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ABSTRACT

The authors, based on their long experience in helping children and adults to think and function more creatively, express their conviction in the possibility of increasing the creativity of people through special instruction. Many experiments have shown that, although some types of warm-up and reward conditions increased the chances of creative thinking occuring, it was still evident that the lack of fundamental skills was a handicap. Moreover, research indicates that preconscious and emotional elements play an important role in creativity. Consequently, the authors devised special teaching procedures to teach certain skills and means of using emotions to facilitate creative thinking and behavior. This booklet presents various procedures and programs which can be used in a variety of situations, such as in the classroom, creative arts, testing, and the media to help people be more creative. On many occasions, the authors have employed various evaluative techniques and found that their procedures were quite successful in fulfilling the aims set for them. (SE)

IS CREATIVITY TEACHABLE?

E. Paul Torrance and
J. Pansy Torrance

Delta Kappa Educational Foundation

E. PAUL TORRANCE

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IS CREATIVITY TEACHABLE?

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WHAT'S THE ARGUMENT?

"I'm just not creative and there is nothing anybody can do about it!"

"If someone is not very good at thinking and solving problems by the time he is my age, then it is too late."

"Some people are naturally born to be more creative than others and there is nothing that can be done."

"Children can learn to read and do arithmetic, but they cannot learn to think better or get better ideas."

What validity is there in these beliefs? Both of the authors have heard them expressed over and over, not just by children and poorly educated adults but by highly educated adults. These beliefs are expressed so frequently by otherwise knowledgeable people that there are times when the authors have momentarily doubted their own perceptions. By now, however, their biases about the teachability of creative thinking are fairly well established and will be described here.

For over fifteen years, studying and teaching creative thinking has been a major interest of both authors. At the present time, they are constantly working with a great variety of groups of all ages. Both of them work once each week with a group of four- and five-year-olds and Pansy works at least one day each week in a day-care center. Usually they have a program going with some elementary school, teaching children from kindergarten

through seventh grade. As a community volunteer, Pansy teaches a group of high school students a short course in creative problem solving. Then there are Paul's regular undergraduate and graduate courses at the University of Georgia, all of which have a definite creativity component. In addition, Pansy teaches a short course on creative problem solving to nurses and other professional groups; and both conduct in-service workshops for teachers and other professional educators. In all of these experiences, they constantly see evidences that teaching makes a difference in creativity. During these experiences, the participants give evidence of improved skills in creative problem solving, and the frequency of genuinely creative ideas increases. For years following these experiences, they receive reports of continued creative growth and functioning.

Since the authors realize that it is easy for teachers to kid themselves about these matters, they have employed many safeguards against self-deception. On many occasions they have employed various measurement techniques, but they have tried never to lose sight of the importance of "real behavior" in solving "real life problems" and "real creative achievements." Since their long-range follow-up has not been systematic, they realize that there is still a chance that they are kidding themselves. It is difficult, however, to deny the validity of the changes that participants report and that they are able to observe.

They have defined creative thinking as a natural human process in which a person becomes aware of a problem, difficulty, or gap in information for which he has no learned response; searches for possible solutions from his own past experiences and those of others; formulates hypotheses about possible solutions; evaluates these possible solutions and tests them; modifies them and retests them; and communicates the results to others. If, as the authors maintain, creativity is a natural, human process, why is it necessary to teach creative thinking? Or, is it teachable?

At one point, Paul and some of his students entertained the possibility that it might not be necessary to teach creative thinking. If favorable conditions were created or if adequate warm-up were provided, perhaps it would not be necessary to teach creative thinking. Were efforts to teach creative thinking only a

warm-up for what would happen naturally? After more than twenty experiments, it became clear that some types of warm-up and reward conditions did indeed make a difference, increasing the chances that creative thinking would occur. However, even under the most effective warm-up and/or reward conditions, it was still evident that the lack of fundamental skills was handicapping and the quality of thinking that resulted was usually disappointing.

An examination of the authors' definition of the creative thinking process indicates that a number of skills are necessary for the process to be successful—the skills of becoming aware of problems and gaps in information, defining these problems and gaps, retrieving and combining information from previous experiences and accumulated knowledge, producing possible alternative solutions, developing criteria to evaluate these solutions, using these criteria to judge these solutions, testing the most promising solutions, deciding upon the best solution, working out plans and details for implementing the solution, and the like. All skills require practice and can be enhanced by teaching.

It is also rather generally accepted that the creative thinking process as the authors have defined it involves strong elements of the emotional, the irrational, the preconscious. After breakthroughs involving these emotional, irrational elements, of course, the results must be subjected to logic. The creative idea does not occur by logical processes, however. Thus, a part of the business of teaching creative thinking is teaching people to understand and consciously to use these emotional, irrational processes and later to formulate and apply criteria for evaluating alternative solutions.

It should be made clear that no teaching and no disciplined approach to creative problem solving will guarantee creativity. They only increase the probability that creativity will occur.

WHAT 142 STUDIES TELL

Recently Paul surveyed 142 experiments designed to provide information about the teachability of creativity (Torrance, 1972a). In this monograph, the authors will summarize the results of this survey and describe in some detail a few of the teaching procedures used in obtaining these results. The survey included only studies using empirical evidence and those involving elementary and high school students. Studies involving college students and adults were not included.

In the evaluation of the 142 experiments surveyed, there was in most instances access to the documentary reports. In some cases, however, it was necessary to rely upon journal articles and abstracts. To help in the organization of the data from the 142 studies surveyed, the studies were classified into the following nine categories according to method of stimulating creativity:

1. Teaching procedures emphasizing the Osborn-Parnes Creative Problem Solving procedures or modifications of them
2. Other disciplined procedures of creative problem solving such as general semantics training and creative research methods
3. Complex programs involving packages of materials, such as the Purdue Creativity Program; Covington, Crutchfield, and Davies' Productive Thinking Program; and the Myers and Torrance ideabooks
4. The creative arts as vehicles for teaching and practicing creative thinking

5. Media and reading programs designed to teach and give practice in creative thinking
6. Curricular and administrative arrangements designed to create favorable conditions for learning and practicing creative thinking
7. Teacher-classroom variables, indirect and direct control, classroom climate, and the like
8. Motivation, reward, competition, and the like
9. Testing conditions designed to facilitate a higher level of creative functioning or more valid and/or reliable test performances.

The frequency of each of these types of studies and estimates of the success attained from them are summarized in Table 1. In judging success, a score of 1 was awarded if all of the measured objectives of the experiment were attained. If the experiment had a single objective, such as increasing the degree of originality of thinking, a score of 1 was still assigned when the effort proved to be successful. However, if data were given for fluency, flexibility, originality, and elaboration and the only statistically significant gain over the control group was in originality, a score of .25 was awarded. If ten of twenty tests indicated significant differences, a score of .50 was awarded.

It will be noted from Table 1 that the most popular approach to teaching children to think creatively has been through complex programs involving packages of materials, the manipulation of teacher-classroom variables, and the use of modifications of the Osborn-Parnes Creative Problem Solving training program. Somewhat less popular have been the creative arts as vehicles, motivation techniques, and facilitating testing conditions.

The best batting averages have been compiled by those experiments using the various modifications of the Osborn-Parnes training program and other disciplined approaches—over 90 percent. Programs involving the creative arts, complex programs involving packages of materials, media, and reading programs, motivation, and facilitating testing conditions have also been relatively successful—around 75 percent. The poorest batting averages have been compiled by studies involving curricular and administrative arrangements and teacher-classroom variables.

