. It might be fun for you, but it's not going to help you learn about Eleanor Roosevelt's young adulthood. And let me remind you, the exam will take place in less than an hour." Note how this statement brings home the fact that the reinforcement contingencies have shifted considerably. Now Susan does not gain much from putting Carlos down. And she stands to lose a great deal, not just from the teacher singling her out for criticism but because she needs to know Carlos's information.

Gradually, but inexorably, it began to dawn on the students that the only chance they had to learn about Carlos's segment was by paying attention to what he had to say. If they ignored Carlos or continued to ridicule him, his segment would be unavailable to them and the most they could hope for would be an 80% score on the exam—an unattractive prospect to most of the children. And with that realization, the kids began to develop into pretty good interviewers, learning to pay attention to Carlos, to draw him out, and to ask probing questions. Carlos, in turn, began to relax more and found it easier to explain out loud what was in his head. What the children came to learn about Carlos is even more important than the information about the lesson that they got from him. After a couple of days, they began to appreciate that Carlos was not nearly as dumb as they had thought he was. After a few weeks they noticed talents in him they had not seen before. They began to like Carlos, and he began to enjoy school more and to think of his Anglo classmates as helpful friends and interested colleagues rather than as tormentors.

EVALUATING THE JIGSAW TECHNIQUE

Over the course of several experiments, we have evaluated the effects of participating in jigsaw learning groups on students like Carlos and Susan. We began on a small scale, carrying out pilot studies in individual classrooms. Finding that the jigsaw method seemed to be successful, we conducted more systematic and comprehensive experiments implementing the technique in many classes in several schools. Then we brought the research back into the social psychological laboratory to investigate some of the mechanisms we hypothesized to underlie the beneficial changes we measured in jigsaw participants.

Taken together, the results of our project show a strong positive pattern of feelings, behaviors, and abilities which can be attributed to the jigsaw groups. It appears that relative to traditional classrooms, this interdependent learning method increases the students' liking for their classmates and for school, enhances their self-esteem, improves their academic performance, decreases their competitiveness, and helps them view their class-
mates as learning resources. Children exposed to the jigsaw method also demonstrate a greater ability to place themselves in the role of another person and tend to make ego-enhancing attributions for themselves and for their peers.

Long before the data from our evaluations was accumulated and analyzed, however, it was clear to most of the teachers in our studies that the jigsaw technique was working. Experienced teachers are sensitive to subtle changes in the attitudes and performance of individual students; they do not need complex statistics, graphs, or tables in order to assess the viability of an instructional innovation. Indeed, one of the most gratifying aspects of our research was listening to the excitement of many of the teachers as they shared anecdotes and success stories with us—long before the final results were tabulated.

Though the teachers' testimony was dramatic and important, it cannot be accepted at face value as proof of the method's effectiveness. Experimenter bias is a well-known phenomenon to be avoided in social psychological experimentation and a particular hazard of evaluation research. There is a tendency for those involved with a project to unconsciously edit their observations and reports. It is possible that because of their commitment to the effort or their agreement with its goals, observers may selectively emphasize positive incidents and relegate negative ones to the back of their minds. It is also conceivable that in the absence of adequate controls, the progress that occurs in some classes could be due to special circumstances unrelated to the jigsaw technique itself.

These problems have hampered many educational innovations. In many instances, the initial responses of students and teachers seems promising, so the innovation is widely publicized and adopted. Only later might there be any systematic evaluation. Furthermore, the researchers who create the new technique often enter a few classrooms, institute their changes, gather their data, and then leave. It is rare that they explain their reasoning and results fully enough or train teachers sufficiently for whatever positive changes they effect to be sustained beyond the time of their departure. Thus many supposedly fantastic innovations turn out to be ineffective, either because the techniques are flawed or as a result of their being implemented incorrectly. And many teachers and school administrators grow skeptical and reluctant to adopt them.

For these reasons, we felt that it was essential to conduct unbiased, carefully controlled research to evaluate the effects of the jigsaw method and to help develop it fully. One of our goals was to determine whether it was a valuable way to educate individual students, eliciting the benefits of increased liking, self-esteem, and performance that were originally predicted to follow desegregation. So we designed a meticulous assessment, rigorous enough to pass the scrutiny of our scientific colleagues. At the same time, we endeavored to refine a set of techniques that teachers could readily apply to their classrooms. Thus emerged a strategy of "action research" to improve the effectiveness of our method and to plant the seeds for jigsaw groups to spread from classroom to classroom.

THE JIGSAW PILOT STUDIES

To test the feasibility of the jigsaw method, our first step was to run a two-week exploratory study on two fifth-grade classes. All of the students were divided into small groups of five or six children. Half of the groups were taught in the traditional manner, by their teacher or one of our graduate students. The other half were the experimental groups, with the students using the jigsaw method to teach each other. The small groups met for one hour each day.

