ANALYSIS OF A TEACHER INSERVICE EDUCATION MODEL DESIGNED TO CHANGE TEACHER PERFORMANCES AND ATTITUDES

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ABSTRACT

ANALYSIS OF A TEACHER INSERVICE EDUCATION MODEL DESIGNED TO CHANGE TEACHER PERFORMANCES AND ATTITUDES

By

Barbara A. Bowman

The purpose of this study was to describe and assess a teacher inservice education model utilizing the Educational Sciences conceptual framework. An attempt was made to determine whether or not inservice programs focusing upon the Educational Sciences would increase teacher knowledge and enhance attitudes toward the Educational Sciences.

The science of Educational Cognitive Style provides a means for determining how students derive information from the environment enabling teachers to plan appropriate instructional programs to facilitate learning and foster success. A four day inservice program was designed. The volunteer teacher participants were instructed in the overall design and rationale for the Educational Sciences. They were assigned the task of learning the definitions related to Educational Cognitive Style. Mathematical and empirical mapping techniques were used to acquaint teachers with their own style, and

with the styles of other teachers and subsequently styles of students. Classroom methods and materials were analyzed to determine which student styles would best match these methods and materials. Analysis of sample Educational Cognitive Style maps was also incorporated in the inservice program to determine which style elements could be augmented or strengthened.

Over a four year period in the East Lansing School District, as well as in the four replication sites, K-12 teachers and administrators volunteered in increasing numbers to participate in the inservice workshops.

Upon completion of workshop activities, teachers and administrators were asked to take an achievement test designed to determine their knowledge of the Educational Sciences. At the end of the academic school year, they were given attitude surveys to determine their degree of satisfaction as a result of their participation in the inservice program and implementation procedures in the classrooms and schools during the preceeding school year.

The findings and conclusions of this study indicated that increasing numbers of teachers volunteered each year to participate in the program; teachers remained in the program for more than one year; and teachers indicated that their diagnostic and prescriptive abilities were improved.

Acquisition of the theoretical concepts of the Educational Sciences and in particular Educational Cognitive Style mapping was achieved at a high level. Achievement test data indicated that in the majority of cases, teachers scored above the 90 percent level of success.

Teachers felt that as a result of their knowledge of Educational Cognitive Style, they were in a better position to know what to do in the classroom, how to map, and what is needed in diagnosing and prescribing for problem situations. Over the four years individual teachers generated many Educational Cognitive Style maps, sometimes on entire classes. Over 200 case studies on students were prepared.

Administrators rated the use of the Educational Sciences as having value to education in general. They rated the use of the Educational Sciences high, in terms of increased teacher awareness and improvement of student attitudes. They see the Educational Sciences as primarily used by teachers to help students and not necessarily as useful to themselves in their administrative activities.

Replication of the inservice program in the other districts--Flushing, Woodhaven, Taylor, and Pontiac, Michigan--was accomplished with high achievement levels on the Educational Sciences Achievement posttest. New participants recorded higher scores on the average than East

Lansing teachers and also somewhat higher scores on the attitude inventory were recorded.

It can be concluded that administrators and teachers in a variety of educational settings demonstrated the ability to learn the knowledge and definitions of the Educational Sciences and have begun the implementation activities.

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By

Barbara Ann Bowman

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CHAPTER I

INTRODUCTION

The outcomes of education have recently been brought into focus by both the private and the public sectors of American society. How to provide an efficient input system in order to generate effective outputs in terms of curriculum, organization, and instruction, has manifested itself in a variety of forms and approaches. One potential approach to attain high standards is through inservice education programs designed to upgrade teachers' skills in the areas of curriculum reform, use of materials, personalized education, use of modern technology, and an understanding of the different types and styles of students who are to interface with these different types of materials and procedures.

The need for inservice education in relation to curriculum reform became acute during the late 1950's and 60's, in the various subject areas, such as mathematics, science, social studies, and language arts, reaching a peak with the advent of the post Sputnik era, and has since witnessed further expansion with the emergence of a highly complex technological society. Subsequently,

with the call for personalization of instruction for the educationally disadvantaged, teachers have had greater need than ever before for updated inservice education programs.

In an attempt to accommodate the call for effective outputs in the context of a rapid expansion in knowledge along with the wide range of ability of students within a classroom, organizational changes in the forms of nongraded schools, team teaching, and open classrooms have been suggested. Furthermore, in the area of instruction there has been an emphasis on the teaching and acquisition of the predominantly cognitive skills. Business and industry have also played a role in trying to provide accountability in the educational scene with their utilization of performance contracting in an attempt to guarantee success by all learners. Barro writes:

> The basic idea . . . is that school systems and schools, or more precisely, the professional educators who operate them, should be held responsible for educational outcomes--for what children learn. If this can be done, it is maintained, favorable changes in professional performance will occur, and these will be reflected in higher academic achievement, improvement in pupil attitudes, and generally better educational results.[1]

It is in this light that inservice education programs are considered to be a major area of concern. When coupled

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[1]Stephen M. Barro, "An Approach to Developing Accountability Measures for Public Schools," Phi Delta Kappan 52 (December 1970): 196.

with the goal of personalizing instruction, some professionals view inservice education programs as the major vehicle that will increase the probability for each individual student to achieve his or her greatest potential.

Accountability and Inservice Education in Personalized Educational Systems

One of the goals of education for the State of Michigan is:

> . . . education must assure that an individual is not limited in his educational experience. He must be provided with quality education, including the best possible methods of teaching, and learning. . . .[2]

Proponents for accountability in mass education argue that it is imperative that the recognition of individual differences, and thus individualized progress, characterize the educational system enabling each student to gain the greatest development possible from his educational experiences. This idea of a relationship between accountability and individual variability in terms of educational needs, thus focusing instruction upon the individual student rather than the group, is not a new idea. In retrospect, America's first schools, those of the one room

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[2]Michigan, Department of Education, The Common Goals of Michigan, 1974, p. 9.

type, offered many individualized learning opportunities with each student progressing at his own rate.[3]

During the late 1800's, procedures for the individualization of instruction were being developed in the Pueblo, Colorado, schools. By 1911, Fredrick L. Burke, along with some associates at San Francisco State College Training School, began to individualize instruction in all curriculum areas.[4] These attempts led into the current practices which are designed to maximize learning achievement for each unique individual.

If one begins with the assumption that each student is relatively unique in terms of the way in which he or she views the world, and also, if educators are to discuss accountability in terms of such uniqueness, then they must prescribe educational strategies which hold potential for including the individual student, along with the teacher, in the accountability model being employed. In the past such prescriptions have been based on general tests of intelligence, tests of achievement in various subject matter disciplines, and other evaluation instruments available to the teacher. These

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[3]Richard L. Hawk, "Individualized Instruction in the School Setting," Educational Horizons (Spring 1971): 73.

[4]William P. McLoughlin, "Individualization of Instruction vs. Nongrading," Phi Delta Kappan 53 (February 1972): 378.

diagnostic instruments are not designed to indicate the possible mix of materials, methods, societal modes, or teacher strategies needed to individualize or personalize instruction in the context of accountability.

It would appear that the need is not for appropriate diagnostic tools to help provide personalized instruction, but is that of the need for a conceptual framework as Hill as stated.

> The factual descriptions, concepts, generalizations, laws and theories which could comprise a scientific conceptual framework for education are of many kinds. Under these circumstances, it is necessary to recognize that the conceptual framework which will probably best serve the purposes of education will be one composed of a set of disciplines which we might call the educational sciences.[5]

Furthermore, as Conant has indicated:

> . . . Teachers, like physicians, think in terms of predictive generalizations as well as arguments derived from general principles. Some people would like to combine these two modes of thought and speak of a single, all-embracing science of education. The question is whether it is useful to try to cover with the word "science" a vast field of human activity directed toward practical ends. I have come to the conclusion that it is not. . . . I prefer not to speak of the science of engineering but of the engineering sciences. I doubt that there is or ever will be a science of medicine, yet I am sure enormous strides forward have been made in the medical sciences. Therefore, I think it would be better to discuss . . . what might be

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[5]Joseph E. Hill, The Educational Sciences (Michigan: Oakland Community College Press, 1972), p. 5.

> called "educational disciplines" rather than the science or the discipline of education.[6]

The need for a structure within which the personalization of educational programs could occur has led to a situation in which many students fail or drop out of school in part because of the lack of a systematic method of diagnosis and prescription for different styles. Some educators find that the situation has arisen wherein each year approximately one-third of the students in our schools will "succeed," one-third will be "average," while the remaining third will "fail."[7] To many this is an unacceptable performance with today's educational goals regarding accountability and quality education for everyone. Bloom, at the University of Chicago writes:

> . . . most students can learn what the schools have to teach--if the problem is approached systematically. . . .
> . . . if students are normally distributed with respect to aptitude, but the kind and quality of instruction and learning time allowed are made appropriate to the characteristics of each learner, the majority of students will achieve mastery of the subject.[8]

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[6]James B. Conant, The Education of American Teachers (New York: McGraw Hill Book Company, Inc., 1960), p. 120.

[7]Benjamin S. Bloom, "Learning for Mastery," U.C.L.A. Evaluation Comment 1 (1968).

[8]Benjamin S. Bloom, "Recent Developments in Mastery Learning," Educational Psychologist 10 (February 1973): 53-54.

Therefore, educators are faced with the challenge of accounting for "contexts" of instruction, individual differences, and their own approaches to understanding, when they engage in the process of determining who succeeds or who fails in group competition. Put in another way, perhaps educators should become aware of the need for adapting to differences in learning patterns as a means of devising teaching techniques to insure the individual's success in his total educational program, whether it be acquisition of skills, attitudes or adjustments to our highly technological society.

As previously stated, efforts designed to increase efficiency and effectiveness in the areas of curriculum, organization, and instruction have as their base, concern for individual needs, capabilities, and personal preferences. Moreover, these aspects of education have manifested themselves in a myriad of forms.

Extensive research has been conducted related to the above mentioned areas. Educators have witnessed a number of approaches, each of which is advocated as being the answer to the problems facing American education. For some, a new idea or practice is the solution, but to date, no single practice or set of concepts has satisfied the profession. At best, educators are able to define what education is and does as being "in the

form of a loosely knit collection of methods, materials, and techniques."[9] As a result, educators find themselves accepting various philosophies and theories, arguing over procedures and pursuing a wide variety of goals while the rest of the American public, particularly the professional world, observes.

Until recently only limited efforts of establishing frameworks of concepts which teachers might employ to analyze how students could probably be taught more effectively and efficiently than is currently possible have been proposed. Bloom's taxonomy, however, is a noteable exception.[10]

In the early 1950's Hill and some associates at Wayne State University began the development of a logical conceptual framework with an attendant common language that would form an applied field of knowledge for activities classified as education. The framework which has been formulated is called, the "Educational Sciences."[11] The Educational Sciences (and in particular the Educational Science of Cognitive Style) hopefully, provide a

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[9]Joseph E. Hill, lectures from "Conference on the Educational Sciences," Barry College, Florida, January, 1973.

[10]Benjamin S. Bloom, Taxonomy of Educational Objectives (New York: Longmans, Green and Company, 1956).

[11]Joseph E. Hill, The Educational Sciences (Michigan: Oakland Community College Press, 1972), p. 5.

vehicle to assist in efforts to personalize instruction in a meaningful way to serve the needs of individual students in their search for meaning.

Implications of Accountability for Teacher Inservice Education

With the explosion of knowledge, techniques, and skills which are reshaping our intellectual, political, and cultural working environment, man will be forced to undergo job retraining in his lifetime. The individual consumer, businessman, industrial worker, and educator will acquire new skills through inservice training programs. It would seem then, that such training and retraining must be accomplished in an efficient and effective manner. The design and conduct of the program should be undertaken with accountability in mind.

Inservice education, or "the continuing education of teachers,"[12] as Rubin characterizes it, is a concept that has been part of the American educational system for the past 130 years.[13] The focus of inservice education has had such variety of forms and activities (depending

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[12]Louis J. Rubin, Improving In-Service Education: Proposals and Procedures for Change (Boston: Allyn & Bacon, 1971), p. xi.

[13]Ralph W. Tyler, "In-Service Education of Teachers: A Look at the Past and Future," in Improving In-Service Education: Proposals and Procedures for Change, ed: Louis J. Rubin (Boston: Allyn & Bacon, 1971).

upon the apparent needs of society at a particular time) as curriculum revision, organizational change, adoption of new methods and materials, and the implementation of innovations. Nevertheless, inservice programs probably have had one idea in common--that of increasing the competency of the educational practitioner. Harris and Bessent write:

> In-service education . . . is concerned with . . . the development of instructional staff members as professional practitioners in such ways as to have a reasonably direct impact upon the quality of instruction offered in the school or college. . . .[14]

To introduce new skills and knowledge during pre-service in teacher education institutions is desirable for future teachers. This type of education, however, would require many years to have a significant impact on the majority of classrooms already functioning, since the turnover rate of teachers is relatively low at this time. Consequently, for those teachers already in classrooms, the inservice programs through which new skills, innovations, and changes are implemented seems to be the major avenue.

Of particular interest to the present study is the Teacher Improvement Project, (TIP), a teacher

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[14]Ben M. Harris, and Wailand Bessent in collaboration with Kenneth E. McIntyre, In-Service Education A Guide to Better Practice (Englewood Cliffs: Prentice Hall, Inc., 1969), p. 2.

inservice effort designed to respond to the needs of teachers in a local school district. TIP is based on the implementation of the Educational Sciences in a public school system setting. This project came into being as a result of a needs assessment performed by teachers and administrators in the East Lansing School District, East Lansing, Michigan. The results of the assessment effort were that the concept of individualized or personalized instruction should become an integral part of the district's program goals. The goals adopted by the school district in 1971 were:

1. Meet varying needs of students, parents and staff by developing alternatives that broaden options for education in our schools and community.
2. Building a curriculum, pre-school through grade 12, in which students are provided a strong, basic curriculum and progress according to their individual needs and abilities, and in which they develop skills and attitudes to make them effective in individual and group processes.[15]

It was felt that teachers could provide more of a personalized education approach if they acquired tools to diagnose the Educational Cognitive Style of students, and thereby prescribe educational strategies in terms of appropriate persons, processes, and properties on a more "scientific" basis than otherwise might be possible.

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[15]East Lansing, East Lansing Schools, East Lansing Target Goals, rev. 1972.

Commitment to these concepts brought the Educational Sciences to the elementary level in 1972. Research data exists as reported in the Bibliography of the Educational Sciences With Commentary on student achievement and attitudes of teachers toward their effectiveness, but these data are only beginning to emerge at the elementary school level.[16]

Through a series of inservice training sessions, based on a model specifically developed for teachers, pre-school through grade 12, conducted during 1972-76, teachers received instruction in the Educational Sciences, obtained a map of their own Educational Cognitive Style, learned how to map the Educational Cognitive Style of students, mapped the mode of understanding required by materials of instruction, and prescribed instructional strategies. After four years of inservice training in these areas, it is important to know how teacher's skills and attitudes toward teaching have changed, what administrators think about the effort, and how the endeavor has contributed to the notion of "accountability in education."

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[16]J. J. Berry, T. J. Sutton, and L. S. McBeth, Bibliography of the Educational Sciences with Commentary (rev.) (Bloomfield Hills: American Educational Sciences Association, 1975).

Purpose of the Study

The primary purpose of the present study is to describe and assess a model, the Teacher Improvement Project (TIP), of inservice training over a four year period. The project has been implemented primarily in the East Lansing School District--Flushing, Woodhaven, Taylor, and Pontiac recently have begun implementation projects. Inherent in the purpose of the study is the description and examination of the process by which the Educational Sciences were utilized in the East Lansing school system with the goal of providing personalized instruction for students.

Operationally, the purpose of the study is to:

a. Describe the rationale and development of the Teacher Improvement Project.

b. Analyze this model in the dimensions of data related to teachers' achievement in understanding the Educational Sciences and their attitudes toward teaching as a result of participation in the inservice program.

c. Report attitudes of administrators toward the project.

Significance of the Study

This study will determine the outcomes and trends following the four years of implementation of the Educational Sciences through a teacher inservice training program designed to change teacher performance. The findings

will cover the first large scale training of teachers in a school district. Therefore, this study is intended to be of value and give guidance to those teachers, administrators, superintendents, and educators who wish to apply the concepts inherent in the Educational Sciences for personalized education to their respective classrooms, schools, and districts by utilizing an inservice education program.

Further significance indicating importance of this study is related to the concern of school systems attempting to provide meaningful education for the disadvantaged. Problems exist in this area stemming from the twin roots of discriminating tests which fail to measure non-verbal strengths and the ignorance of means to utilize such strengths while building language and number skills. The Educational Sciences claim to offer methods for dealing with disadvantaged youth, diagnosing critical areas of Educational Cognitive style and also prescribing strategies which will augment the student's "styles" and thus enable such students to progress and avoid the stigma of failure.

Moreover, public school systems are witnessing a wide variety of problems in attempting to educate multicultural groups of students encompassing a wide variety of backgrounds, experiences, interests, and motivations.

The teachers in East Lansing are faced to some extent with disadvantaged youth, as well as students from multi-cultural backgrounds. Thus, the findings of this study will describe their attitudes and performance in relation to the strengths and weaknesses of the Educational Sciences in dealing with these students.

General Questions to be Answered

This study has been designed to be descriptive in nature and to review the trends and data generated over a four year period. Consequently, the study will seek answers to the following questions:

1. Is it possible to design an effective inservice training program in the theoretical foundations and practical applications of the Educational Sciences for elementary and secondary school classroom teachers?

2. Can the theoretical concepts of the Educational Sciences be learned adequately by school teachers in a four day training session?

3. Once teachers have been trained in the application of the Educational Sciences, will their diagnostic and prescriptive skills be improved?

4. Will administrators find the Educational Sciences to be effective in schools?

5. Will it be possible to implement the project in other school districts using the same overall inservice education program?

Assumptions Underlying the Study

The following assumptions are inherent in the nature of this inservice project and the study of it:

1. Inservice education is an appropriate vehicle for classroom teachers to participate in and thereby be able to apply the Educational Sciences.

2. The design of the study is based on the assumption that the responses of the teachers and administrators to the various instruments related to their acquisition of theoretical material of the Educational Sciences and attitude inventories represent their actual knowledge, opinions, feelings, and honest convictions.

3. Providing an individualized or personalized educational program for students is a worthy function of the teaching/learning situation.

4. The development of the Educational Sciences has followed sound, acceptable research procedures.

Limitations of the Study

Limitations of this study relate to the following areas:

1. The study described and assessed one inservice education program and was not compared with other inservice programs.

2. The use of the Educational Sciences was the sole content base of the inservice program. Other methods

for enhancing student's learning were not explored, therefore, findings cannot be interpreted on a comparative basis.

3. The study was limited to teachers who volunteered to participate in this program.

Definition of Key Terms

Selection of the key terms presented below was determined following a review of material in the Educational Sciences published by Hill and Nunney[17] and others.[18] The intent has been to maintain consistency of definition. Permission has been given to paraphrase Hill's definitions. Exact definitions are located in Appendix A.

Cognitive Style Map

A picture of an individual's Educational Cognitive Style representing the variety of profiles and elements used in education, i.e., that are used while searching for meaning. Information regarding elements recorded on the map encompasses data gathered from the first three Educational Sciences--the individual's use of Symbols and their Meanings; the Cultural Determinant

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[17]Joseph E. Hill, and Derek N. Nunney, Personalizing Educational Programs Utilizing Cognitive Style Mapping (Bloomfield Hills: Oakland Community College Press, rev. 1974).

[18]Harris and Bessent, In-Service Education A Guide to Better Practice, p. 2.

influences on the Meaning of Symbols; and one's Modalities of Inference or reasoning patterns.

Educational Cognitive Style

The ways in which an individual searches for and derives meaning from the world. Also, how a person forms concepts as a result of a search for meaning.

Educational Sciences

A conceptual framework and attendant scientific language for the applied field of education comprised of the sciences of: (1) Symbols and their Meanings; (2) Cultural Determinants of the Meanings of Symbols; (3) Modalities of Inference; (4) Educational Memory; (5) Educational Cognitive Style; (6) Counseling Styles, Administrative Styles, Teaching Styles, and Student Styles; and, (7) Systemic Analysis Decision-Making.

Major Orientation

Signifies that a student has scored between the 50th and 99th percentile in use of a particular cognitive style element. This is symbolized or noted by capital letters such as T(VL). Thus, a T(VL) shows that the student demonstrated above average ability in deriving meaning from the printed word.

Minor Orientation

Signifies that a student has scored between the 26th and the 49th percentile in his or her use of a

particular Cognitive Style element. This is symbolized by a capital letter with a prime. Thus, a T'(AL) would designate that the student scored below the upper half and above the lower quarter in ability to derive meaning from the spoken word.

Negligible Orientation

Shows that a student scored between the 0 and the 25th percentile on an element. A negligible orientation signifies that the element is without significant strength in the student's style. This is symbolized on hand prepared maps by drawing a line through the element. On the computer generated maps, the negligible elements are not printed.

Mode of Understanding

Refers to the specific elements of any material or methodology used in the instructional program. It involves the identification of the elements which characterize any one prescription. For example, a programmed instruction text such as portions of the Sullivan Reading Series for elementary school would contain the elements, T(VL), Q'(V), Q(CET), I, A', M,R. These are the essential cognitive style elements which the learner must possess in order to match successfully the unit or prescription.

Personalized Education

Providing an individualized instructional prescription of educational activities for a student designed for successful achievement based upon the utilization of the student's Educational Cognitive Style Map and subjective information gathered in informal conversations or structured interviews between students and instructors. Furthermore, the prescription, which is arrived at, is based upon the student's needs, ability, and personal preferences. The diagnosis of an individual's Educational Cognitive Style and the modes of understanding required by an instructional situation can be used as a basis for matching a student with the instructional setting.

Qualitative Symbol

Is that symbol which presents, and then represents to the nervous system or to the awareness, that which the symbol itself is to the individual. Feelings, sensations, and pictures are examples of qualitative symbols.

Teacher Inservice Education

"Planned activities for the instructional improvement of professional staff members."[19] It is the continuing professional education of teachers or the continual

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[19]Harris and Bessent, In-Service Education A Guide to Better Practice, p. 2.

updating of the practitioner in the classroom. Inservice education or "on-the-job" training is designed to improve, for example, teacher competency, presentation of new materials, curriculum changes, updating in terms of innovative practices.

Theoretical Symbol

Is that symbol which presents to the nervous system or to the awareness something different from that which the symbol itself is. For example, the spoken word, "boat," is a theoretical auditory linguistic symbol, T(AL).

TIP

Teacher Improvement Project in the East Lansing School System--and other school systems where replication of the project has taken place--a teacher inservice education program based upon the implementation of the Educational Sciences and specifically Educational Cognitive Style mapping. The East Lansing project was funded through Title III, Elementary Secondary Education Act (ESEA).

Summary

It has been the purpose of this chapter to present a rationale for, and background related to the use of a teacher inservice education model. Teacher inservice education is viewed as a major vehicle through which currently

employed professional teachers may acquire diagnostic and prescriptive skills needed to assist each student to achieve his or her potential. The Teacher Improvement Project, a teacher inservice education program, was designed to provide teachers with additional skills and incorporates the use of the Educational Sciences.

Overview

The statement of the problem to be addressed in this study, purpose, significance, general questions to be answered, assumptions underlying the study, definition of key terms, and a short overview have been the focus of Chapter I. Chapter II will be a review of related literature pertaining to teacher inservice education and the Educational Sciences conceptual framework. Design of the study, which is the purpose of Chapter III, will contain the sample selection, data collection, the instrumentation employed in the study, and procedures utilized. Chapter IV, analysis of the data, will include a description of the analytical techniques used, tables showing the results of this analysis and findings related to the questions. However, answers dealing with the five questions posed in Chapter I will be handled specifically in Chapter V, along with the summary, conclusions, implications, and recommendations.

CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction to Inservice Education

The literature reviewed for this study deals with two areas: (1) teacher inservice education, and (2) the Educational Sciences. In the first section, teacher inservice education will be reviewed in relation to: (a) a method for dealing with changes within the educational system, and (b) the necessity for updating of teachers in order to handle the increasing complexities with which they are confronted. The second section will be concerned with the development of the Educational Sciences, implementation projects, and a critical analysis of problem areas which have emerged in the developmental phase of the Educational Sciences.

Inservice Education: The Need

Professional educators, businessmen and women, and industrial workers are realizing the imperative need to update themselves in terms of techniques, methodologies, and vocabularies with the development of the information explosion, the new technological computerized era, and the resultant complex societal structure. The need

for inservice education has been highlighted by Alvin Toffler in his discussions of Future Shock in which he states:

> In the three short decades between now and the twenty-first century, millions of ordinary, psychologically normal people will face an abrupt collision with the future. Citizens of the world's richest and most technologically advanced nations, many of them will find it increasingly painful to keep up with the incessant demand for change that characterizes our time. For them, the future will have arrived too soon. . . .
>
> Western society for the past 300 years has been caught up in a fire storm of change. This storm, far from abating, now appears to be gathering force. . . .
>
> For the acceleration of change does not merely buffet industries or nations. It is a concrete force that reaches deep into our personal lives, compels us to act out new roles. . . .[1]

The changes which have occurred in education have not only reflected the changes in society at large, but also changes in methodologies and techniques available to educators including television, programmed instruction, computer assisted instruction, and areas such as transactional analysis, and human potential seminars. These developments lead one to the assumption that inservice education for teachers is of prime importance if the educational system is to maintain its efficiency and effectiveness. Supporting this position, Bell, while serving as the United States Commissioner of Education stated:

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[1]Alvin Toffler, Future Shock (New York: Random House, Inc., 1970), pp. 9-10.

> New methods, materials, and machines have shaped a new and changing world in which knowledge and skill are paramount. . . . The nature of today's culture also demands specialized skills and understandings. . . .[2]

In the competitive world of industry and business, specific training programs are designed to continuously upgrade employees so that they can maintain an efficient role in the highly competitive profit-making world. Outstanding examples of inservice training programs include those in the computer companies, automobile manufacturers, telephone companies, and also the military. In these fields the need for winning and being accountable to stockholders and citizens is apparent. Retraining seems to be critical for the survival of General Motors. Each year money is earmarked for the upgrading and training of their personnel. As an example, recently, the Pontiac Motor Division of General Motors

> . . . established a two-year, combination in-plant (on-the-job), in-school training program designed to prepare first-line production supervisory candidates for their new roles as managers of the modern work force.[3]

An additional goal was

> . . . to develop an adequate number of well-trained people who not only could function effectively as

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[2]T. H. Bell, "Challenges for Inservice Vocational Education," Theory Into Practice 14 (October 1974): 1.

[3]F. J. Schotters, "Pontiac Pre-Supervisory Training Programs," Personnel Development Bulletin 13 (January 4, 1973): 1.

> Foreman, but who also had potential for advancement into high levels of management.[4]

Reviewing inservice education in other professions Moffitt concluded:

> The teaching profession is not unique in this respect: other professions are requiring added preservice and inservice education as more and more research alters practices.[5]

Continuous education is also a key characteristic in professions where there is a constant infusion of new technical language related to materials, techniques, and methodologies. Chandler has stated:

> A good deal of similarity exists between in-service programs in the various professions. For example, the American Medical Association, the American Dental Association, and the American Hospital Association all report extensive use of publications, conventions, and conferences, graduate study, and clinics or workshops. These activities are common among the various professions.[6]

The teaching profession with its goal of developing the future citizens and students of the nation has applied its beliefs in education to itself and exemplifies Chandler's assertion that "successful practice in any of the major professions requires that a practitioner continue to learn throughout his career. . . ."[7]

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[4] Ibid.

[5] John Clifton Moffitt, In-Service Education for Teachers (Washington, D.C.: The Center for Applied Research in Education, Inc., 1963), p. 4.

[6] B. J. Chandler, Education and the Teacher (New York: Dodd, Mead & Company, 1961), p. 329.

[7] Ibid.

The continuing education of teachers has existed for the past 130 years and has focused on the changing needs in relation to curriculum, organization, methods, and materials, and implementation of innovations. It is important to state here that whereas inservice efforts in the past have been at best minimally successful with the impact of the desegregation laws and the Federal Poverty Programs of the 1960s, and the incredible advancement brought about by the impact of television and computers during the last twenty or so years, the problems in designing meaningful inservice education programs have become acute.

The extent of the impact of change was summarized in 1974 by Roeber who stated:

> . . . in the last ten years changes in our social environment have come upon us so abundantly and rapidly that there is no ignoring their effects inside the organization. The social environment has become turbulent and the old assumptions about decision-making . . . no longer hold.[8]

These social changes encompassing technology, perceptions of the world through education, mass communication, decline of religion, the pressure of the increase in the population, wealth of western industrialized society, the energy shortage, environmental pollution, and the break-down of the family affect people and the educational

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[8]Richard J. C. Roeber, The Organization in a Changing Environment (Reading: Addison-Wesley Publishing Co., 1973), p. vii.

structure. In contrast, the process of changes that took place prior to World War II was gradual so that effects were naturally assimilated. Roeber concluded:

> This period of organic adaption is now ending. Society has changed greatly in the past few generations, but the rate of change within an organization cannot handle the demands of a turbulent environment. We have entered a period in which there is required a more conscious redesign of organization to anticipate the effects of change.[9]

Inservice Education: The Problems

A review of literature reveals that educators see inservice education as the means for handling and facilitating change. Inservice programs in education during the past 130 years, according to Tyler, have centered around the "hows" of teaching subject matter (largely remedial in nature), new ways of teaching the same basic skills or new understandings of the old content, presentation of new materials, filling the gaps of degree requirements and since 1930, implementation of new curricula and educational programs.[10] As society changed and the educational system emerged and developed, inservice education tried to meet teachers' needs. However, some educational writers and researchers feel that to a great extent most

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[9] Ibid., pp. 20-21.