TABLE 1
Summary of Successes in Teaching Children to Think Creatively According to Type of Intervention

Type of Intervention	Number Studies	Number Successes	Percentage Successes
1. Osborn-Parnes Creative Problem Solving Procedures and/or modifications	22	20.0	91
2. Other disciplined approaches	5	4.6	92
3. Complex programs involving packages of materials	25	18.0	72
4. Creative arts as vehicles	18	14.5	81
5. Media and reading programs	10	7.8	78
6. Curricular and administrative arrangements	8	4.0	50
7. Teacher-classroom variables, control, climate, etc.	26	14.4	55
8. Motivation, reward, competition, etc.	12	8.0	67
9. Facilitating testing conditions	16	11.0	69
TOTAL	142	102.3	72

Let us look more carefully at the summaries for each of the nine categories and an illustration from each category. The 142 studies are listed at the end of the journal article in which the studies are summarized (Torrance, 1972a). In that list, as well as in the abbreviated list given at the end of this monograph, the category for each study is indicated by the number in parentheses after each reference. For example, all references describing experiments using the Osborn-Parnes Creative Problem Solving approach are indicated by (1); all of those using other disciplined approaches by (2); etc.

ease, Pansy asked, "Do you know why you are here?" The responses were "No," "My homeroom teacher told me to come," "The community school director told me to come," and the like. A short bit of information about the Creative Education Foundation and the Annual Creative Problem Solving Institute seemed to interest them enough to warrant asking them to take a pretest before we went any further.

The pretest, which is also used as a posttest, consists of three questions:

> For the next three minutes, you are to think of as many uses as you can for the everyday object you will be shown. List these below.
>
> (A wire coat hanger [pretest] and a bleach bottle [posttest] are the objects.)
>
> Think of a pet peeve you have. Write it down, worded as a problem, in the following space.
>
> When you have several ideas for solving a problem, what are some of the yardsticks (criteria) you use to measure and determine the best of these?

Several small prizes are given during the six-hour module, and the first two are given for the most ideas listed under question 1. Usually a small plastic horn is given to the two who have the most ideas, so they can "toot their own horn." The youngsters commonly ask, "What do you mean by 'pet peeve'?" so that is clearly identified, with at least one of the group being able to translate it into their current terminology—in this case, "What really gets to you?" To aid in defining criteria, the question "What does one do with a yardstick?" promptly brings the response "Measures things," which is exactly what criteria are used for. The concept of measuring ideas to determine the best one is promptly introduced.

As soon as they seemed ready, we proceeded to the steps of problem solving.

Step 1: Problem Definition

A simple sketch of the creative problem solving process was distributed and briefly discussed. It was pointed out that one always has problems but is sometimes slow to pick up the real problem, that one really tries many solutions unconsciously at times and therefore needs to know how to choose the best idea to implement as a solution. Examples of criteria were given by asking, "Why did you choose the blouse/shirt/dress/pants you have on today?" and "What are the yardsticks you use when you choose a place to eat hamburgers?" Students are usually quick to recognize that they have been unconsciously using criteria all their lives. At times the distribution of this sketch comes later and brainstorming is then the first introduction to formal problem solving.

Most of the young people quickly grasp that this is not the kind of problem one encounters in mathematics, but in seeking better ways of identifying and solving everyday situations which "bug them" or "get to them."

A brief glance through the pretest answers will give some idea of what might be appropriate problems to discuss. First a transparency of a Beetle Bailey cartoon is used to introduce the idea of carefully wording a problem. Suggesting that using an opening phrase such as "In what ways might Beetle . . ." leaves a good open-ended statement to preface Beetle's problems. A favorite Beetle cartoon is one where Beetle has painted part of a barracks building with a picture of Sarge with horns and Beetle's words, "Oh, NO! Sarge said he would be gone today. . . . He sees me!" Typed below the cartoon is the caption, "What is (are) Beetle's problem(s)?"

The initial laughter of the tenth graders was quickly followed by spontaneous suggestions:

Keep from being seen by Sarge
Keep Sarge from seeing the wall
Convince Sarge it's April Fool
Convince Sarge he's painting over it
Get away fast
Get Sarge to go the other way, and so on.

These were recorded on a chalkboard or easel for later reference. Usually from twelve to fifteen aspects of the problem are identified. The students see that there are several problems and that some of the problems border on solutions. We discussed the differences between "In what ways might Beetle get away fast?" and "In what ways might Beetle convince Sarge it's April Fool?"

When they began giving answers which might be solutions, they were able to recognize that the words have multiple meanings. We lead into a discussion of how they worded the problems on the pretest and how they might have reworded them more effectively.

On the pretest with this group some of the problems suggested were rather typical for young people:

When someone is a hypocrite. Example: My parents say that I can't do something because it is not right and then they go and do the exact thing I wanted to do.

What irritates me is when people run into me (in the halls) and then cuss me out because they ran into me.

It really bugs me when someone interrupts me, especially if it is an older person. I feel like they don't think I have anything to say. If someone interrupts to add something to what I'm saying, it doesn't bug me as much.

Why do people litter the city?

As the students see the possibilities, various quotes are introduced by the instructor, such as, "John Dewey said, 'A problem well-worded is a problem half solved!" After the students have tried their hand at wording their initial problem again, we move along. Usually one of a group of fifteen or twenty high school students is really good at wording as well as in other aspects of creative problem solving. Definition seems to be one step that young people grasp faster than do older persons.

Step 2: Idea Finding for Solutions

Brainstorming is the one technique for idea finding which the students practiced in this short course. The session was introduced

with some of the Gestalt pictures such as the one with the two faces and the vase or the one with the old woman and the young girl. Since most of the students have seen one or both of these pictures, a squares figure was also used. This was a variation of the four squares by four squares figure and contains forty squares. Most groups are rather quick at getting beyond thirty and occasionally one person will get forty. Sometimes teleidoscopes are used to stress bringing information from the outside to transform into new combinations and kaleidoscopes are used to emphasize rearranging known material. Looking around a room for ideas is another suggestion.

After the warm-up and emphasis on seeing more than one usually sees, a single sheet was distributed. We discussed the killer phrases ("Let's refer it to a committee." "You don't understand the problem."); the igniter phrases ("It has great potential." "Why didn't I think of that?"); and then moved on to practicing brainstorming.

Each rule was practiced separately, with a score kept on the chalkboard to show progress. Dyads were also used, with each person calling out his own ideas and writing them down while his partner called and recorded his own ideas. The stimulation of another person's ideas usually increased the output.

The four basic rules of brainstorming are:

Criticism is ruled out.
"Free wheeling" is welcomed.
Quantity is wanted.
Combination and improvement are sought.

With the tenth graders, the following problems were used:

Rule 1: Each dyad thought of one teacher who had an uninteresting class. "In what ways might I influence that teacher to present more interesting classes?"

Rule 2: How might we get the teacher more interested in us as students?
(The most delightful idea for this was to put an abandoned baby at his house so that he would get interested in babies and used to children and therefore like us better.)

Rule 3: How might I keep from going to sleep in class?

Rule 4: In what ways might I convince the teacher I was present when I was absent from class?

Three minutes were used for each rule in succession and the total number of ideas for each rule was:

No criticism	65 ideas
Free wheeling	109 ideas
Quantity	224 ideas
Combination	158 ideas

In this group, the students attributed the drop in number of ideas on the fourth try to lack of interest in the problem. Fatigue may also enter in, or the instructor may fail to develop four equally interesting, relevant problems.

