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ABSTRACT

Elementary school teachers' perceptions of the Technology for Children Program (T4C) were the subject of this dissertation. The T4C program involved a learn-by-doing approach to language arts, science, mathematics and social studies instruction in elementary schools. The program invclved the development of "Episodes" or "Unit Kits" for teaching a variety of skills and concepts. Kits dealt with such areas as photography, bottle recycling, rocketry and weaving. The dissertation surveyed teachers' attitudes concerning three goals of the program: improvement in students' level of self-awareness, understanding of technology, and academic skills. A questionnaire was designed to explore attitudes towards these goals and was administered to 24 teachers selected randomly from first through sixth grade classrooms in the Bayonne, New Jersey, school district. Teacher ratings of 509 students indicated that the teachers perceived significant growth in children's self-awareness and understanding of technology, but not in academic skill development (in comparison with control groups). The dissertation also included an extensive literature review describing the development of the T4C program and surveying related projects in the United States and Great Britain. (BD)

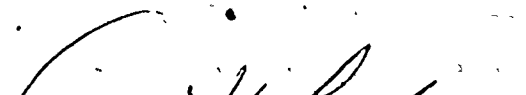
ABSTRACT

A STUDY OF TEACHERS' PERCEPTIONS CONCERNING THE EFFICACY OF THE TECHNOLOGY FOR CHILDREN PROGRAM

By

Michael A. Wanko

B.A. Jersey City State College, 1969
M.A. Jersey City State College, 1971
M.A. Seton Hall University, 1974



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A Dissertation Submitted in Partial Fulfillment
of the Requirements for the Degree of
Doctor of Philosophy

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ABSTRACT

The Technology for Children Program (T4C) is a hands-on approach to learning which was intended to be incorporated into a heavily academic atmosphere created by the post-Sputnick era. The Bayonne School District began the program on a small level during the 1972-73 school year.

A study was proposed during September, 1976 through June, 1977 to established teachers' perceptions of students under their tutelage concerning T4C. Specifically, the researcher was concerned with teachers' attitudes concerning the students' level of self-awareness, understanding of technology, and academic skills. These three areas were designed as goals of T4C by the New Jersey State Director of the Program.

The instrument for the study was a specifically designed questionnaire that sought to explore attitudes towards these three goals. A random selection of teachers and their respective classes was made and the Solomon 4-Group Design was utilized in formulating the study.

The results of the study indicated that teachers perceived significant growth in the first two of the three goals. However, no significant difference which could be attributed to T4C was indicated concerning the third goal between the control and experimental groups.

The researcher concluded that teachers perceived a higher level of self-awareness and understanding of technology on the part of their students after exposure to the Technology for Children Program. Also, due to the fact that academic skills were rated similar in both groups even if the treatment T4C was not introduced in the control classes, the researcher concluded that the entire T4C Program is of consequence and should be continued in the Bayonne School District.

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ACKNOWLEDGMENTS

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CHAPTER I

The Problem

Although the Technology for Children Program has been in existence for over ten years, there has not been literature dealing with the efficacy of the program from which educators could assess its value.

Many of the philosophies and concepts of the program seemed to parallel the Open Classroom, Child-Centered Learning and Individualized Instruction styles of education but unlike these styles, proponents of the Technology for Children Program claimed that the program affords the child a unique opportunity to experience many facets of learning not usually available in today's schools. Also, the design of the project allowed for implementation in an infinite number of ways, thus making the program potentially less obtrusive to the existing curriculum.

This study dealt with the problem of assessing teachers' perceptions concerning the efficacy of the Technology for Children Program.

Need for the Study

The Technology for Children Program was initiated in the Bayonne School System in 1973, seven years after its introduction in 1966 by the New Jersey Division of

Vocational Education. This "hands-on" approach to learning was intended to be incorporated into a heavily academic atmosphere created by the post-Sputnick era.

Schools provide a new phase of life for the child, and most parents and children alike expect new concepts to be learned. Unfortunately, the implication is when the child begins schooling he should put away childish things and begin his lessons. However, there exists a considerable shock of separation from the home and a period of accommodation seems appropriate.

> . . . the process of learning develops gradually and play continues to be of the greatest importance as a means of understanding and learning. If it is eliminated too soon the delight and pleasure of learning may go with it and drudgery take their place. Indeed the element of play is valuable in all work throughout life.[1]

One of the first educators most responsible for calling attention to the importance of play and the direct output of physical energy was John Dewey. His assertion that physical activity is a phase of whatever directly occupies the child, such as play and games, bolstered the Technology for Children philosophy.