[10] Ralph W. Tyler, "In-Service Education of Teachers: A Look at the Past and Future," in Improving In-Service Education: Proposals and Procedures for Change, ed: Louis J. Rubin (Boston: Allyn & Bacon, Inc., 1971), pp. 5-14.

inservice programs have met with minimal success. They attribute this to a variety of reasons. It is felt that inservice programs have been relatively inadequate and have not really served the major purposes of improving professional performance. Edelfelt summarizes the current situation:

> Inservice education has been the neglected stepchild of teacher training. Most resources and effort in teacher education have gone to preservice preparation. For the last four decades, this concentration of resources and effort was defensible in order to assure that teachers were adequately prepared prior to service. Now, however, preservice goals have been largely accomplished. . . . Meanwhile, inservice education for teachers remains a wasteland of evening, Saturday, and summer courses or workshops mandated by school districts and state departments of education. Inservice education takes place almost entirely on the teacher's time and in advanced collegiate study at the teacher's expense. It is required for a standard teaching certificate or for advancement on a local district's salary schedule. It is planned and executed by educators other than teachers. Too often it is taught in a manner that violates almost every principle of good teaching. Perhaps most important, too little of its emphasis has been on improving teacher performance.
>
> Point one, then, is that inservice education has been inadequate. It has not met teacher needs. It has been pursued as an adjunct to a full-time job. It has been required by super-ordinates largely without consultation with teachers.[11]

Further critical analysis centers on the over-importance placed on teacher replacement techniques and training programs designed to mechanize instruction. For example, Robert Bush states:

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[11]Roy A. Edelfelt, "Inservice Education of Teachers: Priority for the Next Decade," The Journal of Teacher Education 25 (Fall 1974): 250.

> Educational reform after World War II, which emphasized the building of new curricula, in its early stages seemed to take as its goal the development of a system so complete, so foolproof, that it could be operated without teachers, or at least with teachers of only limited competence. The inadequacy of this approach has now become apparent.
>
> Much of the current paraphernalia and practice in inservice education has grown up haphazardly and without a coherent rationale over a half century or more. It grew in response to a large degree, not well prepared. They required supervision and every possible exhortation to bring themselves up to a minimum level of competence. This condition has changed drastically over the past fifty years. In-service education has not. It now needs to be brought into harmony with the current competence of teachers.[12]

The lack of relevance in the inservice programs and the concern by teachers for movement on the salary scale through the accumulation of graduate credits earned in inservice is attacked by Allen, Otto and Erickson, in the following statements.

> Of all the tradition-bound practices in American education, the current state of in-service teacher training is probably the most indefensible. Such training as there is seems to be guided by two mutually incompatible perspectives: (1) in-service training as relevant to the upgrading of teachers' professionalism and classroom performance; (2) in-service training as a convenient way to pile up units, which will move a teacher horizontally across the pay schedule. All too often, of course, the second perspective dominates to the exclusion of everything else, and thus it is difficult to find anyone in the profession, from teacher to administrator to school of education faculty member, who has a good word to say about in-service courses.

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[12] Robert N. Bush, "Curriculum-Proof Teachers: Who Does What to Whom," in Improving In-Service Education: Proposals and Procedures for Change, ed: Louis J. Rubin (Boston: Allyn & Bacon, Inc., 1971), pp. 38-9.

> But perhaps even more ironically, the ultimate goal of current in-service training, bound as it is to the accumulation of pay-raising units, seems to be to move teachers out of the classroom, rather than to improve their effectiveness within it; . . .
>
> We seem to believe that (1) the bestowal of a teaching credential creates lifetime professional competence; (2) inadequacies in pre-service training leave a life of irremediable professional handicaps. With this view of the relationship between pre-service and in-service training, and with a century-old belief in time as the criterion of educational success, it is understandable, though indefensible, that in-service training has become the disgrace that it is.[13]

Otto and Erickson give additional reasons encompassing the following:

> The concept of inservice education has been with us for a long time, probably because the limitations inherent in the preservice education of teachers have long been recognized. The bad news is that inservice programs have tended to be unsystematic, poorly focused, and largely ineffectual. There are many reasons for this poor showing, but perhaps the main ones are lack of adequate budgetary support for inservice efforts and lack of a comprehensive scheme for planning and implementing sensible inservice programs.[14]

Other possible reasons for weak inservice programs involve a lack of design and management of the inservice programs by individuals intimately acquainted

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[13]Dwight W. Allen, "In-Service Teacher Training: A Modest Proposal," in Improving In-Service Education: Proposals and Procedures for Change, ed: Louis J. Rubin (Boston: Allyn & Bacon, Inc., 1971), pp. 109-10.

[14]Wayne Otto and Lawrence Erickson, In-Service Education to Improve Reading Instruction (Newark: International Reading Association, Inc., 1973), p. vii.

with the environment in which particular teachers operate;[15] the removal of inservice programs from the classroom environment to college classrooms;[16,17] and somewhat related to the foregoing, Fantini suggests that there has been a failure on the part of curriculum and planners to take into consideration both the child's and teacher's frame of reference in developing inservice programs.[18] Cane reports that many classroom teachers felt inservice courses had little resemblance to the realities of their teaching situation and also that they were not consulted as to the planning of structure and content sessions.[19]

Inservice programs developed for the purposes of accumulating extra credits towards a higher degree, certification, advancement on the salary scale, using them as the route out of the classroom or as a temporary rescue

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[15]Ronald Lippitt and Robert Fox, "Development and Maintenance of Effective Classroom Learning," in Improving In-Service Education: Proposals and Procedures for Change, ed: Louis J. Rubin (Boston: Allyn & Bacon, Inc., 1971), pp. 142-50.

[16]Allen, "In-Service Teacher Training," p. 113.

[17]Edward J. Meade, Jr., "No Health in Us," in Improving In-Service Education: Proposals and Procedures for Change, ed: Louis J. Rubin (Boston: Allyn & Bacon, Inc., 1971), p. 223.

[18]Mario Fantini, "Teacher Training and Educational Reform," in Improving In-Service Education: Proposals and Procedures for Change, ed: Louis J. Rubin (Boston: Allyn & Bacon, Inc., 1971), pp. 190-204.

[19]Brian Cane, In-Service Training (London: King, Thorne & Stace Ltd., 1969), p. 5.

mission to overcome a poor school program or practices could be characterized by what Harris and Bessent call, "some mistakes in practice."[20] They and others including Fantini and Meade see "In-service education--the continual updating of the practitioner in the classroom-- . . . clearly suffering as much from the sins of omission as from those of commission."[21] According to Meade inservice program planners have failed to: analyze the interplay between teaching and learning; examine the many dimensions in which learning occurs; study the social curriculum to develop competence in the art of living; look at individualized or personalized instruction; and plan development of criteria for good and poor teaching; and use theories of teaching.[22]

Harris and Bessent, in this regard, tell us that inservice programs have experienced:

1. Failure to relate inservice program plans to genuine needs of staff participants.
2. Failure to select appropriate activities for implementing program plans.
3. Failure to implement inservice program activities with sufficient staff and other resources to assure effectiveness.[23]

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[20]Harris and Bessent, Inservice Education A Guide to Better Practice, p. 4.

[21]Meade, Jr., "No Health in Us," p. 211.

[22]Ibid., pp. 212-215.

[23]Harris and Bessent, Inservice Education A Guide to Better Practice, p. 4.

Yet, in spite of the seeming lack of direction, scope, purpose, and planning of some of the past inservice programs, the need and desire for such a vehicle is very apparent. According to Edelfelt:

> Despite all its short comings, teachers apparently still want inservice education. For example, in the 1973-74 NEA assessment of teachers' needs in 20 widely different local associations, inservice education was one of three needs that surfaced in every instance. Teachers want to continue to improve; they want to be current. The data also confirmed that they want changes and improvements in inservice education so that it more adequately meets their needs.[24]

In a survey conducted in England, Scotland, and Wales, Cane also found a strong need for inservice education expressed by teachers. He stated:

> So very few teachers were completely antagonistic to the idea that inservice training was a necessary part of their future working life. In each of three countries 80% of the teaching staff declared positively their need for inservice training.[25]

The conclusion should not be drawn that all inservice attempts have netted poor results. In a study by Ryan, at Michigan State University in 1969, dealing with an inquiry-centered inservice social studies program, data showed that teachers could be successfully taught to

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[24]Edelfelt, "Inservice Education: Priority for Next Decade," p. 250.

[25]Cane, In-Service Training, p. 4.

use an inquiry method of social studies instruction.[26] In a study by Ward in 1973, involving an inservice program for educators in Kent County, Michigan, it was found that the workshop in fact was effective in fulfilling its goals utilizing

> . . . group effect in solving professional problems related to the educational offerings in their system, . . . facilitating attitudinal and/or behavioral change by the participants, . . . districts . . . and facilitating change within the cooperating universities.[27]

Halik's study in 1973, revealed that the inservice program for teachers in the affective domain was successful. He stated: "The teachers who participated in the inservice workshops did show a significant gain in awareness of the affective needs of the students in their classrooms."[28]

Furthermore, with educators being exposed to the same knowledge and technology explosion, they probably feel the inservice route is the most viable in which to

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[26]Thomas Francis Ryan, "An Analysis of an Inquiry Centered In-Service Social Studies Program for Elementary Teachers" (Ph.D. dissertation, Michigan State University, 1969).

[27]Keith W. Ward, "An Interinstitutional Approach to In-Service Education for Public School Personnel: The Kent Interinstitutional Workshop 1971-72" (Ph.D. dissertation, Michigan State University, 1973).

[28]Richard J. Halik, "Teacher In-Service Education in the Affective Domain: Outcomes for Teachers and Students" (Ph.D. dissertation, Michigan State University, 1973).

meet the challenge of our complex society and its effects on the schools, the way in which to handle changes that result, and the way to foster change, in the school's structure and themselves. Moffit stated:

> Proper education of the nation's teachers is and should be the concern of every citizen. It is the education of teachers that determines the quality of learning and therefore the quality of the people of this country. Now and in years to come teachers must become sensitive to new and challenging responsibilities. The increase of knowledge is as profound as it is inspiring. This accumulation of knowledge appears to be endless and will be accelerated as the years go by. Teachers of our time and those in the future must accept this unparalleled opportunity for professional growth as they teach. To do otherwise would be to threaten the expanding ideals of this democracy. The sensitivity of teachers to the array of problems with which they are confronted may be noted by their eagerness for continuous growth. It therefore appears safe to conclude that the quality of any school system may largely be determined by the quality of the in-service educational programs involving the total professional staff.[29]

Fishback also comments:

> In-service education, whether individually or group initiated is a process of working toward change. Viewed in terms of human behavior the changes are ordinarily identified as gaining new knowledge, increasing understanding, acquiring more desirable attitudes, and strengthening interests. Viewed in terms of materials, media, and knowledge itself, changes may suggest exploration, evaluation, modification, amplification, and elimination. All of these latter processes, also implying personal involvement, both contribute to behavior changes and lead to changes in administrative and teaching practices.

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[29]Moffitt, In-Service Education for Teachers, p. 8.

> . . . The historian, Toynbee, in writing about change, has this to say: "Change cannot be brought to a halt. To try to halt change is to court an explosion. The constructive way of dealing with the inevitability of change is to make changes voluntarily before they impose themselves. The earlier we take action, the wider will be our range of choice. If we foresee a necessary change soon enough, few shall have some chance of guiding it into channels in which its effect will not be devastating, but constructive."[30]

Inservice Education:
Future Trends

In light of the foregoing data, man must foresee change, and if educators accept the premise that change is a constant in the world of today, then it would seem that at least two questions need to be asked and answered: (1) What are the educational problems to be dealt with? and (2) How can teacher inservice educational programs be structured to handle the identified problems? Analysis of past failures--the "sins of commission and omission" of inservice programs is valuable only insofar as it provides the basis for improved future programs.

Earlier in this chapter mention was made of the varied emphases teacher inservice has had over the years. Some or all of these purposes no doubt will continue to focus programs. However, what educators today seem to be

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[30]Woodson W. Fishback, "In-Service Education Considerations--Psychological Factors," in Readings in In-Service Education, ed: I. J. Patel and M. B. Buch (India: Anand Press, 1968), pp. 12-13.

saying is that in addition to designing inservice programs to provide teachers with skills that have been developed or designed since their preservice training at the university or college, and providing new ways of teaching basic skills, inservice education programs of the future will be determined by societal and teacher needs. Decisions for and the how of professional growth will be made by those individuals intimately involved--whether they be teachers, administrators, university personnel, or outside consultants. Consequently, to the question of the future focus of teacher inservice education the following can be suggested.

Robert Bush writes: ". . . a new element has been added to the social forces impinging on the school, namely, the computer and audio-visual revolutions."[31] Such devices provide a better information dissemination system bringing the world closer together. Weekly television, magazines, and newspapers contain more information than our grandparents had in a year. Computers will become an integral part of our educational system.

It is perhaps the realization on the part of teachers that retraining through inservice education in regard to these developments and others will be a critical factor for their survival and the survival of education. Bush adds:

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[31]Bush, "Curriculum-Proof Teachers," p. 49.

> As the new technology develops, I predict alteration of the teacher's role, but not a diminution of the strategic importance of the teacher. Teachers with much higher training will be required if the new technology is to be developed and used wisely. . . . Technology will so alter our way of life that fewer and fewer people will carry on what we formerly considered the productive work of the world, and more and more people will turn to service occupations and will have greater leisure to cultivate their own interests.[32]

Other changes in the educational system are already quite visible and will continue to expand. For example the training and use of paraprofessionals in classrooms allowing more individualization of instruction will demand attention. The concept of differentiated staffing will reduce the number of highly trained professionals at the top of the educational pyramid, but will at the same time increase the numbers of persons with lesser training working under the direction of qualified professional persons.

A viable method of training such types of new and additional personnel is needed. Inservice, in-the-school, or on-the-job training might be the best vehicle. Rubin tells us that

> In the period ahead we will see the introduction of new technological devices, the extension of the classroom to the resources of the community-at-large, and the emergence of new instructional materials and methods. Each of these will demand special teaching skills. We must capitalize upon the lead time remaining, identify these skills as

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[32] Ibid., p. 40.

> soon as possible, and institute programs of professional growth which guarantee skill mastery.[33]

Therefore, says Ralph Tyler,

> In-service training of the future will not be limited to college and university campuses or to school buildings but will be carried on in a variety of settings related to the problems and the resources to be dealt with. For example, some will be carried on in welfare agencies and other slum settings, some in factories or other work environments, some in laboratories, some in camps, parks, or other recreation spots, some in communication centers, and some will be quasi internships in political and social organizations.[34]

The point to be made is that wherever the changes need to occur is the place where inservice training should take place. Therefore, when experienced teachers need or want to become knowledgeable and skillful in an innovation or new program, they must be trained on-the-job, relating the new concepts to the actual classroom experience, to themselves and their students.

In addition to the future emphasis of inservice programs on greater variety of technical devices to carry on instruction, more efficient use of paraprofessionals and their training, at least two other areas of focus will need greater attention and effective teacher inservice--vocational and technical education with emphasis in the classroom on the world of work and new instructional programs for the disadvantaged. Miller writes:

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[33]Rubin, Improving In-Service Education, pp. 16-17.

[34]Tyler, "Inservice Education of Teachers: A Look at the Past and Future," p. 15.

> Change is now and of the future. The ability of vocational education to provide relevancy while creating alternatives for learners of all ages which reflect the workforce needs of the nation depends, in a large measure, on change. In turn, keeping pace and providing a self-renewing leadership requires a personnel development system responsive to the needs of individuals. . . .
>
> Creating and sustaining change in educational practice is a goal of inservice education. The challenge for vocational education is to develop an inservice model which has application to the priority concerns of the individual, state, and nation. The delivery system created by such a model when applied to persistent and emerging problems in vocational education would allow vocational education personnel development programs to deal effectively with demands created by change.[35]

A great deal has been written about the problems of the disadvantaged and the need to understand them in order to develop sound programs at all levels. Fantini has stated:

> The basic elements of the needed reform are unmistakable because much of the school population suffers from emotional disabilities and psychological unrest, the base of our instructional program must be extended to include to a far greater extent experiences that make for a more stable personality. Since racial discrimination, poverty, unemployment, and a general social malaise are the crucial societal dilemmas of our time, they must be dealt with forthrightly in the school. It is imperative that the curriculum be made more realistic and more relevant to the fundamental concerns of youth. We must devise instructive procedures through which to deal with the problems of alienation, identify confusion, disconnection, and the pervasive belief that the good life is possible only for white, middle-class

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[35]Melvin D. Miller, "A State Model for Vocational Inservice Education," Theory into Practice 14 (October 1974): 52.

> society. Put another way, the schools must become more congruent with the life of their clients and must overthrow convention and conformity in order to revitalize the school by making more imaginative use of learning opportunities in the community.[36]

These are some of the challenges of today and tomorrow facing educators. Whether training involves the updating of teacher's skills in certain areas, the introduction of new instructional materials, technological devices, development of programs for the disadvantaged, or the implementation of an innovation, the training will have to come, so it seems, via the inservice route. Otto and Erickson feel that:

> In terms of possible payoff, in-service efforts to improve . . . instruction appear to be well worth the effort. In fact, among all of the alternatives available, in-service programs appear to offer the best chance for change. . . . In-service programs can introduce and implement new ideas and procedures. New practices need to be tested, ideas modified, and well-known, proven practices continued. In-service programs are needed to insure that . . . instruction is maintained in a lively dynamic state.[37]

Furthermore, to ensure successful teacher inservice, in addition to societal goals, programs must also reflect teacher's needs and desires. In a recent study by Brimm and Tollett, statewide teachers in Tennessee were asked to identify the types of inservice programs that

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[36]Fantini, "Teacher Training and Educational Reform," p. 203.

[37]Otto and Erickson, In-service Education to Improve Reading Instruction, p. 6.

would be most beneficial to them in carrying out daily activities. They found that an overwhelming majority of teachers prefer some sort of individualized inservice program.[38] They also hold for system wide inservice activities, prefer program activities conducted in their own school setting, and released time for inservice. Of the teachers polled, 90 percent strongly felt that programs should help teachers upgrade their performance in the classroom--in other words, they should be relevant, and 93 percent felt that teachers need to be involved in the development of programs.[39]

How specific teacher inservice programs should be structured will depend upon the particular identified needs, program goals and emphasis. However, one of the first considerations is that "inservice education is a process for change."[40] Havelock and Havelock relate in discussing change:

> It rests on the assumption that social progress can be planned and engineered so that it is more reliable and more beneficial to more people. This new concept of "planned innovation" stresses the importance of realistic diagnosis of needs, . . . collaborative planning and solution building,

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[38]Jack L. Brimm and Daniel J. Tollett, "How Do Teachers Feel About In-Service Education?" Educational Leadership Research Supplement 31 (March 1974): 523.

[39]Ibid., p. 524.

[40]Harris and Bessent, Inservice Education A Guide to Better Practice, p. 16.

and systematic design and evaluation of alternative solutions.[41]

Introduction to the Educational Sciences

The literature contains outlines of the efforts which have been made to develop and build a theoretical base for the field of education. Various scholars and educators have presented ideas. For example, during the 1950's Conant suggested that education be considered a science or set of disciplines.[42] Bloom provided a taxonomy which synthesized the functioning of the human being into three domains--cognitive, affective, and psychomotor.[43] Hill, in turn along with some associates at Wayne State University, has put forward a basis for a conceptual framework for education consisting of separate bodies of information which he has termed, the Educational Sciences.[44]

Rationale for Development of the Educational Sciences

The conceptual framework for education presented by Hill is composed of a body of knowledge categorized to

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[41]Ronald G. Havelock and Mary C. Havelock, Training for Change Agents (Ann Arbor: University of Michigan, 1973), p. 2.

[42]Conant, The Education of American Teachers.

[43]Bloom, Taxonomy of Educational Objectives.

[44]Joseph E. Hill, The Educational Sciences (Bloomfield Hills, Michigan: Oakland Community College Press, 1976).

form seven Educational Sciences. The rationale for this development emanates from past acceptable approaches to the structures of knowledge. Over the years academic disciplines have been formulated by scholars and furthermore, applied fields have developed as man has sought to change and control the problems he faced in his environment.

Hill makes the distinction between fundamental disciplines, applied fields of knowledge, and general education in the following manner. Fundamental disciplines such as biology, history, art, psychology, and mathematics comprise bodies of knowledge generated by communities of scholars who produce pure and distinctive forms of information about phenomena which they (the "communities") choose to study.[45] The applied or derivative fields of knowledge are differentiated from the fundamental disciplines and are defined as fields of knowledge derived from the use of information drawn from the fundamental disciplines. They ". . . are generated by practitioners who deal with practical considerations of the human condition. Medicine, pharmacy, engineering, and law are examples."[46]

Often there is a need to "know about" knowledge produced by academicians in their disciplines as well as

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[45] Ibid., p. 2.

[46] Ibid.

the applied knowledge used by professionals in their fields. The areas of general information or general education provide a means for presenting this knowledge in such form as to allow people to understand the concepts developed in the academic disciplines and applied fields. The curriculum model as presented in the following diagram illustrates the relationship between fundamental disciplines, applied or derivative fields, and areas of general information as described by Hill. This model was developed to provide the basis for the design of the Educational Sciences conceptual framework.[47]

Many applied fields of knowledge have well developed conceptual frameworks and attendant "languages" permitting free flow of communication with concomitant facilitation of problem solving. It has been suggested that unlike other professions, education has not provided these attributes. According to Hill, education has lacked a well-defined conceptual framework and precise language. Together with his associates he has addressed this problem and has developed a conceptual framework and technical language for the applied field of education.[48]

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[47] Ibid.

[48] Joseph E. Hill, "Conference on the Educational Sciences," lecture presented at Barry College, Florida, 13 January 1973.

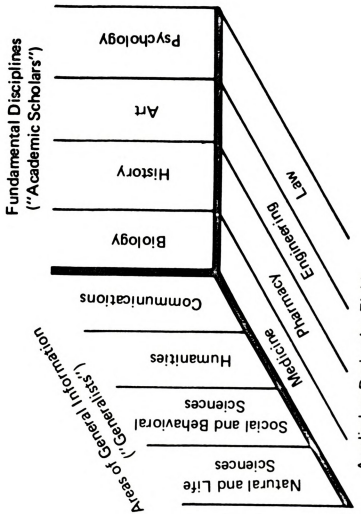

Figure 1. Curriculum Model.

The development of the Educational Sciences as a conceptual framework with its accompanying language was undertaken so that

> . . . the solutions of problems and explanations of phenomena are facilitated, and educational problems accruing to inadequate communication, misinterpretation of information, and fragmentation of effort are alleviated.[49]

The Educational Sciences are based on the following assumptions:

1. Education is the process of searching for meaning.
2. Thought is different from language.
3. The human creature is social in nature and has an unique capacity for deriving meaning from its environment and personal experiences through the creation and use of symbols.
4. Not content with biological satisfactions alone, humankind continually seek meaning.[50]

Many educators who have used the Educational Sciences or analyzed outcomes from their use, have found such application to be beneficial. Following an extensive review of the literature Sutton, Berry, and McBeth summarized their findings:

> Any particular facet of education can be analyzed either in terms of one of the seven stated sciences or by means of some combination of two or more Educational Sciences.[51]

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[49] Hill, The Educational Sciences, 1976, p. 2.

[50] Ibid.

[51] Berry, Sutton, and McBeth. Bibliography of Educational Sciences, p. 1.

Historical References

The development of the Educational Sciences resulted from an extensive review of the literature by Hill and his associates culminating in a synthesis of the ideas generated in the studies and writings of scholars, philosophers, educational thinkers, and the experiences of practitioners. The numerous studies, articles, and books which present the work are listed in the Bibliography of the Educational Sciences with Commentary.[52]

During preparation of the bibliography, Sutton, Berry, and McBeth indicated they had extensive discussions with Hill to determine the accuracy of statements concerning the Educational Sciences. Their compilation which resulted in the bibliography was presented as an abstract and provides a valuable synthesis.

The historical review presented here is a summary based on seven major sources: (1) Cognitive Style as an Educational Science;[53] (2) The Educational Sciences;[54] (3) Bibliography of the Educational Sciences with

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[52]Ibid.

[53]Joseph E. Hill, Cognitive Style as an Educational Science (Bloomfield Hills, Michigan: Oakland Community College Press, 1969).

[54]Joseph E. Hill, The Educational Sciences (Bloomfield Hills, Michigan: Oakland Community College Press, 1972).

Commentary;[55] (4) Personalizing Educational Programs Utilizing Cognitive Style Mapping;[56] (5) Lectures from "Conference on the Educational Sciences";[57] (6) Educational Cognitive Style: A Basis for Personalizing Instruction;[58] and (7) "Personalizing Educational Programs at Oakland Community College," (film).[59] Permission for the use of these materials including abstracted summaries and paraphrasing has been given by the authors.

At their present stage of development, the Educational Sciences consist of the following seven areas:

1. Symbols and Their Meanings
2. Cultural Determinants of the Meanings of Symbols
3. Modalities of Inference
4. Educational Memory
5. Educational Cognitive Styles of Individuals

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[55]Berry, Sutton, and McBeth. Bibliography of Educational Sciences with commentary.

[56]Joseph E. Hill and Derek N. Nunney, Personalizing Educational Programs Utilizing Cognitive Style Mapping (Bloomfield Hills, Michigan: Oakland Community College Press, January 1971).

[57]Derek N. Nunney, "Conference on the Educational Sciences," lecture presented at Barry College, Miami, Florida, 15 January 1973.

[58]Derek N. Nunney, Educational Cognitive Style: A Basis for Personalizing Instruction (Bloomfield Hills, Michigan: Oakland Community College Press, 1975).

[59]Film, "Personalizing Educational Programs at Oakland Community College" (Bloomfield Hills, Michigan: Xerox Corporation, 1972).

6. Counseling Styles, Administrative Styles, Teaching Styles, and Student Styles

7. Systemic Analysis Decision-Making[60]

Symbols and Their Meanings.--This science is based on the assumption that man mediates two kinds of symbols, the theoretical and the qualitative. The distinction made between these two types of symbols emanates primarily from the works of Champlin[61] and Villemain.[62] Both writers synthesized selected ideas from Peirce[63] and Dewey.[64] According to Sutton, Berry, and McBeth:

> Further support can be found in the writings of Korzybski (1949, 1950) who emphasized that the symbol influences the functioning of the nervous system and Rapaport (1962) who argued that man can mediate more than one type of symbol.[65]

Some essential characteristics of the theoretical and qualitative symbols are as follows. The theoretical

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[60]Hill and Nunney, Personalizing Educational Programs Utilizing Cognitive Style Mapping, 1974, p. 2.

[61]Nathaniel L. Champlin, "Controls in Qualitative Thought" (Ph.D. dissertation, Columbia University, 1952).

[62]Francis T. Villemain, "The Qualitative Character of Intelligence" (Ph.D. dissertation, Columbia University, 1952).

[63]Charles S. S. Peirce, The Collected Papers of C. Peirce, eds: Charles Hartshorne and Paul Weiss, vol. 2 (Cambridge: Harvard University Press, 1932).

[64]John Dewey, "Qualitative Thought," in On Experience, Nature, and Freedom, ed: Richard J. Bernstein (Indianapolis: Bobbs-Merrill Company, Inc., 1960).

[65]Berry, Sutton, and McBeth. Bibliography of Educational Sciences, p. 2.

symbol can be both linguistic and quantitative in form such as words, sentences, and numbers, and they are received by a person either auditorally or visually. These characteristics of theoretical symbols are differentiated as follows:

Theoretical	Auditory	Linguistic	T(AL)
"	Visual	"	T(VL)
"	Auditory	Quantitative	T(AQ)
"	Visual	"	T(VQ)[66]

The qualitative symbol has been considered in three dimensions--sensory, programmatic, and codes.[67] They consist of pictures, images, sounds, sensations, feelings, and other non-verbal forms of communication. The five sensory elements are:

Qualitative	Auditory	Q(A)
"	Olfactory	Q(O)
"	Savory	Q(S)
"	Tactile	Q(T)
"	Visual	Q(V)[68]

The ten programmatic elements are:

Qualitative	Proprioceptive	(Fine)	Q(PF)
"	"	(Gross)	Q(PG)
"	"	Dextral (Fine)	Q(PDF)
"	"	" (Gross)	Q(PDG)
"	"	Kinematics (Fine)	Q(PKF)
"	"	" (Gross)	Q(PKG)
"	"	Sinistral (Fine)	Q(PSF)
"	"	" (Gross)	Q(PSG)

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[66] Hill and Nunney, Personalizing Educational Programs Utilizing Cognitive Style Mapping, 1974, p. 2.

[67] Ibid.

[68] Ibid.

Qualitative	Proprioceptive	Temporal	(Fine) Q(PTF)[69]
"	"	"	(Gross) Q(PTG)

The ten cultural codes are:

Qualitative	Code	Empathic	Q(CEM)
"	"	Esthetic	Q(CES)
"	"	Ethic	Q(CET)
"	"	Histrionic	Q(CH)
"	"	Kinesics	Q(CK)
"	"	Kinesthetic	Q(CKH)
"	"	Proxemics	Q(CP)
"	"	Synnoetics	Q(CS)
"	"	Transactional	Q(CT)
"	"	Temporal	Q(CTM)[70]

Essentially the theoretical and qualitative elements are seen to operate in combinations as presented, for example, in the following form: (1) T(VL)--Q(V): (2) T(AL)--Q(CET).

Cultural Determinants.--The second Educational Science is comprised of three elements--Individuality, I; Associates, A; and Family, F. These are the elements in the culture which impinge upon a person and influence how he or she interprets symbols.[71] The basis for these concepts can be found in the writings of Parsons[72] on the Individual and Merton's work on role set theory.[73]

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[69]Hill, The Educational Sciences, 1976, pp. 4-5.

[70]Ibid., p. 5.