Small laughter-provoking prizes were given to the dyad with the most ideas each time. In case of a repeat, the dyad often suggests that the next highest pair receive a prize, and on the fourth try all participants are given some small prize.

For a seventh-grade group, where the problem to be attacked was "In what ways might we in this room (boys, girls, teacher) get along better?", contact between pairs of fuzzy feet was used to establish a bond between the dyads and also between room members. These were given out at the beginning of the sessions and other small prizes were used later.

Ordinarily in the six-hour mini-module, there is a three-hour session with one break given one day and a similar three-hour session another day. Usually we are far enough along at the end of three hours that the students are asked if they would like to work on a problem of their own. The response is usually "Yes," so they are then asked to think of a small problem, to try to word it at the beginning of the next session, and to try to work it through to a conclusion.

For the second session various methods of warm-up are used. The teleidoscopes may be out. A collection of spoons may be used to demonstrate the acronym SCAMPER. The spoon collection may be flashlights or screwdrivers. There should be at least one to demonstrate each of the following:

Substitute (may be material or function)
Combine
Adapt; add
Minify
ultiply
odify
agnify
Put to other uses
Eliminate
Reverse, rearrange

At the beginning of the second session for the tenth graders, a four-page, creative, problem-solving outline was given each student. Instructions are:

> In the space below, describe a situation you wish to seek solutions for: where, who, what, when, how, why, and the facts. Be as brief and complete as possible.

Five minutes was allotted for this. Students are always told how much time they have for each activity and, when brainstorming, they are reminded when a minute or two minutes remain. They are also reminded that another person will read their description and question them if the description is not clear. The dyads are given three minutes per problem to review and ask questions. If they seem to have real trouble getting the problem clarified, questions or rewording are suggested because of time limits. When they all seem to have the situation described, they word their problem for creative attack.

With this group some of the final problems were:

1. In what ways might I find more time for my homework? I get home at 4:00 and snack. I watch television until 6:00. Meanwhile I eat dinner. I prepare my clothes for the next day. Then I watch TV from 8:00 to 9:00. I really don't care to do my homework anyway.

His partner commented:

First of all, you are going to have to get used to the homework. Snack and two hours TV? What about 9:00 to 10:00? You could do your homework in your homeroom if nothing else.

2. I have this problem about lunch money. In what ways might I earn lunch money?

3. In what ways can I keep the other horses out of my horse's stalls? I have to leave the doors open for my horses but since the other owners don't leave their doors open, they chase my horses out and stay in there.

(She had twenty ideas for solution, among them—put on a combination lock that only my horses can open, and make a secret tunnel.)

Brainstorming was done in dyads with five minutes allowed for each problem. Then we were ready to consider seriously step 3.

Step 3: Development of Criteria and Evaluation of Ideas

In the initial mimeographed sheet, we have criteria defined as a yardstick and every opportunity has been taken to point out how criteria are used in the sessions. Now we emphasized the use of the criteria in a more orderly fashion.

We asked each student to choose five of the ideas he *likes best* from his brainstormed list. We stress that "likes best" is a gross criterion.

As we look at the ideas each student has chosen, we can suggest criteria which might be applicable to several of the students. Several students had problems which involved self-discipline so "Will I do it?" seemed appropriate.

We asked each student to list at least four criteria to be checked for appropriateness. The girl who was concerned about her horses listed her criteria as follows:

Work involved
Feelings of other owners
Trouble I may get into
Feelings of horses

On the pretest, four students were unable to identify a criterion, and only two students were able to identify as many as three criteria. On the posttest, the range of criteria was from one (only one student) to ten, with a mean of 5.5, compared to a mean of one on the pretest.

As soon as the five best ideas from the previous page were

listed horizontally and the four criteria were listed vertically, ways to compare the ideas according to criteria were discussed. A crucial point and one easily overlooked is that one and only one criterion should be used against all five ideas before going on to the next criterion.

We finally decided in this group to choose the best idea and give it 1 point; the next best, 2; the third best, 3; the fourth best, 4; and the fifth best, 5. This means that the idea with the lowest total score will be the best idea. With such a short session, this seems to be the best way to handle the evaluation of ideas. Both seventh and tenth graders have understood it better than when ratings of good, fair, and poor are used.

When all ideas have been evaluated against each of the four criteria, the total score is added across for each idea. Thus the idea which has the lowest score is the best, and is carried on to the next page.

Time ordinarily catches up with the group and there is limited time for the page on acceptance-finding. At least a part of the first column was completed. On the horse problem, the student's best idea was to "chase the other horses to the far side of the field." The student decided that she would do this every day, riding one of her horses, and hoping that her horse would be encouraged to be more aggressive.

The last task was the posttest, which takes about ten minutes. The student who had stated the pet peeve about parents, stated his pet peeve on the posttest thus:

> Because I sell programs at the football game, and other sellers are always selling where I go, how will I be able to discourage them so that I can sell more?

Other students also showed improvement in stating problems.

Although the authors recognize that six hours of instruction is inadequate, it does seem to improve the ability of students to look at a problem and think of it in a more organized and productive fashion.

OTHER DISCIPLINED PROCEDURES

Under the category "other disciplined procedures" are included a method of teaching remedial reading (Allen, 1969), two different programs for teaching creative research methods (Dunn, 1968; Torrance and Myers, 1962), a program involving creative expression and sense perception (Schaefer, 1970), and general semantics training (True, 1966). Although we know of some successful experiments in teaching children the synectics approach (Torrance and Myers, 1970) and some of the experimental materials have been published (Synectics, Inc., 1968), we were unable to locate any empirically evaluated studies.

Allen's experiment with remedial reading and creative dramatics will be described to illustrate this category. Involved in this experiment were three experimental and two control groups of fifth graders. One of the experimental groups received forty hours of instruction in creative dramatics, a second group received forty hours of remedial reading instruction, and a third group received twenty hours of instruction in creative dramatics and twenty hours of remedial reading instruction. The creative dramatics experiences were under the direction of a leader trained and experienced in theater work and informal dramatics with both adults and children. The remedial reading sessions were conducted by a leader who had specialized in working with disadvantaged children in remedial reading.

All of the creative dramatics sessions followed the same general plan of organization but the content varied from session to session. Each session featured a particular stimulus such as a story read by the group leader, recording, film or filmstrip, or

painting. One of these devices was used during the initial ten-fifteen minutes of each session. The second phase of a session called for a reaction by the children in the group. If there had been a story, the children discussed the parts they liked, or any element of it that aroused interest. This phase led naturally into the third phase, the enactment of roles which had been generated by the story and the subsequent discussion. Roles might vary from characters in stories, to animals and plants, and to flowers. About twenty to thirty-five minutes were usually devoted to this phase. The fourth phase called the initial device back into play. When a film had been used, for example, it was not shown again but a brief reference was made to it. If a painting had been used, the children again looked at the painting. This phase was brief and became the basis for the final phase of the session, the evaluation.

In the evaluation phase, group members were asked to examine the roles they had played and make any comments that might occur to them. A child might be pleased with his performance and feel that he had caught the essence of the character, or he might make suggestions as to how he could have dramatized the character more effectively. Efforts were made to free the children to express whatever judgments they might have.

Although the children in the experimental groups were away from regular classroom instruction for fifty minutes a day for eight weeks, they achieved as well on reading at the end of the study as did the children remaining in the classroom. The groups receiving creative dramatics and creative dramatics plus remedial reading performed as well on the reading measures as the children who had had the full forty sessions of remedial reading. The only groups showing significant gains on the originality and elaboration measures of the *Torrance Tests of Creative Thinking* (Torrance, 1966) were the two experimental groups who experienced the creative dramatics sessions.