At several intervals in the study, we measured the students' liking for one another in order to determine whether it changed due to their participation in a competitive or an interdependent group. While there were no differences in the ratings prior to the beginning of the study, after a week the members of the jigsaw groups grew to like each other more than the members of the teacher-taught groups did. At that halfway point, the traditional groups were also changed to the jigsaw format. By the end of the study a week later, their liking ratings also increased to the levels found among the original jigsaw groups. We also tested the children on the material they studied. While the students in the original jigsaw groups performed slightly better than the controls, the difference did not reach statistical significance.

By altering the classroom routine for members of both of the groups, our design attempted to equalize Hawthorne effects, the tendency for people to perform better and appear happier when they think their superiors are trying to improve their working conditions. All of the children seemed to enjoy meeting in the smaller groups, even the control students in the competitive ones. But it was only when they joined the jigsaw groups that they exhibited the increase in liking for their groupmates. Simply working in small groups was not sufficient—interdependence makes the difference in liking.

Soon after this initial study, we replicated the experiment in a sixth-grade classroom in a poorer neighborhood. The results were similar. The jigsaw groups fostered more friendship and at least as much learning as the traditional teaching method.
OUR FIRST FULL-SCALE EXPERIMENT: BLANEY ET AL. (1977)

Encouraged by the results of these pilot studies, we believed that the jigsaw technique was a workable and effective teaching method; accordingly, we began planning a more systematic and comprehensive experiment (Blaney et al., 1977). We wanted to test a greater number of students, in several different schools, across more measures. Before discussing its procedure and results, we will focus on two methodological issues raised by the larger scale investigation: the problems of gaining the support of teachers and of acquiring equivalent experimental and control groups.

Whereas a decision to expand a laboratory experiment might entail recruiting more subjects and perhaps hiring another research assistant, increasing the scope of our intervention in the schools necessitated enlisting the cooperation and participation of many teachers. Some of them would have to volunteer to implement the jigsaw technique in their classrooms, and others would be needed to teach their classes in the traditional manner so that we could use them as control groups.

Our preliminary studies had demanded very little from the teachers. They merely taught one of the small groups in their usual manner; we helped the children learn the jigsaw system, adapted the curriculum to it, and observed the groups. Now we would have to motivate and train teachers to use our method and take over those responsibilities. We also needed to ensure that the technique would be used similarly in all of the jigsaw classes.

To accomplish this, we conducted a five-day workshop for 14 fifth- and sixth-grade teachers a few weeks before the school term started. (See Aronson et al., 1978, Appendix D for details.) Its goal was to change the teacher's role from that of a dispenser of information to that of being a facilitator of the group process. The teachers learned how to use the jigsaw method by experiencing it themselves. They were trained to handle problems that might arise and given instructions and exercises to help them introduce the technique. Most important, the great majority came to realize that temporarily relinquishing the awesome power they held in the classroom allowed them to be more creative, to face new challenges, and that it would be valuable and fun for them and their students.

Ten of the teachers who participated in the workshop volunteered to implement the jigsaw technique, and their classes became the experimental condition in our experiment (Blaney et al., 1977). We wanted the control teachers and classes to be as similar as possible, so we rejected the idea of using teachers who had originally offered to try the jigsaw method. Since they had volunteered to learn a new teaching technique, we reasoned that those teachers might not be deeply committed to their old styles. We wanted good teachers who believed in the traditional manner of teaching.

To obtain our control groups, we asked our experimental teachers to recommend other teachers from their schools whom they considered to be at least as competent as themselves and who would be willing to donate time in their classes for testing. In this way we tried to ensure that they would be capable, and as committed to their mode of teaching as the jigsaw teachers were to theirs. Thus, our control group (of students) differs from a traditional control group in that the classroom teachers were not sampled from precisely the same population. Technically speaking, this turns our experiment into a quasi experiment. At the same time, because of the high motivation of the teachers in the control condition, we believe this to be a conservative strategy—reducing the possibility of committing a type I error. In addition, by selecting teachers from the same schools, we could match the racial composition and socioeconomic status between the conditions. To make certain that the traditional classrooms acted as legitimate control groups, we asked their teachers to refrain from employing any small-group or cooperative teaching methods during the course of our study.