[71]Ibid.

[72]Talcott Parsons, The Social System (Glencoe, Illinois: Free Press, 1959).

[73]Robert K. Merton, Social Theory and Social Structure, rev. ed. (New York: The Free Press, 1968).

Homans,[74] Newcomb,[75] and Tolman,[76] also made contributions--particularly related to the influence of "norms and roles" on behavior. The basis for incorporating the influence of associates in Educational Cognitive Style was derived from the work of Asch,[77] in particular the influence of group pressure on decision-making as the individual searches for meaning.

Modalities of Inference.--This science deals with the ways in which a person reasons inductively and deductively.

> Concepts from statistical inference and logic supplemented by the works of Piaget (1952), Wertheimer (1959), Bruner (1966), and Guilford (1967) served as the foundation of this science.[78]

According to Hill, the inductive reasoning process is built around four elements.[79] The Magnitude, M type

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[74]George C. Homans, The Human Group (New York: Harcourt, Brace and Company, Inc., 1950).

[75]Theodore Newcomb, Ralph Turner, and Philip Converse, Social Psychology (New York: Holt, Rinehart and Winston, 1965).

[76]Edward C. Tolman, "Value Standards, Pattern Variables, Social Roles, Personality," in Toward a General Theory of Action, eds., T. Parsons and E. A. Shils (Cambridge: Harvard University Press, 1962).

[77]Soloman E. Asch and Herman A. Witkin, "Studies in Space Orientation," Journal of Experimental Psychology 38 (1948): 762-82.

[78]Berry, Sutton, and McBeth. Bibliography of Educational Sciences, p. 4.

[79]Hill, The Educational Sciences, pp. 5-6.

thinker tends to classify and categorize information. The Difference, D type compares or contrasts things and ideas on the basis of a single characteristic, on a one-to-one basis. The Relationship, R type thinker synthesizes and analyzes information, pulling together many ideas using analogies, examples, and comparisons of two or more similar characteristics. The Appraisal, L type of thought process involves the use of all three of the above methods before a conclusion is reached.[80] Deductive reasoning, (K) relates to the form of logical proof used in most mathematics and syllogistic reasoning.[81]

It is important to state here that approximately one hundred thousand Educational Cognitive Style maps have been generated in the past ten years. An analysis of many maps shows that individual cognitive styles are composed of various combinations of all these elements. Different people may have one or more of the elements which have been categorized for each of the sets. It has been noted that strengths and weaknesses do occur, but also that where weaknesses exist, through specific educational programs, such elements can be augmented.

More complete definitions of these elements can be found in The Educational Sciences, located in Appendix A of this study.

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[80] Ibid., p. 6.

[81] Ibid.

References for the sciences of Educational Memory, Counseling, Administrative, Teaching, and Student Styles, and Systemic Analysis Decision-Making can be found in Hill's work previously cited. Since the main focus of this study relates to the Science of Educational Cognitive Style as the basis for teacher inservice education, a discussion of the related literature is presented here.

Science of Educational Cognitive Style.--The term "Educational Cognitive Style" was based upon the work of Allport who suggested the concept of "style," defining it as the consistency and pattern of expressing behaviors manifested by individuals while performing various types of activities. In this context of definition of style, Allport's concept seems to be similar to its common use in such expressions as: an individual's style of living, a writing style, or style of dress. In this context Hill has suggested the term "style" can be used to denote an entire pattern of response.[82]

For example, style may be used to refer to a particular way of life or to a particular class of events such as a style of speaking. Therefore, the term "style" is considered as both general and relatively specific since it is not restricted to a particular denotation.

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[82]Hill, Cognitive Style as an Educational Science, p. 1.

In other words, it encompasses all aspects of response patterns.[83]

Broverman, Gardner, Kagan, Moss, Sigel, and Witkin[84] suggest that cognitive behaviors form an integral part of a socio-personal matrix and that the employment of certain classes of behavior called "cognitive," have consistent qualities which justify their being defined as "stylistic."[85] Related to Educational Cognitive Style for teachers, Hill writes:

> The construct of Cognitive Style is a vehicle which can be used to diagnose individuals and prescribe activities that provide the high probability of the student's accomplishing successfully the educational task confronting him.[86]

This concept has meaning for the classroom teacher in that it provides a means to handle the complex educational problems by using the cognitive style of the individual student. Hill further states:

> It should be noted that the Cognitive Style of an individual is a relative concept, and depends not only on the educational level and cultural background of the individual, but upon the symbolic condition of the task to be accomplished. In this concept, the derivation of an appropriate style for an individual demands that the diagnostician analyze the student as well as the substance of the educational task to be considered.[87]

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[83] Ibid.

[84] Ibid.

[85] Ibid., p. 2.

[86] Hill, The Educational Sciences, 1972, p. 15.

[87] Nunney, "Conference on the Educational Sciences."

According to Nunney, given this diagnostic tool:

> The "sciences" provide a means for mapping a student's Educational Cognitive Style, or the way he searches for meaning in his world; determining modes of understanding of educational tasks; prescribing and then analyzing realistic instructional goals for the individual. An individual's Educational Cognitive Style is determined by the way he takes note of his total surroundings, how he seeks meaning from the world around him or how he becomes informed.[88]

As a vehicle to facilitate the personalization of education, Nunney has introduced the Educational Sciences to many educators and students in various colleges and school systems. On the basis of this work, he has indicated that it is possible for a teacher to employ information from the sciences to establish hypotheses concerning such conditions as: whether the student is a listener or a reader of information, the degree to which the student depends on each of the five senses in deriving meaning from the environment, the ability to empathize with others, whether rules guide his or her behavior, and the use of non-verbal communication.[89]

He also states that it can be determined if the student is concerned only with his or her own viewpoint or if he or she is influenced in decision-making by the family or associates. Of equal concern is whether the student tends to reason in a deductive logical fashion as

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[88] Ibid.

[89] Ibid.

mathematicians do, rather than in terms of inductive relationships.[90]

The information gives teachers tentative indications of a student's strengths and weaknesses or the degree to which these cognitive elements are present in an individual. Determination of the student's Educational Cognitive Style and production of the resulting "map" provides the basis for the implementation of a personalized educational program.[91] According to Nunney:

> The value of a Cognitive Style Map in an instructional setting is much the same as the X-ray is to a medical doctor. Analysis of the map indicates strengths and weaknesses which can be acknowledged and which form the basis for prescribing one or more of the many alternative methods, or educational prescriptions, available to the teacher-educational scientist.[92]

In summary it would appear that Nunney and Hill believe that the teacher's role can be that of diagnostician and/or prescriptionist. Furthermore, that knowledge of Educational Cognitive Style facilitates development of the student's academic skills, and enables teachers to prescribe more selectively activities and types of instruction that will enhance interpersonal relations, concept development, problem solving skills, and a personal

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[90]Nunney, Personalizing Educational Programs Utilizing Cognitive Style Mapping, 1971, p. 3.

[91]Ibid.

[92]Nunney, Educational Cognitive Style: Basis for Personalizing Instruction, p. 6.

awareness or confidence in dealing with the total environment.

Implementation of the Educational Sciences

The first implementation project was designed to be a Job Corps Center to be established at Gross Ile.[93] This project was not funded, but the proposal was used as a basis for the development of the Urban Adult Education Institute in Detroit.[94] In 1969, Hill and Nunney introduced the Educational Sciences and the Personalized Education Programs (PEP) to Oakland Community College. Their purpose was to ". . . first find out how the student uses symbols to solve problems--how he uses his senses and inference processes when faced with a situation which has no existing meaning for him."[95] The overall goal of the PEP program was summarized as ". . . to guarantee the student a 90 percent success level of performance."[96] The development of the program designed to achieve this goal was based on the following assumptions presented by Nunney:

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[93]Joseph E. Hill, "A Proposal for the Design, Operation, and Management of a Job Corps Regional Training Center," 1964.

[94]Oakland Community College, "Career Opportunities Program" (Oakland Community College Press, n.d.).

[95]Hill and Nunney, Personalizing Educational Programs Utilizing Cognitive Style Mapping, 1971, p. 3.

[96]Ibid.

1. that each individual searches for meaning in his own unique way;

2. that it is possible to determine which elements of a person's Educational Congitive Style have enabled him to succeed in the past;

3. that 90 percent of all individuals can and do achieve at a 90 percent level of success in certain informal and/or formal educational settings of their choice;

4. that it is possible to match an individual's Educational Cognitive Style to a mode of understanding or form of presentation in order to produce a 90 percent achievement level; and

5. that an educated person is one who has developed perceptual, cultural, inferential, and memory skills so that he or she is able to use theoretical and qualitative symbols to search for meaning in all experiences.[97]

During the past several years questions have been raised concerning the reliability, validity, and sample size of the studies conducted in the Educational Sciences. Also, the use of empirical mapping as well as mathematical mapping, experimental design, and levels of application have been questioned. This is understandable in light of the expanding impact that Hill's work is having on the educational scene. A review of the studies would indicate that more than adequate attention has been paid to the basic research design needs.

Sample Size, Reliability, and Validity.--The original projects started at Oakland Community College

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[97]Nunney, Educational Cognitive Style: Basis for Personalizing Instruction, p. 1-2.

were in the area of the Social Sciences. Implementation of the concept of personalized education and instruction through the use of the Educational Sciences in Social Science at the college was conducted by Wangler (1974)[98] with a sample of 722 students. Five instructors each with his own mode of instruction agreed to participate. Students were placed into one of four modes of instruction based on their Educational Cognitive Style map and personal preferences. In other words, an educational prescription was written for each student. Each of the four prescription centers provided a variety of personalized learning activities. The Educational Cognitive Style Test Battery was used to determine the student's cognitive styles. Wangler makes note of the fact that the test battery has been revised and updated several times since its development in 1968.[99] He further states:

> The following information pertaining to factors of reliability and validity associated with the ECSTB, respectively, was available in the Diagnostic Testing Center of the College at the time of the research project:
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> > Based upon information pertaining to the Differential Aptitude Tests (4th Ed. - Forms L and M - The Psychological Corp.,

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[98] John A. Wangler, "Personalizing Education by Means of the Burst Configuration Utilizing the Educational Sciences in the Study of Social Science" (Ph.D. dissertation, Wayne State University, 1974).

[99] Ibid., p. 61.

1966) of Verbal Reasoning and Grammar, and information regarding the Nelson-Denny Reading Test, the validity and reliability indices for each of the cognitive style elements shown was:

Elements	Sex	Validity Coefficients	Reliability Coefficients	Levels of Educational Development
T(VL)	Female	.80	.939	(8-12)
	Male	.72	.921	
T(VQ)	Female	.72	.92	(8-12)
	Male	.73	.93	
T(AL)	Female	.75	.91	(8-12)
	Male	.70	.90	
T(AQ)	Female	.66	.87	(8-12)
	Male	.61	.84	

These indices covered the first six tests included in the Battery.

The values of the reliability coefficients for different entering classes (from June 1969 through August 1970), on the four inventories included in the Battery, ranged from .78 through .84, inclusively. The values were computed on the basis of domain sampling by means of applying the Kuder-Richardson "21" formula to data yielded on all elements (e.g., Q's., I,A,F,M,D,R,L) by the four inventories. The values of the validity coefficients (point-biserial correlation coefficients), for the entering classes noted above, ranged from .72 to .77, inclusively.[100]

Final grades for the 722 students who were mapped and involved in the Educational Sciences study indicated that 65 percent of the students received A's and B's and 82.5 percent received C or better. All students were given specific educational prescriptions based on their

[100] Ibid., pp. 61-62.

individual Educational Cognitive Style map and the modes of instruction available.

Niles (1974)[101] conducted a study comparing the Educational Cognitive Styles of the most successful Michigan community education directors and other Michigan directors of community education. The two samples involved 126 subjects. The Oakland Community College Cognitive Style Mapping Interest Inventory was administered to both samples. On determining validity Niles writes:

> The validity of the Cognitive Style Mapping Interest Inventory Test has been based on the concept of construct validity. Construct validity includes the concepts of predictive, concurrent, and content validity, as part of its "program of description" regarding the process of validation (Hill, 1973). No single index of relationship can denote construct validity; rather,
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> > . . . the determination and description of construct validity is an on-going dynamic process, i.e., a "program," that includes a periodic reporting of a limited number of validity co-efficients pertaining to certain aspects of the instrumentality supplemented by verbal descriptions based upon professional judgments (Hill, 1973, p. 48).
>
> In an effort to obtain at least one validity coefficient, the researcher gave the Cognitive Style Mapping Interest Inventory Test to a total of ten people, all of whom belonged to one of four families. After the test had been completed and scored, the results were explained to each person and to the other members of his family. Content

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[101]Thomas Russell Niles II, "A Comparison of Cognitive Styles Between the Most Successful Michigan Directors of Community Education and Other Michigan Directors of Community Education" (Ed.D., Western Michigan University, 1974).

> validity, as judged by both the individual test-taker and his family, ranged between .80 and .95 in every case. Thus, the content validity coefficient of approximately .85 can be used to eventually provide for an accurate assessment of construct validity.
>
> More specifically, calculation of content validity was performed in the following manner. After a family member received his test results, he was asked to determine the degree of validity on each element as it applied to him. Using his map again, a second member of the family was asked to repeat this validating process. Both individuals' ratings were correlated by means of the Pearson product-moment correlation co-efficient, and a validity coefficient for each element was obtained. Averaging the validity coefficients for each element gave an overall validity coefficient for a single test. Repeating the validating process for all ten members yielded scores of content validity, a significant portion of construct validity, ranging between .80 and .85.[102]

In relation to the determination of reliability of mapping Educational Cognitive Style Niles further writes:

> Reliability of cognitive mapping has been formulated in terms of domain sampling. Within the Cognitive Style Mapping Interest Inventory Test has been included eight questions relating to each one of the elements included in a cognitive map. These questions attempt to measure a person's reaction to a representative domain sampling of various situations, where a particular element being measured is apt to be employed. . . . As the individual's cognitive style changed, however, his way of perceiving the same situations might also change. Naturally the resultant changes would be demonstrated in one's cognitive map, and the reliability coefficient would reflect this result. Since domain sampling provides the means for computing the value of a reliability coefficient on the basis of one set of scores (data), the coefficient's value could be found

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[102] Ibid., pp. 45-46.

> accordingly. If the reliability of the battery, taken over a period of time is desired, a second administration of the instruments would be required, and the value of the coefficient for this second set of data could be computed. The values of the coefficients, one for the first set of data and another for significance of difference, thus rendering information regarding the reliability of the battery over a time span.[103]

Niles found that the group of successful directors obtained higher scores on Cognitive Style elements when compared to the group of randomly selected directors in the following: Theoretical Auditory Quantitative T(AQ); Qualitative Code Histrionic Q(CH): Qualitative Code Kinesics Q(CK); Qualitative Code Proxemics Q(CP): Qualitative Code Transactional Q(CT); Associates A; and Difference D. The second finding was that the successful directors scored lower than the randomly selected directors in the following elements of Educational Cognitive Style: Theoretical Visual Linguistic T(VL); Qualitative Code Ethic Q(CET); Individuality I; Magnitude M; and Appraisal L.

Evidence on the reliability and validity is found in the study by Crowe (1974)[104] who analyzed sex bias in relation to high school programs. In her study reliability coefficients ranged from r=.78 to r=.89. Validity coefficients ranged from r_{bis}=.74 to r_{bis}=.84. She states:

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[103]Ibid., p. 47.

[104]Kathleen P. Crowe, "Sex Bias and Placement in High School Programs," The Educational Scientist 1 (Spring 1976).

> The validity index was found for each element in the cognitive style maps of twenty sample subjects according to methods described by Hill (1973). The average validity for the battery was r_{bis}=.783. The Kuder-Richardson formula was used to determine the value of the reliability coefficient, r_{xxx}. A reliability coefficient of .81 was determined.[105]

Related to the findings of her study Crowe reports that interpretations of collective cognitive styles indicate that both females and males are probably capable of engaging in vocational education programs currently existing as one-sex vocational programs. On a comparative basis, male and female, significant strengths within the female groups could be utilized in other vocational programs.

Further review to determine the existence of acceptable sample size revealed Lange's (1972)[106] study in the area of nursing education which focused on the identification of effects on learning when students' Educational Cognitive Style and preferred Teaching Style were matched with the instructor's Educational Cognitive Style and Teaching Style. The 255 students comprising the sample were assigned to 33 nursing faculty members on the basis of matching cognitive style factors.

Lange's study revealed that there was no significant difference in the failure-withdrawal rate when the

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[105] Ibid., p. 23.

[106] Crystal Marie Lange, "A Study of the Effects on Learning of Matching the Cognitive Styles of Students and Instructors in Nursing Education" (Ph.D. dissertation, Michigan State University, 1972).

cognitive style and preferred teaching style of students was matched with the cognitive style and teaching style of faculty when compared with the baseline data. However, significant differences did occur in the failure-withdrawal rate of one matched group when the cognitive style and preferred teaching style of students was matched with the cognitive style and teaching style of faculty. In testing the research hypotheses several other findings emerged: (1) Students whose cognitive styles and preferred teaching styles were matched to the instructor's cognitive style and teaching style perceive the instructor more positively than non-matched students; (2) These students achieved higher mean scores in final course grades than the non-matched students; (3) Those students who were given a choice of instructional mode indicated a preference for being given a choice; (4) 70 percent of the faculty felt that matching styles was a valuable tool, 62 percent recommended continuing the study; (5) The greater the number of major and minor Cognitive Style elements a student has, the greater are his or her chances for passing nursing courses.

Grasser (1973)[107] compared the cognitive styles of 162 successful and unsuccessful students enrolled in elementary algebra at Oakland Community College. The sample

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[107]Albert A. Grasser, "A Multivariate Analysis of Cognitive Style Elements as They Relate to Aptitude and Achievement Factors in Elementary Algebra" (Ph.D. dissertation, Wayne State University, 1973).

included male and female students based on pre- and post algebra achievement tests.

Grasser found that certain elements of Educational Cognitive Style in many instances correlated highly with pre- and posttest algebra aptitude scores as well as achievement tests. Also, significant differences in mean scores on Educational Cognitive Style elements occurred between those students who were successful (A final grades) and those who were unsuccessful (F final grades).

In looking at college freshmen English, Hoogasian (1970)[108] studied the cognitive styles of 472 students. The students had been mapped at Oakland Community College and had earned letter grades in English 151 and 152 Freshman English. On the basis of his analysis of the data, he indicated that cognitive styles could be used "as a gross predictor of success or failure in English."[109]

With a sample of 118 high school English students, Schroeder (1970)[110] attempted to study the relationship of the Educational Cognitive Style of students and teachers and teacher evaluations prepared by students.

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[108]Vaughn Hoogasian, "An Examination of Cognitive Style Profiles as Indicators of Performance Associated with a Selected Discipline" (Ed.D. dissertation, Wayne State University, 1970).

[109]Ibid., Abstract.

[110]Arlen Vance Schroeder, "A Study of the Relationship Between Student and Teacher Cognitive Styles and Student Derived Teacher Evaluations" (Ed.D. dissertation, Wayne State University, 1970).

Three major findings pertaining to this study were: (1) To a significant degree those students whose Cognitive Styles were similar to the instructor's, rated the instructor as being more effective than those evaluations of student's whose Cognitive Styles were "disjunct" with the instructor; (2) Those students whose styles were similar to the teacher, to a significant degree, received higher grades than those whose styles were disjunct; (3) It was found that certain predominant common elements of Educational Cognitive Style existed in both groups.

A study employing an experimental and control group with samples of N=90 and N=81 respectively, was designed by Retzke (1976).[111] The purpose was to measure changes in motivational levels of junior high students as a result of employing specific learning activities based upon Educational Cognitive Styles of students.

Retzke found that the teacher's use of Educational Cognitive Style data on students for purposes of increasing motivation had a positive and significant effect. Students who had attended only one experimental class made the greatest gains. Also, students with certain Educational Cognitive Styles showed greater gains than other students.

Beginning shorthand performance at the community college level was the focus of a study by Stencel

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[111]Ronald E. Retzke, "The Effect of an Experimental Treatment Using Cognitive Styles on the Motivation of Students in a Junior High Setting" (Ph.D. dissertation, Wayne State University, 1976).

(1974).[112] This study was designed to determine the effect of Educational Cognitive Style on beginning shorthand performance. A comparison of cognitive style elements held in common by the highly successful students was made to the unsuccessful. The sample of 61 students fell into two groups: Successful--N=32; Unsuccessful--N=29.

From an analysis of data, Stencel found that the elements Theoretical Visual Quantitative T! (VQ) and Qualitative Visual, Q' (V) appear to be very necessary for successul achievement. Magnitude M, Difference D, and Relationship R' appeared to be elements which would assist in reaching high achievement levels. Students with Individuality I, and Qualitative Code Ethic, Q'(CET) may not perform well in shorthand; and a student exhibiting an Appraisal L would have difficulty developing speed.

It can be concluded that adequate attention has been paid to sample sizes according to Borg and Gall's definition.

> A problem that must be faced in planning every research project is to determine the size of the sample necessary to attain the objectives of the planned research. The general rule is to use the largest sample possible. . . . The larger the sample, the more likely are their means and standard deviations to be representative of the population mean and standard deviation. . . .

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[112]Carol Frances Stencel, "Effects of Educational Cognitive Style on Beginning Shorthand Performance" (Ph.D. dissertation, Michigan State University, 1974).

> Generally in correlational research it is desirable to have a minimum of 30 cases.[113]

Analysis of the studies in terms of reliability and validity has been conducted in relation to Borg and Gall's statement concerning acceptable levels of correlations:

> Correlations ranging from .20 to .35 . . . show a very slight relationship between the variables, although this relationship may be statistically significant. . . .
>
> Correlations ranging from .35 to .65 . . . are statistically significant beyond the one percent level. With correlations around .50, crude group predictions may be achieved. . . .
>
> Correlations ranging from .65 to .85 . . . . make possible group predictions that are accurate enough for most purposes. As we move toward the top of this range, group predictions can be made very accurately, usually predicting the proportion of candidates in selection problems within a very small margin of error. . . .
>
> Correlations over .85 . . . indicate a close relationship between the two variables correlated.[114]

Generally, the studies show relationships above the .65 level and according to Borg and Gall, correlations at this level are sufficient for accurate prediction purposes.

Empirical and Mathematical Mapping.--Studies utilizing both empirical mapping and mathematical mapping have been conducted by Baecher and Schroeder. Baecher

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[113]Walter R. Borg and Meredith D. Gall, Educational Research An Introduction, 2nd ed. (New York: David McKay Company, Inc., 1973), p. 123.

[114]Ibid., pp. 359-60.

(1973)[115] studied the potential achievement of 33 fourth and fifth grade bilingual Mexican American and Puerto Rican American students. He used both techniques of mapping Educational Cognitive Style--mathematical or direct measurement of elements, and empirical mapping. To determine levels of educational development, selected subtests of the Iowa Test of Basic Skills were adapted and administered in English and the Spanish spoken in the home. Utilization of "empirical mapping" was made to ascertain selected elements of Educational Cognitive Style. Baecher describes this process as ". . . a process involving human judgments based on various observations and other sources of information. . . ."[116] Verification or "validation" of elements was made by ethnic personnel connected with the Bilingual Program involved in his study.

Baecher's study indicates that significant differences were found between the two groups of elementary students--Mexican American and Puerto Rican American in listening comprehension levels (Theoretical Auditory Linguistic, T(AL) related to English and home Spanish. No significant differences were found with respect to the

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[115] Richard Emeram Baecher, "An Exploratory Study to Determine Levels of Educational Development, Reading Levels, and the Cognitive Styles of Mexican American and Puerto Rican American Students in Michigan" (Ph.D. dissertation, University of Michigan, 1973).

[116] Ibid., Abstract.

other Educational Cognitive Style elements, reading levels, and grade levels.

Schroeder discussed his use of empirical mapping as follows:

> Empirical "mapping" (diagnostic) techniques formed the primary mode of data collection. These techniques involved both the direct and indirect measurements of elements of cognitive style. Direct measurement consisted of interpretations of observations of student behavior. Indirect measurements were derived from an intensive examination of student permanent records and an instrument designed to ascertain certain elements of a student "style."[117]

Initial implementation of the Educational Sciences in 1971, at Polk Community College, Winter Haven, Florida, developed as a result of ". . . efforts . . . to pinpoint needs and processes in the area of student motivation."[118] Allsopp, Lee, and Taylor, in describing their implementation project, write:

> First the student is taught all the elements on the educational cognitive style map and understands how each relates to learning. Then he empirically maps himself prior to receiving his actual printout. Through this familiarity with the theory of the Educational Sciences, the map elements, and his own individual map, the student has an opportunity to explore actively and understand more fully his own approach to learning and decision-making processes.[119]

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[117] Schroeder, "Study of Relationship Between Student and Teacher Cognitive Styles," Abstract.

[118] Ginger Allsopp; Owen Lee, Jr.; and William Taylor, "A Practical Implementation of the Educational Sciences at Polk Community College, Florida," The Educational Scientist 1 (Spring 1976): 3.

[119] Ibid., p. 4.

Support for the use of empirical mapping based upon observation of behavior as a legitimate and necessary tool toward the better understanding of man is found in the following passage by Stone and Church.

> While the canons of scientific method stress measurement, the fundamental technique of the developmental psychologist is observation, watching children in action to see what they do and how they go about it in homes, supermarkets, playgrounds, nursery schools, and other settings. It is through observation, often combined with some variant of Piaget's "clinical" method, by which one discusses with a child his thoughts and activities, that one comes to a first intuitive comprehension of what children are like. An astute observer can learn a great deal simply by watching and listening to and talking with children. . . . Observations can be made in free situations or in carefully arranged ones, and can be oriented toward recording behavior in general or only some selected aspect of behavior. We can observe with a view to learning about children in general (the nomothetic approach) or to capturing the idiosyncratic uniqueness of a particular child (the idiographic approach) (Allport, 1942).[120]

Weber writes:

> . . . knowledge of the child's development (is) gained from study, much of a kind of "watching," a systematic observation of a child acting spontaneously in a natural situation. The attempt is to understand the meaning of each piece of a child's development in a total context.[121]

Also in support of observation of empirical research, Issacs concludes:

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[120] L. Joseph Stone and Joseph Church, Childhood and Adolescence, 3rd ed. (New York: Random House, 1975), pp. 171-72.

[121] Lillian Weber, The English Infant School and Informal Education (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1971).

> Without such a background of the total response of children to whole situations, partial studies of this or that response to limited experimental problems may be no more than sterile and misleading artifacts.[122]

Experimental Design. Use of adequate experimental and control groups appear in the review of cognitive style mapping, and implementation projects. Lange (1972)[123] compared successful and unsuccessful nursing students. On the basis of the cognitive style maps and interviews (empirical mapping) students were assigned to specific groups: two matched experimental and two non-matched control groups. The study design (with reference to Campbell and Stanley) was a modified post evaluation only control group design. No changes in group assignments were permitted.

Through the use of an experimental and control group design (N=34 and N=33 respectively), Warner (1970)[124] focused his study on the use of Educational Cognitive Style as a tool to identify individual differences in students and prescribe educational exercises

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[122]Susan Issacs, Social Development in Young Children (London: Routledge and Kegan Paul, Ltd., 1937), p. 4.

[123]Lange, "Study of Effects on Learning of Matching Cognitive Style of Students and Instructors in Nursing Education."

[124]James LeRoy Warner, "An Analysis of the Cognitive Style of Students of Community College Freshmen" (Ph.D. dissertation, Wayne State University, 1970).

geared toward student success in a Life Science course at Oakland Community College. The experimental group was given a self-instruction multimedia approach and the control group of students was taught via the lecture/discussion method. Students did not change groups once groups had been formed. Success in both groups at the end of the course of study was determined on the basis of comparison of individual gain scores--pre- and post-test scores of a standardized test and compared by means of their Educational Cognitive Styles. Warner also used the Oakland Community College Test Battery to determine the Educational Cognitive Styles of the students.

In comparing the two approaches used in his study, the multimedia and lecture/discussion methods, Warner found that certain elements of Educational Cognitive Style appear to be amenable to instruction utilizing each in meeting the objectives of the Life Science course.

Terrell (1974)[125] conducted an exploratory study to determine whether anxiety would be reduced if student's cognitive styles were matched to the instructional mode. Fifty-one Oakland Community College freshmen enrolled in an audio-tutorial Life Science course were given the Oakland Community College Test Battery in addition to the

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[125]William R. Terrell, "An Exploratory Study of the Modification of Student Anxiety Levels Utilizing Cognitive Style Matching" (Ph.D. dissertation, Michigan State University, 1974).

State-Trait Anxiety Inventory. Educational Cognitive Style maps for each student were compared to the cognitive style map for the audio-tutorial instructional mode to identify those matched to the instructional mode and those non-matched. The matched group consisted of high and low anxiety students as did the non-matched group.

Terrell's study supports the position that Cognitive Style matching motivates the individual to perform. Matching to the instructional mode is related to differences in anxiety levels and achievement levels.

Retzke[126] employed an experimental/control group design. The experimental group attended classes where Educational Cognitive Styles were utilized. The Junior Index of Motivation Scale was administered as a pretest and posttest to both groups and the Cognitive Style Assessment (Junior High Level) was used to determine Educational Cognitive Style. No changes in groups were made once the study began.

Concern that the majority of research has been conducted at the college level is a point which appears to be valid. The majority of studies reviewed were conducted at the college level. However, exploratory studies have been conducted at the K-12 levels as reported by DeNike

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[126]Retzke, "Effect of Experimental Treatment Using Cognitive Style on Motivation of Students in Junior High."

(1973),[127] Baecher (1973),[128] Basco (1974),[129] Rundio (1973),[130] Beleutz (1975),[131] and Schroeder (1970).[132]

What would appear to be strong evidence for the generality of the Educational Sciences is found in the review of literature which indicates application in a wide variety of subject areas: Life Science, Terrell (1974)[133] and Warner (1970);[134] College Orientation

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[127]Lee DeNike, "An Exploratory Study of Cognitive Style as a Predictor of Learning from Simulation Games" (Ph.D. dissertation, Kent State University, 1973).