PACKAGED INSTRUCTIONAL MATERIALS

The twenty-five experimental studies involving complex programs with packaged instructional materials have been concentrated primarily upon three programs: (1) the Covington, Crutchfield, and Davies Productive Thinking Program (1972); (2) the Purdue Creative Thinking Program (Feldhusen, Bahlke, & Treffinger, 1969; Feldhusen, Treffinger, & Bahlke, 1970); and (3) the Myers and Torrance ideabooks (1964, 1965ab, 1966ab). In the evaluations, each of these sets of materials scores fairly well, especially when there is class and teacher involvement in their use. Without this involvement, the "batting average" for this category is relatively low.

Less frequently evaluated are the Wisconsin materials developed by Davis and his associates (1968, 1969), the Montessori materials (Freyermuth, 1968), the Chicago Inservice Kit (Provus, 1970), scrambled textbook programmed exercises (Shackel and Lawrence, 1969), and various kinds of "homemade" packages (Deroche, 1965). Only for the Purdue Creative Thinking Program have separate components and combinations of components been evaluated. The exercises seemed to come out best in these evaluations, and the presentations of principles of creative thinking poorest. All three programs seem to have been effective with both high and low "Intelligence Quotient" groups.

The Purdue Creative Thinking Program

The Purdue Creative Thinking Program consists of a series of twenty-eight audiotapes, and, for each tape, a set of three or four printed exercises. Each of the twenty-eight lessons is designed to

foster the divergent thinking abilities of verbal and figural fluency, flexibility, originality, and elaboration and consists of three parts. The first part is a three- to four-minute presentation which attempts to teach a principle or idea for improving creative thinking. The second part is a ten-minute story about a famous American pioneer. The third part consists of a series of three or four printed exercises.

The first section of each audiotape, called the presentation, gives specific suggestions for improving one's creative thinking skills and emphasizes the value of creative thinking. For example, one of these presentations deals with the use of creative ideas outside the classroom and suggests that children who think of new and unusual ideas for games have more fun. Other lessons emphasize problem solving, tolerance for the ideas of others, the importance of humor, and putting ideas together in unusual ways to create original products.

The dramatized stories are historical in content and are divided into four sets, each containing seven stories. The first group includes stories about explorers such as Columbus, Cortez, and Lewis and Clark. The second consists of the stories of important men and events in the history of the United States, such as Abraham Lincoln, Samuel F. B. Morse, and the first transatlantic cable. The third group includes stories of statesmen such as George Washington and Simon Bolivar. The final group deals with recent historical events, such as the development of a polio vaccine and space exploration.

The third phase of each lesson, the printed exercises, is based on the lesson's story. Children are frequently asked what they might have done if they had been the people in the story. The motivation is for many alternative solutions instead of a single correct answer. Some exercises are designed to strengthen verbal fluency, flexibility, and originality while others provide figural fluency, flexibility, originality, and elaboration.

A number of evaluations of this program, its elements, and combinations of its elements have been carried out, primarily at the third-, fourth-, and fifth-grade levels. In almost all instances, the total program achieved its creators' goals of improving verbal and figural fluency, flexibility, originality, and elaboration. When different components and combinations were evaluated, the

printed exercises alone or in combination with other components proved to be most effective. The stories alone or in combination with other components were also quite effective. The presentations appeared to be the least effective component.

CREATIVE ARTS

The eighteen experiments involving one or more of the creative arts as vehicles for teaching children to think creatively seem to have been rather effective, as indicated by an 81 percent batting average. These experiments ranged from programs in which the curriculum is built upon the creative arts (as in the Fortson [1969] and Torrance-Fortson [1968] studies) through those involving the creative arts as an extracurricular activity (as in the Skipper [1969] and Even [1964] studies) to those involving creative arts experiences in single courses and those involving special summer or out-of-school programs. Most of these programs have, in fact, a distinct out-of-school flavor.

Programs using the creative arts as a vehicle for developing curricula seem to be especially promising with disadvantaged and ethnic minority groups in which the creative arts are valued and encouraged. These programs capitalize upon such creative positives of disadvantaged children (Torrance, 1972b) as emotional expressiveness; enjoyment of and ability in the visual arts; enjoyment of and ability in creative movement, dance, and dramatics; enjoyment of and ability in music, rhythm, etc.; and articulateness in role playing and storytelling.

A Creativity Workshop for Disadvantaged Children

To illustrate programs featuring the creative arts, the authors will describe briefly the creativity workshop for disadvantaged children developed as a laboratory for Paul's summer session class on the learning problems of disadvantaged children and youth.

During the past seven years the authors have tried in a variety of situations to design an educational model for combining disciplined approaches to creative problem solving with creative expressive and investigative activities. The vehicle that has been most useful is a series of three-week creativity workshops for disadvantaged young people. These workshops, directed by the authors, have served as laboratories for Paul's course on Learning Problems of Disadvantaged Children and Youth. The scientific basis of the model comes from a dozen or so studies which have shown that in most situations there are no statistically significant differences in performance on the *Torrance Tests of Creative Thinking* (1966) due to race or socioeconomic status.

In the 1971 workshop, ninety-one young people were enrolled, ranging in age from six to thirteen years. Fifty-nine of the enrollees were boys and thirty-two were girls; fifty-one were black and forty were white. Most of the enrollees came from large low-income families in the vicinity of the city park in which the workshop was held. They were recruited through a brochure describing the workshop, delivered by a young man who had participated in the 1969 program. The workshop leaders were forty-seven mature students enrolled in Paul's course on Learning Difficulties of Disadvantaged Children.

Each day's session lasted four hours and involved participation in large-group, small-group, and individual activities. The day began with a large-group activity, usually a creative dramatics and problem-solving session, a film made by participants, a dance contest, or the like. This was followed by moderate-sized groups in creative music or dance and photography and craft programs. After a juice break, the session shifted to small groups working with sculpture, painting, biology, dramatics, puppetry, crafts, and Frisbees, and solving puzzles and mysteries. After a second break, all of the participants worked in four-person groups, under the supervision of an adult, on brainstorming and creative problem-solving training and practice. This was followed by another set of small-group activities: sculpture, painting, creative writing, science, newspaper, carpentry, leadership, Frisbees, hula hoops, singing, baking, and storytelling. The final session involved all workshoppers and leaders in discussing "the great things that happened today." The purpose of this final ses-

sion was to encourage leaders to recognize and acknowledge creative behavior and to make the young people aware of their own creative possibilities.

Creative Problem-Solving Training

The basic training in creative problem solving was given during a thirty-minute period each day but deliberate efforts were made to encourage the workshoppers and leaders to use creative problem solving in all of the activities of the workshop and in their homes. During the first two weeks, training was given in the rules of brainstorming and other component skills. Each session ended in contests among the four-person teams, and prizes were awarded to the winning team in the six- to eight-year division and the nine- to thirteen-year division.

At the beginning of the last week, each team began a series of sessions dealing with one problem, the improvement of the park as a place for learning and play. On the first day, the period was devoted to the production of ideas for improving the park. On the second day, the adult leaders helped the groups to develop criteria for evaluating their ideas, and then to evaluate the most promising ideas and choose one for implementation. On the third day, ideas were brainstormed for implementing and selling the idea that had been chosen. On the final day, each group made a poster to promote the idea its members had chosen for implementation.

At the beginning, few of the leaders had used creative problem solving as part of their teaching. As we entered the final week, however, almost all of them were using the process in all kinds of individual and small-group activities. Only a few examples can be cited here.