PROCEDURE

Since the Blaney et al. (1977) study served as a precursor for many of the follow-up investigations, we will describe its procedure, measures, hypotheses, and results in some detail. About a month after the school year began, the jigsaw technique was introduced in the 10 fifth-grade classrooms, which were from seven elementary schools in Austin, Texas. Three classes were utilized as controls. Over 300 students participated. The experimental classes met in jigsaw groups for about 45 minutes a day, three days per week. Students were assigned to groups with an eye toward evenly distributing children according to ethnicity, academic ability, and sex. We also tried to avoid having close friends or bitter enemies as members of the same jigsaw group. The curriculum was basically the same for the experimental and the control classes.

At the beginning and at the conclusion of the six-week experiment, we administered a sociometric instrument to measure the students' liking for their classmates and had them complete questionnaires to assess several of their attitudes relating to school. We trained undergraduates to give the tests, reducing experimenter effects by having them read from standardized scripts when questioning the children. Though they observed the classes, we prohibited these students from intervening in the process in any way—the teachers facilitated the groups. We tried to minimize demand characteristics on the participants' responses by keeping the jigsaw students unaware that this questioning was related to their learning groups. We informed them that
the information they were providing was part of a study of the entire school system and assured them that their teachers would not see their answers.

MEASURES

We developed a sociometric instrument to measure the students' liking for their fellow group members (in the jigsaw condition) and for the remaining children in the class. We considered simply asking them to designate whom they liked or disliked, but advice from the teachers changed our minds. They feared that such explicit statements might lead to hurt feelings among the students. Our highest priority in carrying out this research was to avoid causing either physical or emotional disruptions, so we tried to devise a measure that would be pleasant for the students while also yielding valuable information. The instrument emerged as our alternative.

Our data collectors asked the students to imagine taking a trip to an exciting island. They could bring their classmates, but since they had to travel in a small boat they could carry only a few of them at a time. But they could make several trips. We gave class rosters to the students and had them assign numbers to each of their classmates according to which boatload they would have them ride. They would assign a seven to those classmates who would join them on the first trip, a six to those who would come over in the second boatload, and so on down to those who would get a one and would join them on the last trip. We assumed that these preferences would reflect the students' liking for those classmates.

We also designed a questionnaire to assess the students' attitudes toward school, their feelings about themselves, and their opinions concerning cooperation and peer teaching. Each of its 22 questions was read aloud twice, and students were asked to respond by marking one of the seven boxes beneath each item (see Figure 1). Each of the boxes was accompanied by a verbal description, and they were of increasing size to present a picture of the degree of feeling represented by the labels. We found that this way of presenting the questions was helpful, especially for students with reading difficulties.

"How much do you like school this year?"

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FIGURE 1 Student Questionnaire

HYPOTHESES AND RESULTS

On the basis of the psychological research and our own reasoning, observations, and preliminary studies, we were able to make several predictions about what we would find. We expected that students in jigsaw groups would show increased liking for their groupmates. We also thought that, compared to children taught in traditional classrooms, students in jigsaw classes would like school more, increase more in self-esteem, decrease in feelings of competitiveness, and have a stronger belief that they could learn from other children.

Peer liking. The previous research comparing the effects of competitive and cooperative relationships, including the classic experiments by Deutsch and by Sherif, supported our prediction that the children in our interdependent groups would come to like their groupmates more than the children taught in the traditional manner would like their classmates. As we have mentioned, the results of our pilot studies confirmed this hypothesis. We were concerned, however, that the jigsaw students' increased liking for their groupmates not come at the expense of isolating themselves from or growing to dislike the other students. So we totalled two liking scores: one representing the average ratings the jigsaw children gave their groupmates and the other (the only one for the control classes) representing the average of the ratings assigned to the other classmates. Notice that our instrument is flexible enough to reflect changes in students' liking for individuals as well as for overall levels of liking for their classmates. Since the instructions do not specify the number of children that can be accommodated on each boatload, the liking score assigned to one classmate need not be compensated by a reduced ranking for another. Thus, individual rankings and average liking scores could vary.

We found that students in the jigsaw classes grew to like the others in their groups more than they liked their other classmates, even though they liked their groupmates slightly less than the others at the beginning of the study. Moreover, this increase did not come at the expense of their liking for the other classmates, as this score also increased, though not nearly so dramatically. This is important, not only for its direct consequences of more friendship in the classroom but also because increased liking for a student is a first step for the child being accepted and given support by his or her classmates. According to Coopersmith and Feldman (1974), this acceptance is a major prerequisite for the development of positive self-esteem.

Liking for school. Our observations and our memories of attending school suggested that in traditional classes, boredom and dissatisfaction grow as the school year progresses. We thought that the jigsaw method would help prevent this decline in interest, and we hypothesized that stu-
tudents in the jigsaw classes would come to like school better than students in the control classes. We tested this hypothesis by summing the students' responses to three questions: "How much do you like school this year?"; "When you are in the classroom, how happy do you feel?"; and "When you are in the classroom, how bored do you feel?"