[128]Baecher, "Exploratory Study of Educational Development of Mexican American and Puerto Rican American Students in Michigan."

[129]Claire Yolande Basco, "An Exploratory Study Employing the Educational Science of Cognitive Style for Students with Impaired Decoding Skills" (Ph.D. dissertation, Wayne State University, 1974).

[130]Paul Arnold Rundio, "An Exploratory Study of Educational Cognitive Style as a means of obtaining clues for Personalizing the Instruction of Ninth Grade Students in Biology" (Ed.D. dissertation, Wayne State University, 1973).

[131]John Beleutz, "Cognitive Style as an Indicator of Possible Success in Mastering Computer Programming" (Ed.D. dissertation, Wayne State Universtiy, 1975).

[132]Schroeder, "Study of Relationship Between Student and Teacher Cognitive Styles."

[133]Terrell, "Study of Modification of Student Anxiety Levels Utilizing Cognitive Style Matching."

[134]Warner, "Analysis of Cognitive Style of Students of Community College Freshmen."

Blosser (1971);[135] Technical Students, Fragale (1969);[136] Middle and High School French, Ort (1971);[137] Junior High School Biology, Rundio (1973);[138] and Math by Shuert (1970)[139] and Spitler (1970).[140]

Recently Nunney discussed an analysis of the studies and projects. He presented the following assumptions concerning the feasibility of increasing personalization of instruction utilizing Educational Cognitive Style mapping.

1. Educational cognitive style maps can be generated for all students.

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[135]Charles Russell Blosser, "A Pilot Study to Explore the Relationships Between Cognitive Style, Need Achievement and Academic Achievement Motivation" (Ph.D. dissertation, Wayne State University, 1971).

[136]Marvin Joseph Fragale, "A Pilot Study of Cognitive Styles of Selected Faculty Members and Students in a Community College Setting" (Ed.D. dissertation, Wayne State University, 1969).

[137]Barbara S. Ort, "An Examination of Relationships Between the Measurable Cognitive Characteristics of a French I Teacher and the Student's Success in that Course" (Ph.D. dissertation, Michigan State University, 1971).

[138]Rundio, "Study of Educational Cognitive Style for Personalizing Instruction of Ninth Grade Students in Biology."

[139]Keith I. Shuert, "A Study to Determine Whether a Selected Type of Cognitive Style Predisposes One to Do Well in Mathematics" (Ed.D. dissertation, Wayne State University, 1970).

[140]Gail Jean Spitler, "An Investigation of Various Cognitive Styles and the Implications for Mathematics Education" (Ed.D. dissertation, Wayne State University, 1970).

2. Different mapping techniques will have to be used for different students, largely dependent on their level of educational development and the context in which the mapping is effected.

3. Analysis of the Educational Cognitive Style maps must precede the design of the educational process to be followed.

4. A heterogeneous group of 30 students will need at least 5 or 6 alternative prescriptions.

5. A one prescription system will rarely be successful for all students involved.

6. Teacher-aides, peer-tutors, and volunteers can be matched with a student's Educational Cognitive Style.

7. The teacher's role varies from diagnostician to prescriptionist to educational process designer.

8. Case studies on individual students must be developed in order to assess the efficiency of the prescription and the potential need for change.

9. Augmentation of elements at any age level is possible but the amount of time needed depends upon the level of educational development, the element being augmented, the degree of motivation, age of the student, and the establishment of realistic performance goals.[141]

Educational Sciences Conferences and Workshops

During the past several years numerous inservice workshops and conferences related to the implementation of the Educational Sciences have been conducted. Initially Hill and Nunney conducted graduate level courses for Oakland Community College faculty members. Subsequently,

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[141]Nunney, Educational Cognitive Style: Basis for Personalizing Instruction, p. 16.

a three day workshop was designed and held at Columbiere College.[142] From this initial venture a series of workshops were designed. The goals included the following:

1. To explore the components of the ongoing Personalized Educational Programs of Oakland Community College and the possible transportation of these approaches to instructional-training systems of other institutions;

2. To introduce a general framework which will enable the constituents to communicate with understanding and clarity about the following topics:

Administrative Styles	Modalities of Inference
Individual Differences	Youth-Tutor-Youth
Cognitive Style Mapping	Symbols and their Meanings
Educational Prescriptions	Cultural Determinants
Systemic Analysis	Counseling Style
Teaching Styles	Diagnostic Testing

3. To acquaint the conferee with the concept of "matching" the teacher-student cognitive styles; the counselor-student cognitive styles; and the administrator-teacher cognitive styles;

4. To explore the existing means of implementing counseling and pre-entrance diagnostic testing for neophyte collegians, and,

5. To enable the participant to gain an understanding of "cognitive style" using his own "mapped style.[143]

Concurrent with these dissemination activities, interest was generated by various teacher groups in the State of Michigan. Hill and Nunney gave numerous presentations

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[142]Interview with Dr. Joseph E. Hill, President of Oakland Community College, Bloomfield Hills, Michigan, 19 April 1976.

[143]"Educational Sciences Conferences," Oakland Community College, The Institute for Educational Sciences, 1973.

including one in 1971, in Lansing, Michigan, where East Lansing teachers and administrators became aware of the Educational Sciences and their possible implementation in a school system.

The first effort to implement the Educational Sciences Conference Design in the public schools was undertaken in 1972 in East Lansing.[144] The following outline incorporates the East Lansing Workshop in 1973 based on the overall Oakland Community College conference design.

1. Overview of conference and introduction to the Educational Sciences
2. Mapping of Educational Cognitive Styles
3. Interpretation of Educational Cognitive Style maps
4. Discussion and lectures on the first three sets related to Educational Cognitive Style
5. Theoretical foundations
6. Mapping modes of understanding
7. Oakland Community College film
8. Socio-drama
9. Discussion of the conceptual framework and remaining four sciences
10. Intensive skill building related to style elements.
11. Mapping students (empirical) by project staff

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[144]Virginia B. Svagr, Workshop on the Educational Sciences in East Lansing, Michigan, August 1972.

12. Mapping students (empirical) by workshop participants.

13. Mapping materials used in the classroom.[145]

Summary

The review of the literature indicates that inservice education for teachers has been important in the United States for the past 130 years. Although many problems and weaknesses have existed in the past, teachers continue to express a strong need for retraining and upgrading their knowledge and skills. In many instances in the past, changes occurred slowly and the inservice education programs have managed to be minimally successful. In the instance where programs have not succeeded, possible causes have been due to lack of teacher supported goals, teacher motivation based on salary or degrees, or lack of relevance. Training programs in the professions, business, and industry have tended to lead the way over the past several decades. The need for intensive and constant updating has been seen in the training programs related to business and industry. Such efforts based on the profit-motive become important to educators who themselves are now faced with the critical concept of accountability. Further trends call for extensive teacher

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[145]Barbara A. Bowman, Workshops on the Educational Sciences, in East Lansing, Michigan, and replication sites 1973, 1974, 1975, 1976.

and administrator joint participation in the analysis of the educational profession and the subsequent design of programs geared to the emerging arts and sciences of education.

In the section on the Educational Sciences, the review has been conducted in relation to the following areas of concern: the basic rationale and historical support for the development of the conceptual framework forming the seven Educational Sciences; the consideration of the academic basis for the concept of Educational Cognitive "style" and the potential use of "cognitive style maps;" the assumptions and questions raised following the implementation of the Educational Sciences; the basic design of the studies in regard to sample size, reliability, validity, empirical and mathematical mapping; the experimental designs used; and the level and scope of reported studies. A brief outline of the development of conferences and workshops used to disseminate information and train educators in the utilization of the Educational Sciences has been presented.

It can be concluded that the Educational Sciences were developed after extensive review of the literature by Hill and his associates. The synthesis has continued over a twenty year period with modifications based upon further analysis of scholarly research. Numerous dissertations have been conducted with attention directed toward

acceptable standards of inquiry. The studies have been conducted in a wide variety of subject areas in elementary, secondary, and college settings.

The review of literature tends to indicate that the Educational Sciences and in particular Educational Cognitive Style mapping would form the basis for a sound inservice program for elementary and secondary teachers.

From this review of literature, covering both teacher inservice programs and the Educational Sciences, there emerges a possibility that some of the basic needs of teachers can be met through coordinated action which will bring to the attention of teachers a potential vehicle for educational problem solving. Assistance is needed with problems related to accountability, education for the disadvantaged, new curricula, and the use of modern technology to name a few. A major concern appears to exist in terms of planning the programs and supplying appropriate incentives for change.

CHAPTER III

DESIGN OF THE STUDY

Introduction

The background of the study and the review of related literature were presented in Chapters I and II. This chapter deals with: the source of data, a description of the setting, sample selection, how the data were collected including the instruments used, and the procedures followed.

This study is to describe and analyze the trends over a four year period of a teacher inservice education program. Essentially the study is descriptive and exploratory in nature designed to generate new questions --perhaps hypotheses related to other aspects of inservice education, and to answer general questions related to the implementation of the Educational Sciences.

Source of Data

East Lansing School District

Implementation of the Educational Sciences through a systematic program of teacher inservice education activities designed to increase teacher's diagnostic and prescriptive skills began in the East Lansing School

District in 1972. The district is located in the south central part of the State of Michigan. It consists of nine elementary schools, two middle schools, and one high school containing approximately five thousand students. One Catholic parochial school offering grades one through eight, with about four hundred students is also located within the city limits. This school has also participated in the inservice program since its inception.

The City of East Lansing, a suburb of Lansing--Michigan's capital, is considered a college community since Michigan State University is also located within the city boundaries. For the most part, the population is largely middle class. However, a significant minority of lower class families are located at the north end of the district.[1] East Lansing can be termed a "bedroom" type community with some office and retail establishments, but having no industry.

According to Dr. Kenneth Harper, Director of Personnel, 1969 to 1975, for the East Lansing School District, "The Educational level of most parents in East Lansing is expectedly high. . . . They are upwardly mobile, with expectations that their children will achieve well above the national and state norms."[2]

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[1]Interview with Kenneth Harper, Director of Personnel, East Lansing Schools, 12 March 1975.

[2]Ibid.

There is relatively strong community support for schools. Of the 65 millage votes that have been proposed by the Board of Education, only one has been defeated. East Lansing has the highest voted operating millage in its tri-county area.

The district also has one of the highest professional to student ratios in the state--ranking third or fourth with 63 professionals per 1,000 students.

The following is a table describing the school system as it existed in 1974. The 1974 district figures were selected for inclusion in this study as they are representative of the district during the mid-point of this teacher inservice program. (It should be noted that current figures vary only slightly.)

TABLE 3.1.--East Lansing School District Populations.[a]

	Students	Teachers	Counselors	Administrators	Curriculum Consultants
Elementary	2263	92.5	0	9	18.7
St. Thomas	405	20	0	1	0
Middle	1124	69.66	3	4	7
High	1550	81.9	6	4	3

[a]Interview with Kenneth Harper, Director of Personnel, East Lansing Schools, 12 March 1975.

Funding Levels

TIP is a Federally financed project supported by the Michigan Department of Education with grants from Title III, ESEA. The funding levels were as follows:

1972:	$35,000
1973:	42.400
1974:	47,200
1975:	83,000
1976:	78,000

The increases in funding were for additional inservice workshops, staff, and materials. The 1975-76 funding was increased to incorporate training for the replication districts. Each district received up to $5,000 for inservice training.

Samples Employed in the Study

The present study was designed to analyze the trends over a four year period related to the implementation of the Educational Sciences, and Educational Cognitive Style mapping through a program of Teacher inservice education.

During 1972 to 1973, participation involved Kindergarten through second grade teachers in four East Lansing elementary schools. Selection of the original four schools was made on the basis of the following differences. The

> . . . schools were originally chosen because of the economic, racial, and educational diversity which exists in the service areas of the (four) schools.
>
> One of the schools is a Title I school, (ESEA, 1964) the second services an affluent area, and the third serves children of the university (Michigan State University) housing in the community. . . . It should be noted that in the school which serves the "university" segment of the district there are many children for whom English is a second language. The fourth school is parochial and serves . . . (children in grades one through eight).[3]

After the initial year, participation in the teacher inservice program expanded to other schools in the district on a voluntary basis, as well as to other grade levels.

TABLE 3.2.--Grade Level Participation.

1972-73	Kindergarten to Grade 2
1973-74	Kindergarten to Grade 3
1974-75	Kindergarten to Grade 12
1975-76	Kindergarten to Grade 12

SOURCE: Files in the Project Office.

The school district operates with an administrative structure composed of the following: Superintendent; Director of Instruction; Director of Personnel; and Principals with a core of resource people supplying various services to the teachers and principals.

[3]East Lansing Schools, "Title III Proposal to the Michigan Department of Education," 1972, pp. 5-6.

The following table relates to participation in the inservice program. It reports the voluntary participation by East Lansing teachers, administrators, and curriculum consultants over the four year period from 1972 to 1976, as well as the other districts.

TABLE 3.3.--Inservice Education Participants.

	Teachers	Administrators	Curriculum Consultants
1972-73	22	4	7
1973-74	42	7	26
1974-75	63	9	36
1975-76	75	9	14
Other Districts 1976-77	58	15	4

Data Collection

Collection of data for this study was intended to provide the basis for evaluation and further implementation of the Educational Sciences through a program of teacher inservice education for the East Lansing School District. Data on teacher and administrator knowledge of the Educational Sciences, teacher attitudes, and administrator attitudes toward the use of the Educational Sciences were collected. Descriptions of the instruments, and procedures related to data collection appear below.

Instrumentation

The instruments used in the study were: (1) Educational Sciences Achievement Test which was completed by

teacher and administrator participants after the workshop training; (2) Teacher Attitude Survey responded to by teachers at the close of the school year; and (3) Administrator Attidude Survey, also responded to upon the completion of the School year.

Educational Sciences Achievement Test

This achievement test (see Appendix C) was designed to test the knowledge level of teachers once the workshop activities had been completed. It was also administered as a pretest to a selected sample of teachers to verify the anticipated lack of information concerning the Educational Sciences prior to participation in the workshop.

The test consists of 50 questions based upon knowledge and information concerning the Educational Sciences conceptual framework with particular emphasis on the elements of Educational Cognitive Style. This instrument was locally constructed to determine whether teachers, kindergarten through grade 12 learned the technical material presented in the workshop pertaining to the Educational Sciences. A "panel of experts" composed of ten people knowledgeable in the Educational Sciences (see Appendix D) were given the questions for validation purposes related to construction of this instrument.

Teacher Attitude Survey and Administrator Attitude Survey

The Teacher Attitude Survey and the Administrator Attitude Survey (see Appendix E and F) were also locally constructed in an effort to determine the degree of satisfaction of the teachers and administrators as a result of their participation in the inservice program and implementation in the classrooms and schools during the following school year.

In the preparation of the attitude surveys, attention was given to information on the preparation of opinionnaires or attitude scales as discussed by Best. He writes:

> The information form that attempts to obtain the measured attitude or belief of an individual is known as an opinionnaire or attitude scale. . . .
>
> How an individual feels, or what he believes, is his attitude. . . . The researcher must depend upon what the individual says as to his beliefs and feelings. This is an area of opinion. Through the use of questions, or by getting an individual's reaction to statements, a sample of his opinion is obtained. From this statement of opinion may be inferred or estimated his attitude--what he really believes.[4]

Ahmann and Glock write:

> The concept of attitude refers to the way individuals act and think toward and about people, objects and situations they encounter, as a result of their previous experiences. . . . Evaluation of

[4]John W. Best, Research in Education (Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1959), p. 155.

> attitude formation and change becomes just as important, therefore, as achievement in the basic skills.[5]

Validity tests "the degree to which a test measures what it purports to measure,"[6] and is according to Ahmann and Glock,

> . . . the most critical quality an instrument can have. Thus the author is obliged to examine with care the aims of his instrument and, for each aim, present evidence that the instrument can validly perform that function. The burden of proof is in the hands of the author.[7]

The Educational Sciences Achievement Test can be classified as an "informal achievement test"[8] based on content validity. Issac and Michael write: "Content validity is demonstrated by showing how well the content of the test samples the class situation or subject matter about which conclusions are to be drawn."[9] This test was

> . . . developed on the basis of educational objectives that have verbal or mathematical aspects that are designed to measure the degree to which the (teachers) have achieved those objectives.

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[5]J. Stanley Ahmann and Marvin D. Glock, Evaluating Pupil Growth (Boston: Allyn & Bacon, Inc., 1961), p. 463.

[6]Borg and Gall, Educational Research, p. 135.

[7]Ahmann and Glock, Evaluating Pupil Growth, p. 88.

[8]Ibid., p. 84.

[9]Stephen Issac and William B. Michael, Handbook in Research and Evaluation (San Diego: Robert R. Knapp, Publisher, 1974), p. 84.

> Therefore, to construct a test with content validity, the teacher must begin with the same educational objectives that guided his classroom instruction.[10]

The "panel of experts" previously cited served in the role of judges to validate the content of the test. A series of conferences and meetings were held in which each item was discussed, generated, and approved. Further evidence of the content validity of the achievement test was gathered following the inservice training program when the teachers demonstrated their abilities both to analyze student's Educational Cognitive Style and generate Cognitive Style maps (140 teachers have generated 3,000 maps as of 1975).[11]

Reliability coefficients for the Educational Sciences Achievement Test were generated using the Kuder-Richardson Formula 21.

$$\alpha = \frac{n}{n-1} \left[\bar{X} \frac{(n-\bar{X}}{S^2} \right]$$

where:

n = number of subjects

$\bar{X}$ = mean score on the test

S^2 = variance on the test.

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[10]Ahmann and Glock, Evaluating Pupil Growth, p. 88.

[11]Derek N. Nunney, "Teacher Improvement Project, Evaluation Report 1975," p. 5. (Mimeographed.)

The following table gives the reliability coefficients by year for the achievement test which were generated using the KR-21 formula.

TABLE 3.4.--Reliability Coefficients Educational Sciences Achievement Test.

1973	1974	1975	1976
N=33	N=65	N=32	N=60
.727	.853	.703	.823

Reliability tests for the attitude surveys were run using the Cronbach Alpha Formula.

$$\alpha = \frac{n}{n-1} \left[1 - \frac{\Sigma S_i^2}{S_x^2} \right]$$

where:

n = number of items

S_i^2 = variance of a single item

S_x^2 = variance of the total test

Σ = all item variances are added together.

The following two tables give the reliability coefficients by year for the attitude surveys which were generated using the Cronbach Alpha Formula.

TABLE 3.5.--Reliability Coefficients.

Teacher Attitude Survey			
1973	1974	1975	1976
N=29	N=40	N-21	N=25
.905	.929	.924	.846

TABLE 3.6.--Reliability Coefficients.

Administrative Attitude Survey			
1973	1974	1975	1976
N=7	N=8	N=3	N=6
.979	.897	.921	.908

Procedures

Listed below are the procedures followed in the process of data collection over a four year period from 1972 to 1976.

1. During the summer of 1972, 29 East Lansing teachers, administrators, and curriculum consultants attended the first workshop in the district on the theory and application of the Educational Sciences with particular emphasis on the science of Educational Cognitive Style and the mapping process.

2. Three months following the workshop an Educational Sciences achievement test was developed and administered to the workshop participants.

3. During the school year, 1972-73, teachers and administrators attended three half day additional inservice sessions geared toward implementation and review of Educational Cognitive Style mapping. Additional follow-up sessions with teachers and administrators included daily visits to classrooms, lunchtime discussions, staff meetings, and informal discussions after school were used for continuous dialogue on the Educational Sciences for implementation.

4. A selected group of teacher and administrator participants and curriculum consultants produced the teacher and administrator surveys which were administered to teachers and school district principals in May, 1973.

5. Scoring of the Educational Sciences Achievement Test and tabulation of the data on both surveys was made during May, 1973, to determine workshop participant knowledge of the Educational Sciences and perceived effectiveness in implementation.

At this time and also during the subsequent years of data collection, teachers and administrators were required to return the instruments with their responses to the evaluator. However, it should be noted that in some instances both teachers and administrators did not return

the instruments due to the following reasons: (1) they felt they could not respond to enough items since their perceived implementation of the Educational Sciences was minimal; (2) they forgot; (3) some surveys were returned months after the deadline, consequently, they were not necessarily added to the file; (4) some teachers and administrators refused to fill out the surveys. Therefore, this situation might bias the data. It should also be noted that a few teachers did leave the district or withdrew from the program before the end of the school year. Reasons for withdrawal were solicited and recorded. See Appendix G.

6. With some significant modifications, the above procedures were generally followed during the next three years of implementation--1973-74, 1974-75, and 1975-76.

7. Periodic meetings were held during the summer and fall of 1973 with teachers and curriculum consultants. Discussions at these meetings resulted in changes of the workshop format. A comparison of the two formats appears in Appendix H.

8. Periodic meetings were held during the summer and fall of 1973. Further feedback concerning the effectiveness of the workshops resulted in the modification of the three evaluation instruments used. Information was derived by both administrators and teachers.

The format which was generated in 1973-74 was maintained throughout the following three years of data collection.

In the meetings during 1972-73 items on all instruments were submitted to a "panel of experts" for their review and recommendations. They were asked to determine whether or not the items were appropriate in terms of the appropriateness of questions related to both content and attitudes.

9. All three instruments were administered to teachers and principals involved in similar workshops in Flushing, Woodhaven, Taylor, and Pontiac, Michigan, during the period from February to June, 1976. These districts have begun replication of this teacher inservice project.

10. In the 1973, 74, and 75 workshops, the Educational Sciences Achievement Test was administered during the last hour of the four day workshop.

11. Data was gathered using the following procedures:

a. Educational Sciences Achievement Test

b. Attitude data

Summary

This chapter on the Design of the Study focused on the source of data, samples employed, data collection, instruments, and procedures followed. The analysis of the

data and findings related to the present study effort form the basis for the next chapter.

CHAPTER IV

ANALYSIS OF DATA AND FINDINGS

Introduction

The first three chapters dealing with the background of the study--its purpose and significance, the review of related literature, and study design incorporating source of data, samples employed, procedures of data collection have served to provide the basis for analysis and reporting of the findings.

It is the purpose of this chapter to describe the analytical and statistical techniques which were employed in order to answer the five questions presented in Chapter I. Discussion of the techniques and examples pertaining thereto will be given along with the findings of the present study.

The data for this study, related to achievement and attitudes of teachers and administrators toward the use of the Educational Sciences in a school system was analyzed on a yearly basis from 1972 to 1976. The purpose was to discover and report trends in the teacher inservice education program over a four year period. In addition, the data was viewed in terms of its value to other school districts which have begun replication of

the workshop and inservice education model during the first six months of 1976.

Analytical Techniques

The analytical and descriptive techniques used in this study were of three types: statistical, including mean scores, percentages, and gain scores; content analysis; and trend analysis. The following two sections will describe the statistical and analytical procedures used in this study.

Statistical Techniques

Descriptive or summary statistics were employed as techniques to analyze the data collected from the samples. Descriptive statistics were used to organize and systematize large numbers of observations into more convenient and understandable forms. An example of the data in this form is: The average gain score between the pre- and posttest on the Educational Sciences Achievement Test for a sample of 20 teachers was 42.75 points. A further analytical technique used to expand on the information derived from statical techniques is content and trend analysis which is considered below.

Content Analysis and Trend Analysis

Analysis of data in this study employing the technique of content analysis provided additional

information yielded by responses to certain questions in the instruments previously described. Hill and Kerber describe this process in the following manner:

> Content analysis research deals with the systematic examination of current information--be it written, spoken, mechanical, or portrayed in art form--to provide data that might be categorically classified and evaluated, and thus provide a description and interpretation of a situation or condition not otherwise describable.[1]

Based on this definition, content analysis is of value to researchers in the situations indicated below:

1. describing specific conditions that exist
2. indicating possible trends or patterns extant in the information being analyzed
3. determining differences between stated objectives and the practices that prevail
4. identifying attitudes, interests, and orientations of people.[2]

Related to the foregoing, of particular importance to this study are points two and four. Data yielded by the instruments indicating possible trends are reported. The data gathered over the four year period have been analyzed to determine whether or not changes occurred. For example, the following question from the Teacher Attitude

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[1]Joseph E. Hill and August Kerber. Models, Methods, and Analytical Procedures in Education Research (Detroit: Wayne State University Press, 1967), p. 109.

[2]James R. Gural, "A Cognitive Style Approach to the Reconceptualization of a Curriculum for Vocational Guidance and Counseling" (Ph.D. dissertation, Wayne State University, Detroit, Michigan, 1972).

Survey related to implementation of the inservice program in replication school districts illustrates a trend.

Question: As an experienced TIP teacher, do you believe the Educational Sciences would be valuable in other school districts?

Responses:

	1973	1974	1975	1976
Number of Responses	N=29[a]	N=40	N=21	N=25
Mean Score	8.689[b]	8.384	8.33	8.92

[a]Number of persons responding.

[b]Mean score on a 10 point scale where 1 is low and 10 is high.

On the attitude survey over the four year period teachers rated the replication of the project in other districts as the first in their priority when compared with other attitudes.

Rationale for Analysis of Achievement Test Data

The scores on the Educational Sciences Achievement Test were analyzed on the basis of the specified performance goal which was that 90 percent of the students should score at a level of 90 percent success. This performance goal relates to the positions taken by Bloom, Ofiesh, Nunney, and Bruner and reported by Nunney:

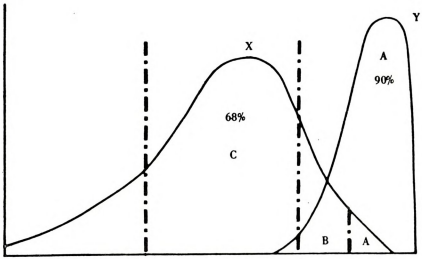
> Adoption of the position that a 90 percent level of achievement should be the goal of education has its roots in the early pronouncements of Watson and later of Bruner, Ofiesh, Nunney and

Bloom. In his experimental work, which was related to child observation and behaviorism, Watson indicated (Garrett, 1961, pp. 127-147) his belief in educational development through training programs which were appropriate at certain stages of development.

Pursuing this position, and following the Woods Hole Conference during which 35 scientists, scholars and educators reviewed the purpose and process of education, Bruner (1961) concluded, "We begin with the hypothesis that any subject can be taught effectively in some intellectually honest form to any child at any stage of development," and in an important added dimension stated, "No evidence exists to contradict it; considerable evidence is being amassed that supports it" (p. 33). The search for such an intellectually honest method has characterized much of the educational innovation during this century.

Following Skinner's (1958, pp. 969-977) work in the introduction of programmed instruction, Ofiesh (1959, p. 180) established a 90 x 90 criterion for acceptance of programmed instructional materials in the U. S. Air Force training programs. This was adopted (Nunney, 1963) and used as a basis for projecting the Normal Curve of Achievement.

> "There is no doubt that far more people than the top 2-3 percent can acquire the knowledge deemed necessary to earn 'A' grades. In fact, one criterion for acceptance of a program for use in the school and college situation is that 90 percent of the students must learn 90 percent of the material. Such a program requirement is, in fact, a reality and the problem this brings to the area of grading can be understood by reference to the following diagram.
>
> The curve X approximates the normal curve of distribution which many have assumed applicable in the area of achievement. It is seen that 68 percent, or thereabouts, of the groups would score 'C.' However, in the curve Y, where 90 percent of the students learn 90 percent of the material, they most probably will be located in the 'A' grade range" (pp. 3-10).



More recently, Bloom (1968) has discussed mastery learning and has stated the goal as follows:

> Most students (perhaps over 90 percent) can master what we have to teach them, and it is the task of instruction to find the means which will enable our students to master the subject under consideration. Our basic task is to determine what we mean by mastery of the subject and to search for the methods and materials which will enable the largest proportion of our students to attain such mastery."[3]

Analysis of the trends was conducted in order to determine if there were any changes. If it was determined that a 90 percent level of achievement was made, then the performance goal was achieved.

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[3]Nunney, "Educational Cognitive Style: A Basis for Personalizing Instruction," pp. 3-5.

Findings

The findings reported in this section of the study were based on the data compiled from the instruments described in Chapter III and the analytical procedures described previously in this chapter. The questions presented in Chapter I are related to the findings.

Teachers who volunteered to participate in this program received financial reembursement when workshops were held during summers or on weekends. The hourly rate of pay per teacher during the first year was $5 per hour for a maximum total of 48 hours or $240. After the initial year, the workshop was modified and the number of days was reduced to four and the hours to 24. The rate per teacher was increased to $7.50. With these changes a teacher earned $180 per workshop.

When workshops were held during the school year, they were scheduled during the regular school day. Inservice monies were then paid to the teacher's substitute at the substitute rate and teachers were given the released time. There appeared to be no difference in attendance when comparing a paid or released time approach.

Participation in the project was voluntary and teachers were given additional released time during the

school day for attendance at inservice sessions related to mapping students, writing prescriptions, and completing the evaluation instruments. Generally speaking, best attendance occurred at sessions when the teachers were given released time. Attendance at lunch hour sessions was the second preference and minimal attendance occurred in the after school sessions.

Continued participation in the program following completion of the initial inservice workshop was not required of teachers.

The number of Educational Cognitive Style maps generated by teachers is shown in Table 4.1.

TABLE 4.1.--Number of Educational Cognitive Style Maps Generated on a Yearly Basis.[a]

1972	1973	1974	1975	1976
350	850	1550	2500	175[b]

[a]The number stated includes maps on file together with reports on file with the teachers.

[b]The number of maps produced by the replication teachers in the other districts.

Tables J.1 and J.2 present an analysis of gain scores on the Educational Sciences Achievement Test

between pre- and posttests on the selected samples as described in Chapter III. Table 4.3 presents the gain scores made by a sample of 20 teachers who had little or no information about the Educational Sciences.

