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ABSTRACT
             The major emphasis of this paper (a summary of the
results and implications of recent research into the nature of the
teaching process) is the relationship between teacher behavior
patterns and teacher effectiveness. The underlying thesis is that
application of the scientifically supported systems approach to
teacher training can yield (and has yielded) significant improvement
in teacher effectiveness (i.e., "the ability to create the classroom
conditions considered essential for attainment of multiple
educational objectives.") Among the concepts and teaching strategies
which the author defines, summarizes, and examines in terms of his
thesis are those related to: (1) inquiry ("an attitude toward
learning and a philosophy of education"); (2) productive thinking
(Questioning strategies); (3) guided learning (emphasis on the
particular nature of the learner and the learning task); (4)
creativity (supportive materials and approaches); (5) interpersonal
relations (sensitivity training); (6) clinical supervision
(interaction analysis systems); and (7) academic achievement (the
positive effect of these strategies on pupil growth). The paper
presents a rationale and model for preservice and inservice teacher
training based on those systems or strategies "for which there is
either empirical evidence, or apparently sound theory, or both." (ES)

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TUESDAY, MARCH 18, 1969
DENVER, COLORADO

WILLIAM T. WARD
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It has been said that a person's life will be shaped irrevocably by that for which he hungers most. The significance of this statement for educational decision makers is astounding. The way children think, the extent to which the various factors of the intellect are developed, the search models they develop, and the aspects of their potentialities developed in school are dependent upon the value system of the educational decision makers.

Dr. Herbert Thelen, social psychologist and professor of education, hits at the core of one of my concerns when he says: "As judged by our hopes for mental health, social stability, or scientific competition with Russia, our schools are good, bad, or indifferent, depending upon how you define your terms. As judged by what could be done if we were to understand and apply modern knowledge to educational problems, all our schools are obsolescent."

"We know a great deal about the nature of man, knowledge, and society; about the dynamics of learning by individuals; about factors affecting group performance; about intergroup relations and social action; about community improvement. But most of this knowledge has so far made almost no dent at all on educational practices, and, with the present tendency to think that educational problems can be solved with money and organizational changes, the likelihood of any significant improvement is discouragingly slight."

"This state of affairs is downright maddening."

"I think our present situation is grave; more, it is immoral, for to act ignorantly when knowledge is available, to deny realities that patently exist and make a genuine difference is the worst crime of civilized man. I am optimistic, however, in the belief that men of good-will can move toward a state of grace through hard work, persistence, and study."

I have chosen as my topic "The Most Effective Use of Scientific Knowledge
to Improve the Teaching-Learning Process" because we are continually
confronted with the accusation from all sides of the 25- to 50-year gap
between the findings emerging from the laboratories of the behavioral
scientists and the evidence of the effective use of these results by
the practitioners in the operation of educational systems. This is
disturbing to me, not because the statement is made repeatedly, but
because it is true and there is no need for it. Four reasons can be
cited to substantiate my concern. (1) During the past 10 to 15 years
there has been a phenomenal amount of research relevant to the development
of teacher behavior patterns that are related to the eliciting of desired
learner behaviors. (2) Several techniques for systematically observing
and recording classroom events have been developed to give the practitioner
the tools to obtain accurate data concerning patterns of interaction between
him and the students. This feedback enables him to assess his performance
in terms of his expectations and to make appropriate adjustments according
to the demands of the situation. (3) A number of these scholars have
derived systems of teaching strategies from their research that are meaningful
to teachers. When used systematically by teachers, these strategies
are effective in eliciting the desired behaviors in learners. (4) Technology
has now been developed to enable us to manipulate a multitude of variables
and assess alternatives that were physically impossible five years ago.

We have worked for the past five years with a number of teachers and
administrators from public and private schools and colleges, state
departments of education, and the Bureau of Indian Affairs in the Northwest
to develop an understanding of these systems and have produced a model
that has the potential for dealing effectively with the problems identified.
We can now do more than just talk about the need for better utilization of
scientific knowledge.