Significant differences over time and between groups were obtained for this measure. By the end of six weeks, students in the control classes liked school less than they had at the beginning. Students in the jigsaw classes, however, liked school about as well. This confirmed our hypothesis: Jigsaw groups help students sustain the interest in school which most children have at the beginning of a new school year. These results indicate that participating in jigsaw groups tends to forestall the decline that we found in teacher-oriented classrooms.

When we examined the responses by members of different ethnic groups, we found differences between Anglo, Black, and Mexican-American students. Anglos in the jigsaw groups grew to like school more during the six weeks, while Anglos in the control classes liked school less. Black students in the experimental classes came to like school slightly less than they had at the beginning, but in the traditional classes their liking decreased substantially. Unexpectedly, the trend was reversed for Mexican-American children. Mexican-Americans in the control classes showed a marked increase in liking for school that was greater than the minor increase they exhibited in the jigsaw classes. We speculated that the most likely explanation for this unexpected difference was traceable to the language problems faced by Mexican-Americans, which were highlighted by the students being forced out of their usual silence in the classroom to participate in the peer teaching required by the jigsaw format. A replication of our study by Gefner (1978), which we will describe shortly, helped verify this speculation.

Besides our data demonstrating the increased liking for school due to the jigsaw technique, we also learned of its positive effects in more casual ways. Both students and teachers commented on the fun they had and the freedom they felt in the groups. The students also expressed satisfaction with their involvement in their own learning, and after a while they were heard to exclaim, "How come it's only such a short time that we get to meet in small groups?"

Self-esteem. We considered the self-esteem of the students to have crucial importance on their attitudes and performance in school. Our observations in the classrooms meshed with various psychological conceptualizations to lead us to hypothesize that our interdependent groups would have beneficial effects on their participants' feelings of self-esteem.

A short theoretical discussion will help to illuminate our reasoning. A person's self-concept is thought to consist of all the attitudes, abilities, and assumptions that the individual holds about himself or herself that act as a guide to behavior (Coopersmith and Feldman, 1974). Self-esteem is the evaluative component of the self-concept, and can be defined as the amount of worthiness or power that the person perceives himself or herself to possess. Evidence about one's worthiness or power is provided by two main sources: from the individual's interpersonal interactions and as a function of the person's experiences, accomplishments, and abilities. Thus, self-esteem can be viewed as having an "outer" component, resulting from social comparison processes and the appraisals of relevant others, and an "inner" component, developing from objective data pertaining to successes or failures in one's interactions with the environment (Franks and Marolla, 1976). These two dimensions of self-esteem are not mutually exclusive; they may overlap as well as interact with each other. Both factors can be vitally important in the classroom.

In education, these two dimensions of self-esteem develop from children's interpretations of the feedback from teachers and classmates as well as from their own learning experiences. Recalling our observations of the traditional classrooms will help to illustrate how these interpretations and experiences can operate to enhance or to cripple children's self-esteem. As we have seen, the emphasis on competition creates a situation in which there are winners and losers in the classroom. A few fortunate students win their teacher's praise, attribute their success to their abilities (e.g., "I did well on the exam because I am smart."), and expect to do well in the future. The research suggests that this leads to a cycle of positive self-fulfilling prophecies, in which the students' high self-esteem leads to better achievement and, conversely, their high performance elevates their self-esteem (Covington and Beery, 1976; Purkey, 1970).

Unfortunately, successes are all too rare and rewards all too scarce in the traditional classroom. Its system of education exacts high performance partly by instilling students with a fear of failure. The lack of successful experiences and scarcity of rewards can lead some students to give up and to stop trying to succeed. Low self-esteem and low achievement are maintained through a cycle of negative self-fulfilling prophecies.

We thought that changing from a competitive to a cooperative environment in the classroom would promote situations in which all students could have successful experiences that would build their self-confidence and self-esteem. The emphasis for all participants to work together to accomplish mutual goals virtually eliminates the production of "losers." Under these circumstances, it is likely that the students will experience positive outcomes, as well as receiving more support from their classmates. As these
phenomena occur, they will almost certainly produce increases in self-esteem from the positive feedback that the children receive and from the skills they gain when they help their classmates.

As we hypothesized, over the six-week period, the students in the experimental classrooms increased in self-esteem to a greater extent than those in the competitive classes. To measure self-esteem, we combined the results of four questions: "How much do you like being yourself?"; "When you are in the classroom, how important do you feel?"; "When you are in the classroom, how smart do you feel?"; and "When you are in class, how often do you feel you can learn whatever you try to learn?" In general, the results indicated that the students in the jigsaw classes significantly increased in self-esteem while the control students decreased.