The assumption that teachers had at best minimal knowledge was substantiated. The pretest scores ranged from 0-20, and the posttest scores ranged from 42-50, achieving an average gain score for this group of 42.75 points. This data indicates that 85% of the teachers scored 20% or below on the pretest.

The data concerning gain scores (see Appendix J) from pretest-posttesting using the Educational Sciences Achievement Test were gathered in the 1976 programs in the new districts. They are presented first in this chapter as supportive evidence and verification of the assumption that teachers entered the workshop with very minimal knowledge of the Educational Sciences for the most part. It was found that the average gain score on the posttest was 42.75, where 50 was the maximum score possible. Pretest scores ranged from 0 to 20, posttest scores ranged from 42 to 50. The assumption that teachers would not have knowledge of the Educational Sciences, together with the assumption that pretesting under such circumstances would generate a negative attitude, was the reason for omitting the pretest during the first three years of

inservice programs. During later workshops, pretests were administered to a sample of teachers in order to validate the assumptions that the teachers entered the workshop with little or no knowledge of the Educational Sciences and that the material could be mastered by the teachers at a successful level of competency. The positive results have led to the need to reconsider the initial assumption that pretesting would negatively affect the workshop outcomes. This will be presented and discussed later.

Additional observations during test administration are presented here. Two participants refused to take the pretest expressing: "I can't do it, it's like a foreign language." One participant said that in spite of the fact that no grade or ranking was involved, the threat of a test made her nervous. Her pretest score showed 20 percent and the posttest score showed 58 percent. She said afterwards that because it was a test she just couldn't think, but really knew the answers.

Analysis of the pretests indicated that 60 percent of the participants scored at the 10 percent level or lower on the pretest. In terms of correct responses on the pretest, 85 percent of the participants scored at the 20 percent level or lower. Analysis of the posttest scores showed that with this selected sample, posttest

scores were at a level of at least 90 percent for 95 percent of the participants--a score much higher than the average scores of the total number of participants over the three year period. These figures would seem to verify the assumption of minimal or no knowledge of the Educational Sciences prior to the workshop.

During the pretesting it was observed that the degree of frustration and hostility became high as the teachers were asked to respond to questions about which they had little or no information. This supported the assumption that had been projected that pretesting would be counterproductive. However, analysis of the data indicated that where pretesting had been used, posttests tended to be higher when compared with the groups not having pretesting.

This finding raises the question of whether or not all future workshops should begin with a pretest. There exists the possibility that the anxiety generated in the pretesting when coupled with the fact that the teachers became aware of the specific information to be learned, this generated a positive focal factor.

Achievement Data Findings

Table J.2 presents pre- and posttest data on a selected group of teachers who had participated in either a graduate course on the Educational Sciences or some

other conferences in this area prior to the workshop. Pretest data reflected the higher level of information previously attained by this group.

The relearning effect following the second exposure culminated in the situation in which 10 of the 11 teachers scored 100 percent.

In analyzing the differences between the average gain scores of the sample who had little previous experience (42.75), compared to those who had previous knowledge (13.27), a difference of 29.48 points was found.

The following tables (4.2, 4.3, 4.4. and 4.5) present the achievement levels produced by the population of teachers who participated in the workshops on the Educational Sciences Achievement Test. Each table represents one of the major groupings in the Educational Sciences.

Analysis of the scores shows that the teacher responses to the questions related to the theoretical symbols--T(VL); T(AL); T(VQ); and T(AQ) demonstrated a very high level of achievement. In no instances did the scores drop below 96 percent mastery. This was apparent not only in the East Lansing district, but also in the replication districts.

In each of the four years all teachers scored above 90 percent correct on responses to questions related to their knowledge of qualitative symbols. In 8 out of 17 cases on the 2nd and 4th year of the testing,

TABLE 4.2.--Educational Sciences Achievement Test.

Element*	Number of Group with Correct Responses on Theoretical Symbols							
	1973	N=33	1974	N=64	1975	N=32	1976	N=60
	Score	Percent	Score	Percent	Score	Percent	Score	Percent
T(VL)	33	100	64	100	32	100	60	100
T(AL)	33	100	63	98.4	32	100	60	100
T(VQ)	32	96.9	63	98.4	31	96.8	59	98.3
T(AQ)	33	100	64	100	32	100	60	100

*T(VL) = Theoretical Visual Linguistic.
T(AL) = Theoretical Auditory Lingustic.
T(VQ) = Theoretical Visual Quantitative.
T(AQ) = Theoretical Auditory Quantitative.

TABLE 4.3.--Educational Sciences Achievement Posttest.

Element*	Number of Group with Correct Responses on Qualitative Symbols							
	1973	N=33	1974	N=64	1975	N=32	1976	N=60
	Score	Percent	Score	Percent	Score	Percent	Score	Percent
SENSORY								
Q(A)	33	100	64	100	32	100	60	100
Q(O)	33	100	64	100	32	100	60	100
Q(S)	33	100	64	100	32	100	59	98.3
A(T)	33	100	63	98.4	32	100	60	100
Q(V)	33	100	63	98.4	32	100	60	100
PROGRAMMATIC								
Q(P)	31	93.9	62	96.8	29	90.6	59	98.3
Q(PK)	31	93.9	61	95.3	30	93.7	57	95.0
Q(PTM)	31	93.9	59	92.1	32	100	58	96.6
CODES								
Q(CEM)	33	100	64	100	32	100	60	100
Q(CES)	33	100	64	100	32	100	60	100
Q(CET)	33	100	64	100	32	100	59	98.3
Q(CH)	33	100	63	98.4	32	100	59	98.3
Q(CK)	33	100	64	100	32	100	59	98.3
Q(CKH)	32	96.9	61	95.3	30	93.7	59	98.3
Q(CP)	33	100	63	98.4	32	100	60	100
Q(CS)	33	100	64	100	32	100	60	100
Q(CT)	33	100	62	96.8	32	100	57	95.0

*Q(A) = Qualitative Auditory
Q(O) = Qualitative Olfactory
Q(S) = Qualitative Savory
Q(T) = Qualitative Tactile
Q(V) = Qualitative Visual

Q(P) = Qualitative Proprioceptive
Q(PK) = Qualitative Proprioceptive Kinematics
Q(PTM)= Qualitative Proprioceptive Temporal

Q(CEM) = Qualitative Code Empathic
Q(CES) = Qualitative Code Esthetic
Q(CET) = Qualitative Code Ethic
Q(CH) = Qualitative Code Histrionic
Q(CK) = Qualitative Code Kinesics
Q(CKH) = Qualitative Code Kinesthetic
Q(CP) = Qualitative Code Proxemics
Q(CS) = Qualitative Code Synnoetics
Q(CT) = Qualitative Code Transactional

TABLE 4.4.--Educational Sciences Achievement Posttest.

Element	Number of Group with Correct Responses on Cultural Determinants							
	1973	N=33	1974	N=64	1975	N=32	1976	N=60
	Score	Percent	Score	Percent	Score	Percent	Score	Percent
I	33	100	63	98.4	32	100	60	100
A	33	100	64	100	31	96.8	59	98.3
F	32	96.9	63	98.4	32	100	60	100

I = Individuality
A = Associates
F = Family

TABLE 4.5.--Educational Sciences Achievement Posttest.

Element	Number of Group with Correct Responses on Modalities of Inference							
	1973	N=33	1974	N=64	1975	N=32	1976	N=60
	Score	Percent	Score	Percent	Score	Percent	Score	Percent
M	33	100	63	98.4	32	100	59	98.3
D	32	96.9	64	100	32	100	58	96.6
R	31	93.9	62	96.8	32	100	60	100
L	33	100	63	98.4	32	100	60	100
(K)	33	100	63	98.4	32	100	59	98.3

M = Magnitude
D = Difference
R = Relationship
L = Appraisal
(K) = Deductive Reasoning

100 percent was recorded. During the first year 13 of the 17 scored 100, and during the third year of testing 14 out of 17 cases scored 100 percent on the test.

In the area of "Qualitative Proprioceptive" there existed the lowest level of understanding. Furthermore, this appears to be related to the lower lack of understanding of Q(CKH). These two elements relate to programmed or habitual forms of activity or behavior. Q(CKH) refers to behavior followed to form. Problems in these areas support the observation by the instructors in the inservice workshops that some teachers experience difficulties with the two concepts.

The second Educational Science, displayed in Table 4.4 concerning the Cultural Determinants, was mastered at the 96th or 100 percent level in all cases. Teachers apparently find little difficulty in understanding these three concepts and have the ability to differentiate between them.

Findings related to the third Educational Science as presented in Table 4.5 would seem to indicate that workshop participants had minimal difficulty understanding these elements. Only 11 people out of the 189 taking the test during the four years missed any items. Again, mastery did not drop below 96 percent.

Understanding related to the third science was found to be above the 90 percentile in all cases.

Teachers demonstrated the ability to acquire knowledge of these definitions. The 32 teachers in 1975, demonstrated 100 percent mastery level on all items.

Summary of Findings of Achievement Testing Relative to Cognitive Style Elements

Summary of Findings Related to Achievement Testing on Cognitive Style Elements

To summarize the findings related to the Educational Sciences Achievement test, it can be stated that:

1. In all four years a 90 percent level of knowledge was achieved by at least 90 percent of the teachers on the theoretical symbols.

2. In all cases related to the qualitative sensory elements, a better than 90 percent achievement level was accomplished by all teachers. In 17 out of the 20 scores recorded for the qualitative sensory elements, the achievement level of 100 percent was accomplished.

3. Of the 12 scores recorded on the programmatic elements, only one achieved a level of 100 percent. This area is often confused with Q(CKH) and in scoring the test questions, it is found that the answers are reversed.

4. In knowledge of the Cultural Determinants no group scored lower than 96 percent indicating a high degree of understanding related to this area of knowledge.

5. Related to Modalities of Inference the same statement of a high degree of achievement and understanding

can be made since no groups scored lower than 93 percent.

Analysis of the achievement data by yearly groups showed that during all years the achievement level was over 90 percent for each group. Maximum achievement (100% responses correct) was recorded in 44 out of a total of 72 test situations, 95 percent or over were found to be correct in 91.66 percent of responses. Consequently, it can be stated that in 90 percent of the group achievement scores, 90 percent of the groups scored over 90 percent correct.

The trend over the four year period reflects a consistently high level of achievement in all areas of the Educational Sciences. Data supporting this finding are presented in Tables 4.2 to 4.7. In 1976 in the the new districts, the achievement scores were higher.

Questions related to Table 4.6 and the application of the Educational Sciences were analyzed as a group. These areas on which the questions were based included:

1. Techniques for determining Educational Cognitive Style
2. Cross Age Tutoring and Youth Tutor Youth
3. Mapping
4. Prescription Writing
5. Modes of Understanding

TABLE 4.6.--Educational Sciences Achievement Posttest.

Percent Correct on Questions Related to the Application of the Educational Sciences				
	1973 N=33	1974 N=64	1975 N=32	1976 N=60
Question	Percent of Correct Responses	Percent of Correct Responses	Percent of Correct Responses	Percent of Correct Responses
1	100	81.2	81.2	100
6	100	100	100	100
13	100	89	75	100
19	96.9	100	100	100
24	100	95.3	96.8	100
29	100	100	100	100
36	100	100	100	100
38	100	100	96.8	100

6. Augmentation

7. Major, Minor, Negligible Orientations.

Overall the teachers showed a high level of understanding. In 28 out of 32 test situations (87.5 percent), the achievement level was above 90 percent. This level of achievement did not meet the 90/90 criterion. However, on the questions related to Mode of Understanding, in all test situations with the exception of the external groups, there were many incorrect responses. Analysis indicated the possibility of misunderstanding of the question, rather than lack of knowledge concerning the concept.

Test Data Related to Theory
of the Educational Sciences

TABLE 4.7.--Educational Sciences Achievement Posttest.

Percent Correct on Questions Related to the Theory of the Educational Sciences				
	1973 N=33	1974 N=64	1975 N=32	1976 N=60
Question	Percent of Correct Responses	Percent of Correct Responses	Percent of Correct Responses	Percent of Correct Responses
16	96.9	98.4	87.5	100
21	100	96.8	100	95
32	96.9	95.3	87.5	100
34	90.9	100	96.8	100
41	96.9	93.7	100	96.6
42	87.8	98.4	100	90
46	63.6	76.5	96.8	90
48	63.6	68.7	96.8	98.3
50	100	89.0	100	93.3

On the test questions related to the theory of the Educational Sciences (Table 4.7) teachers showed the lowest level of knowledge. In 28 out of 36 test situations (77%) the achievement level was above 90 percent. This fell well below the 90/90 criterion.

Further analysis indicates that the primary area of this low achievement dealt with memory concern and memory function. The trend over the four years shows increasing knowledge related to the two areas. In 1975

and 1976, the four scores were all above the 90th percentile, whereas in 1973 and 1974, all scores were below 77 percent.

This bears out observations during the workshops. In the first two years very little time was spent in discussion on the fourth Educational Science of Educational Memory. As has been noted earlier, the inservice program design placed emphasis on the first three sciences and Educational Cognitive Style. During the past two years more information related to Educational Memory has been incorporated into the theory of the Educational Sciences.

Attitude Surveys

Rationale for Analysis of Attitude Surveys

Analysis of the attitudinal survey scores was conducted in order to determine whether or not the majority of the groups had similar attitudes toward the Educational Sciences. To determine if a collective group attitude existed, it was necessary to establish a cut-off score. Flannigan's technique for establishing critical elements in which 72 percent is the cut-off point for the existence of a ctitical element was utilized.[4] Therefore,

[4]John C. Flannigan, "General Considerations in the Selection of Test Items and a Short Method of Estimating the Product-Moment from the Data at the Tails of the Distribution," Journal of Educational Psychology 30 (December, 1939): 674-80.

on the 10 point scale, 7.0 and above was selected to represent a positive attitude. The average score of 7.0 has been used as the cut-off point for acceptance of an attitude as being collectively held by the group. This cut-off point was also used in analyzing individual scores.

The attitudes of the Teachers and Administrators are presented in six general areas. Questions related to each attitude were grouped and are referred to as "clusters."

Teacher Attitude Survey

Teacher attitudes as determined by responses on the Teacher Attitude Survey are presented in the following tables. The attitudes have been considered in six clusters. The clusters are:

1. Teacher Attitudes Toward the Usefulness of the Educational Sciences.
2. Improvement of Prescriptive Skills and Purchasing of Appropriate Materials.
3. Student Attention and Productivity in the Classroom.
4. Teacher Attitudes Toward the Educational Sciences as Facilitation of Attitudes and Relationships--Student, Teacher, Parent, and Administrator.
5. Parental and Community Involvement.
6. Implementation of the Educational Sciences in Other School Districts.

The tables show the mean scores of the questions grouped into the six clusters. The clusters over the four year period of data collection including the four new replication districts, are ranked in the following order of importance or priority according to Teacher's preferences.

In Table 4.8 the collective mean scores of the four years are presented in rank order. It should be noted that mean scores of each cluster are very close, ranging from 8.58 to 6.817. It is perhaps this ranking that individual teachers see is the most descriptive of their feelings toward the implementation of the Educational Sciences at this time period. The fact that the only year teachers as a group matched this hierarchy of attitudes (see next section) was 1975, does not negate the data.

Table 4.9 presents the data indicating teacher attitudes towards each cluster. A cut-off point of 7.0 has been previously established as the point which will indicate an accepting or nonaccepting attitude.

Further analysis of the data presented in Table 4.9 was conducted in a rank order of the attitudes by clusters. These data are presented in Table 4.10 in rank order by mean score and year.

Analysis of this ranking by teachers on a yearly basis reveals that in all four years the highest ranked

TABLE 4.8.--Rank Order of Mean Scores of Teacher Responses on Attitude Clusters.

Attitude Cluster		Mean
1.	Implementation in Other Districts	8.58
2.	Improvement of Prescriptive Skills and Purchasing of Appropriate Materials	7.80
3.	Teacher Attitudes Toward the Usefulness of the Educational Sciences	7.76
4.	Teacher Attitudes Toward the Educational Sciences as Facilitation of Attitudes and Relationships	7.60
5.	Student Attention and Productivity in the Classroom	7.188
6.	Parental and Community Involvement	6.187

item was the importance of Implementation of the Educational Sciences in Other School Districts. This would seem to underscore the need for such an inservice program for teachers generally. Teachers who had participated in the inservice workshop activities and had learned the theoretical concepts and spent several months in application thereof are recommending this process to other teachers as valuable diagnostic tools to aid in prescribing appropriate educational programs for students.

Conversely, the lowest ranked item in all cases was the Parental and Community Involvement. This is due perhaps to the fact that not all teachers make use of parent volunteers in prescription centers in their teaching program. In some instances parents or community

TABLE 4.9.--Teacher Attitude Survey.

Question	1973 N=29	1974 N=40	1975 N=21	1976 N=25
Cluster 1:	Attitudes Toward the Educational Sciences			
1	8.10	7.85	7.857	8.0
2	7.72	7.525	7.761	7.6
11	7.93	7.625	7.476	7.708
	Total Group Mean: 7.76			
Cluster 2:	Improvement of Prescriptive Skills and Purchasing of Appropriate Materials			
3	8.103	7.75	8.571	7.8
4	7.551	7.15	7.523	7.24
22	8.517	7.85	7.809	7.626
	Total Group Mean: 7.80			
Cluster 3:	Student Attention and Productivity in the Classroom			
5	6.88	6.361	6.588	6.19
6	8.172	7.5	8.4	7.833
7	7.275	6.8	7.15	7.043
8	6.892	6.5	6.55	7.4
9	7.6	7.4	8.15	7.904
10	7.344	6.783	6.736	7.086
	Total Group Mean: 7.188			
Cluster 4:	Teacher Attitudes Toward the Educational Sciences as Facilitation of Attitudes and Relationships			
12	8.392	7.473	7.571	8.64
13	8.071	7.368	6.52	7.84
14	7.55	7.105	6.809	8.16
15	8.22	7.315	7.047	8.48
16	8.785	7.875	7.95	8.64
17	7.33	7.0	7.473	7.36
18	8.071	6.621	7.157	7.0
	Total Group Mean: 7.60			
Cluster 5:	Parental and Community Involvement			
19	7.461	7.394	6.6	7.0
20	6.784	6.725	6.273	7.15
	Total Group Mean: 6.817			
Cluster 6:	Implementation in Other Districts			
21	8.689	8.384	8.33	8.92
	Total Group Mean: 8.58			

TABLE 4.10.--Rank Order of Attitude Cluster by Mean Score and Year--Teacher Attitude Survey.

Attitude Cluster	Rank	1973	Rank	1974	Rank	1975	Rank	1976
Implementation in Other Districts	1	8.69	1	8.38	1	8.33	1	8.92
Attitudes Toward the Educational Sciences as Facilitation of Attitudes and Relationships	2	8.06	4	7.23	5	7.08	2	8.02
Improvement of Prescriptive Skills and Purchasing of Appropriate Materials	3	8.06	3	7.58	2	7.97	4	7.63
Attitudes Toward the Usefulness of the Educational Sciences	4	7.92	2	8.66	3	7.70	3	7.78
Student Attention and Productivity in the Classroom	5	7.36	5	6.89	4	7.26	5	7.24
Parental and Community Involvement	6	7.12	6	6.73	6	6.27	6	7.15

people, on, even a semi-regular basis, are unavailable. This is particularly true in the schools located on the university campus and the inner city and farming land areas. Another reason is the increasing number of working mothers. On a limited basis, some of the teachers are able to call upon senior citizens or "grandparents" to help implement prescriptions with students. This is due to proximity to schools and transportation.

Attitudes of Teachers Toward the Usefulness of the Educational Sciences in terms of increased skills and teacher effectiveness, choice of appropriate materials, facilitation of positive student attitudes toward school and relationships--student, parent, teacher, administrator--held ranks of either 2, 3, or 4 during the four years of data collection with the exception of 1975, when it was recorded that Student Attention and Productivity was of higher order than attitudes and relationships. However, it should be noted that the scores between these two categories differed by only .2 of a point suggesting that both areas are of relatively equal importance to teachers.

Further analysis of the scores reveals that of the 24 scores for the 4 years, only 3 fell below the established level of 7.0 (6.89, 6.73, and 6.27). Two of these scores (6.73 and 6.27) were ranked the lowest in that they dealt with the question of Parental and

Community Involvement already discussed. The remaining scores ranged from 6.89 to 8.92, indicating the high level importance of the various uses teachers make of the Educational Sciences.

The second lowest ranked group of questions in three of the four years related to the value of the Educational Sciences in terms of student attention, productivity, and achievement in class activities. The scores ranged from 6.89 to 7.36. Ranking this set of items at this lower level appears to be in accord with the priorities of the program. First, the focus of the initial inservice sessions is acquainting teachers with the potential uses of the Educational Sciences as well as learning the theory and content. They spend the next several months increasing their knowledge as well as diagnostic and prescriptive skills. In other words, the performance goals at these early stages are changes in teacher behavior and only secondarily on student changes. Secondly, once the teachers have become comfortable with the processes and language, they then focus direct attention on several individual students. Implicit in this is that changes in teacher behavior hold potential for change in student behavior. Since these questions related directly to student outcomes after only a few months of knowledge and practice, it is possible that teachers had not had a sufficient amount of time to apply the knowledge

and tools emanating from the Educational Sciences to a large number of students.

It can be noted that on several surveys, teachers wrote in that they had only applied Educational Cognitive Style mapping and prescriptive techniques to one or a few students. With these they experienced success, but hesitated to rank the item very high because they did not involve many students in their respective classrooms.

Administrator Attitude Survey

Because the number of administrators responding to the attitude survey for any given year is rather small, the analysis of data will be reported on a semi-individual basis. The 21 questions on the survey were grouped according to the following six clusters. They are administrator attitudes toward:

1.	Student Achievement	(SA)
2.	Student Attitudes	(ST)
3.	Teacher Awareness	(TA)
4.	Parental Awareness	(PA)
5.	Administrator Use of the Educational Sciences	(ES)
6.	Implementation in Other Districts and Grade Levels	(OG)

The administrator attitudes listed on each of the following four tables related to these attitude clusters have been ranked according to their mean score

TABLE 4.11.--Administrator Attitudes: 1973 Attitude Clusters.*

Rank Order Administrator	SA*	ST*	TA*	PA*	ES*	OG*		Individual Mean Score on Survey
B-3	9.0	7.86	9.0	8.0	8.75	9.0	=	8.60
B-1	8.66	9.33	8.5	7.0	8.0	10.0	=	8.58
B-2	4.0	7.43	9.5	8.0	9.7	10.0	=	8.10
B-4	7.0	7.29	8.0	8.0	8.0	8.75	=	7.84
B-6	5.0	7.86	7.5	4.0	7.75	9.0	=	6.85
B-5	7.0	6.71	6.5	4.0	3.25	8.0	=	5.91
B-7	0.0	0.0	3.5	2.0	5.5	0.0	=	3.67
Mean Score of Attitude Clusters	6.78	7.75	7.5	5.86	7.27	9.13		

*SA = Student Achievement
ST = Student Attitudes
TA = Teacher Attitudes
PA = Parental Awareness
ES = Administrator Use of the Educational Sciences
OG = Implementation in Other Districts and Grade Levels

TABLE 4.12.--Administrator Attitudes: 1974 Attitude Clusters.*

Rank Order Administrator	SA*	ST*	TA*	PA*	ES*	OG*		Individual Mean Score on Survey
C-1	8.33	8.14	10.0	8.0	8.75	10.0	=	8.87
C-2	8.33	8.0	8.5	7.0	8.5	10.0	=	8.39
C-4	6.66	7.29	8.5	7.0	8.0	9.0	=	7.74
C-5	6.0	7.14	9.0	6.0	8.0	10.0	=	7.69
C-3	9.0	7.86	7.0	6.0	7.0	8.0	=	7.48
C-6	6.66	7.0	7.5	6.0	7.0	8.0	=	7.03
C-7	8.0	6.57	7.0	4.0	3.5	8.75	=	6.30
C-8	5.33	5.142	5.5	5.0	4.75	10.0	=	5.95
Mean Score of Attitude Clusters	7.29	7.14	7.86	6.13	6.94	9.22		

*SA = Student Achievement
ST = Student Attitudes
TA = Teacher Attitudes
Pa = Parental Awareness
ES = Administrator of the Educational Sciences
OG = Implementation in Other Districts and Grade Levels

TABLE 4.13.--Administrator Attitudes: 1975 Attitude Clusters.*

Rank Order Administrator	SA*	ST*	TA*	PA*	ES*	OG*		Individual Mean Score on Survey
D-2	8.0	7.86	8.5	8.0	7.25	7.0	=	7.77
D-3	7.66	7.0	8.0	8.0	6.5	8.0	=	7.53
D-1	5.33	7.43	7.5	3.0	7.25	8.0	=	6.42
Mean Score of Attitude Clusters	7.0	7.43	8.0	6.33	7.0	7.66		

*SA = Student Achievement
ST = Student Attitudes
TA = Teacher Attitudes
PA = Parental Awareness
ES = Administrator Use of the Educational Sciences
OG = Implementation in Other Districts and Grade Levels

TABLE 4.14.--Administrator Attitudes: 1976 Attitude Clusters.*

Rank Order Administrator	SA*	ST*	TA*	PA*	ES*	OG*		Individual Mean Score on Survey
R-1	10.0	9.57	10.0	10.0	10.0	10.0	=	9.93
R-2	10.0	9.33	8.0		8.0	9.0	=	8.87
R-3	9.0	8.43	9.0	8.0	8.66	10.0	=	8.75
R-4	7.66	8.0	9.5	7.0	8.0	10.0	=	8.36
R-6	6.0	7.0	6.5	5.0	6.5	6.5	=	6.25
R-5	4.33	6.43	5.0	2.0	3.5	9.5	=	5.13
Mean Score of Attitude Clusters	7.83	8.13	8.0	6.4	7.44	9.16		

*SA = Student Achievement
ST = Student Attitudes
TA = Teacher Attitudes
PA = Parental Awareness
ES = Administrator Use of the Educational Sciences
OG = Implementation in Other Districts and Grade Levels

on individual surveys. Also included on these tables is the mean score for each cluster of the total group of administrators for that particular year.

Table 4.15 presents the rank ordering in importance of the administrator attitudes. The group means were derived by averaging the scores over the four year period for each attitude cluster. The table contains summary data related to administrator attitudes. The data forms the basis for comparison of attitudes by administrators on a yearly basis.

Analysis of the six attitude clusters on the Administrative Attitude Survey over the four year period of data collection reveals several trends. As a total group, the 24 administrators ranked the six clusters in the order of importance as shown in Table 4.16.

In three of the four years the groups of administrators all matched this ranking with only one deviation per group. In 1973 the order was maintained except for Student Attitudes and Teacher Awareness, where the positions were reversed. The 1975 ranking only differed in terms of positions one and two where Teacher Awareness and Implementation in Other Districts and Grade Levels were reversed. For the 1976 group there was also only one change in rank order--Student Achievement and Administrator Use of the Educational Sciences. It would seem from this ranking that administrators, after several

TABLE 4.15.--Rank Order of Attitude Cluster by Mean Score and Year--Administrator Attitude Survey.

Attitude Cluster	Rank	1973	Rank	1974	Rank	1975	Rank	1976
Implementation in Other Districts and Grade Levels	1	9.13	1	9.22	2	7.66	1	9.16
Student Attitudes	2	7.75	4	7.14	3	7.43	2	8.13
Teacher Awareness	3	7.5	2	7.88	1	8.0	3	8.0
Administrator Use of the Educational Sciences	4	7.27	5	6.94	4	7.25	5	7.44
Student Achievement	5	6.78	3	7.29	5	7.0	4	7.83
Parental Awareness	6	5.86	6	6.13	6	6.33	6	6.4

TABLE 4.16 --Rank Order of Mean Scores of Administrator Responses on Attitude Clusters.

Attitude Cluster	Mean
1. Implementation in Other Districts and Grade Levels	8.79
2. Teacher Awareness	7.84
3. Student Attitudes	7.61
4. Administrator Use of the Educational Sciences	7.23
5. Student Achievement	7.22
6. Parental Awareness	6.18

months exposure to and use of the Educational Sciences, are as a group relatively consistent in their attitudes toward the Educational Sciences in their schools.

In three of the four years Implementation in Other Districts and Grade Levels was ranked as number 1. In 1975, it was ranked as number 2. It can possibly be concluded that generally, principals see a potential value in the utilization of the Educational Sciences and therefore, feel they can recommend it to other administrators.

Conversely, the lowest ranked cluster for all years involved, dealt with Parental Awareness. Since most administrators did not attend the workshops to the fullest extent as their teachers did, they may have felt reluctant to discuss application of the Educational

Sciences with parents. Furthermore, principals usually depend upon their teachers to discuss particular programs with parents. It can be further stated that as with teacher priorities in terms of implementation, dissemination to parents during the early stages and even the first year was not widely discussed with administrators. The dissemination that took place to parents was handled by the project staff, director, consultants, and to a minor degree as required, by administrators. However, in most instances administrators felt more comfortable leaving this function to the project staff.

Apparently, administrators feel that the use of the Educational Sciences by teachers with students has had some impact, since they rated Teacher Awareness of what to do for students and changes in Student Attitudes in the upper half of the ranked listing.

Perhaps related somewhat to the low rating of Parental Awareness in terms of dissemination to parents, is the fourth ranked cluster dealing with Administrator Use of the Educational Sciences. Again, administrator participation in workshops has been primarily to lend support to teachers and gain an understanding of the process, to be of help, but not necessarily to become knowledgeable practitioners. However, it should be stated that there are definite exceptions to this premise. A few principals in the East Lansing district, as well

as ones in the new districts have become as knowledgeable or more so than some of their staff members. In subsequent inservice sessions and school staffings on individual students, the principals sit in the session and actively participate in the diagnosis and prescription process.