It now appears that there is a cluster or constellation of environmental
conditions under the control of the teacher that are related to the
attainment of educational objectives identified by experts in the
following areas: creativity, academic achievement, mental health,
motivation, group skills, inquiry, guided learning, and productive thinking.
The teacher behavior patterns or constellation of patterns that are
related to the establishment of these conditions can be taught, are being
taught, in fact, at both the pre-service and in-service level of teacher
preparation programs.

Joseph Schwab, professor of biology and professor of education at the
University of Chicago, gets at another one of my major concerns when he
states: "Educators are in a dangerous position. We are virtually surrounded
by a group of cliches and slogans. These slick, simple, chrome-plated

slogans--any slogans--are dangerous to (you) personally, as men of careers, and they are dangerous to education. The danger stems from what a slogan is: A complex and highly qualified idea which has been stripped of its complexities and bereft of its qualifcations. A slogan is like the victim of a mad scientist in a horror movie: brains removed and replaced by a dime store toy computer."

Some examples of these "slogans" are: (1) learning by discovery, (2) problem solving, (3) teaching and learning by inquiry, (4) concept formation, and (5) the process approach." Others could be enumerated.

According to Schwab, "There appears to be only three things to do with slogans: recognize them for what they are and reject them; or fail to recognize them as slogans and try to put them to work. If we take the first course--recognize them for what they are and reject them--whatever soundness and promise they may have had for education before they were "sloganeered" is lost; we miss the boat. If, on the other hand, we fail to recognize them as slogans and climb on the bandwagon, we face these consequences: we corrupt organized education; we give it another black mark to be identified by the next generation of critics; we give ourselves black marks as identifiable persons who contributed to a stupidity or fraud."

"However, there is a third way to deal with a slogan--it is the only way to neutralize the danger--and that is to give back to the slogan its brains, to read back into in its complexities and qualifications."

It is to the latter task that we have been addressing our attention for the past five years in Oregon and are now extending into Washington, Idaho, Montana, and Alaska through the work of the Northwest Regional Educational Laboratory. Our procedures have been planned to give meaning to the ideas imbedded in these slogans in such a way that the behavior of educators reflects an understanding of them.

To do this we have attempted to get educators to examine their belief about the following: (1) the nature of the learners, (2) the nature of knowledge, (3) the nature of the learning process itself, and (4) the relationship between process and content.

I propose to present to you the idea and data to support the thesis that the classroom conditions considered to be essential for attainment of multiple educational objectives are surprisingly similar. To be specific, a number of researchers working independently have identified a constellation of environmental conditions under the control of the school that are related to the attainment of objectives in mental health, creativity, guided learning, inquiry development, developing higher level thinking, subject matter achievement, and developing group skills. There is also a positive relationship between pupil motivation in the classroom and the presence of these conditions.

We will then explore some of the teaching behavior patterns that are related to the eliciting of the desired behavioral responses from the learner, and the classification schemas that enable these to be assessed by the teacher. I plan to follow this with a description of an in-service training model designed to provide every teacher, administrator, college methods instructor, and supervisor of new inductees with specialized instruction in the techniques that are related to the attainment of expected educational outcomes within ten years of the implementation of the model. My presentation will be terminated by a discussion of a plan for teacher preparation, at both the pre-service and in-service level, designed to produce teachers capable of exhibiting the desired behaviors.

Soar[9] emphasizes the point that at the global level, education is concerned with the optimal functioning of the individual, and, as a part of this optimal functioning, with the development of such characteristics as intellectual knowledge and understanding, creativity, curiosity, self-expression, motivation and self direction, ability to relate effectively with peers and with superiors and the enhancement of personal adjustment and mental health.