Competitiveness. Does the jigsaw experience change students' attitudes toward competing and winning at all costs? We hypothesized that compared to students in the control classes, students who participated in the jigsaw groups would show less of a preference for competitive behaviors. This hypothesis was tested by the questionnaire item, "I would rather beat a classmate than help him." The responses indicate that students in the jigsaw classes grew less competitive over the six weeks while students in the control condition became more competitive. This lowered competitiveness appeared to extend beyond the jigsaw groups themselves. Jigsaw teachers reported that even the music or physical education teachers remarked about the improved attitudes and behavior of the jigsaw students.

Learning from others. We also hypothesized that students in jigsaw classes would come to believe that they could learn from other students. The question "Can you learn anything from the other kids in your class?" was the test for this prediction. We found that students in the jigsaw groups increasingly believed that they could learn from other students, while students in the control classes decreased in this belief. The experiences of teaching and being taught by classmates helped them learn to use their peers as resources.

AN ATTEMPTED REPLICATION

Thus the results from the Blaney et al. experiment confirmed our hypotheses. The data, our observations, and the reports from teachers and students corroborated that participating in the jigsaw groups increased the students' liking for their groupmates, maintained their interest in school, improved their self-esteem, reduced their competitiveness, and increased their belief that they could learn from their classmates. Our evaluation of the jigsaw technique indicated that it had been successful on these measures and that it was a valuable way to educate students.

Accordingly, we turned to the second goal of our action research: to refine the method and to encourage its adoption in the schools. We wanted to demonstrate that the program could be grafted onto the existing classroom process with little stress or strain. So we redesigned and shortened our teachers' workshop, trained 14 teachers to implement the jigsaw groups in their classrooms and recruited 4 more to be the teachers in the control classes, and began the experiment again.

The results astonished us. Predictably, we obtained the characteristic advantages to the jigsaw students' friendship with their peers, their satisfaction with school, and so forth. But the children in the control classrooms also showed shifts in these directions, and the differences that we expected between the experimental and the traditional classes failed to materialize.

Our researchers who observed the classrooms helped to explain why they failed to occur. The traditional classes were not traditionally competitive—most of their teachers were employing some form of small-group learning. Therefore the control classes did not act as controls, instead becoming an intermediate condition in which cooperation was used but was not as extensive or systematic as in the interdependent groups, and which had an impact on the children, though it was not as significant as in the jigsaw classes.

In scientific circles it might be charged that our experiment had been contaminated, invalidating our results. But our experience exemplified that we had been successful in perhaps a more important role, that of change agents. It appeared that some of the teachers who were enthusiastic about our method had spread word-of-mouth accolades across the school system. Six months after we had introduced the jigsaw technique in our first classrooms, it was hard to find a purely traditional fifth-grade class in the Austin public schools. We had contributed to a mini-revolution in education, which frustrated our replication effort but which gratified us as more classes adopted our method.

A REPLICATION AND EXTENSION: GEFFNER (1978)

In his Ph.D. dissertation, Geffner (1978) followed a similar methodology to investigate the implementation of the jigsaw method in the Watsonville, California, elementary schools. He conducted the research over an eight-week period in 10 fifth-grade classes in Santa Cruz County, where the composition of the schools is approximately 50% Anglo and 50% Mexican-American. To control for Hawthorne effects and to formally operationalize the three conditions that arose from the replication, he compared classes that instituted the jigsaw method to traditional classes and to classes taught with innovative cooperative techniques other than interdependence. He explored self-esteem in more depth by using a modified version of "A Pictorial
Self-Concept Scale for Children" (Bolea et al., 1971), and he also studied the students' interethnic and intraethnic perceptions.

Gefner's results replicated those of Blaney et al. in most respects. Students in both the interdependent groups and the other cooperative classes improved or maintained positive attitudes about their peers, about school, and about themselves, with the jigsaw students improving more. Students in the traditional classes suffered declines. The inconsistently smaller gain in liking for school by Mexican-American students taught by the jigsaw technique, found in the Blaney et al. research, was not obtained in Gefner's. The Mexican-American students in the Texas schools were strongly in the minority and were in a new situation; this, combined with some language barriers, probably accounted for those inconsistent results. The Mexican-American children in the Watsonville schools were much more familiar and comfortable with their school environment since they comprised nearly half of the population and had been in the situation for a few years, and showed the greater liking for school characteristic of participating in the jigsaw groups.