> . . . it is not so much the objective facts, much less the scientific laws, that concern the child, as it is the direct manipulation of materials, and the application of simple forms of energy to produce interesting results. Much of the meaning of

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[1]John Blackie, Inside the Primary School (London, Her Majesty's Stationery Office, 1967), p. 33.

> art work with little children would also be lost, if we eliminated this aspect of the direct output of physical energy in realizing ideas. School gardens belong here, too. But it is of the manual training, the work with cardboard, wood, bent iron, the cooking, sewing, weaving, etc., that we have more directly to do. They so obviously involve modes of physical activity that the name used to designate them, "manual training," has been selected on this basis alone.[1]

Administrators in the Bayonne District believed that the students on the K-6 level could use improvement in the areas outlined as the three goals of the T4C Project.

Objectives:
1. Achieve better self-awareness
2. Develop a better understanding of technology
3. Attain a more meaningful level of academic skills.[2]

The researcher conducted a survey measuring teachers' perceptions concerning the efficacy of the Technology for Children Program (T4C). By the same token, the researcher provided the only existing account of the T4C Program, which should prove helpful to educators.

Children today are engulfed in a highly technological world; they must learn how to cope with that technology at an early age, but they should not learn purely from lectures or textbooks. Advocates of the T4C theory believed that

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[1]John Dewey, "The Place of Manual Training in the Elementary Course of Study," Manual Training Magazine (Chicago; University of Chicago Press, July, 1901, Vol. 2, No. 4), pp. 193-194.

[2]Fred J. Dreves, Basic Principles of Technology for Children (Trenton: Department of Education, State of New Jersey, October, 1973); p. 1.

there is no departure from our world of technology, and the sooner that children learn to cope with technology by experiencing it themselves, the easier the educational process will become.

> What this means in practice is that children in the T4C program learn language arts, science, mathematics and social studies by making things. Sixth-graders, for example, learn about music and about acoustics by building musical instruments and then by playing them. Kindergartners study language arts by making stick puppets and then using them to dramatize stories.[1]

This "learn by doing" concept was deeply interwoven into the T4C philosophy. It was anticipated that a child will remember and understand better if he is afforded the opportunity to explore in a learning situation, rather than be expected to absorb knowledge through osmosis. As an ancient Chinese proverb states:

> I hear . . . and I forget.
> I see . . . and I remember.
> I do . . . and I understand.[2]

Learning may be considered a type of play for the child, and many types of play are explorations of the physical world. Through play, the child attempts to discover how the world is related to his being. Technology for Children afforded the opportunity for a child to "play" or

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[1]Ian Elliot, "Occupational Orientation Means Work for You," Grade Teacher Magazine (Greenwich, Connecticut: CCM Professional Magazines, Inc., April, 1971), p. 64.

[2]"Ancient Chinese Proverb" (Anonymous), Cited in Introduction to the Elementary Science Study (Massachusetts: Education Development Center, Inc., 1966), pages not numbered.

explore through a hands-on experience in the classroom setting utilizing "Episodes" or "Unit Kits."[1] Naturally, this setting deviated from what was considered the norm. One section of the room might be divided into a cooking area episode, another a measurement area episode where the child can measure himself, others, or the weight of the bounce of a ball. A store might be located in another segment of the room, providing an episode which allowed children to "play" grocer and consumer. This interest-centered thematic approach lent itself well to initiating and supporting the child's way of learning.

The central activity in most nursery schools is play. This play activity is vital to the child's learning and usually becomes an integral part of the education process. Yet, many feel that children are wasting their time in school through play. These people are unaware that play during early childhood is one of the principle means of learning.

> It is the way through which children reconcile their inner lives with external reality. In play, children gradually develop concepts of causal relationships, the power to discriminate, to make judgments, to analyze and synthesize, to imagine and formulate. Children become absorbed in their play and the satisfaction of bringing it to a satisfactory conclusion fixes habits of concentration which can be transferred to other learning.[2]

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[1]See Appendix A.

[2]Central Advisory Council for Education (England), Children and Their Primary Schools (London: Her Majesty's Stationery Office, 1967), Vol. 1, The Report, p. 193.

T4C had as the basis of its philosophy not turning the child off to education, but rather, proponents of the program believed that this style of education was quite motivating to the child, and that this was what was lacking in many of our schools today - the joys of learning.