Creative Writing

The creative writing groups used brainstorming and creative problem solving at all stages, from the selection of topics to the creation of surprising endings. Perhaps its most systematic use was in the composition of cinquains (five-line poems). After the

selection of a title, the author brainstormed words to describe the topic (adjectives); then, words to tell what the topic does (verbs); and finally, words to tell about the feelings of the topic (adverbs). The cinquain was composed by selecting the two words that best described the topic for the second line, the three words that best tell what the topic does for the third line, and the four words that best describe the feelings of the topic for the fourth line. Finally, words were brainstormed and one word selected to synthesize the entire poem or catch its essence.

Dance and Creative Movement

The objective of one creative-movement session was to enable the participant to create new patterns of rhythmic movement for the different body parts. Each participant was asked to select a rhythm that he liked and move his head to the rhythm in as many ways as possible, then his shoulders, arms, hips, and so forth. Participants were asked to combine these different movements in response to the music and continue to add different movements using the different body parts. They were then asked to vary movements to the kind of feeling they wanted to express (happy, sad, lonely, angry, etc.).

In the dance contest held each Friday, a similar approach was encouraged in the creation of routines. The judges attempted to reward originality as well as skill, aesthetics, and the like.

Sculpture

One of the sculpture groups began by canvassing the entire park area for broken glass. In the small group, the leader then led them in exploring all the possible ways to use the glass in their sculpture. Members demonstrated to one another how the broken pieces of glass could be combined with other materials. On subsequent days, group members made beautiful sculptures by placing the pieces of broken glass in frames made of coat hangers and wire, making three-dimensional pictures in small cardboard boxes with broken pieces of glass and Elmer's glue, and making objects by arranging and mounting pieces of glass on blocks of wood.

Painting

During the last week of the workshop, the two painting groups made a large mural which is now on display in the College of Education of the University of Georgia and has attracted a great deal of attention and praise. The following excerpts from the account by one of the leaders shows how creative problem solving was used in this activity:

> What could we use for our theme? What could each person contribute to our group painting? These questions started the children talking about their group project and producing ideas for it. . . . It was decided that Dudley Park would be our best subject and, as they brainstormed their ideas they became increasingly enthusiastic about the mural.
>
> In preparation for our mural work, the children took a walk and looked around Dudley Park. Returning, we talked about the park, what it meant to them and the things they did while they were there. We made a long list of things that might be in the mural. Next the children began drawing their ideas of what they would like to put in the mural.
>
> After the first drawings were completed, we hung them up and discussed what they liked about them and how they could be put together in a single painting. After deciding what each person wanted to contribute, we began work on the actual drawing. The panels had been prepared earlier by several children and were dry by our group time. We divided our group and while one subgroup drew on the mural itself, the other subgroup began to mix the colors for painting. Through their mixing they achieved a variety of exciting colors.

A task of this complexity confronts the leaders with many problems that challenge the best that the creative problem-solving process can yield. Once disadvantaged young people are "turned on" to creative thinking, it comes forth at every point, as shown in the following evaluative comment by one of the leaders concerning a boy in the painting group:

> "My problem" with Joseph (if it can be called a problem) was that he thought of so many visual approaches to our mural that I

was beginning to think that we should never get down to the actual work of doing it. He sees things from different viewpoints quite easily. . . .

There were also the inescapable problems of getting so diverse a group (different ages, races, socioeconomic backgrounds, and sexes) to synthesize their efforts into a single production. The following evaluative summary by one of the leaders reflects some of this process:

> They were possessive at first of "their part" of the mural and didn't want anyone to "mess it up." But as they worked together and one problem after the other was solved, they became more tolerant of the views and contributions of others and now have begun to rely on each other more. This has created a greater sense of teamwork and they shared willingly and offered advice and materials more readily than before in any of our earlier small-group activities. They shared and built upon the ideas of one another.

Evaluation

No attempt was made to evaluate outcomes of the workshop by using traditional tests of reading, arithmetic, language development, science, social studies, and the like. Although it was plain to us that such gains were occurring, it seemed more important that the children use this precious time to paint, act, write, dance, do science experiments, solve problems and puzzles, and the like, than to take tests that would document and establish the occurrence of such growth. Furthermore, we were far more interested in evaluating what kinds of people these young people were becoming, how involved they were becoming in their learning, how well they were able to produce and consider alternatives, how well they were able to work together and make decisions.

We did administer alternative forms of the *Torrance Tests of Creative Thinking* at the beginning and end of the workshop, and documented statistically significant gains in ability to produce original ideas. More important to us, however, was the evidence the leaders were able to cite to show that the children

had become increasingly involved in their learning; increasingly gave expression to their innate sense of wonder and curiosity; increasingly gave vent to their desires to find out things; increasingly showed ability to persist with a task; learned how better to withstand failure and start over, if necessary, to achieve a desired goal; became more sensitive and humane in their responses to others; developed more positive attitudes about learning; and began considering a greater variety of alternative solutions to problems.

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MEDIA AND READING PROGRAMS

The ten experimental studies surveyed in this category scored a relatively high batting average, achieving 78 percent of their objectives. A number of elementary school reading programs now have built-in creativity components, of which the Reading 360 Program (Clymer *et al.*, 1969) probably represents the most thorough-going attempt in this direction. It is the only one for which there has been an evaluation of the facilitation of creative growth (Nash and Torrance, 1970). The Imagi/Craft Program is quite similar to the Purdue Creative Thinking Program and might have been included in the same category. Its initial field test, however, was a large and thoroughgoing one and produced impressive results. Thus, its originators have not seen fit to conduct additional evaluations.

Of the ideas represented among the ten studies surveyed, the Junior Great Books Club (Casper, 1964); the films, pictures, recordings, etc. developed by Baker (1963) for stimulating creative writing; and the use of typewriters in fourth-grade creative writing seem to offer excellent promise. Our guess is that any one of these devices in the hands of a skilled teacher who understands creative learning and teaching could be counted upon to produce positive results.

Creativity Strand in Reading 360

To illustrate how reading packages and other media can be used to facilitate creative growth, we have selected the creativity strand of Reading 360 for which Paul served as consultant. The

Reading 360 Program includes "packages" at thirteen levels (ten levels for grades 1-3 and three levels for grades 4-6). Level 1 consists of cards, shapes, and various kinds of readiness materials. A central feature of each of the other levels is a reading book. The stories have been selected to educate about the creative process and to stimulate further thinking and reading; the art work and graphics further support creative objectives. The teacher's edition at each level includes suggested exercises and assignments for creative activities before, during, and after reading a particular selection. Guides are also given teachers for creating their own exercises, asking provocative questions, etc., for encouraging creative thinking. In addition, there are available for each level (except Level 1) a skills handbook which includes exercises in creative thinking.

A good example of stories that encourage creative thinking is found in *A Duck is a Duck* (Level 3). The title of the story "What Is It?" is announced on a double-page spread showing four children and a dog leaving home apparently for school. One of the boys tries to send the dog back home but the dog discovers something hiding in a bush. The children investigate to see what could be hiding in the bush and finally determine that it is a turtle. They examine it first at a distance and then closely, finally putting it in a box and taking it to school. They then engage the teacher in guessing what is in the box. After offering several alternative hypotheses, she guesses that it is a turtle and this is verified. The next problem is to decide what to do with the turtle. The children propose several alternatives and then one girl leads them in applying several criteria (What does the turtle want? What do turtles like to do? What do turtles like to eat?). Through this process they decide that the turtle should be placed in the park and proceed to test their solution.