A number of researchers have concluded that conditions that foster one of these kinds of growth will also foster the others: Biber, 1955; Rivlin, 1955; Stevenson, 1956; Smith, 1961; Bower, Tasnovian, and Larson, 1958; Stringer, 1959; Rogers, 1954; Maslow, 1959; Torrance, 1961; Getzels and Jackson, 1958; and Burton, 1958.[10]

In short then, there is a broad constellation of classroom processes which will support numbers of aspects of pupil growth.

Central to the establishment of optimal conditions for maximizing pupil outcomes are such things as: (1) acceptance of the individual as a person of unconditional worth or respect for the individual; (2) a sharing of responsibility with the group; (3) freedom of expression; (4) the importance of a supportive emotional climate; (5) learning from the examination of one's own experience; (6) greater emphasis on intrinsic and lesser emphasis on extrinsic motivational devices; (7) empathic understanding; and (8) reaction to the person's behavior rather than to him.

The central concern then is with increasing teacher effectiveness. This goal can be and is being implemented by disseminating the results of recent research which have developed ways of conceptualizing, analyzing, and recording the process of teaching. The rationale for teaching these systems to teachers is that they provide simultaneously a way of thinking about the teaching process, a system of feedback for examining one's own teaching behavior, and a language for communicating with other people

about the teaching process. For purposes of evaluation, these systems also have the useful characteristic of providing the means of measurement of change in teaching behavior. At the same time, the aspects of teaching toward which attempts at change are directed are those for which past research indicates relationships with pupil growth, as well as those whose importance is supported by current theory. That is, the major thrusts are those for which there is either empirical evidence, or apparently sound theory, or both, to indicate their importance in producing change in pupils. Let us look at these.

Related Research and Literature

Prior to the 1950's, very little had been done in the way of analysis of the relationship between the behavior a teacher exhibited in the classroom and the consequences of this behavior on the behavior patterns of the learner.

Since 1950, H. H. Anderson,[11] John Withall,[12] Herbert Thelen,[13] Ned Flanders,[14] Morris Cogan,[15] Donald Medley and Harold Mitzel,[16] Marie Hughes,[17] Hilda Taba,[18] James Gallagher,[19] Richard Suchman,[20] Paul Torrance,[21] Robert Spaulding,[22] B. O. Smith,[23] and Arno Bellack,[24] representing but a few of the major researchers, have been concerned with and have made significant contribution to the development of better understandings of pupil-teacher interaction. These understandings have provided the stimulus for experimentation with specific teacher behavior patterns that elicit desired behaviors from the learners. Through practice under supervision, it is now possible for a teacher to learn to control his behavior in a classroom so that his effectiveness in attaining certain specific goals will be enhanced.

Teaching Strategies

The teaching strategies and assessment procedures that have proven successful in helping teachers establish the optimal conditions and thereby attain the desired educational objectives really represent the "guts" of my message. They also represent the core of the better teacher preparation programs in the United States.

Teaching includes many variables: the teacher, the nature of the subject matter, the learner, and the learning process. Each of these variables needs to be taken into account in making decisions about teaching. Even in such a simple teaching act as deciding what question to ask a third grade group, the teacher must consider such factors as the subject he teaches, what objectives he pursues, and the age and characteristics of the students. These variables impose certain requirements on the teaching-learning process which must be accommodated simultaneously.[25]

TEACHING STRATEGY DEFINED

Teaching strategy, therefore, is a pattern and sequence of teacher
behaviors designed to accommodate all important variables, consciously
and systematically.

According to Costa, Lavaroni, and Newton, "Teaching strategies are more
than just lesson plans. They include mental maps that the teacher uses to
give directions to discussion and activities toward a long-range toal.
The maps allow the teacher to distinguish the relevant from the irrelevant
activity; the productive from the non-productive comments and the "fat"
from the "thin" types of questions."[27]

"Teaching strategies are long-range plans of action that encompass what
is known about learning theory and acceptable pedagogical methods. They
take into account important general principles of learning such as the
methods of motivation, reinforcement, and the transfer of learning."[28]