The modified self-esteem scale he adapted consisted of cartoonlike pictures of stick figures in various types of situations and included five dimensions of self-esteem deemed important by the students themselves: scholastic abilities, athletic abilities, physical appearance, social interactions, and family interactions. Relative to the traditional classrooms, the cooperative conditions enhanced the students' self-images regarding their social interactions and their scholastic abilities and even generalized to increase their confidence in athletic abilities and family interactions. Having more successful experiences and getting more feedback and support probably led to the generalized improvement in self-esteem and feelings of competence.

An important goal for desegregation was the reduction of interethnic prejudice; and Gefner's research also found that, to a far greater extent than students in control classrooms, the Anglo and Mexican-American children in jigsaw classes improved their general attitudes toward their own ethnic group as well as toward members of other ethnic groups.

TESTING ACADEMIC PERFORMANCE: LUCKER ET AL. (1977)

These studies made it clear that the jigsaw method can produce benefits in peer liking, attitudes toward school, and self-esteem, but its effect on academic performance still needed to be assessed. A recent analysis of various innovative classroom procedures suggesting that these methods do not necessarily improve or even maintain academic achievement (Chalupske and Coles, 1977) and current publicity that national test means are falling and that some students are graduating from high school without being able to read, write, or compute adequately have created a "back-to-basics" sentiment that threatens educational innovation. We expected that the advantages to students' attitudes resulting from the jigsaw technique would increase their achievement by changing the cycle of self-fulfilling prophecies that we discussed earlier. In the aforementioned experiments we also examined the students' grades, which improved in the jigsaw condition while decreasing in the traditional classes. Though these results and the teachers' impressions about academic performance were encouraging, the teachers' assignment of grades as well as their observations may be subject to bias or expectancy. Thus a well-controlled study was required.

Our research team designed and carried out such an experiment (Lucker et al., 1977). The subjects were 303 fifth- and sixth-grade students from five Austin schools. Six classes met in jigsaw groups for about 45 minutes each day, while five classes were taught in the traditional manner by highly competent teachers and represented the control condition. The social studies curriculum for both groups was standardized during the two-week study and consisted of a unit on colonial America taken from a fifth-grade textbook along with supplemental materials. A standardized test about the lessons was given to the children both before and after they studied the unit.

Though the pretest showed no discernible differences between the students in the two conditions, the posttest demonstrated that those in the jigsaw classes showed significantly more improvement than those in the control classes, F(1, 280) = 6.73, p < .02. An analysis of the data reveals that this was mainly due to the increased performance of minority students in the

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* Raw posttest scores (which followed the same pattern) adjusted for reading level and pretest score by covariance analysis.
jigsaw groups. Anglo students performed as well in the jigsaw classes as they did in the traditional classes ($F < 1.0$). But minority students performed significantly better in the interdependent groups than in the control classrooms, $F(1, 280) = 8.77, p < .01$. Only two weeks of jigsaw activity narrowed the performance gap between the unadjusted scores of Anglos and minorities by over a third. Interestingly, the jigsaw method does not work a hardship on high-ability children: Students in the top quartile in reading ability benefited just as much as students in the lowest quartile. Two integral features of the jigsaw method safeguard their interest and achievement: the new role for them of teaching and the exam’s being a function of individual performance so that they are not penalized by others’ lower grades.

INVESTIGATING UNDERLYING MECHANISMS

Having established that several advantages accrue from the jigsaw method, we sought to illuminate some of the mechanisms assumed to underlie its positive effects. We investigated jigsaw participants’ role-taking abilities and their attributional processes to focus more directly on why cooperative interactions enhance prosocial behavior.

MEASURING ROLE- TAKING ABILITIES: BRIDGEMAN (1977)

We believed that one of the crucial mechanisms underlying the effects of cooperative behavior on liking, positive attributions, self-esteem, and performance is empathy. According to Piaget’s (1932) theory, children construct their ways of viewing the world by actively interacting with their environment to resolve social and cognitive conflicts. He suggested that egocentrism and role taking are negatively correlated in children’s development. Therefore, if they engage in cooperative interactions, the process of modifying their intended behavior in anticipation of the others’ needs and responses would diminish their egocentrism and provide a framework for increasing their abilities to take another’s perspective.

Bridgeman (1977) tested this hypothesis about the relationship between cooperative learning and role-taking abilities in her Ph.D. dissertation. She tested 120 fifth-grade students from three Santa Cruz County schools. Roughly half of the students spent eight weeks participating in jigsaw groups while the others were taught either by traditional methods or in innovative small-group classrooms. She revised Chandler’s (1973) role-taking cartoon series to assess the students’ perspective-taking abilities.