The construction of the exercises and assignments suggested in the teacher's editions was guided by a set of strategies developed by Paul for use before, during, and after a reading lesson. The following are examples of a few of them:

Before a Reading Experience

1. Confrontation with ambiguities and uncertainties
2. Heightened anticipation and expectation

3. Looking at the same thing from several different physical, psychological, or emotional points of view
4. Predictions from limited information
5. Encouragement to take the next step from what is known

During a Reading Experience

1. Awareness of problems heightened
2. Exploration of missing elements and possibilities made systematic and deliberate
3. Juxtaposition of apparently irrelevant or unrelated elements
4. Mysteries and puzzles explored and examined
5. Visualization of events, places, and the like encouraged

After a Reading Experience

1. Ambiguities and uncertainties played with
2. Digging deeper, going beyond the obvious, encouraged
3. Elaborating some element through drawing, painting, dramatics, imaginative stories, and the like
4. Experimentation and testing of ideas encouraged
5. Transforming and rearranging information or other elements.

Paul's book, Encouraging Creativity in the Classroom (1970), devotes several chapters to these strategies and gives examples of activities suggested by each of them. There is also available from Ginn and Company a free monograph, The Creative Teacher at Work (1972c), prepared by Paul.

The skills handbooks contain exercises designed to develop such skills as study methods, vocabulary, language, comprehension, literature, and creativity. The following are examples from the handbook for On the Edge (Level 12).

1. On page 140 is an exercise in ingenuity. After a brief statement on the meaning and usefulness of ingenuity, the English folk song, "The Hole in the Bucket," is cited as an example of lack of ingenuity. The student is then asked to think about what Georgie could have used to mend his bucket.

2. On page 143, after some descriptive material about the treasures that the sea gives up, the student is asked to pretend

that while he was out beachcombing he discovered one of the objects listed below and create a story about how it came to be on the shore:

> rusty iron-tipped harpoon; life ring; Spanish gold coin; broken stern of a small boat; rum bottle with note inside, etc.

3. On page 139 are pictures of two abandoned houses. After some warm-up statements about the "stories that abandoned houses tell," the student is asked to examine these photographs and write a story about the people who may have lived there and tell why no one lives there anymore.

Nash and Torrance (1970) conducted a rather systematic and thorough evaluation of the use of the Reading 360 Program in two first-grade classes with quite positive results. The creative growth and creative functioning of the children experiencing the program exceeded that of controls on both individual and small-group measures. Other independent evaluations have had similar positive tones, as illustrated by the following quotation from a report in *The Creative Teacher* (Plooster, 1972):

> These are only a few of the many activities that the Reading 360 Program initiated for these first graders. The children become very enthusiastic about securing information for so many things that they were taking from 4-6 library books per week from the school library plus those they found in the public library. This reading program never ended at any time period. Instead, it acted as a springboard for daily, weekly, and yearly class activities in all subject areas (p. 5).

CURRICULAR AND ADMINISTRATIVE ARRANGEMENTS

Both those who believe that creativity is teachable and those who deny this possibility have advocated various kinds of curricular and administrative arrangements for the facilitation of creative development. Those who believe that creativity is teachable see such arrangements as independent study, the open classroom, and other curricular and administrative reforms as offering a better chance to teach creative thinking. Those who believe that creativity is not teachable see these arrangements as offering a better chance for the student's natural creative abilities to function. Nevertheless, in the eight studies surveyed, there was a batting average of only 50 percent successes.

Perhaps the brightest spot in the picture obtained from an analysis of the studies in this category is Seides' (1967) experiment in placing artistically and musically talented slow learners in a talent class and giving them opportunities for talent development. This impresses us as a potentially productive idea and what happened in this experiment seems to be similar to what has happened with older youngsters talented in the arts in the North Carolina School of the Arts (Giannini, 1970).

Talent Class Placement

A brief description of the Talent Class Placement experiment (Seides, 1967) will serve to illustrate experiments in this category. The subjects of this study were eighty-four seventh graders classified as slow learners. Students talented in art and music were identified. One talented group was placed in a talent class. A sec-

ond equally talented group was placed in a regular class. A third group, non-talented, was placed in a regular class. The groups were initially comparable on measures of intelligence, reading, arithmetic, personality adjustment, and creative thinking ability. After one academic year, all students were retested and differences among groups analyzed. It was concluded that talent class placement had a generalized learning effect on the talented slow learners. On both mathematics and reading, their achievement was higher than that of their counterparts in both the talented and non-talented groups in regular classes. They also showed more positive personality adjustment and higher scores on the tests of creative thinking ability.

TEACHER-CLASSROOM AND CLIMATE VARIABLES

Those who place their hopes for creative growth on teacher-classroom and climate variables are found among both the believers and nonbelievers in the teachability of creative thinking. Generally, however, those who place their emphasis on the power of teacher-classroom and climate variables believe that creative thinking is teachable. They simply believe that certain kinds of teacher-classroom interactions provide for more teaching and practice of the skills involved in creative thinking.

While the number of studies involving teacher-classroom variables (twenty-six) is impressive, their success in teaching (or facilitating) creative thinking has not been outstanding, as might be inferred from a batting average of 55 percent successes. Studies that have relied upon the creative thinking abilities of the teacher have rather consistently failed to show significant results. The creative motivations of the teacher seem to be more powerful than creative thinking abilities; the two studies using the Torrance Creative Motivation Scale for identifying high and low creative teachers (James, 1964; Torrance, 1965b) showed promising, though not outstanding, results.

Most of the studies that have focused on observation and analysis of classroom interaction have been unsuccessful. However, most of them have been doctoral studies lacking in strong commitment from the school systems involved. Where highly competent and seasoned persons have been involved—Soar (1968), Clark and Trowbridge (1971), Mitchell (1967, 1971), with an in-service trainer such as George I. Brown (1971)—the results have been much more promising. A number of promising sidelights worth noting emerge from this category of studies. There are indi-

cations that the verbal creative thinking abilities receive useful practice in expert indirect-influence teaching while the figural creative thinking abilities, especially elaboration, receive such stimulation under the expert direct teacher. The results obtained by Torrance (1969a b d) with dyadic interaction also suggest that experimentation with small-group arrangements might be promising.

Predetermined and Jointly-Determined Structure

Crabtree's (1967) study of the effects of predetermined and jointly-determined structure on second-grade children's thinking in social studies will be used to illustrate possibilities in this category. The two types of structure were established during what Crabtree called "antecedent instructional periods." These are fifteen-minute, teacher-directed group discussions.

In establishing the Predetermined Structure, the teacher instituted rigorous limitations in the children's thinking. Discussion topics were teacher-selected. Children were asked highly structured questions which called for a limited range of responses which could be evaluated as "right" or "wrong" against established information. If children introduced tangential ideas or went beyond the frame of reference the teacher had established, their responses were ignored, rebuked, or rechanneled in line with what the teacher wished to pursue. Positive reinforcement was given for correct responses. Teacher questions were structured to cue the answer desired and to keep both error and digression to a minimum.

In the Jointly-Determined Structure condition, the teacher opened to the children opportunities to explore ideas they initiated, provided those ideas bore relevance to the subject under study. Classroom materials in the form of bulletin board displays, pictures, charts, and three-dimensional models were arranged to establish the subject matter frame-of-reference. Open-ended questions elicited the children's interest within the subject area. Children's interests thereafter provided the cues for the content of these discussions and the pacing of them. When tangential ideas were introduced, the teacher helped the children define criteria for determining their relevance.