"Strategies will vary with each discipline or content area. The logical
processes inherent in the disciplines will partially dictate the style
and mode of teaching. The strategies used to teach the aesthetic processes
will vary from those used to teach the scientific processes. Teaching
strategies, then, vary with each operational objective. The form and
structure of the teaching strategy is partially determined by the process
objective of the teaching."[29]

TEACHER STRATEGIES RELATED TO ATTAINMENT OF MULTIPLE OBJECTIVES

A number of systems have been developed that have tremendous potential
for developing the cognitive abilities of learners. For example, the
research of Dr. Hilda Taba and Norm Wallen and the development work of
Alice Duvall have produced a series of specific teaching strategies
related to concept development; developing children's ability to see
cause and effect relationships; to make inferences, predictions, and
generalizations, in other words to interpret data; and to apply known
principles to new situations. Taba has also worked with teachers to
develop generic strategies designed to assist them in maintaining
appropriate balance between intake and expression, inductive sequencing
and deductive sequencing, and accommodation and assimilation. These
strategies assist the teacher in going from the concrete to the abstract,
the general to the specific, and the simple to the complex. By developing
in the social studies a series of experiences planned sequentially, incre-
mentally, objectively, and systematically that have all of these strategies
built in, multiple educational objectives are attained simultaneously,

via., knowledge objectives, skills, attitudes and thinking abilities.
Taba has also developed a classification system for analysis purposes.
This helps teachers assess the degree to which they are able to control
their behavior according to the desired mode to elicit the type of learner
behavior valued by the school, the teacher, the learner himself, or
society.

INQUIRY DEVELOPMENT

Dr. Richard Suchman, Fred Newton, Ben Strasser and others have produced
evidence that shows certain teacher strategies and techniques to be
related to the development of children's ability to inquire.

The problem: As students progress through the educational system they
depend more and more upon an external authority (the teacher or the
printed word) for "the right answer." Investigations of classroom
procedures reveal that 90 per cent of the time is spent in rote memori-
zation, recall upon demand, and seeking the right answer, and less than
10 per cent in classifying and generalizing, comparing and evaluation,
analyzing and synthesizing, and deducing and inferring.

Teachers tend to reject contributions made by students that are not
compatible with the teacher's "pre set" expectations. Teachers also
tend to expect students to follow a narrow range of search models in
obtaining data to provide the answer the teacher has in his mind.

INQUIRY DEFINED

Inquiry Development, according to Suchman, is a method of teaching the
skills and strategies of scientific inquiry. The purpose is to help
young students develop the procedures of investigation that are necessary
for the autonomous discovery of causal relationships. The students
observe phenomena for which they must find appropriate explanations in
terms of principles. They learn to formulate their explanations
inductively by gathering data from which they make inferences and
generalizations. The aim is to teach the learner to gather and organize
data, to isolate variables, to hypothesize relationships between variables,
and to test these hypotheses through experimentation. The key to
inquiry is the interplay between theories and data.

The Inquiry Development program is based on the assumption that concepts
are the most meaningful, are retained longest, and are most available
for future thinking when the learner actively gathers and processes data
from which the concepts emerge. Factors that support this assumption
are: (a) the experience of data gathering (exploration, manipulation,

experimentation, etc.) is intrinsically rewarding; (b) discovery through inquiry strengthens the learner's faith in the regularity of the universe which enables him to pursue causal relationships under highly frustrating conditions; (c) learning through inquiry builds self confidence which encourages the learner to make creative intuitive leaps; and (d) practice in the use of logical inductive processes involved in discovery through inquiry strengthens and extends these cognitive skills.[30]

The key elements of the program are:[31]

1. The problem episode which places the children in a situation where they do not understand the situation so are forced to find out why. They are faced with a series of discrepant events that need to be assimilated. This provides a focus.