Each of Chandler’s cartoon sequences depicts a central character caught up in a chain of psychological cause and effect, such that the character’s subsequent behavior is shaped by and fully comprehensible only in terms of the events preceding it. In one of the series, for example, a boy who had been saddened by seeing his father off at the airport began to cry when he later received a gift in the mail of a toy airplane similar to the one which had carried his father away. Midway into each sequence, a late-arriving bystander is introduced, such as the mailman, who witnessed the resultant behavior of the principal character but who was not privy to the antecedent events. Thus it is possible to place the subject in a privileged position relative to the story character whose role the subject is later asked to assume and to specify the degree to which the subject is able to set aside facts known only to him or herself and adopt a different perspective. For instance, when asked to explain the child’s behavior, both adults and children usually can explain the association which caused him to cry. It is when they are asked to assume the role of the latecomer mailman that differences in egocentrism emerge. When they take the role of the mailman, young children tend to give the egocentric explanation that he knew that the boy’s father had recently left town and that the boy would cry. Adults would answer that the mailman probably would be confused by the boy’s crying.

The results of Bridgeman’s experiment indicated that the jigsaw students manifest less egocentrism than was found among the controls. Both role taking of rational thought (considering the logical perspective of another) and role taking of affective thought (considering the emotional perspective of another) showed significant increases after students experienced eight weeks in the cooperative groups. There was no change for students taught in more traditional ways. Bridgeman’s results are consistent with both Piaget’s theories and the assumptions underlying the cooperative process. And they point out that the effects of the curriculum-incorporated role-taking experience from the cooperative interactions generalized to the noncurriculum tasks of the Chandler stories. Further, these data support the notion that empathic role taking may be a key ability which mediates other prosocial behaviors.

ATTRIBUTIONAL PATTERNS: TWO LAB EXPERIMENTS

Another important influence on the way students perform and relate to each other comes from the attributions that they employ to explain their own and their classmates’ behavior (see Heider, 1958; Jones and Davis, 1965). Earlier we described how students who experience successes or failures in the classroom will make attributions that are consistent with their experiences and self-esteem. Students who perform well generally will make dispo-
sitional attributions to explain their successes (e.g., "I did well because of my ability"). This tends to be reversed for low-achieving students. They come to believe, along with their classmates and even some teachers, that their occasional successes are due to situational factors (to luck) and that their failures are traceable to dispositional factors (to poor ability and low self-worth). These patterns initiate cycles of positive or negative self-fulfilling prophecies which perpetuate the students' success or discouragement.

As the jigsaw groups improve the self-esteem and achievement of students who might be considered "losers" in many traditional classrooms, we hypothesized that the change from a competitive to a cooperative or an interdependent environment would transform their own and others' attributions about their performance from negative to positive, to more ego-enhancing ones. To investigate this, we designed and conducted two laboratory experiments, in which students were removed from the hustle and bustle of the classroom and tested under more controlled conditions. By taking our research into the laboratory, we were able to test refinements without disrupting the classroom procedure. This enabled us to perform a quick study on children who had not been exposed to the jigsaw technique and then return them to their usual classroom routine.

In one such study, Stephan et al. (1977a) demonstrated that these attributional patterns are more complex. Their results suggested strongly that once friendship and empathy have been established, competition appears not to produce the kind of one-upmanship that can be demoralizing to the loser and harmful to the relationship between the competitors. The researchers set up a situation in which sixth-grade students succeeded or failed at a motor task (throwing bean bags at a target) that was performed competitively, independently, or cooperatively. They found that when the children beat a friend in a competitive situation, the usual ego-enhancing attribution process was reversed such that winners were more likely to losers to attribute their performance on the task to luck. It looks as though children are reluctant to gloat and boast at the expense of a friend's ego, at least temporarily.

A similar experiment was designed to look more closely at the type of attributions made by college students in competitive, cooperative, and interdependent interactions with other students (Stephan et al., 1977b). The subjects' results were manipulated to indicate that they succeeded or failed on a task involving artistic judgments. Generally, ego-enhancing attributions were made by the students to explain their success or failure. In the cooperative and interdependent conditions, similar attributions were made for their partner's success or failure (i.e., attributing success to ability and failure to

luck). In the competition condition, however, the process was reversed such that their partner's failure was attributed to personal abilities and success to situational variables. In short, cooperation leads individuals to treat their partners in the same kind of ego-enhancing manner in which they treat themselves. Competition creates a harsh difference.

This line of research lends credence to the model of self-fulfilling prophecies developed earlier, yielding evidence that an interdependent, cooperative environment can change the self-defeating attributions and negative self-fulfilling prophecies made by the students who are considered by themselves and others as failures. The experiments demonstrate that these cycles can be reversed, not only by enhancing the performance of the individual but also by changing the attributions that tend to be made as a function of a cooperative (rather than a competitive) interaction.