Under both conditions, the instruction centered upon the

social studies curriculum with focus on community studies of harbor and airport activities. In both conditions, the teacher's role was an active one. Effects of teacher structuring on children's thinking were assessed each day in a follow-up dramatic play session wherein the children were given opportunity to engage in nondirected simulation of harbor and airport activities. During this period, the children in both conditions were free to use the materials as they wished and to develop play patterns of their own.

The following indicators of divergent thinking were observed during the play phase:

Creates new and original use of a known piece of equipment
Uses or creates a new object in some unique way
Changes appearance of object in some new way
Suggests a new idea, tangential to what is being done
The leadership he exerts is toward a new, previously unexplored patterning of the elements of the activity
Structures a new and productive problem solution. Implies a restructuring of the elements already present or a striking departure from the present field into a new pattern of conceptual thinking.

The subjects of Crabtree's experiment were twenty-four second-grade children, pretested for creativity with Torrance's measures, paired on the basis of test results, and randomly assigned to each of the two groups. Both groups received, in alternate sequence, both experimental programs.

The effects were assessed by observations made of the play sessions following the fifteen-minute sessions in which the structuring was established. Time-sampling and anecdotal recording of observations were made by trained teams of independent observers.

Divergent thinking, characterized by originality and flexibility of response, occurred more frequently following the sessions having jointly-determined structure. Convergent thinking, defined as conceptually accurate, consensually validated responses, was more frequent following sessions wherein the structure had been predetermined by the teacher. Play following the jointly-structured sessions was also more constructive than that following the predetermined structured sessions.

MOTIVATION STUDIES

Some of the critics of the studies discussed in the previous sections have argued that the results obtained in them have resulted from increased motivation. The relatively low batting average (67 percent successes) of the motivation studies surveyed certainly suggest that motivation alone is not always dependable but that motivation alone can be powerful enough to make a difference. Most of these results have been achieved through different kinds of intrinsic motivation and generally these kinds of motivation have to be reapplied each time the desired performance is required and cannot be counted upon to produce continued creative thinking.

FACILITATING TESTING CONDITIONS

Throughout the history of attempts to develop tests of creative thinking ability, the authors have recognized that children have to be motivated to think creatively if one is to obtain valid measures. Early in their own work, the authors and their associates experimented with extended time limits, take-home tests, special warm-ups preceding actual testing, and variations in instructions. The elements finally packaged in 1966 as the research edition of the *Torrance Tests of Creative Thinking* represent a considerable compromise between what the authors and their associates considered reasonable and feasible for use in schools and what they considered ideal. They realized that their solutions were not the best ones possible, and they are still considering and evaluating other alternatives. When appropriate criteria of adaptability to school conditions, cost, performance level, and the like have been applied, however, the decisions made in 1966 have continued to stand up quite well.

Following Wallach and Kogan's challenge of the authors' methods of administration (Wallach, 1967, 1970, 1971; Wallach & Kogan, 1965), there was a flurry of experiments to investigate some of the issues raised. Unknown to Wallach and Kogan, the authors had already conducted experiments relevant to most of the issues they raised. For example, they had found the instructions to think of "the cleverest, most interesting and unusual ways you can think of . . ." to be more freeing, especially to children, than instructions to think of "as many ideas as possible, regardless of how good they are." They had also found that the instructions to draw a picture that "no one else in the

class will think of" much more productive of original ideas than instructions without this specification. They had found that children enjoyed this aspect of the testing process rather than being traumatized by it as Wallach and Kogan have intimated. The authors' instructions avoid the use of the term "test" and nowhere on the test booklet does the word "test" appear. The covers of the booklets have curiosity-arousing designs that help create a non-test, non-school atmosphere. In fact, Paul has had the recent experience of encountering a class of underachievers who had been rather traumatized by a barrage of the usual kinds of intelligence, achievement, personality, and attitude tests. They had, according to their teacher, become very resistant to taking tests and had developed a very hostile attitude concerning tests. When she administered one of the *Torrance Tests of Creative Thinking* the response was different. The children themselves began writing Paul and asking him to send them additional tests. They have now taken about all of the creative thinking tests he has ever invented and still the demand continues.

Analysis of the sixteen experiments involving facilitating test conditions included in this survey show superior results in 69 percent of the cases. These results indicate that improved performance on tests of creative thinking can probably be obtained by appropriate warm-up just prior to the administration of the test and by providing a variety of visual materials in the testing room. The results concerning the game-like atmosphere, take-home administrations, and extended time limits are not clear. In fact most of them are negative. In one instance (Torrance, 1969a), performance on the take-home test seemed to be more valid than the timed test. However, the participants in this study were all highly able, high-achieving, well-motivated youngsters and only one test task was used. When this procedure was applied by Towell (1972) using the complete verbal battery with students representing the full range of ability, the infeasibility of this procedure became clear. Few of the children were motivated to continue producing responses. They obtained ideas from parents and other persons, in spite of being cautioned not to do so and in the absence of any threat. In many schools, children are not permitted to take books home and have never been assigned any homework. The take-home test procedure simply does

not fit into this kind of school. The take-home procedure also compounds scoring problems. Some children produce such large numbers of responses that the scoring task becomes extremely expensive.

The authors would like to encourage continued experimental work on testing conditions, testing instructions, and the like. Already such experimentation has provided new insights into the conditions and instructions that facilitate creative thinking. Even though it may not be feasible to apply the results to the tests themselves, the insights can be applied to classroom instruction, the making of assignments, and the motivation of creative behavior.

CONCLUSION

In answer to the question posed by the title of this fastback, it does indeed seem possible to teach creative thinking. The most successful approaches seem to be those that involve both cognitive and emotional functioning, provide adequate structure and motivation, and give opportunities for involvement, practice, and interaction with teachers and other students. Motivating and facilitating conditions certainly make a difference in creative functioning but differences seem greatest and most predictable when deliberate teaching is involved.

REFERENCES

Allen, E. G. An investigation of change in reading achievement, self-concept and creativity of disadvantaged elementary children experiencing three methods of training. Doctoral dissertation, University of Southern Mississippi, 1969. (University Microfilms Order No. 69-4683; *Dissertation Abstracts* 29:3032). (2)

Baker, M. G. Motivation for the release of creativity through creative writing. Doctoral dissertation, Ball State Teachers College, 1963. (University Microfilms Order No. 64-3577; *Dissertation Abstracts* 24: 11/4578). (5)

Brown, G. I. Human Teaching for human learning. New York: Viking, 1971. (7)

Casper, T. P. Effects of the Junior Great Books Program at the fifth grade level on four componential operations and certain of their componential factors as defined by J. P. Guilford. Doctoral dissertation, St. Louis University, 1964. (University Microfilms Order No. 64-13, 453; *Dissertation Abstracts* 25:4570-4571). (5)

Clark, B. M. & Trowbridge, N. Encouraging creativity through inservice teacher education. *Journal of Research and Development in Education*, 1971, *4*(3), 87-94. (7)

Clymer, T. et *al. Reading 360 Program*. Lexington, Mass.: Ginn, 1969. (5)

Covington, M. V., Crutchfield, R. S., & Davies, L. B. *The productive thinking program*. Columbus, Ohio: Merrill, 1972. (3)

Crabtree, C. Effects of structuring on the productiveness of children's thinking. *Journal of Experimental Education*, 1967, *37*, 1-13. (7)

Davis, G. A. & Houtman, S. E. *Thinking creatively: a guide to training imagination*. Madison Wisc.: Wisconsin Research and Development Center for Cognitive Learning, 1968. (3)