2. The responsive environment is a necessary condition for inquiry. In the course of inquiry training, the teacher assumes a new role. He stops "teaching" and starts responding. He stops structuring concept development for the child and starts facilitating discovery by the child. By giving the child more of a chance to employ autonomous search and data processing, the teacher helps him learn to perform these operations with skill and confidence. In order to force the children to focus and structure their probes, a ground rule is established that the teacher will only answer questions that are answerable by "yes" or "no." In this way, the student is forced to use the teacher as the laboratory to try out various experiments verbally.

3. A focus on process. (An attempt to build a conceptual structure about inquiry itself.) In inquiry training an attempt is made to build a conceptual structure about inquiry itself so that the child can plan his searching operations in advance, develop strategies that will increase productivity, and be able to evaluate and improve his own inquiry. The elementary-school child is typically concerned with the content of his searching and relatively unaware of the processes by which he and others are obtaining his content. He rarely considers the possibility that the way they go about looking for information has anything to do with what he finds. An important step in inquiry training is to call the children's attention to the dimensions of process and show them that the productivity of inquiry is a direct function of the methods used by the inquirer.

4. <u>Guided practice</u>. Becoming aware of process and making it more schematic and logical come partly from the verbal structuring of the teacher and partly from the trial-and-error experimentations of the child. In the guided practice of inquiry training, the children are permitted to make mistakes in strategy, but the teacher sees to it that when the child runs into difficulty as a result, the source of his trouble is made clear to him. The teacher reviews the children's operations with them to help them see which strategies and tactics are effective and which are not.

5. <u>Low pressure</u>. It is easy for a student to feel pressured into achieving a solution to a problem as he feels that such a solution is expected and that he will be evaluated on the basis of his solution. Such pressure on an inquirer tends to inhibit his creativeness. Most creative thinking occurs when the thinker is free to play with ideas, to invent, to take chances, to change his mind and reserve direction. If the student is concerned about the kind of impression he is making on the teacher, his inventiveness is reduced. The teacher must behave in such a way as to minimize this social pressure on the student. One of the most difficult things for a teacher is to refrain from showing his approval or disapproval of various kinds of thinking or performance. If the teacher is to encourage inquiry, however, he must hold back responses of this kind, so that the students will gain their reinforcement directly from the success of their own ideas in adding meaningfulness to the environment. The teacher must listen to all ideas and respond to them without indicating which he considers silly or which he considers brilliant. All requests for data should be answered, even if the teacher considers them irrelevant, repetitious, or silly.

The main conclusions reached by Suchman was that the technique in its present form has a marked effect on the (1) <u>motivation</u>, (2) <u>autonomy</u>, and (3) <u>question-asking fluency of children</u>. They clearly enjoy having the freedom and the power to gather their own data in their quest for assimilation. Because they are not generally accustomed to having and exercising this freedom under ordinary circumstances in most classrooms, they have some initial difficulty making full use of it in the beginning of the training period. But, as the results clearly show, after twenty-four weeks their fluency and autonomy are far in advance of children who have not had inquiry training.[32]

According to Suchman: "When given a chance to generate knowledge rather than just to take in, store, and retrieve other people's conclusions,

children gain a dimension of freedom that puts a new premium on thinking and inventing. The consequences that can result from giving a child a chance to build and test his own theories are:

1. An involved and motivated learner who has a real sense of responsibility for his own education.

2. A new appreciation of how knowledge comes into being through inquiry, and a set of strategies for engaging in the process.

3. A recognition of the relativity of knowledge; of the fact that data are concrete and verifiable, but that conclusions and explanations are the inventions that give meaning to data.

4. A sense of self-esteem that comes from building theories that have power, and can be used time and again to predict, control and explain.

5. An emerging set of conceptual models that are meaningfully articulated with reality as opposed to the empty generalizations that result when children are forced to store and retrive abstractions they did not construct and which are not rooted in concrete experiences.