However, most administrators depend on their teachers to handle the Educational Sciences information and do not actively use it with parents or as part of their other administrative duties.

As stated with the Teacher Attitude Survey, the primary goals for teachers during the months following the workshops are to continue to increase their knowledge of the Educational Sciences and the process, practice Cognitive Style Mapping on a small scale to become proficient and begin writing prescriptions. This takes time. As a result, a teacher may not begin to see dramatic results in achievement due to the lateness in the year. The administrator is also aware of this situation and consequently, rates student achievement lower than the other clusters at the end of the first year of implementation. Therefore, it is not surprising that Student Achievement was rated fifth.

It should be noted that within the East Lansing school district during the four year period some administrators changed schools. In one instance one

administrator had a very low attitude in 1974 when he was at a school where there was minimal participation. The second year at that school, more teachers continued to volunteer to participate. He became involved and provided positive administrative support. In the second year his overall attitudes changed from 5.95 to an accepting attitude above the 7.0 level, specifically 7.77.

Another principal in 1973 ranked the six attitude clusters at a mean level of 3.67. The following year the mean on the total survey increased to 7.03. This was primarily due to the principal's active participation with several teachers in the implementation in her school. Also, extra effort by the project staff to help teachers at that school with case studies on students probably helped to increase favorable attitudes.

Summary

The analysis of data presented in this chapter will form the basis for the findings of the Conclusions, Implications, and Recommendations to be presented in Chapter V. The questions posed in Chapter I will be answered on the basis of data which has been presented in this chapter together with analysis of the Educational Sciences Achievement Test and the attitude surveys which are located in the appendix.

CHAPTER V

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Introduction

In this study an attempt has been made to determine whether or not inservice programs based upon the Educational Sciences would produce teacher knowledge and enhance attitudes toward the Educational Sciences. A review of the literature reveals that apparently, teacher inservice education efforts to date have not always produced the anticipated support from the teachers. This appears to have been caused by many fundamental design problems. However, it can be concluded that teachers do agree that a need for inservice education exists.

The Educational Sciences which are based on an extensive review of the literature by Hill and his associates have formed the basis of several studies. Inservice workshops designed to help teachers personalize instruction for students through the knowledge and application of the Educational Sciences developed as a result of the earlier studies. The science of Educational Cognitive Style provides a means for determining how students derive information from the environment, enabling teachers

to plan appropriate instructional programs to facilitate learning and foster success.

A four day inservice program for East Lansing teachers was designed on the basis of the Oakland Community College Conference Design and was modified as a result of feedback from teachers who were involved initially. The volunteer teacher participants were instructed in the overall design and rationale for the Educational Sciences. They were also assigned the task of learning the definitions related to Educational Cognitive Style. Mathematical and empirical mapping techniques were used to acquaint teachers with their own style, and with the styles of other teachers and subsequently, styles of students. Classroom methods and materials were analyzed to determine which student styles would best match the methods and materials. Analysis of sample Educational Cognitive Style maps was also incorporated in the inservice program to determine which elements could be augmented or strengthened.

Activities designed to facilitate learning of this information included role playing and analysis of sociodrama characterizations of Educational Cognitive Styles, review of films and slide tapes of other implementation projects, and intensive skill building sessions in which teachers used the language of the Educational Sciences.

Conclusions

The first section of this chapter deals with conclusions drawn from the study which are based on the findings presented in Chapter IV, and which provide the basis for answers to the general questions posed in Chapter I. It is important to state that these conclusions are not absolute. They must be viewed as tentative from this descriptive study. Furthermore, they are the result of the implementation and evaluation of the Educational Sciences in a teacher inservice program designed to increase teachers' skills in personalizing educational programs, and improving teacher and administrator attitudes. This particular teacher inservice project utilized the Educational Sciences at the K-12 level. The study itself raises questions for further in-depth study rather than aboslute statements of fact.

Question One:

> Is it possible to design an effective inservice training program in the theoretical foundations and practical applications of the Educational Sciences for elementary and secondary school classroom teachers?

As manifested by this study, it is possible to design an effective inservice training program in the Educational Sciences. Effectiveness can be considered in a number of dimensions. First, the number of teachers volunteering to participate each year increased by at

least 40 percent from the number who had participated the previous year. (See Table 3.3.) Project staff members did not solicit participants each year. Instead, flyers were sent to all teachers in the East Lansing District inquiring as to whether they would be interested in attending a workshop on the Educational Sciences and Educational Cognitive Style mapping. Response was good and three separate workshops were held in 1973 with 33 participants, two were held in 1974 with 64 participants, and two conducted in 1975 with 32 participants. Three additional inservice workshops were held for the replication districts during 1976 with 60 participants. This amounted to a total of 189 teachers and administrators volunteering to participate.

A second area of effectiveness relates to the number of teachers remaining in the project for more than one year. For example, of the original group of 22, 18 teachers remained in the program during 1973--the loss of four was due to teachers leaving the district. In 1974 of the 63 teachers, 27 of them had been in the project for one or two years. It should be stated that in many instances, teachers after having been involved for a year or two felt they could implement the workshop techniques on their own without formal requests for help from project staff or attendance at additional inservice sessions.

Based upon an analysis of teacher responses to questions on the attitude survey related to the Usefulness of the Educational Sciences, (see Tables 4.9 and 4.10), it can be stated that teachers believe as a result of the workshop that:

a. Educational Cognitive Style mapping has increased their ability to assess the ways in which students might be taught.

b. utilization of the Educational Sciences has increased their effectiveness as an instructor, and,

c. the Educational Sciences have been effective in facilitating student instruction.

In regard to Teacher Attitudes Toward the Educational Sciences as Facilitators of Attitudes and Relationships, (Tables 4.9 and 4.10), the teachers felt that their experiences in the workshop and participation in the program positively helped them to be effective in terms of the development of student's own attitudes toward self, peers, school, and teachers, and student, teacher, parent, and administrator relationships. It can be concluded that these ratings in attitudes underscore an increased system of communication between the many persons who are involved in a school setting as a result of the inservice program.

It was determined that over the four years teachers volunteered in increasing numbers. Formal separations from the program have been very small (5 out of 63 in

1974 and 2 out of 75 in 1975). Reasons for separating ranged from "too much paperwork involved" to "not accepting the Educational Sciences" conceptual framework for education. It can be concluded that the holding power of the program appears to be very high.

Question Two:

> Can the theoretical concepts of the Educational Sciences be learned adequately by school teachers in a four day training session?

This question is related to the willingness and ability of teachers to learn the language and concepts of the Educational Sciences and the ability of the workshop leaders to provide meaningful instruction. The teachers demonstrated a high level of understanding of the Educational Sciences as follows:

1. Achievement Test Data (Tables 4.3 to 4.10), indicate that 90 percent of all the teachers scored 90 percent or above on the portions of the test dealing with the elements of Educational Cognitive Style mapping.

2. Achievement scores related to the questions on the theory and application of the Educational Sciences fell below the 90 percent level of success. However, group response was at a level of 87.5 percent related to the theory, and those related to application were at a level of 77.77 percent. These levels of attainment are

still high in achievement. Of the 184 testing situations, scores of 100 percent were recorded in 108 of these situations.

3. In the groups where teachers responded to a pretest and posttest, in all cases a score of 90 percent or above was recorded on the posttest.

From this it can be concluded that teachers are able to acquire the information and definitions related to the Educational Sciences and in particular Educational Cognitive Style mapping within a four day teacher inservice education program. It can be further concluded that the workshop activities including recitation of definitions, preparation of Educational Cognitive Style maps, discussion of elements, mapping other teachers and students all with continuous dialogue and use of the language to the point of almost total immersion in the language does facilitate the acquisition. Under these circumstances changes in the format of the workshops will not be contemplated at this time.

Question Three:

> Once teachers have been trained in the application of the Educational Sciences, will their diagnostic and prescriptive skills be improved?

The teachers ranked as second in order of importance the Teacher Attitudes Toward the Improvement of Prescriptive Skills and the Purchasing of Appropriate

Materials. The mean score for the four years was 7.8 (see Tables 4.11 and 4.12). Teachers see the Educational Sciences, Educational Cognitive Style mapping and the workshop activities as

a. helping them to be more effective in dealing with problem learning,

b. aiding them in helping problem students--be it an academic or behavioral problem--overcome their educational difficulties, and

c. helping them in being more selective in the purchase of instructional materials.

It can be concluded that as a result of their knowledge of Educational Cognitive Style, teachers feel they are in a better position to know what to do, how to do it, and what is needed in diagnosing and prescribing for problem situations.

The question related to improvement of teacher's diagnostic skills can be partially answered by reference to the number of maps generated over the past four years. (See Table 4.2).

1. For the first two years of the project, each teacher generated at least 10 maps per year. In some cases teachers generated as many as 20 maps. A few teachers mapped their entire class.

2. When implementation expanded to middle and high school, more large scale mapping took place as teachers began to map total classes in order to develop instructional groups.

3. Over two-thirds of the high school's students and approximately two-thirds of the students in one middle school have been mapped.

4. On file are 200 case studies on elementary students and 30 case studies on high school students.

The case studies and prescriptions for individual students were developed from the Educational Cognitive Style maps. Included in the case studies were prescriptions designed to augment selected Cognitive Style elements. A copy of an Educational Cognitive Style map and case study is located in Appendix I. It can be concluded from the foregoing information that teachers have demonstrated the ability to apply in the classroom knowledge of the Educational Sciences.

Question Four:

> Will administrators find the Educational Sciences to be effective in schools?

Tables 4.14 and 4.19 in Chapter IV present tabulations of the responses to the questions related to the six attitude clusters. Administrator's attitudes toward the effectiveness of the Educational Sciences can be answered as follows: they see the Educational Sciences as of value to education in general since the question dealing with Implementation in Other Districts and Grade Levels was rated the highest of the six clusters. Teacher Awareness and Student Attitudes also occupied positions

in the upper half of the list indicating administrator satisfaction with the Educational Sciences and how teachers were conducting the implementation activities. The higher ratings given to activities of teachers indicate that the administrators observed marked differences in teacher behavior following the inservice training program.

It can be concluded, however, that for the most part administrators have not seen themselves as active users of the Educational Sciences. They see this project as primarily concerned with relationships between teachers and students or relationships between teachers and teachers. This appears to be true of the administrators in East Lansing, as well as the administrators in the replication districts.

In this initial phase administrators have not taken an active role in creating awareness of the Educational Sciences to parents. They feel this is the primary responsibility of the teachers or project staff members who are basically more knowledgeable in this area.

Question Five:

> Will it be possible to implement the project in other school districts using the same overall inservice education program?

The question of feasibility of replication of the inservice program is answered in terms of the

achievement levels gained and attitudes generated by teachers and administrators in the replication districts. Sixty teachers and administrators volunteered to participate in four new replication districts. Furthermore, all have elected to remain in the project for the next full academic year, 1976-77. Following the four day inservice program conducted for all of the new districts, 90 percent of the teachers and administrators scored 90 percent or better on the achievement test. The mean score for the new replication group was higher than the mean score for the previous three East Lansing groups tested.

Pre- and posttest data on the achievement test were collected from the new districts. Analysis of Table 4.3 reveals that 17 out of 20 scored 100 percent. This also indicated the value of pretests as a possible aid to teachers in achieving the desired 90 percent level of mastery. Analysis of the total group of tests (Tables 4.5 to 4.10), indicated 26 out of 47 scored 100 percent. This was higher than in other previous groups. These teachers also scored higher on the theory and application questions than previous groups (Tables 4.9 and 4.10).

Administrator attitudes in the replication districts (Tables 4.14 and 4.17) reveal that on the six attitude clusters, administrators rated each cluster higher than the administrators in the other three years

of data collection with the exception of one instance. The 1975 group rated the question on the Value to Other Districts .06 of a point higher. It can be concluded that replication attempts have produced the following generalizations:

1. As a total group, individual teachers and administrators scored higher on the achievement test than the demonstration district.

2. It has been demonstrated that utilizing the same four day inservice workshop in four new districts initial results are as high as those found in the East Lansing Schools.

Implications

Analysis of the data presented in this study and the review of the findings and answers to the questions posed in Chapter I have led to the development of the following implications.

1. In the majority of the cases teachers scored above the 90 percent level on the Educational Sciences Achievement Test. Therefore, it can be implied that the four day inservice program should not be substantially changed.

2. The fact that teachers have demonstrated the ability to learn the definitions and knowledge related to the Educational Sciences indicates that expressed

concerns that the Educational Sciences are too complicated and technical for teachers is no longer valid.

3. Teachers who have been in the project for several years as well as the newcomers have jointly indicated the strong value of the inservice program to themselves and have projected the same value to other school districts. The teacher's responses show a willingness to learn and apply the concepts. These attitudes were expressed freely four to five months after the termination of the four day workshops. Such acceptance and positive attitudes by almost two hundred teachers indicates strongly to other districts that this particular inservice program is worthy of their consideration and replication.

4. Once teachers have acquired the knowledge of the Educational Sciences, particularly Educational Cognitive Style mapping, and have reported improved diagnostic and prescriptive abilities, it can be anticipated that student's attitudes will also be improved. If student attitudes improve, one can also anticipate that teacher's attitudes will improve. Thus, a self-perpetuating cycle of positive attitudes are possible.

5. Expansion of the inservice workshops to include Educational Memory now appears to be appropriate in light of a recent paper by Hill.[1]

6. The success of the initial inservice program in the East Lansing Schools led to the assumption that expansion would be feasible in other school districts. Now that the first phase of the replication has met with a high level of success in four widely divergent school districts, the possibility for continued acceptance and expansion becomes a reality.

7. The success in the replication districts may well have resulted from the ability of the project staff to learn from the initial start-up problems in East Lansing. Being able to implement the project in a new district knowing all the potential hazards ahead of time led to a very smooth transition.

Personal observation of teacher reaction in the new districts indicates a strongly positive attitude. The early experiences together with the new replication projects have produced the following observations:

a. In order to maintain a positive attitude by teachers and keep drop-outs or separation to a minimum, teachers must be given the option to participate or not to participate in an inservice program.

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[1]Joseph E. Hill, "The Educational Science of Memory: Function X Concern X Condition," The Educational Scientist 1 (Fall 1975): 3-11.

b. Instructors approaching the inservice program with a positive attitude, really believing that teachers can learn the information regarding the Educational Sciences, generate a self-fulfilling prophecy.

c. Informing new teachers that the project has been successfully implemented by other teachers leads to acceptance by new teachers--possibly they do not consider themselves the "experimental group."

d. Approaching teachers on a professional level--as teacher to teacher to work out problems was borne out as beneficial activity and supports the concept of the teacher centers.

Recommendations

Based on the results of this study dealing with a model for teacher inservice education utilizing the Educational Sciences, the following recommendations can be made:

1. A longitudianl study should be undertaken to determine whether teachers continue to make use of the Educational Sciences in their teaching following the completion of the inservice education program--and if not, then why not.

2. A longitudinal study should be undertaken to determine the effects the personalized diagnostic and prescriptive process based on Educational Cognitive Style effects with students throughout their school career.

3. There is a strong need for an indepth study concerning student achievement. This study has been primarily directed towards teacher improvement and achievement in the Educational Sciences. On the basis of projects at the college level where higher student achievement has occurred, it was assumed that similar gains would be made in elementary and secondary schools. School teachers have indicated positive results. Now the need is for an indepth large scale follow-up study of students to measure lasting changes in achievement.

4. Further study of workshops incorporating teachers who teach in widely different socio-economic areas should be undertaken to determine whether the Educational Sciences conceptual framework can be utilized as a basis for diagnosis and prescription, thus,

a. raising achievement levels of educationally disadvantaged students,

b. modifying student behavior that might prevent maximum academic achievement in the school setting, and

c. augmenting Educational Cognitive Style elements.

5. Strong administrative support must be sought through more involvement and workshop participation. The lower scores on the Administrative Attitude Survey indicated weakness in the areas of Parental Awareness and Administrator Use of the Educational Sciences.

6. In order for such an inservice program to be successfully implemented, the administrators involved must make a firm commitment to the program. Administrator attendance at workshops and work with parents should be encouraged, but not mandated.

Summary

This final chapter has presented the conclusions, implications, and recommendations drawn from the description and analysis of a teacher inservice model for the continuing education of teachers in a school system. The conclusions which were drawn from the data displayed in Chapter IV, answered the general questions posed in Chapter I. The implications were offered in an effort to discuss implied results not included in the findings. In view of the fact that not all questions can be answered by any one study, recommendations were suggested as practical approaches to increase the body of knowledge pertaining to the Educational Sciences as a basis for teacher inservice education.

APPENDICES

APPENDIX A

THE EDUCATIONAL SCIENCES

Joseph E. Hill

THE EDUCATIONAL SCIENCES

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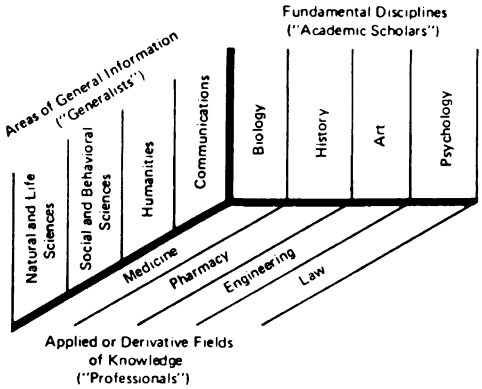
THE EDUCATIONAL SCIENCES

Dr. Joseph E. Hill

Fundamental disciplines are bodies of knowledge generated by communities of scholars that produce pure and distinctive forms of information about phenomena which they study. Biology, history, art, psychology and mathematics are examples of fundamental disciplines.

A fundamental discipline must be either a science or an art, it cannot be both. Sciences, as bodies of information, must recognize the principles of completeness and that of closure. The arts (e.g., history, a synoptic art, and art, an esthetic art) do not need to recognize these two principles.



Complementing the fundamental disciplines are the applied or derivative fields of knowledge. These bodies of information are generated by practitioners who deal with practical considerations of the human condition. Medicine, pharmacy, engineering and law are examples of applied fields of knowledge.

The applied fields are composed of terms and methods of inquiry borrowed from the fundamental disciplines and other "cognate" fields. Their practitioners are not concerned with producing pure and distinctive forms of information. In this context, the applied fields are composed of both sciences and arts that are designed to explain phenomena and solve problems in the practical aspects of the human situation. For example, the applied field of knowledge called "medicine" is composed of the medical sciences and medical arts. Engineering of the engineering sciences and the engineering arts.

Although much of the knowledge produced by academicians in their disciplines and professionals in their "fields" is frequently beyond the comprehension of persons outside the specializations in question, and although this knowledge may appear at times to have little relevance to the immediate concerns of persons not committed to it by affiliation with these specializations, there is a great need for at least knowing about the structures and functions of such bodies of information. In order to make such information available to society, clusters of information related to such broad areas as natural and life sciences, social and behavioral sciences, humanities, and communications can be formed on the basis of representative ideas, methods of inquiry employed, and significant applications of these ideas to problems extant in the human condition.

The areas of general information provide a means for presenting the fundamental disciplines and the applied fields of knowledge in forms that will allow persons to realize the essentiality of these disciplines and fields to their own, and to contemporary society's ultimate potential and welfare. The aim of the areas of general information is to present selected characteristics in logical patterns of the fundamental disciplines and applied fields to which they pertain. The organization of ideas included in an area of general information is based upon making relevant to the education of any person, rather than to the education of the student specializing in a given body of knowledge, essential understandings of the disciplines and fields under consideration.

The Educational Sciences provide a conceptual framework and scientific language for the applied field of knowledge called education. These "sciences" approach a level of precision that is found in such other derivative fields as medicine, pharmacy, engineering and law.

With the development of the Educational Sciences, the solutions of problems and explanations of phenomena are facilitated, and educational problems accruing to inadequate communication, misinterpretation of information, and fragmentation of effort are alleviated.

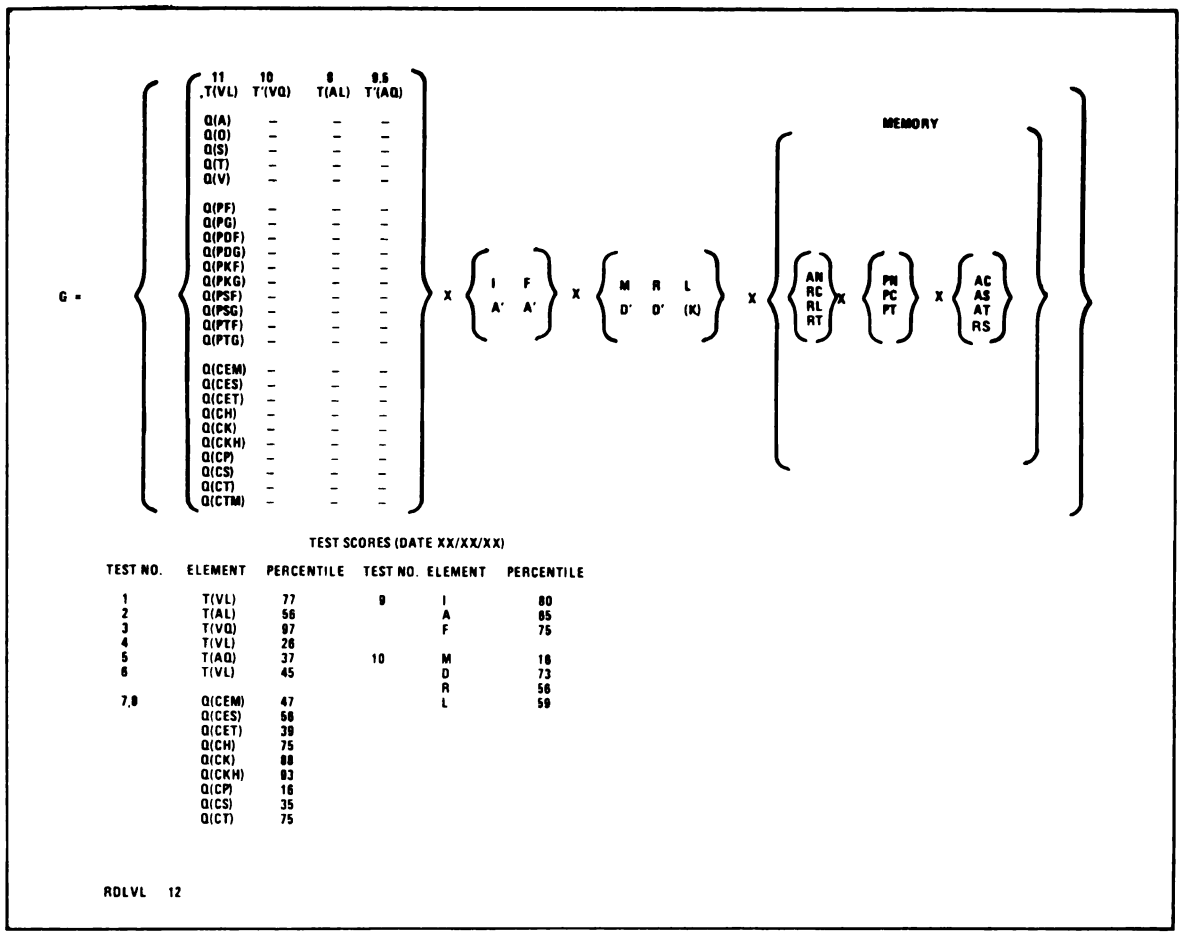
In the process of creating and developing the Educational Sciences, the following assumptions are made:

1) Education is the process of searching for meaning.
2) Thought is different from language.
3) The human creature is social in nature and has an unique capacity for deriving meaning from its environment and personal experiences through the creation and use of symbols.
4) Not content with biological satisfactions alone, humankind continually seek meaning.

These assumptions are essential to the conceptual framework for education called the Educational Sciences.

At the present time, there are seven educational sciences:

1) Symbols and their meanings
2) Cultural determinants of the meanings of symbols
3) Modalities of inference
4) Educational memory
5) Cognitive styles of individuals
6) Teaching styles, administrative styles and counseling styles
7) Systemic analysis decision-making



Educational Cognitive Style

Oakland Community College accepts the premise that no two students seek meaning in exactly the same manner. We believe that 90% of the students with normal ability can learn 90% of the material 90% of the time if the teaching methods and media are adjusted to the student's educational cognitive style. The College maps the cognitive style of each student to provide a picture of the various ways in which the individual searches for meaning. Each student has a relatively unique cognitive style or way of seeking meaning or knowing.

Cognitive styles are determined by the way individuals take note of their surroundings – how they seek meaning, how they become informed. Are they listeners or are they readers? Are they concerned only with their own viewpoints or are they influenced in decision-making by their families or associates? Do they reason as mathematicians, or as social scientists, or as automotive mechanics?

These are but a few examples of the facets of human makeup that are included in a student's cognitive style. Family background, life experiences, and personal goals make each of us unique. Each map reflects each student's cognitive style. A cognitive map provides a picture of the diverse ways in which an individual acquires meaning. It identifies cognitive strengths and weaknesses. This information can be used to build a personalized program of instruction.

Results from a battery of tests and inventories are processed through the College's computer system to produce a map of cognitive traits that describe the many ways each student might seek meaning. Cognitive maps are printed out in the form of a cartesian product of three sets. The first set indicates a student's tendency to use certain types of symbols, one's ability to understand words and numbers, qualitative sensory symbols, qualitative programmatic symbols, and qualitative codes. The second set indicates influences which the student brings to bear in deriving meaning from symbols. These influences are effected mainly in terms of one's own **individuality (I)**, or one's **associates (A)**, or those of one's family **(F)**. The third set indicates the manner in which the individual reasons, or the way in which one infers. Whether the individual thinks in **categories (M)**, or in terms of **differences (D)**, or synthesizes multiple **relationships (R)**, or uses all three **(L)**, one's modality of inference influences, and is influenced by, symbols and the cultural determinants that are employed in that person's style. These three sets of elements, i.e., symbolic mediation, cultural determinants, and modalities of inference, comprise the cognitive style of the individual. A maximum of 3,260 different profiles of these elements are possible in an individual's map at a given level of educational development.

Major Orientation/Minor Orientation

Major orientation is noted by capital letters. For example, **T(VL)** would indicate a major orientation in theoretical visual linguistic symbolic mediation. A major orientation is accorded a given element if it occurs in the 50th–99th percentile range of a distribution of that element at a given "developmental" level. The person showing a **T(VL)** in the cognitive style map at, say, the twelfth level of educational development would have realized a score which occurred somewhere within the range of the 50th–99th percentiles of the distribution of that element, **T(VL)**, for persons at a twelfth level of educational development.

The symbol **T'(AL)**, read **"T prime AL"**, indicates a minor orientation in this element of style. If **T'(AL)** were indicated in an individual's cognitive style map, it would mean that the individual had realized a score for this element that occurred in the range of the 26th–49th percentiles, inclusively, of a distribution of scores for that element at a given level of educational development.

If an individual realized a score that occurred at the 25th percentile or below of a distribution of scores for a given element, at a given level of educational development, that individual would be said to have a negligible orientation and the symbol for that element would be omitted from the individual's cognitive style map.

I. SYMBOLS AND THEIR MEANINGS

Two types of symbols, theoretical (e.g., words and numbers) and qualitative (e.g., sensory, programmatic, and codes), are created and used by individuals to acquire knowledge and derive meaning from their environments and personal experiences. Theoretical symbols present to the nervous system, and then represent to it, something different from that which they themselves are. For example, the spoken word "cup" is an auditory sensation which represents to the individual hearing it the physical object of a cup. Since this auditory sensation (the sound "cup") presents to the individual's nervous system something different from that which it (the symbol) itself is, it is called a "theoretical auditory linguistic symbol." In the visual dimension, the imagery resulting from the individual's observing the printed word "cup", which would present to the awareness of the individual the same physical object that the word "cup" would produce, is an example of theoretical visual linguistic symbolic mediation.

Qualitative symbols present and then represent to the nervous system of the individual that which they (the symbols) themselves are to that individual. Meanings for qualitative symbols are derived from three sources: 1) sensory stimuli; 2) cultural codes (games); and 3) programmatic effects of objects which convey an almost automatic impression of a definite series of images, scenes, events or operations. At the present time, there are 25 qualitative symbols included in the "symbolic" set; five of them associated with sensory stimuli, ten that are programmatic in nature, and ten associated with cultural codes.

There are two main types of theoretical symbols – auditory and visual – each of which can be divided into linguistic and quantitative elements. The four theoretical symbols are defined as follows:

T(VL) **Theoretical Visual Linguistics** – ability to find meaning from words you see. A major in this area indicates someone who reads with a better than average degree of comprehension.

T(AL) **Theoretical Auditory Linguistics** – ability to acquire meaning through hearing spoken words.

T(VQ) **Theoretical Visual Quantitative** – ability to acquire meaning in terms of numerical symbols, relationships, and measurements.

T(AQ) **Theoretical Auditory Quantitative** – ability to find meaning in terms of numerical symbols, relationships, and measurements that are spoken.

The five qualitative symbols associated with sensory stimuli are:

Q(A) **Qualitative Auditory** – ability to perceive meaning through the sense of hearing. A major in this area indicates ability to distinguish between sounds, tones of music, and other purely sonic sensations.

Q(O) **Qualitative Olfactory** – ability to perceive meaning through the sense of smell.

Q(S) **Qualitative Savory** – ability to perceive meaning by the sense of taste. Chefs should have highly developed qualitative olfactory and savory abilities.

Q(T) **Qualitative Tactile** – ability to perceive meaning by the sense of touch, temperature, and pain.

Q(V) **Qualitative Visual** – ability to perceive meaning through sight.