Davis, G. A., Houtman, S. E., Warren, T. F. & Roweton, W. E. *A program for training creative thinking: I. Preliminary field test*. Madison, Wisc.: Wisconsin Research and Development Center for Cognitive Learning, 1969. (3)

Deroche, E. F. A study of the effectiveness of selected creative thinking and the mastery of a unit in elementary science. Doctoral dissertation, Marquette University, 1965. (University Microfilms Order No. 67-4542; *Dissertation Abstracts* 27:4162). (3)

Dunn, H. C. Gifted children find research can be fun. *Gifted Child Quarterly*, 1968, 12, 10-13. (2)

Even, R. E. An experimental study of the comparative effect of selected art experiences on the creative performance and attitudes of academically superior students. Doctoral dissertation, University of Minnesota, 1964. (University Microfilms Order No. 64-4062; *Dissertation Abstracts* 24:4470). (4)

Feldhusen, J. F., Bahlke, S. J., & Treffinger, D. J. Teaching creative thinking. *Elementary School Journal*, 1969, 70, 48-53. (3)

Feldhusen, J. F., Treffinger, D. J., & Bahlke, S. J. Developing creative thinking: the Purdue creativity program. *Journal of Creative Behavior*, 1970, 4, 85-90. (3)

Fortson, L. R. The creative-aesthetic approach to readiness and beginning reading and mathematics in the kindergarten. Doctoral dissertation, University of Georgia, 1969. (University Microfilms Order No. 70-10, 187; *Dissertation Abstracts* 30:5339-A). (4)

Freyermuth, R. A. A comparison of the effects of various preschool experiences upon the imaginative visual expression of five-year olds. Doctoral dissertation, University of Miami, 1968. (University Microfilms Order No. 69-2684; *Dissertation Abstracts* 29:2603-A). (3)

Giannini, V. Nurturing talent and creativity in the arts. In Heist, P. (Ed.), *The creative college student: An unmet challenge*. San Francisco: Jossey-Bass, 1968, 73-83. (6)

James, G. R. The relationship of teacher characteristics and pupil creativity. Doctoral dissertation, University of North Carolina, 1964. (University Microfilms Order No. 64-9419; *Dissertation Abstracts* 25:4544). (7)

Mitchell, B. M. An assessment of changes in creativity factors of elementary school children involved in a creativity project. Doctoral dissertation, University of Denver, 1967. (University Microfilms Order No. 68-2399; *Dissertation Abstracts* 28:3376). (7)

Mitchell, B. M. The classroom pursuit of creativity: One strategy that worked. *Journal of Research and Development in Education*, 1971, 4(3), 57-62. (7)

Myers, R. E. & Torrance, E. P. *Invitations to thinking and doing*. Lexington, Mass.: Ginn, 1964. (3)

Myers, R. E. & Torrance, E. P. *Can you imagine?* Lexington, Mass.: Ginn, 1965 (a). (3)

Myers, R. E. & Torrance, E. P. *Invitations to speaking and writing creativity*. Lexington, Mass.: Ginn. 1965 (b). (3)

Myers, R. E. & Torrance. E. P. *For those who wonder*. Lexington, Mass.: Ginn, 1966 (a). (3)

Myers, R. E. & Torrance, E. P. *Plots, puzzles and ploys*. Lexington, Mass.: Ginn, 1966 (b). (3)

Nash, W. R. & Torrance. E. P. *A preliminary evaluation of the effects of reading 360 on creative development and functioning at the first grade level*. Athens, Ga.: Georgia Studies of Creative Behavior, 1970. (5)

Osborn, A. F. *Applied imagination*. (3rd Ed.) New York: Scribner's, 1963 (1)

Parnes, S. J. Methods and educational programs for stimulating creativity: A representative list. *Journal of Creative Behavior*, 1967 (a), 2, 71-75. (1)

Parnes, S. J. Creative behavior guidebook. New York: Scribner's, 1967 (b). (1)

Parnes, S. J. Creative behavior workbook. New York: Scribner's, 1967 (c). (1)

Plooster, B. Pilot reading program (Ginn 360). Creative Teacher, 1972, 4(3), 4-5.

Provus, M. Teaching for relevance. Northbrook, Ill.: Whitehall, 1970. (3)

Schaefer, C. E. Evaluation of a program for developing creative thinking in teachers and children at the fourth and fifth grade levels. Bronx, New York: Creativity Center, Fordham University, 1970. (2)

Seides, E. The effect of talent class placement on slow learners in the seventh grade of a New York City junior high school. Doctoral Dissertation, New York University, 1967. (University Microfilms Order No. 68-4821; Dissertation Abstracts 28:4011). (6)

Shackel, D. S., & Lawrence, P. J. Improving creativity through programmed instruction. New Zealand Journal of Educational Studies, 1969, 4, 41-56. (3)

Skipper, C. E. A study of the development of creative abilities in adolescence. Dayton, Ohio: Living Arts Program, 1969. (4)

Soar, R. S. Optimum teacher-pupil interaction for pupil growth. Educational Leadership, 1968, 26, 275-280.

Torrance, E. P. Rewarding creative behavior: Experiments in classroom creativity. Englewood Cliffs, N.J.: Prentice-Hall. 1965 (b). (3) (4) (7) (8)

Torrance, E. P. Torrance tests of creative thinking: technical-norms manual. Lexington, Mass.: Personnel Press, 1966.

Torrance, E. P. Curiosity of gifted children and performance on timed and untimed tests of creativity. Gifted Child Quarterly, 1969 (a), 13, 155-158. (9)

Torrance, E. P. Dimensions in early learning series: creativity. Belmont, Calif.: Fearon, 1969 (b).

Torrance, E. P. A three-year study of the influence of a creative-aesthetic approach to school readiness and beginning reading and arithmetic on creative development. Athens, Ga.: Research and Development Center in Educational Stimulation. University of Georgia, 1969 (d). (4)

Torrance, E. P. Encouraging creativity in the classroom. Dubuque, Iowa: Wm. C. Brown, 1970 (b).

Torrance, E. P. Can we teach children to think creatively? Journal of Creative Behavior, 1972 (a), 6, 114-143.

Torrance, E. P. An alternative to compensatory education. Educational Horizons, 1972 (b), 50, 176-182.

Torrance, E. P. The creative teacher at work. Lexington, Mass.: Ginn, 1972 (c).

Torrance, E. P. & Fortson, L. R. Creativity among young children and the creative-aesthetic approach. Education, 1968, 89, 27-30. (4)

Torrance, E. P. & Myers, R. E. Teaching gifted elementary pupils research concepts and skills. *Gifted Child Quarterly*, 1962, 6, 1-5. (2)

Torrance, E. P. & Myers, R. E. *Creative learning and teaching*. New York: Dodd, Mead, 1970.

Towell, R. D. Performance of high and low curiosity subjects on timed and untimed tests of creativity. Doctoral dissertation, University of Georgia, 1972. (9)

True, S. A study of the relation of general semantics and creativity. *Journal of Experimental Education*, 1966, 34, 34-40. (2)

Wallach, M. A. Creativity and the expression of possibilities. In Kagan, J. (Ed.), *Creativity and Learning*. Boston: Houghton Mifflin, 1967, 36-57.

Wallach, M. A. & Kogan, N. *Modes of thinking in young children*. New York: Holt, Rinehart & Winston, 1965.

Wallach, M.A. *The intelligence/creativity distinction*. New York: General Learning Press, 1971.

Wallach, M. A. Creativity. In Mussen, P. H. (Ed.), *Carmichael's manual of child psychology*. New York: Wiley, 1970, 1211-1272.

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