EVALUATING THE RESEARCH

The direction of the results of our studies assessing the jigsaw technique's effectiveness is clear: It appears to be a valuable way to educate students. Our research consistently finds that on a variety of measures, participants in the interdependent groups give more positive responses over time and relative to students in traditional classrooms. Still, it is possible to question some of our reasoning, methodology, or results and to point out issues still requiring consideration.

One might assert that the advantages claimed for the jigsaw method result from aspects of the learning technique other than interdependence or that they arise from artifacts of the research. The increased liking for peers could be due merely to the effects of increased exposure in the small groups. Greater liking for school might be encouraged by instituting any change that would make the classroom less boring. Gains in performance may not be caused by the interdependent groups themselves but by the increased participation and practice that the students experience. The data could be affected by Hawthorne effects or demand characteristics coming from innovating and testing in the classroom.

No experimentation is perfect or completely rules out alternative interpretations. But while methodological flaws can be discovered in individual studies and alternative explanations might be advanced to account for single findings, we feel that the weight of the evidence points to the legitimacy of our reasoning and research. One should assess our series of experiments as steps in a more comprehensive research strategy, each study attempting to correct flaws or to answer questions raised in the preceding one. For exam-
The results of our research thus far seem promising. They illustrate how, by utilizing social psychological theory and research, the solution for a social problem might be suggested and advanced. A problem arises, and the psychological literature is consulted and analyzed to design a method to solve it. A program is implemented and its effectiveness is evaluated in the field. Mechanisms assumed to be influencing the process are isolated and brought back into the laboratory to be investigated. Thus the theories continue to be tested and the program becomes increasingly refined.

The first goal of our research strategy was to evaluate the effectiveness of the jigsaw method. We have shown that beneficial effects occur as a result of structuring the social psychological aspects of classroom learning so that children spend at least a portion of their time in pursuit of common goals. These effects are in accordance with predictions made by social scientists 25 years ago in their testimony favoring desegregation, and they confirmed our hypotheses for the jigsaw technique as well.

It is necessary to go beyond the results of measures and the confirmation of hypotheses when evaluating the implementation of a social program. Thus emerged the second goal for our strategy of action research: to perfect the jigsaw technique and encourage its widespread adoption in the schools. Evaluating a social intervention demands the explicit consideration of the impact and side-effects of the program. Its goals must be specified. And whether the program meets its goals in a workable and efficient manner must be determined.

We have described two instances in which the impact of our research and intervention received our scrutiny. On the first occasion, we tried to avoid having an impact, attempting to minimize the disruption caused by our research and adjusting the measures that we employed accordingly. On the second, our replication of the Blaney et al. study was contaminated by our program having too much impact, spreading cooperative learning methods to some of our control classrooms. Our observations and the comments from teachers and students indicated that any side-effects arising from the jigsaw method were positive ones.

The goal of the jigsaw technique is not to train young people to be so cooperative that they will be out of place in a highly competitive society. Rather, the aim is to teach cooperation as a skill so that the individual can call on that skill under suitable conditions, when cooperation is the most appropriate way to perform a task. And it is quite clear that some success has been achieved: Children in the experimental classes can do cooperate under appropriate conditions. Moreover, a year later, when the students have moved on to a classroom in which competition predominates, informal reports from teachers indicate that they perform as well as they ever did.

Several aspects of the jigsaw method still merit exploration. Among them are its influence on the motivation or cognitive development of the participants and the effect of sex differences. The dynamics of the groups, such as the distribution of power among the members, deserve consideration. An important issue still to be addressed concerns the long-term effects of the jigsaw technique. Systematic longitudinal studies are needed to determine if the advantages found in jigsaw classrooms are maintained over time and whether they generalize to other situations and environments.
Apparently they have not lost anything important, only their tendency to compete and try to outdo the other person in situations in which cooperation would be a more reasonable strategy.

Finally, it appears that the Jigsaw method is a workable and efficient way to meet that goal and to achieve those advantages previously cited. Its use entails no extra costs. Most teachers like it, and they are easily trained to introduce and facilitate the groups in their classrooms. The Jigsaw groups improve the performance of less successful students without hampering higher achievers. The technique is flexible and may be used with students of a wide range of ages and to teach material from many subject areas. And the program does not need to replace the existing classroom structure—the benefits we have described result from using the Jigsaw groups for only an hour or less each day.

Thus, an aerial photograph of a Jigsaw classroom usually would show a familiar configuration, with students seated in rows and being taught in a traditional manner. During one subject, for about an hour, that pattern would change to depict several small circles of students working together and teaching each other. Most important, we have observed that the clusters that appear in the cafeteria or on the playground would also change, to include more students from different ethnic groups.

REFERENCES