The qualitative symbols that are programmatic in nature are:

Q(PF) **Qualitative Proprioceptive (Fine)** – ability to synthesize a number of symbolic mediations into a performance demanding monitoring of a complex task involving small, or fine, musculature (e.g., playing a musical instrument, typewriting); or into an immediate awareness of a possible set of interrelationships between symbolic mediations, i.e., dealing with "signs." While qualitative proprioceptive fine symbolic intelligence is most readily observable in seemingly automatic motor responses such as reading and playing music, certain types of theoretical symbolic mediation also require qualitative proprioceptive activity. For example, the synthesis of a number of symbolic mediations is evident when an individual upon seeing a sign of smoke immediately interprets it as evidence of fire and experiences an interplay of many sensations including smell of smoke, taste of smoke, and sensation of heat. In this instance a network of previous experiences and related associations produces the theoretical mediation of fire along with the other qualitative aspects.

Q(PG) **Qualitative Proprioceptive (Gross)** – ability to synthesize a number of symbolic mediations into a performance demanding monitoring of a complex task involving large, or gross, musculature (e.g., throwing a baseball, skiing).

Q(PDF) **Qualitative Proprioceptive Dextral (Fine)** – a predominance of right-eyed, right-handed and right-footed tendencies (a typically right-handed person) while synthesizing a number of symbolic mediations into a performance demanding monitoring of a complex task involving small, or fine, musculature (e.g., writing right-handed).

Q(PDG) Qualitative Proprioceptive Dextral (Gross) – a predominance of right-eyed, right-handed and right-footed tendencies (a typically right-handed person) while synthesizing a number of symbolic mediations into a performance demanding monitoring of a complex task involving large, or gross, musculature (e.g., throwing a baseball with the right hand).

Q(PKF) Qualitative Proprioceptive Kinematics (Fine) – ability to synthesize a number of symbolic mediations into a performance demanding the use of fine musculature while monitoring a complex physical activity involving motion.

Q(PKG) Qualitative Proprioceptive Kinematics (Gross) – ability to synthesize a number of symbolic mediations into a performance demanding the use of gross musculature while monitoring a complex physical activity involving motion.

Q(PSF) Qualitative Proprioceptive Sinistral (Fine) – a predominance of left-eyed, left-handed and left-footed tendencies (a typically left-handed person) while synthesizing a number of symbolic mediations into a performance demanding monitoring of a complex task involving small, or fine, musculature (e.g., writing left-handed).

Q(PSG) Qualitative Proprioceptive Sinistral (Gross) – a predominance of left-eyed, left-handed and left-footed tendencies (a typically left-handed person) while synthesizing a number of symbolic mediations into a performance demanding monitoring of a complex task involving large, or gross, musculature (e.g., throwing a baseball with the left hand).

Q(PTF) Qualitative Proprioceptive Temporal (Fine) – ability to synthesize a number of symbolic mediations into a performance demanding the use of fine musculature while monitoring a complex physical activity involving timing.

Q(PTG) Qualitative Proprioceptive Temporal (Gross) – ability to synthesize a number of symbolic mediations into a performance demanding the use of gross musculature while monitoring a complex physical activity involving timing.

The remaining ten qualitative symbols associated with cultural codes are defined as:

Q(CEM) Qualitative Code Empathic – the capacity to derive meaning through sensitivity to the feelings of others; ability to put yourself in another person's place and see things from that person's point of view.

Q(CES) Qualitative Code Esthetic – capacity to enjoy the beauty of an object or an idea. Beauty in surroundings or a well-turned phrase are appreciated by a person possessing a major strength in this area.

Q(CET) Qualitative Code Ethic – commitment to a set of values, a group of principles, obligations and/or duties. This commitment need not imply morality. Both a priest and a criminal may be committed to a set of values although the "values" may be decidedly different.

Q(CH) Qualitative Code Histrionic – capacity to exhibit a deliberate behavior, or play a role to produce some particular effect on other persons. This type of person knows how to fulfill role expectations.

Q(CK) Qualitative Code Kinesics – capacity to understand, and to communicate by, non-linguistic functions such as facial expressions and motions of the body (e.g., smiles and gestures).

Q(CKH) Qualitative Code Kinesthetic – capacity to perform motor skills, or effect muscular coordination according to a recommended, or acceptable, form (e.g., bowling according to form, or golfing).

Q(CP) Qualitative Code Proxemics – capacity to judge the physical and social distance that the other person would permit, between oneself and that other person.

Q(CS) Qualitative Code Synnoetics – capacity to have personal knowledge of oneself.

Q(CT) Qualitative Code Transactional – capacity to maintain a positive communicative interaction which significantly influences the goals of the persons involved in that interaction.

Q(CTM) Qualitative Code Temporal – capacity to respond or behave according to time expectations imposed on an activity by members in the role-set associated with that activity.

II. CULTURAL DETERMINANTS

There are three cultural determinants of the meaning of symbols: 1) **individuality (I),** 2) **associates (A),** and 3) **family (F).** It is through these "determinants" that cultural influences are brought to bear by the individual on the meanings of symbols. The "individuality" influence is frequently reflected by the individual's need to quote definitions, or explain situations, in his own words. The "associates" influence is frequently evidenced by an individual who understands that which is under consideration, but explains or discusses these matters mainly in the words of his associates who may be involved with him in the situation. The "family" determinant is frequently portrayed by the individual possessing it through examples one may use in explaining a situation or solving a problem (e.g., either parents, children, wife, husband, sibling, cousin, close friend, etc., are used to illustrate a situation analogous to the one under consideration).

III. MODALITIES OF INFERENCE

The third set of the Cartesian product indicating cognitive style includes elements which indicate the individual's modality of inference, i.e., the form of inference one tends to use:

M **Magnitude** – a form of "categorical reasoning" that utilizes norms or categorical classifications as the basis for accepting or rejecting an advanced hypothesis. Persons who need to define things in order to understand them reflect this modality.

D **Difference** – This pattern suggests a tendency to reason in terms of one-to-one contrasts or comparisons of selected characteristics or measurements. Artists often posses this modality as do creative writers and musicians.

R **Relationship** – this modality indicates the ability to synthesize a number of dimensions or incidents into a unified meaning, or through analysis of a situation to discover its component parts. Psychiatrists frequently employ the modality of relationship in the process of psychoanalyzing a client.

L **Appraisal** – is the modality of inference employed by an individual who uses all three of the modalities noted above **(M, D, and R)**, giving equal weight to each in his reasoning process. Individuals who employ this modality tend to analyze, question, or, in effect, appraise that which is under consideration in the process of drawing a probability conclusion.

K **Deductive** – indicates deductive reasoning, or the form of logical proof used in geometry or that employed in syllogistic reasoning.

IV. EDUCATIONAL MEMORY

Educational memory is a Cartesian product of three sets of information pertaining to: 1) the memory function, 2) concern components **(persons, processes, properties)**, and 3) conditions. The elements of the condition set of information are: **Assimilation (AS), Accommodation (AC), Attendance (AT),** and **Repression (RS).**

The Piagetian conditions of: 1) **Assimilation,** i.e., acquiring "new" meanings through one's currently existing elements of cognitive style; 2) **Accommodation,** i.e., interiorizing in terms of the new meanings directly (e.g., understanding a foreign language without first needing to translate it into one's own language); 3) **Repression,** i.e., repressing or dampening perseverations interfering with the interiorization processes (assimilation, accommodation); and 4) **Attendance,** i.e., concentration of attention on the meanings being acquired. Assimilation and Accommodation combine with those of Repression and Attendance, to form the elements, in major and minor orientations, that comprise information of the "conditions" set of educational memory. Assimilation is one of two processes of interiorization outlined by Piaget. Accommodation is the other condition of Piagetian interiorization. The processes of Repression and Attendance are the other two elements included in the condition set.

Educational memory is an essential aspect of an individual's cognitive style. Recent work by biochemists and psychobiologists provides information by which the memory function can be expressed in terms of selected biochemical elements and the electrophysiological measurements of **alpha (α), beta (β), theta (Θ),** and **delta (δ),** waves, respectively. The concern components of **Persons (PN), Processes (PS), and Properties (PT),** respectively, are considered to contribute to the biochemical elements produced by memory activity and conditions reflected in the electrophysiological measurements, i.e., α, β, Θ, and δ. For example, some individuals find it easier to remember **persons (PN),** thereby expending less energy (a major orientation indicating a condition of potential energy, or "easy" memory) in the memory activity than they would for, say, remembering **processes, (PS).** Situations in which individuals witness difficulty in exercising the process of memory are indicated by a negligible orientation (i.e.,the element is not shown in the map) in either one or a combination of the processes of recognition, retention, recall and association. The minor orientation is used to indicate a condition of **"neutral energy expenditure"** in one, or in a combination of the four processes of memory, when specimens of body fluids show an average count of residuals of biochemical elements considered to be at work in memory-concern activity.

Recent work by biochemists and psychobiologists differentiates between short-term and long-term memory. Short-term memory must be present, however, before long-term memory can occur. Short-term memory may become long-term memory with the production of proteins and an increase in enzymatic activity levels in the brain cells. Short-term memory is currently thought to be the result of short-lived processes.

Recent experiments with animals have shown that injection of stimulators into the central nervous system can have an affect on both short-term and long-term memory, respectively. Differential effects on memory resulting from chemical injections have also been observed between human subjects. Implications for education in the future might well lie in the use of immediate memory stimulators and other chemicals to increase the attention span and decrease protein elements which inhibit the memory-concern function.

V. EDUCATIONAL COGNITIVE STYLE

The Educational Science of Cognitive Style combines the information included in the first four "sciences," by means of a Cartesian product of these four sets, to provide a picture of the profiles distributed over the four sets that an individual employs in seeking meaning. These profiles reflect the cognitive style "strengths" of the individual, and are vehicles for determining educational prescriptions to help him in the educative process.

At the present time, individuals are being tested and inventoried for elements included in the first three sets only, i.e., symbols and their meanings, cultural determinants, and modalities of inference. Instruments for collecting information relative to the Educational Memory set are currently under construction.

VI. COUNSELING, ADMINISTRATIVE, TEACHING AND STUDENT STYLES (CATS)

Each of these three styles is represented by a Cartesian product of three sets of information pertaining to: 1) **Demeanor,** 2) **Emphasis,** and 3) **Symbolic Modes** of **Presentation,** or **Communication.**

Demeanor x Emphasis x Symbolic Mode

Elements in the emphasis set and the symbolic modes set, respectively, are common to each of the three styles. Differentiation between an individual's teaching style, his counseling style and his administrative style in these dimensions ("emphasis" and "mode") is affected through the change in orientations (major and minor) that might occur with each style. For example, an individual may show a major orientation in **processes (PS)** in his teaching style while indicating a major orientation in **persons (PN)** in his administrative style.

Counseling Style

The cognitive style of individuals involved in counseling situations, as in the case of teaching and administrative styles, is important but does not provide a total explanation of the behavior of counselors. The demeanor elements of counseling style expressed in terms of major and minor orientations involving: a) **Directive (V,v),** b) **Situational (U,u),** or c) **Nondirective (O,o)** are determined on the basis of the counselor's attitude toward who should set the goals and determine the approaches to the goals in the counseling situation. The counselor who reflects "my goals my way," regardless of the counseling situation, is given a major orientation in the directive element in the demeanor set. Counselors who are at times directive and at other times nondirective, depending upon the situation, are accorded major orientations in the situational element. Counselors who tend not to direct behavior, regardless of the counseling situation, are accorded major orientations in the nondirective element. The total counseling style of an individual is expressed in terms of profiles showing major and minor orientations distributed over the three sets of demeanor, emphasis and "symbolic mode." An example of counseling style is shown below:

$$\left\{\begin{matrix} U \\ V \end{matrix}\right\} \times \left\{\begin{matrix} PN\ PT \\ PC\ PC \end{matrix}\right\} \times \left\{\begin{matrix} QP \\ RP \end{matrix}\right\}$$

Administrative Style

Major and minor orientations in four elements of demeanor: 1) **Dominant (N,n),** 2) **Adjustive (J,j),** 3) **Cooperative (C,c)** and 4) **Passive Custodial (X,x);** major and minor orientations combined in the "emphasis elements": **Persons (PN), Processes (PS),** and **Properties (PT);** along with major and minor orientations in the elements of Symbolic Mode **(QP, RP, TP),** are profiles that portray the administrative style of an individual. The **dominant (N)** administrator reflects a "my goals my way" approach, the **adjustive (J)** type reflects "my goals your way, or your goals my way" approaches; the **cooperative (C)** employs a demeanor of "our goals our way"; while the passive custodial demeanor is one resulting from a "your goals your way" approach to administration by the individual. An example of administrative style is shown below:

$$\left\{\begin{matrix} N \\ J \\ C \end{matrix}\right\} \times \left\{\begin{matrix} PT \\ PN \end{matrix}\right\} \times \left\{\begin{matrix} RP \\ TP \end{matrix}\right\}$$

Teaching Style

The demeanor set of teaching style includes three elements: 1) **Predominant (F_{ap});** 2) **Adjustive or "Switcher" (S_{ap});** and 3) **Flexible (B_{ap}).** These three demeanor classifications can occur as either a major orientation in one with minor orientations in the other two, or two major orientations with a minor in the remaining element. Each of these elements is subscripted as **authoritarian (a)** or **permissive (p).** An authoritarian type is an individual who respects the wishes and decisions of persons in superordinate positions relative to his own, and expects his wishes and decisions to be respected when he assumes the superordinate role. A permissive individual is one who does not exercise this "respect," and does not expect it to be exercised by others regarding his role. The orientations in the demeanor set are combined with those of the emphasis and the "symbolic mode" set **(QP–Qualitative Predominant; RP–Reciprocity; TP–Theoretical Predominant)** to form profiles indicating the teaching style of an individual. An example of a teaching style represented by a Cartesian product is shown below:

$$\left\{\begin{matrix} P_a \\ S_p \end{matrix}\right\} \times \left\{\begin{matrix} PT \\ PC \end{matrix}\right\} \times \left\{\begin{matrix} TP \\ RP \end{matrix}\right\}$$

STUDENT STYLE

Student style is described as a Cartesian product of the three sets of: demeanor, emphasis, and symbolic mode of presentation. The elements comprising the latter two sets, emphasis and symbolic mode, are as previously described in connection with counseling, administrative, and teaching styles, respectively. The elements included in the demeanor set of student style are: 1) **Innovator (IN),** that student demeanor in which the individual will employ any means to attain the goal (understanding); 2) **Retreatist (RR),** that student demeanor portrayed by the individual who is indifferent to the means of instruction employed, and is also indifferent to the goal, i.e., understanding that which is being taught; 3) **Ritualist (RI),** that student demeanor in which the individual participates thoroughly in the "ritual" (instructional approach) in order to receive a good grade, but does not truly accept the goal, i.e., to understand that which is being taught; and 4) **Rebel (RB),** that student demeanor in which the individual alternately accepts, rejects, accepts and rejects both the means and the goal of instruction. An example of student style is shown below:

$$\left\{\begin{matrix} RI \\ IN \end{matrix}\right\} \times \left\{\begin{matrix} PC \\ PT \end{matrix}\right\} \times \left\{\begin{matrix} TP \\ RP \end{matrix}\right\}$$

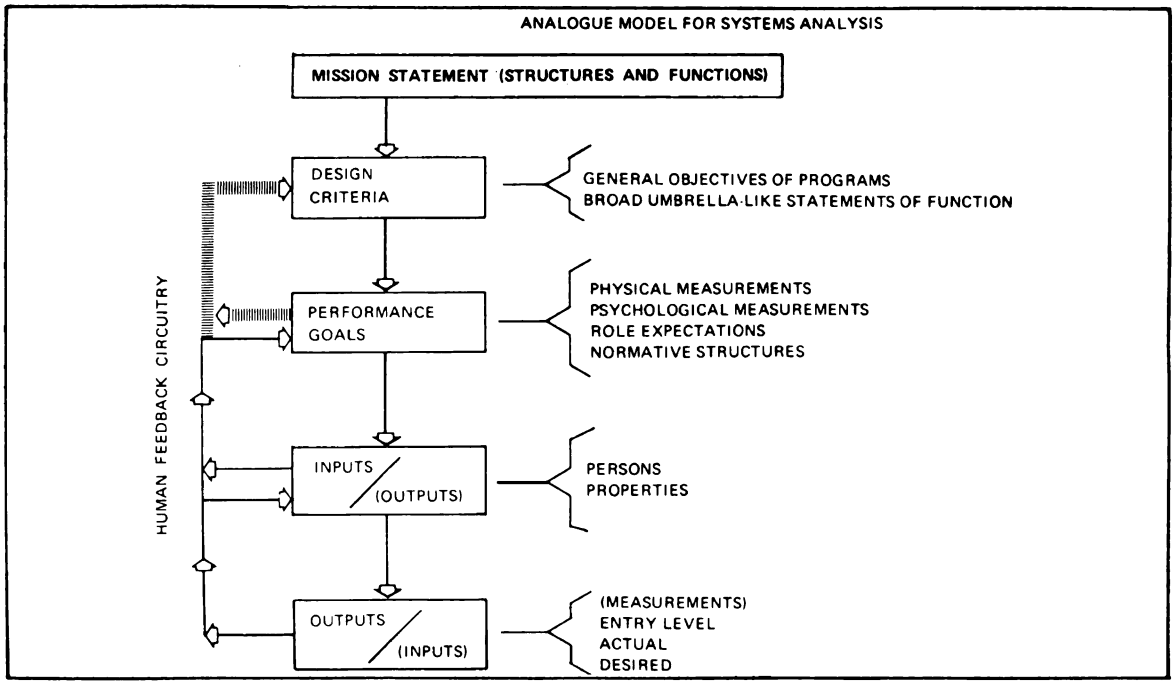
VII. SYSTEMIC ANALYSIS DECISION-MAKING

A system is a defined collection of elements with their interconnections considered over a period of time. Any aspect of education may be considered as a system.

The basic purpose of systemic analysis is decision-making resulting in a choice of options available to the decision-maker. Analysis of a system is conducted in terms of determining how well the goals of a system are being met within the constraints of the inputs of the system, combined with considerations of its mission and the main functions (design criteria) around which the system is designed.

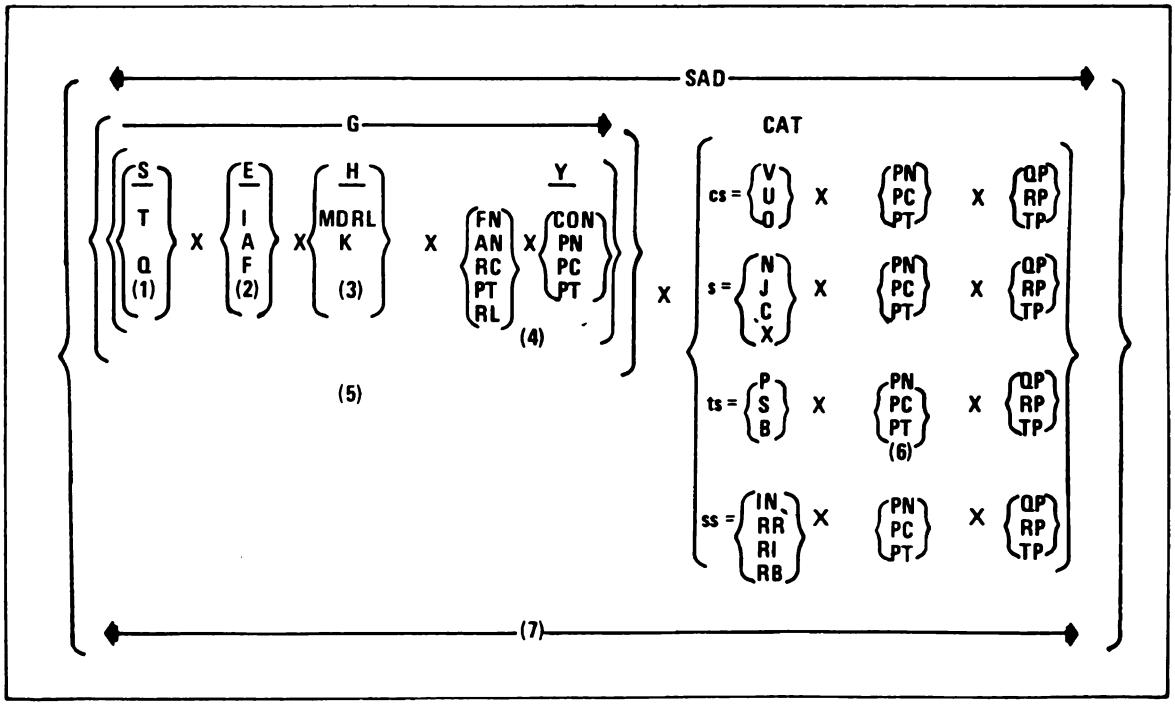
Performance goals must be stated in terms of the tasks to be accomplished, the conditions surrounding the tasks, and the minimum performance needed for successful accomplishment of the tasks. Any system may be defined, and analyzed, by means of the analogue model shown on next page.

For example, an educational program can be defined as a social system of the three generic elements: persons, processes and properties, and their interconnections considered over a period of time. This system can be defined by composing a mission statement for it, stating its design



SUMMARY OF THE EDUCATIONAL SCIENCES

Educational Sciences are summarized in the diagram shown here:



criteria, structuring performance goals for each criterion, and determining the inputs (persons and properties) necessary for achieving the tasks stated in the performance goals of the system.

The outputs of a system are measurements of performances of persons, processes, and properties within the system as support functions (support variables); and as measurements and products resulting from the performance of these three elements toward fulfilling the mission of the system (impact variables).

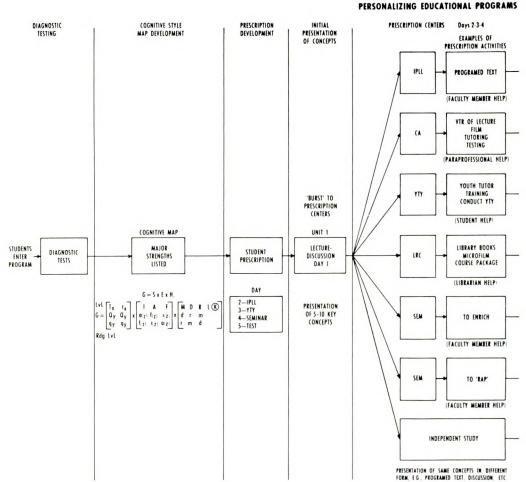
Throughout the period of operation of the system information is placed in the human feedback circuitry element, through meetings and conversations, in order to make decisions regarding possible modifications of elements and/or their interconnections to keep the system adjusted to its internal and external environments. The ultimate objective of systemic analysis is that of deriving optimal decisions, i.e., decisions that are "best" for all elements included in the decision. It should be noted that optimal decisions are not always "perfect" for each of the elements affected by the system.

PERSONALIZED EDUCATION

A student's cognitive map presents a picture of the variety of profiles one uses in his education, i.e., that one uses in the search for meaning. Mapping an individual's cognitive style enables the educator to consider the individual in terms that without the map he or she might not have employed. The diagnosis of an individual's cognitive style and the modes of understanding required by an educational task can be used to match the student to the task. Through this approach it is possible to prescribe educational activities that provide a better probability of successful accomplishment by the individual than otherwise might be possible.

PEP

Flow Chart of Personalized Educational Program (PEP) Illustrating Student Progress From Diagnostic Testing Through Successful Completion of an Instructional Unit.

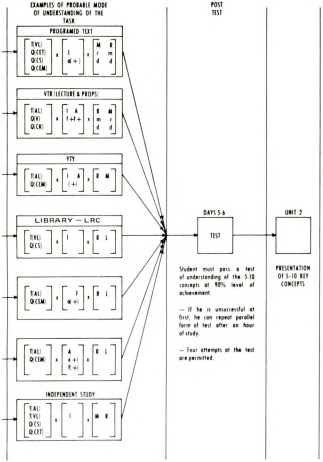


PERSONALIZING EDUCATIONAL PROGRAMS
UTILIZING COGNITIVE STYLE MAPPING

OAKLAND COMMUNITY COLLEGE

DR. JOSEPH E. HILL, PRESIDENT
DR. DEREK N. NUNNEY, VICE PRESIDENT

UTILIZING COGNITIVE STYLE MAPPING



CAMPUS PEP
Computer Assisted Management of Personalized Instruction

The Mode of Understanding of the educational task is used by the computer to design the modes of presentation associated with the Prescription Centers. The computer is then used to match the cognitive style of the student with that mode of presentation found to be "best" for him. After matching, CAMPI administers an entry level test, scores it, reports results to the instructor, to the prescription center, and to the student. CAMPI also administers final tests on units, scores them, reports results to the instructors, the prescription centers, and the students. CAMPI is also capable of analyzing test scores to the point of identifying concepts included in a study unit that:

(a) the student has mastered,

(b) the student has not mastered,

(c) of those he has not mastered, the ones he should complete most easily, and

(d) of those not completed, the ones that will probably be most difficult for him to accomplish

APPENDIX B

COGNITIVE STYLE AS AN EDUCATIONAL SCIENCE

Joseph E. Hill

Cognitive Style as an Educational Science

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COGNITIVE STYLE AS AN EDUCATIONAL SCIENCE

During the latter half of the 1930's, many psychologists were particularly interested in the study of the consistency and predictability of personality. In the early 1940's, Allport suggested the concept of "style," which essentially he defined as the consistency and pattern of expressive behaviors that individuals manifest in performing various types of activities. In the context of Allport's descriptive definition of style, the term is highly similar to its common use in such expressions as: an individual's way (style) of living, a style of speaking, a writing style, or style of dress. This orientation permits the use of the term "style" to denote an entire pattern of responses, i. e., it can refer to not only a particular way of life, but to a particular class of events (e. g., style of speaking). In this sense, the term "style" is both general and relatively specific, i. e., it is not restricted to a particular denotation (e. g., all aspects of response patterns).

Turning to the consideration of investigations of cognitive behaviors, the traditional approaches in these endeavors have dealt mainly with concept formation. These types of studies have tended to be limited to such considerations as: what are concepts? how are they attained? or, how are they learned? In essence, these efforts have been directed toward investigations of various ramifications of what might be termed "concept learning." Investigators involved in these types of studies, however, have not examined cognitive functions in the context of personality.

During the past ten to fifteen years, the concept of cognitive style has been investigated in the context of cognition as a facet of personality. Witkin, for example, has advanced the notion that the phenomenon described as cognitive style is a type of personality construct expressed in the interaction between perceptual (cognitive) response systems and antecedent conditions in the life history of the subject (person). In this context, then, the investigator is interested in such phenomena as the quality of mother-child relationships as antecedents to certain types of cognitive styles.

Certain contemporary studies of cognitive style have been designed to consider the phenomenon as an individual's particular mode of response to a given set of stimuli (variables). Other modern efforts have sought antecedents, or correlates, between cognitive style and: (1) such personality variables as: dependency, anxiety, and passivity; (2) such cognitive variables as: intelligence, problem-solving, and reasoning; and (3) such psychological processes as: learning, and perception. In essence, then, the contemporary studies of cognitive style involve the investigation of cognitive processes in the context of personality and defined social variables. These approaches indicate the recognition on the part of certain psychologists (e. g., Broverman, Gardner, Kagan, Moss, Sigel, Witkin) that cognitive behaviors form a fundamental part of a socio-personal matrix, and that the employment of certain classes of behavior called "cognitive" have consistent qualities which justify their being defined as stylistic.

The concept of cognitive style employed as an educational science is somewhat different from those described and defined in the discipline of psychology. The construct of cognitive style as defined in terms of the educational sciences is a Cartesian product, G, composed of three sets, S, E, and H, where S denotes the set of elements defining symbolic orientations, E indicates the set of cultural determinants of the meaning of symbols, and H designates the set of modalities of inference. The formal definition of the construct is developed as follows:

Consider the set "S" composed of 288 possible binomial combinations involving major and minor theoretical and qualitative symbolic orientations. Expressed in the form of set notation:

$$S = \left\{ \begin{matrix} (T_x - Q_y),\ (T_x - q_y), \\ (t_x - q_y),\ (Q_y - t_x). \end{matrix} \right\}$$

Where "T" denotes a major theoretical symbolic orientation of an individual; "Q" indicates a major qualitative symbolic orientation; "t" a minor theoretical symbolic orientation; "q" a minor qualitative symbolic orientation, the subscript "x" is a place-holder for one of the following notations: "al" -

auditory linguistic, "aq" - auditory quantitative, "vl" - visual linguistic, and "vq" - visual quantitative; and the subscript "y" holds a place for one of eighteen following notations: "a" - auditory; "o" - olfactory, "s" - savory, "t" - tactile, "v" visual, "p" - proprioceptive, "pk" - proprioceptive kinematics, "pt" - proprioceptive temporal, "cem" - code empathetic, "ces" - code esthetic, "cet" - code ethic, "ch" - code histrionic, "ck" - code kinesics, "ckh" - code kinesthetics, "cp" - code proxemics, "cs" - code synnoetics, "ct" - code transactional, and "ctm" - code temporal. Since there are 72 possible binomial combinations for each of the four arrangements; i.e., since there are 72 combinations of the form $(T_x - Q_y)$, 72 of the form $(T_x - q_y)$, 72 of the type $(Q_y - t_x)$, and 72 of the "double minor" category $(t_x - q_y)$; "S" is a finite set composed of $4 \times 72 = 288$ elements.

Consider similarly the fifteen elements, twelve of which are binomial combinations and three of which are of monomial form, comprising the set "E" called "the cultural determinants of the meanings of symbols." Expressed in set notation:

$$E = \left\{ \begin{array}{ccc} I, & A, & F, \\ (I - a_{(z)}), & (A - i_{(z)}), & (F - i_{(z)}, \\ (I - f_{(z)}), & (A - f_{(z)}), & (F - a_{(z)}). \end{array} \right\}$$

where "I" indicates a major "individuality" determinant of the meanings of symbols, "A" denotes a major "associates" determinant, "F" a major "family" determinant, "i" a minor "individuality" determinant, "a" a minor "associates" determinant, "f" a minor "family" determinant, and the subscript "z" holds a place for either a positive sign (+), or a negative sign (-) depending upon the type of influence the minor determinant involved tends to exert on the individual when he is in the process of determining meanings of symbols (e.g., words sentences, pictures, "feels," stories, "tastes").