"There is no sure way to produce powerful thinkers in the classroom, but this power does grow as children actively pursue understanding. The school can create the conditions that stimulate and sustain such pursuit. Open questions and challenging problems set the stage. Rich informational resources provide raw materials for inquiry; and freedom for the pupils to operate autonomously and attack the problems in their own terms opens the door to productive thinking."[33]

Furthermore, according to Suchman, "Learning that is initiated and controlled by the learner himself as a means of expanding his own understanding is inquiry."[34]

THE ROLE OF THE TEACHER

The role of the teacher, according to Suchman,[35] is extremely important in inquiry development of learners. The teacher's role is to (1) stimulate and challenge the students to think, (2) ensure freedom of operation, (3) provide support for inquiry, (4) diagnose difficulties and help students overcome them, and (5) identify and use the "teachable moments" when new organizers can be introduced most effectively.

An inquiry-centered classroom will usually find these things in common: a focus on processes, students actively pursuing their self-directed learning, human conditions of freedom, the teacher searching for meaning, and an environment rich in sources of data. There is evidence of a consistency among the goals, behavioral objectives, strategies, and techniques employed. The human condition is conducive to appropriate learning.

The teacher committed to developing inquiry skills must take on a new role which is in many ways far more difficult and complex than the role of a teacher who simply wishes to impart information. He must create an environment that invites and supports inquiry. This requires knowledge of the inquiry process itself, considerable depth of understanding of the subject matter being inquired into, knowledge of the psychological processes involved, and a thorough understanding of what motivates each student.[36]

If the teacher would promote inquiry, he must provide the child with problems to focus upon, give him opportunities to theorize and test his theories, and help him with road maps that suggest better theories and more productive strategies of investigation. Detrimental to inquiry is the belief that knowledge is absolute, that it must be passed down to the student from authorities, and that the student must accept it as the truth. Inquiry cannot survive in a setting where these beliefs are prevalent. The teacher who would preserve the curiosity and intellectual activity of his pupils must provide a climate where inquiry can flourish.

Inquiry is an attitude toward learning and a philosophy of education.

PRODUCTIVE THINKING

James Gallagher has carried out research based upon the structure of the intellect model originated by Guilford through which he has identified a relationship between teacher question strategies and the development of certain aspects of the intellect. By planning the question strategy, a balance can be maintained between development of divergent thinking, convergent thinking, evaluative thinking, cognition, and memory.

The purpose of Gallagher's studies was to identify and classify productive thought processes taking place in a variety of classrooms (176 students in a university laboratory school, a public junior high school, and a public senior high school) and to determine the relationship between the teacher's behavior and the prevalence of the various thinking operations.

Through this schema it is possible to categorize both teacher questions and student responses. Gallagher's findings included the following:[37]

1. In terms of total output over the five consecutive class sessions, all teachers showed a predominance of Cognitive-Memory questions. In practically all class sessions, the Cognitive-Memory questions made up fifty percent or more of the total questions asked. The second most frequently used category was that of Convergent Thinking with much smaller proporations produced by Divergent and Evaluative Thinking questions. In certain class sessions, the requests for the thought operations of divergence and evaluation were absent entirely.

2. An extremely close relationship was obtained between the type of teacher questions asked and the pattern of thought expression observed from the student's responses. It was clear that the character and style of verbal expression in the classroom was mainly directed by the teacher.

3. Thought expression, as revealed in teacher questions, seemed to follow a different pattern than those revealed in teacher statements. Teacher questions appeared to represent the teacher's method of advancing class discussion, whereas, teacher statements represented individual cognitive style. Teacher statements remained relatively constant in style which the type of question varied as the subject was introduced, developed, and concluded in class.

4. The pattern of performance of the same teacher was observed to vary significantly from one day to another and, in some instances, from one class section to another even while teaching the identical concepts. The total characterization of teacher performance would seem to be very difficult without indicating: (a) the particular group of students with which the teacher is working, (b) the goals of the teacher from this group, or (c) the degree of class progress to these goals at a particular point in time.

By experimenting with different teacher behavior patterns or strategies and obtaining feedback through the analysis system developed by Gallagher, it now seems possible for a teacher to maintain the level of response in each desirable category to accomplish the outcomes she seeks.