Now, consider the set "H" of five monomial and six binomial elements involving what are called "the modalities of inference." Expressed in set notation, the eleven elements appear as follows:

$$H = \left\{ \begin{array}{cccc} M, & D, & R, & L, \\ (M-d), & (D-m), & (R-m), & (K), \\ (M-r), & (D-r), & (R-d). & \end{array} \right\}$$

Where K denotes a deductive inferential process necessary to the completion of certain types of "educational tasks" (e.g., proving a theorem in Euclidean geometry), "M" indicates a major "magnitude" inferential mode, "D" represents a major modality called "difference," "R" denotes a major modality termed "relationship," "L" indicates a major inferential mode known as "appraisal," "m" denotes a minor modality of "magnitude," "d" represents a minor "difference" mode, and "r" indicates a minor modality of inference called "relationship."

With the definitions of sets S, E, and H completed, a fourth set G, expressed as a Cartesian product, is possible. Thus, G becomes:

$$G = S \times E \times H,$$

or:

$$G = \left\{ \begin{array}{c} \underline{S} \\ (T_x - Q_y),\ (T_x - q_y), \\ (t_x - q_y),\ (Q_y - t_x) \end{array} \right\} \times \left\{ \begin{array}{ccc} \underline{E} & & \\ I, & A, & F, \\ (I - a_{(z)}),\ (A - i_{(z)}),\ (F - i_{(z)}), & & \\ (I - f_{(z)}),\ (A - f_{(z)}),\ (F - a_{(z)}) & & \end{array} \right\} \times \left\{ \begin{array}{cccc} \underline{H} & & & \\ M, & D, & R, & L \\ (M-d), & (D-m), & (R-m) & (K) \\ (M-r), & (D-r), & (R-d). & \end{array} \right\}$$

A set "g", a Cartesian product of sub-sets of appropriate elements drawn from sets S, E, and H, can be constructed to define the "cognitive style" of an individual (e.g., student, teacher, administrator). Thus, there is an element "g" (a "cognitive style") of set G such that:

$$g = \emptyset(s, e, h) \qquad (1)$$

Where $\emptyset$ (phi) denotes a function in the form of a Cartesian product, and s, e, and h represent sub-sets of the sets S, E, and H, respectively. Obviously, each of these sub-sets are composed of elements unique to them (e.g., s_1, s_2, s_3, e_1, e_2, h_1, h_2). This type of notation is useful only in that it permits

a compact representation of the "style" of an individual at a particular point of time and level of accomplishment in his educational development.

Put in another way, the set G can be defined as the universal set, i.e., the set of all possible "cognitive styles" accommodated by the Cartesian product of sets S, E, and H. Consistent with the notation employed in (1), this definition of G becomes:

$$G = \emptyset (S, E, H) \qquad (2)$$

Under these circumstances, (1) refers to an element of G, while (2) denotes the universal set G. It should also be noted that according to these definitions, s, e, and h could be called the "coordinates" of "g".

Since the set S is composed of a possible 288 elements, 15 elements comprise E, and H includes 11, it follows that the Cartesian product of these sets, i.e., the universal set G, is composed of: 288 x 15 x 11 = 47,520 different "cognitive style" elements at a given level of educational development. This result is based on the reasoning that there are 288 ways of choosing an element from S, 15 ways of choosing one from E, and 11 ways of selecting one from H, or 288 x 15 x 11 possible ways of defining "styles" over S, E, and H. It should be noted, however, that in actual practice the maximum number of elements that can be included in an individual's style "g", at a given level of educational development, is: 72 x 4 x 8 = 2304.

According to the language of set theory, although G is called the "Cartesian product" (or "direct product") of sets S, E, and H, the term "product" only denotes how the number of elements (47,520) in G was defined. This approach to enumerating (counting) the number of elements in G does not imply that any algebraic operations are to be performed on the elements themselves.

In analogous fashion, the cognitive style of an individual, $g = \emptyset (s, e, h)$, is called "the Cartesian product of the sub-sets s, e, and h. The elements comprising the respective sub-sets serve as coordinates, or "profiles," of an individual's "cognitive style."

The construct called "cognitive style" can now be described as a Cartesian product, or direct product, of three sub-sets, i. e., s, e, and h, with the elements comprising these sub-sets serving as coordinates, or "profiles," of an individual's style. The phraseologies "Cartesian product" and "Cartesian space" are synonymous in mathematical lexicon, i. e., the term "space" is synonymous with "set." Therefore, a Cartesian product is a particular type of space (or set) whose elements may serve as coordinates of "profiles" defined over that space. In this context, a cognitive style profile is a coordinate space of a Cartesian product. The term "space," as used here, emphasizes the non-numerical, and the non-algebraic points of departure of various constructs which can be considered by means of modern mathematical methods.

Mapping

Classifying the elements of a given set (e. g, set A) into two categories included in a second set (e. g., B) is a process mathematicians call "mapping." The notation usually employed for this process is:

$$A \rightarrow B \qquad (3)$$

The notation in (3) indicates a correspondence between the elements of set A and those of set B. In this example, set A is called the domain of the mapping, and B the range.

Mathematical mappings employ only the theoretical symbols of abstract logic or mathematics. Empirical mappings involve persons making judgments on a "makes sense" or "does not make sense" basis to classify elements (e. g., persons, processes, and properties of a social system called "curriculum") into "logical" categories. This type of decision-making employs not only theoretical symbolic mediations (e. g., "words" and "numbers") but demands qualitative symbolic aspects of reasoning (e. g., "picturing" the solution of a problem) as well. For example, in order to diagnose (map) the cognitive style ("g") of an individual, the "educational scientist" (e. g., teacher) must consider the individual's level of educational development in terms of the elements included in the sets S, E, and H, respectively. Empirically, the diagnostician ("scientist") must decide which elements in the sets S, E, and H, respectively, are appropriate

for inclusion in the sub-sets s, e, and h that form the individual's cognitive style. This approach demands the classification of the elements of S into two categories: s and $\tilde{s}$ (not s); E into the two categories: e and $\tilde{e}$ (not e); and H into h and $\tilde{h}$. The process involved here is called "empirical mapping." This type of mapping (diagnosis) can only be effected by a person (e. g., educational scientist) classifying the elements involved on a "makes sense," or "does not make sense" basis. If a mathematical mapping of these elements were desired, there would need to be a logical and theoretical vehicle (e. g., a formula, or equation) available by which the decision could be derived. In this case, a person is not actually involved in the decision-making process associated with the classification. Under these circumstances, the decision is rendered by performing indicated operations on the logical (mathematical) function used to determine the desired outcome. The point to be made is that the mapping of cognitive styles is mainly empirical in nature, and as such, is dependent upon the judgments of persons (diagnosticians) responsible for the process of classifying the elements of symbolic orientations, "cultural determinants," and modalities of inference into Cartesian products that represent the cognitive styles of the individuals under consideration.

The cognitive style of an individual cannot be empirically mapped without considering: (1) the level of educational development of the person, (2) the general symbolic conditions of educational tasks he will be called upon to accomplish, (3) certain antecedents (e. g., family) to his present state of development, and (4) the appropriateness of the elements under consideration for the conditions under which the educational tasks must be completed. The mapping of an individual's style is also affected by the diagnostician's cognitive style. In this context, diagnostic teams have generally been able to produce "styles" of higher predictive and concurrent validity than those "mapped" by the individual diagnostician.

Relationship

In order to reduce the amount of notation associated with the discussion and description of the processes and procedures associated with the empirical mapping of an individual's cognitive style, it is necessary

to consider a concept basic to all science, i. e., the concept of "relationship." The most useful definition of relationship for any branch of science is the one which mathematicians have developed in terms of the elementary concepts of set theory. The definition in question is:

A relationship is a sub-set of a Cartesian space.

A binary relationship is one whose Cartesian space is defined by two sets. A relationship of "n" dimensions (n-ary condition) can always be expressed as a binary relation by distributing the n sets over two groupings, and then defining the Cartesian space of these two groupings (sets) as the binary relation. It is in this sense that the diagnostician (e. g., "educational scientist") maps the n-profiles of an individual's cognitive style into the three sub-sets comprising the Cartesian product representing his style.

A function is defined to be a binary relationship. Therefore, the concept of function and that of mapping, as discussed here, are identical.

From equations (1) and (2) above, it should be noted that "g" is a function of s, e, and h; and that G is a function of S, E, and H. These facts were noted by including "Ø" (phi) to represent the functional relationships involved. These functional relationships permit the following notation to describe, with a minimum number of symbols, the process involved in: (1) the empirical mapping of an individual's cognitive style, and (2) the mapping of an augmented cognitive style. In this context, the notation in (4) describes the mapping of an individual's "style":

$$G \rightarrow g \qquad (4)$$

Where g denotes an individual's cognitive style derived from the "universal" set G composed of: 36,960 possible "profiles."

The cognitive style of an individual can be changed by the process of training and education. A cognitive style is considered to be changed at the training level of development when the individual exhibits behavior (e. g., responses to certain test variables, demonstration of certain physical actions) of his having acquired at least one or more elements in at least one of the sub-sets comprising his cognitive style.

This accomplishment can be noted by the expression shown in (5):

$$g \longrightarrow g_a \qquad (5)$$

Where g_a denotes the augmented cognitive style of the individual, and g is as previously defined in (4). This type of augmentation is defined to be training. When individual demonstrates behavior which indicates that he is employing the "augmented elements" of his "style" to accomplish educational tasks different from those used to effect the original augmentation of his "style," he is considered to be educated at a level of development higher than the one which was associated with his original cognitive style "g."

APPENDIX C

EDUCATIONAL SCIENCES ACHIEVEMENT TEST

TIP-T-1-73

NAME _____

D.C. I--P. G. 2

EDUCATIONAL SCIENCES TEST

1. _____ the technique primarily used for determining cognitive style.

2. _____ ability to exhibit a deliberate behavior.

3. _____ indicates deductive reasoning, or the form of logical proof used in geometry or that employed in syllogistic reasoning.

4. _____ The modality of inference employed by an individual who uses all three of the modalities (M,D,R); giving equal weight to each in this reasoning process.

5. _____ indicates the ability to synthesize a number of dimensions or incidents into a unified meaning, analogies.

6. _____ cross age tutoring.

7. _____ ability to synthesize a number of symbolic mediations into a performance demanding monitoring of a complex task or into an immediate awareness of a possible set of interrelationships between symbolic mediations.

8. _____ ability to perceive meaning through sight.

9. _____ ability to perceive meaning by the sense of touch and temperature.

10. _____ ability to find meaning in terms of numerical symbols, relationships, and measurements that are spoken.

A. CAT

B. Q(P)

C. Cognitive Style Mapping

D. Q(V)

E. Q(CS)

F. Q(T)

G. T(AQ)

H. (K)

I. L

J. Q(CKH)

11.	_____ ability to perform motor skills according to a recommended or acceptable form.	K.	R
12.	_____ personal knowledge of oneself.	L.	Empirical Mapping
13.	_____ a picture of the way a student derives meaning from his environment.	M.	Q(CH)
14.	_____ a form of "categorical" reasoning.	N.	I
15.	_____ ability to understand and to communicate by non-linguistic functions such as facial expressions and motions of the body.	O.	M
16.	_____ words and numbers created and used by individuals to acquire knowledge and derive meaning from their environment and personal experiences.	P.	Modalities of Inference
17.	_____ the family determinant stems from the influence of the group of persons an individual considers to be his family.	Q.	F
18.	_____ ability to find meaning from words you see.	R.	Q(CK)
19.	_____ youth tutor youth.	S.	Theoreticals
20.	_____ individuality influence.	T.	Q(CET)
21.	_____ indicates the manner in which a person reasons, or the way in which he infers--the third set or Science.	U.	Qualitative Code Transactional
22.	_____ ability to perceive meaning by the sense of taste.	V.	T(VL)
23.	_____ this pattern suggests a tendency to reason in terms of one to one contrasts or comparisons of selected characteristics or measurements.	W.	YTY

24. _____ identifies approaches to be used to develop map elements. X. D

25. _____ ability to respond or behave according to time expectations imposed on an activity by members in the role-set associated with that activity. Y. Q(S)

26. _____ commitment to a set of values a group of principles, obligations, and/or duties. Z. Qualitative Code Temporal

27. _____ ability to maintain a positive communicative interaction which significantly influences the goals of the persons involved in that interaction. AA. Prescription Writing

28. _____ ability to judge the physical and social distance that the other person would permit between oneself and that other person. BB. T(VQ)

29. _____ areas medium strength and weakness in the cognitive style map of an individual. CC. Augmentation

30. _____ indicates a student's tendency to use certain types of symbols, his ability to understand words and numbers, qualitative sensory symbols, qualitative programmatic, and qualitative codes. DD. Qualitative

31. _____ ability to acquire meaning in terms of numerical symbols, relationships and measurements in print. EE. Qualitative Code Proxemics

32. _____ a conceptual framework for the applied field known as education. FF. Q(O)

33. _____ ability to perceive meaning through the sense of hearing. GG. Mode of Understanding

34.	_____ the second set or Science--individuality, associates, and family.	HH.	Minors & Negligibles
35.	_____ a combination of elements necessary for understanding an educational process.	II.	Majors
36.	_____ strong places in a person's map.	JJ.	A
37.	_____ the associates determinant shows the influence on the meaning of symbols derived from the peer group or those with whom the student associates.	KK.	Symbols & their Meanings
38.	_____ strengthening minor or negligible elements.	LL.	Educational Sciences
39.	_____ sensory, programmatic and codes created and used by individuals to acquire knowledge and derive meaning from their environments and personal experiences.	MM.	Cultural Determinants
40.	_____ ability to perceive meaning through the sense of smell.	NN.	Q(A)
41.	_____ the process of searching for meaning.	OO.	T(AL)
42.	_____ Mission Statement, Design Criteria, Performance Goals.	PP.	Set
43.	_____ ability to enjoy the beauty of an object or an idea.	QQ.	Education
44.	_____ ability to acquire meaning through hearing spoken words.	RR.	Systemic Analysis Decision-Making
45.	_____ sensitivity to the feelings of others.	SS.	Q(CES)

46. _____ composed of four processes: a. recognition, b. retention, c. recall, and d. association. TT. Q(PK)

47. _____ ability to synthesize a number of symbolic mediations into a performance demanding the monitoring of a complex physical activity involving timing. UU. Memory Function

48. _____ persons, processes, properties. VV. Q(CEM)

49. _____ ability to synthesize a number of symbolic mediations into a performance demanding the monitoring of a complex physical activity involving motion. WW. Memory Concern Components

50. _____ a carefully defined collection of discrete elements. XX. Q(PTM)

APPENDIX D

PANEL OF EXPERTS: PREPARATION OF EVALUATION INSTRUMENTS

TEACHER IMPROVEMENT PROJECT

East Lansing Schools

Panel of experts who helped prepare the evaluation instruments.

Dr. Joseph E. Hill

Dr. Derek N. Nunney

Mrs. Barbara A. Bowman

Two elementary principals

Two elementary teachers

One media specialist

One resource teacher

One speech therapist

APPENDIX E

TEACHER ATTITUDE SURVEY

TIP-T-2-74 (modified) NAME_____

TIP TEACHER'S SURVEY SCHOOL_____

DIRECTIONS: In responding to the following questions, please circle the number that most closely indicates your feelings.

Low		Little				Some			High
1	2	3	4	5	6	7	8	9	10

---

1. To what extent do you feel that Cognitive Style Mapping has increased your ability to assess the ways in which students might be taught?

1 2 3 4 5 6 7 8 9 10

Comments:

---

2. To what extent do you believe that your utilization of the Educational Sciences has increased your effectiveness as an instructor?

1 2 3 4 5 6 7 8 9 10

Comments:

---

3. Has TIP helped you to be more effective in dealing with "Problem Learning?"

1 2 3 4 5 6 7 8 9 10

Comments:

---

4. Did you find that Cognitive Style Mapping enabled you to help problem students overcome their educational difficulties?

1 2 3 4 5 6 7 8 9 10

Comments:

---

5. Relative to prior school years, does it seem to you that your TIP students voluntarily complete more basic skills exercises than required?

1 2 3 4 5 6 7 8 9 10

Comments:

What value have the Educational Sciences had in facilitating instruction of the following types of students?

6. a. Slower achievers:

1 2 3 4 5 6 7 8 9 10

7. b. Average achievers:

1 2 3 4 5 6 7 8 9 10

8. c. Rapid achievers:

1 2 3 4 5 6 7 8 9 10

Comments:

---

9. Do you feel that the TIP students are achieving better now compared to how they achieved previously?

1 2 3 4 5 6 7 8 9 10

Comments:

---

10. As you implemented the Educational Sciences in your classroom, did you feel that your students increased their attention span in basic skills?

1 2 3 4 5 6 7 8 9 10

Comments:

---

11. Have you found the Educational Sciences effective in facilitating student instruction?

1 2 3 4 5 6 7 8 9 10

Comments:

How effective do you believe the Educational Sciences are in developing the students' own attitudes toward:

12. a. her/him self:

1 2 3 4 5 6 7 8 9 10

13. b. her/his peers:

1 2 3 4 5 6 7 8 9 10

14. c. her/his school:

1 2 3 4 5 6 7 8 9 10

15. d. her/his teachers:

1 2 3 4 5 6 7 8 9 10

Comments:

To what extent are the Educational Sciences effective in developing the following relationships?

16. a. student/teacher relationships?

1 2 3 4 5 6 7 8 9 10

17. b. student/parent relationships?

1 2 3 4 5 6 7 8 9 10

18. c. administrator/teacher relationships?

1 2 3 4 5 6 7 8 9 10

Comments:

---

19. Has TIP assisted you in effectively using volunteer helpers in your classroom?

1 2 3 4 5 6 7 8 9 10

Comments:

---

20. Have school/community relationships improved due to the implementation of the Educational Sciences?

1 2 3 4 5 6 7 8 9 10

Comments:

---

21. As an experienced TIP teacher, do you believe the Educational Sciences would be valuable in other school districts?

1 2 3 4 5 6 7 8 9 10

Comments:

---

22. As a result of the Educational Sciences, do you find you are now selecting and purchasing instructional materials differently?

1 2 3 4 5 6 7 8 9 10

Comments:

APPENDIX F

ADMINISTRATOR ATTITUDE SURVEY

TIP-A-1-74 NAME_____

TIP ADMINISTRATOR SURVEY SCHOOL_____

DIRECTIONS: In responding to the following question, please circle the number which most closely indicates your feelings.

Low			Little			Some			High
1	2	3	4	5	6	7	8	9	10

What value have the Educational Sciences had in facilitating instruction of the following types of students?

1. a. Slower achievers:

1 2 3 4 5 6 7 8 9 10

2. b. Average achievers:

1 2 3 4 5 6 7 8 9 10

3. c. Rapid achievers:

1 2 3 4 5 6 7 8 9 10

How effective do you believe that the Educational Sciences and Cognitive Style Mapping are in improving student attitudes toward:

4. a. her/him self:

1 2 3 4 5 6 7 8 9 10

5. b. her/his peers:

1 2 3 4 5 6 7 8 9 10

6. c. her/his school:

1 2 3 4 5 6 7 8 9 10

7. d. her/his teachers:

1 2 3 4 5 6 7 8 9 10

---

8. There has been a better teacher awareness of student instructional needs since we have become involved in Cognitive Style Mapping.

1 2 3 4 5 6 7 8 9 10

9. There has been a better student awareness of the instructional program since we became involved in Cognitive Style Mapping.

1 2 3 4 5 6 7 8 9 10

10. There has been a better parent awareness of childrens' educational programs since we have become involved in Cognitive Style Mapping.

1 2 3 4 5 6 7 8 9 10

To what extent are the Educational Sciences effective in improving:

11. a. student/teacher relationships?

1 2 3 4 5 6 7 8 9 10

12. b. student/parent relationships

1 2 3 4 5 6 7 8 9 10

13. c. administrator/teacher relationships?

1 2 3 4 5 6 7 8 9 10

14. Do you feel that involvement in TIP has helped you to become a more effective administrator?

1 2 3 4 5 6 7 8 9 10

Comments:

15. Did the "mapping" of parents help improve parent/school relationships?

1 2 3 4 5 6 7 8 9 10

Comments:

16. Has TIP had a positive effect on relationships among your teachers?

1 2 3 4 5 6 7 8 9 10

Comments:

---

17. Do you believe that the Educational Sciences would be valuable to other schools within our district?

1 2 3 4 5 6 7 8 9 10

---

18. Do you think it is valuable for teachers in the Middle School to be knowledgeable about the Educational Sciences?

1 2 3 4 5 6 7 8 9 10

---

19. Do you think it is valuable for teachers in High School to be knowledgeable about the Educational Sciences?

1 2 3 4 5 6 7 8 9 10

---

20. Do you believe that the implementation of the Educational Sciences would be valuable to other school districts?

1 2 3 4 5 6 7 8 9 10

Comments:

---

21. As a result of the Educational Sciences, do you find your TIP teachers more selective and discriminative in their selection and purchase of instructional materials?

1 2 3 4 5 6 7 8 9 10

APPENDIX G

REASONS FOR TEACHER WITHDRAWAL

REASONS FOR TEACHER WITHDRAWAL FROM THE PROGRAM

1. Too much paperwork--filling out evaluation forms and making out Educational Cognitive Style maps when I already have the information in my head.
2. This system doesn't seem to be any different from what I have always done, except give me a way of coding my observations.
3. I was told to participate because our school was one of the original schools receiving the grant from the Department of Education--my grade level was to be a part of the experimental program. I would have preferred to be given the choice to be involved rather than told.
4. I don't have time to observe all the behaviors in children the elements of Educational Cognitive Style suggest. I have to teach the basic subjects.

APPENDIX H

WORKSHOP FORMATS

SCHEDULE

8:30 - 11:30 and 12:00 - 3:00

FIRST WEEK

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
		8:30 General Introduction to Educational Sciences 10:30 Film 11:00 Small Groups 11:30 Lunch 12:00 Continue Small Groups 2:00 - 3:00 Q-Sort	8:30 Map Interpretation 9:30 Defining Teaching Style 10:30 Dr. Robert Docking on "Performance Objectives 11:30 Lunch 12:00 Research Design Pre-Test/ Post-Test 1:30 - 3:00 Small Groups Review	8:30 Mapping Children Empirically Slides 10:00 Dr. Hill 12:00 Lunch 12:30 Small Groups "Mode of Response by the Task" 1:30 Mapping Instructional Media 2:30 Loose Ends

SCHEDULE

8:30 - 11:30 and 12:00 - 3:00
SECOND WEEK

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8:30 Role Playing- Empirical Mapping	8:30 Coaching	8:30 Children	8:30 Small Groups	8:30 Children
9:30 Brenner-Gestalt Administration	9:00 Children		10:00 Children	
10:30 Small Groups - Plan Remainder of Workshop	11:00 Small Groups	10:30 SAS		10:30 SAS
11:30 LUNCH	11:30 LUNCH	11:30 LUNCH	11:30 LUNCH	11:30 LUNCH
12:00 Crystal Lange	12:00 Small Groups	12:00 Dr. Docking	12:00 Plan for	12:00 Dr. Joseph Hill
1:30 Practice Test Administration Brenner-Gestalt & Cognitive Style	Review Map and Matching	Dr. Barbara Ott 2:00 Small Groups	Children for Fall	

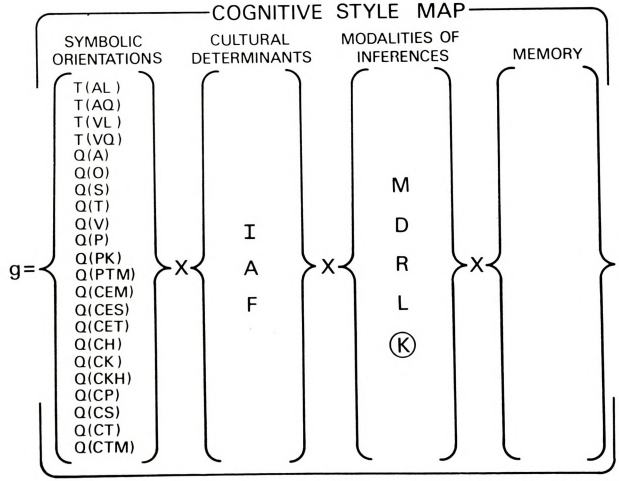
Monday, August 26	Tuesday, August 27	Wednesday, August 28	Thursday, August 29
Where it all began	Theoretical Underpinnings	Empirical Mapping	You and Empirical Mapping
8:00--8:30 Greetings/Introductions First Two Years in TIP (Brief History) 8:30--8:50 Film: "Personalizing Educational Programs Utilizing Cognitive Style." 8:50--9:05 Coffee Break 9:05--10:30 Seven Strata of the Educational Sciences 10:30--11:00 Discussion of packet of materials. First assignment: TIP Handbook Chapters 1-2-3. Answer questions on week's schedule.	8:00--9:00 Assignment: TIP Handbook Chapters 4-5-6 9:00--9:45 Discussion of First Science: Symbols and their Meanings. (Small groups) 9:45--10:00 Coffee break 10:00--11:00 Discussion of Second and Third Sciences: Cultural Determinants, Modalities of Inference.	8:00--9:00 Assignment: TIP Handbook Chapters 8, 10 9:00--9:30 TIP Staff Maps Two Children 9:30--9:45 Coffee break 9:45--10:15 Discussion of Mapping 10:15--11:00 View Mapping Slides for Review of Elements	8:00--9:00 Prepare for mapping. Assemble and become acquainted with students. 9:00--9:45 Map Students 9:45--10:00 Coffee break 10:00--11:00 Teacher and/or Teacher team reports
L U N C H			
You and the Educational Sciences	What it's really all about	We learn from each other	You and TIP
12:00--2:00 Taking the Interest Inventory or Mapping your Cognitive Style. 2:00--2:15 Coffee Break 2:15--3:00 Interpretation of Maps *Use any free time to read TIP Handbook or O.C.C. materials.	12:00--12:15 Assignment: TIP Handbook Chapters 7, 9 12:15--1:45 Individuals describe students they've known for group to practice identifying elements and prescribing. 1:45--2:00 Coffee break 2:00--3:00 Case Studies using Educational Sciences in classroom.	12:00--1:15 Socio-drama 1:15--1:30 Coffee Break 1:30--1:45 Empirical Mapping Statements 1:45--2:45 Small groups write Empirical Mapping Statements for their Grade Level or Subject 2:45--3:00 Sharing our Reports.	12:00--12:15 Slide Tape Presentation of Project 12:15--1:00 The Year Ahead 1:00--3:00 Evaluation of Workshop. Educational Sciences Test.

FORMAT DEVELOPED BY PROJECT STAFF

APPENDIX I

COGNITIVE STYLE MAP AND CASE STUDY

Student _____ Location _____ Soc. Sec. Number _____



Dr. Joseph E. Hill, President
Oakland Community College
Bloomfield Hills, Michigan

TEACHER _____ STUDENT Julie

SCHOOL _____ GRADE 4

STUDENT'S MAP

T(AL)	Q(V)	A	D
T' (AQ)	Q(CES)		
T' (VL)	Q' (CS)	F'	M^5
T' VQ)	Q' (CT)		
	Q' (CTM)	I'	---R---

OBSERVATIONS OR COMMENTS

1. Tunes out everything but what she wants to do.
2. No knowledge of schedule or timing.
3. Negative toward adults.
4. Test data--Stanford Diagnostic (4)--3.7

PRESCRIPTION

1. Work through strengths of A, Q(V), Q(CES), and D--leave options for D.
2. Pair association for reading and math.
3. Language Expression approach to reading--augment T(VL).
4. MSU Aide--have her read aloud to aide.
5. Math--300 CPL Basic Operations--pair association--augment T(VQ).

CHANGES IN MAP AND/OR PRESCRIPTION

T(VL)	Q(CS)		
T(VQ)	Q(CT)	I	M^6
	Q(CTM)		

Student is working alone now mostly except still reading aloud to aide.

More self-confident. More self-directed. Give her more independent work.

Reading improved. Enjoys reading now.
Stanford Achievement: Reading comprehension--6.2
(June 1975) Vocabulary--6.8

APPENDIX J

PRETEST ACHIEVEMENT DATA

TABLE J.1.--Pretest on Educational Sciences Achievement Test.

Teacher	Pretest		Posttest		Gain Score
	Score	Percent	Score	Percent	
S- 1	4	8	46	92	42
S- 2	6	12	50	100	44
S- 3	10	20	42	84	32
S- 4	13	26	50	100	37
S- 5	5	10	50	100	45
S- 6	17	34	50	100	33
S- 7	20	40	50	100	30
S- 8	0	0	50	100	50
S- 9	1	2	50	100	49
S-10	5	10	50	100	45
S-11	8	16	50	100	42
S-12	3	6	50	100	47
S-13	3	6	50	100	47
S-14	10	20	50	100	40
S-15	2	4	50	100	48
S-16	5	10	50	100	45
S-17	4	8	46	92	42
S-18	2	4	50	100	48
S-19	7	14	50	100	43
S-20	4	8	50	100	46

Average Gain Score = 42.75

TABLE J.2.--Pre- and Posttest Scores of Teachers Who Had Previous Knowledge of the Educational Sciences and its Application.

Teacher	Pretest		Posttest		Gain Score
	Score	Percent	Score	Percent	
S2-1	40	80	45	90	5
S2-2	45	90	50	100	5
S2-3	40	80	50	100	10
S2-4	43	86	50	100	7
S2-5	30	60	50	100	20
S2-6	35	70	50	100	15
S2-7	20	40	50	100	30
S2-8	42	84	50	100	8
S2-9	41	82	50	100	9
S2-10	36	72	50	100	14
S2-11	27	54	50	100	23
	Average Gain Score = 13.27				

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