GUIDED LEARNING

Torrance presents a case for what he calls guided learning which falls between "coerced" learning (i.e., learning by authority, overdirection, force, reproduction or imitation or compulsive type) and "unguided" or "laissez-faire" learning with its lack of discipline, direction, and anchors or guides to behavior.

Guided learning has been differentiated from other types of learning by the fact that consideration has been given to the particular nature of the learner and the learning task that generally have been ignored or incompletely considered by other learning approaches. Those who have contributed most to the development of the concept, "guided learning," have generally taken the position that:[38]

1. The human learner is self-acting and creative, requiring guidance and direction but not dictation and coercion.

2. It is natural and healthy for learning to be a continuous process and it becomes such with appropriate guidance.

3. Human intelligence is not a single function, but consists of a union of all of the little functions of discrimination, observation, retention, reasoning, analysis, synthesis, divergent thinking, judgment and the like.

4. All of these abilities are susceptible to development through learning tasks, and of learning the same task in different ways. They may develop at different rates and to different levels.

5. All learners require that learning tasks have some degree of structure, but the degree of structure required varies greatly among each of them.

6. Learning is accomplished most effectively when learning tasks are arranged in some sequence appropriate to the stage of development of the learner, his strategies or skills in learning, and the like.

7. Guidance of learning, other than through the structure and sequence of tasks to be learned, may be accomplished through a variety of both verbal and non-verbal means.

CREATIVITY

Training in techniques which facilitate creative behavior on the part of students is seen as another dimension to the development of teaching strategies which supervising teachers need to impart to prospective

teachers. An examination of the history of creative development in children will reveal that creativity is a characteristic of people that has not been highly prized in the American culture. More often than not, a person who has exercised creative abilities has been ridiculed, punished, and scorned by classroom teachers, parents, and the man on the street. Torrance, in his studies on creativity, has capitalized on the research and writings of Goertzel and Goertzel, Spearman, Simpson, Newell, Shaw, and Simon. However, it was the research of J. P. Guilford that stimulated much of Torrance's work, especially in the test development area.

The test tasks, instructions, and scoring procedures developed by Torrance make use of what is known about the nature of the creative thinking processes, the qualities of creative products, and creative personalities. While tests are only one means of identifying creative potential among students, according to Torrance they do enable teachers to be aware of potentialities that would otherwise be missed.

In his publication, "Application of Creativity Research in the Elementary School," Torrance points out, "The amazing record of inventions, scientific discoveries, and other creative achievements amassed through deliberate methods of creative problem solving is evidence that creative growth does not have to be left to chance."

From experimentation and research, Torrance reviewed the most important characteristics of instructional materials useful in fostering creative development. These included:[39]

1. Materials that permit one thing to lead to another.

2. Materials that inform about the creative process.

3. Materials for teaching research concepts and skills.

4. Materials with honesty and realism in presenting lives of creative people.

5. Materials where knowledge is presented as incomplete.

6. Materials to encourage creative characteristics.

7. Different materials for different kinds of learners.

8. Flexibility of instructional materials.

In collaboration with Myers and Cunnington, Torrance has developed
instructional materials that represented the best information known about
the development of creative potential. The process of becoming a
creative teacher is seen to be very much like the process of creative
thinking itself, requiring the same kind of sensing of defects,
difficulties, disharmonies, and gaps in knowledge; making guesses or
formulating hypotheses; testing and modifying these hypotheses; and
communicating the outcomes. Teaching strategies designed to promote
creativity are identified as including the following:[40]

1. Being respectful of questions and ideas.

2. Asking provocative questions.

3. Recognizing and valuing originality.

4. Developing ability to elaborate.

5. Provoding for unevaluated practice and experimentation.

6. Developing creative readers.

7. Planning for guided experiences.

8. Searching for the truth with the methods of historiography.

9. Searching for the truth with methods of descriptive research.

10. Searching for the truth through experimental research.

INTERPERSONAL RELATIONS

The major obstacles to the effective use of modern educational materials,
equipment, and methods are human--resistance to change, personal
rivalries and conflicts, ingroup defensiveness, misunderstanding produced
by inadequate, misleading or distorted communication. Ineffective handling
of such interpersonal problems by school personnel at all levels (board,
administration, teachers) limits appropriate and needed innovations in
schools.

Although the various studies of sensitivity training show considerable
scattering of methods used, problems studied, and evaluative methods
applied, taken together they show change in behavior in the desired
direction. The changes appear to be ones in which the trainees become

self-insightful and sensitive to the needs and dynamics of others, as individuals and as groups. As a consequence, they become more skillful in working with others in eliciting cooperation, in fostering involvement and encouraging growth in their co-workers and subordinates.

Soar's[41] study revealed that well adjusted teachers, when given sensitivity training changed in the positive direction, i.e., they were better able to provide the kind of environment related to the attainment of multiple objectives referred to earlier, while less well adjusted teachers digressed in terms of providing for this kind of environment.

The National Training Laboratory has also developed programs to train outside and inside change agents. Those programs are designed to attain the following objectives: understanding and better utilization of self as a change agent; small group membership and leadership skills, skills for collaboration and teamwork, skill in collecting and using data to improve action, skill in designing and conducting training activities; and, in discovering and using resources for bringing about change. Competencies are developed in each of the ten steps of the process of constructive thinking and problem solving. These are identified by Goodwin Watson:[42] (1) sensing, (2) screening, (3) diagnosing, (4) inventing, (5) weighing, (6) deciding, (7) introducing, (8) operating, (9) evaluating, and (10) revising.

The program moves from focus on self, to focus on helping one another, to focus on helping members of another system. The scientific knowledge is drawn from theories on individual behavior, interpersonal behavior, group behavior, social systems, linkage, changing, learning, intervening, and values.

CLINICAL SUPERVISION

Cogan has developed a system called Clinical Supervision designed to improve teacher performance. There is evidence that teachers who are able to analyze and evaluate systematically what happens in their own classroom are better able to plan strategies and tactics designed to elicit anticipated behavior from learners. Clinical Supervision is designed to assist teachers in planning for both content and process goal attainment, to collect data from the events of the classroom in an objective and systematic way, to properly analyze teacher-pupil interaction patterns and plan a program for changing teaching behavior patterns. Other Interaction Analysis systems that can feed into the Clinical Supervision cycle are Flanders, B. O. Smith, Gallagher, Taba, Bellack, Spaulding, and others.

ACADEMIC ACHIEVEMENT

An interesting and enlightening finding in Soar's study was that not
only did the children from classrooms where optimal conditions prevail
make more significant gain scores in vocabulary, concept development,
and creativity during the school year; but they also made a two-fold
increase over the summer.

A considerable number of these pupils actually grew more during the
summer than they had the previous year.

Further analysis revealed that there were individual "styles of learning"
by which some pupils tended to grow more during the summer consistently
while other pupils did more of their growing in school.

Torrance,[43] (n.d.) and Getzels and Jackson,[44] (1958) indicated a
considerable relationship between creativity and academic achievement,
with intelligence held constant, and that this relationship is highest
for the kinds of achievement which our contemporary educational
philosophy values most--".....creative applications of knowledge,
decision making and self-initiated learning....."

Flanders has found that pupils in indirect classrooms learned signifi-
cantly more, both in mathematics and social studies. Differences in
the expected direction were also found in pupil attitudes.

The findings reported by Soar that pupils continued growth in subject
matter during the summer following optimal kinds of classrooms the
previous year appears to have far reaching consequences.

It argues that the effect of the classroom does indeed stretch beyond
the room itself, and that the pay-off from an effective classroom
is doubly important. The related finding of apparent differences in
learning style by which some pupils grow more than others away from
the direct influence of the classroom is equally important.

FOOTNOTES

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