Charles Silberman completed a three and one-half year study of the public schools in conjunction with the Carnegie Corporation in which he stated:

> Most of all, I am indignant at the failures of the public schools themselves. The most deadly of all possible sins, Eric Erikson suggests, "is the mutilation of a child's spirit." It is not possible to spend any prolonged period visiting public school classrooms without being appalled by the mutilization visible everywhere--mutilation of spontaneity, of joy in learning, of pleasure of creating, of sense of self. The public schools--those "killers of the dream" to appropriate a phrase of Lillian Smith's--are the kind of institution one cannot really dislike until one gets to know them well. Because adults take the schools so much for granted, they fail to appreciate what grim, joyless places most American schools are, how oppressive and petty are the rules under which they are governed, how intellectually sterile and esthetically barren the atmosphere, what an appalling lack of civility obtains on the part of teachers and principals, what contempt they unconsciously display for children as children.[1]

Education must contain some process of learning that is meaningful and even pleasurable to the student. Jean Piaget believed that educators should present subject matter in accordance with the child's various stages of development and in harmony with his interests.

> The intellectual and moral structures of the child are not the same as ours, and consequently the new

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[1]Charles E. Silberman, Crisis in the Classroom (New York: Random House, 1970), p. 10.

> methods of education make every effort to present the subject matter to be taught in forms assimulable to children of different ages in accordance with their mental structure and the various stages of their development. But with regard to mental functioning, the child is in fact identical with the adult: like the adult, he is an active being whose action, controlled by the law of interest or need, is incapable of working at full stretch if no appeal is made to the autonomous motive forces of that activity. Just as the tadpole already breathes, though with different organs from those of the frog, so the child acts like the adult, but employing a mentality whose structure already breathes, though with different organs from those of the frog, so the child acts like the adult, but employing a mentality whose structure varies according to the stages of its development.[1]

A list of developmental tasks which extend from infancy through adolescence had been developed by Robert J. Havighurst. He defined middle childhood as that period from six to twelve years of age and divided this time into three thrusts; the first being the great thrust of the child from the home into the peer group, the second being the physical thrust into the world of games, and the third being the mental thrust into the world of adult concepts.[2]

> The development tasks of middle childhood grow out of these three thrusts of growth in the child.
>
> 1. Learning Physical Skills Necessary for Ordinary Games
> 2. Building Wholesome Attitudes Toward Oneself as a Growing Organism
> 3. Learning to Get Along with Age-Mates
> 4. Learning an Appropriate Masculine or Feminine Social Role

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[1]Jean Piaget, Science of Education and the Psychology of the Child (New York: The Viking Press, 1970), p. 153.

[2]Robert J. Havighurst, Developmental Tasks and Education (New York: David McKay Company, Inc., 1974), p. 19.

5. Developing Fundamental Skills in Reading, Writing, and Calculating
6. Developing Concepts Necessary for Everyday Living
7. Developing Conscience, Normality, and a Scale of Values
8. Achieving Personal Independence
9. Developing Attitudes Toward Social Groups and Institutionsl

Further justification for this type of interest motivated or independent activity was cited by Carl J. Wallen.

> Direct instruction and independent activities are complementary types of groups because each makes the other possible. Unless the teacher makes some provision for independent activities, she will not be able to instruct children as individuals or in small groups.[2]

Wallen stated that more productive goals can be accomplished through the use of independent activities. He felt that while the minimal purposes of having independent activities will have been met by allowing the child to pursue his interests, independent activities should be ideally suited for accomplishing the goals of self-control, creative self-expression, pursuing interests, and learnings requiring manipulation and experimentation.[3]

The goals established by Wallen and the tasks presented by Havighurst were closely interwoven with the goals of T4C. According to Fred J. Dreves, the State-wide Director of the T4C Project, the goals of T4C were threefold and a detailed breakdown was offered by him in 1973.

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[1]Ibid., p. 19-33.

[2]Carl J. Wallen, "Independent Activities, A Necessity Not a Frill," The Reading Teacher (Delaware: International Reading Association, December, 1973), p. 259.

[3]Ibid., pp. 260-261.

First, the T4C emphasis is on the child--the whole child--and not on the curriculum. Developmentally, children are aided to become thinkers; they come to know, first hand, their likes and dislikes, their interests and disinterests, and their abilities and inabilities. Rather than being subjected to additional curricular materials (even though these materials might bear the high interest factor of world of work) children as individuals are introduced to an interaction with many activities of a world-of-work nature. They develop intelligence dynamically by initiating an activity, thinking it through, observing and testing it.

Second, they interact with this part of the world, they don't just learn the little bit of information that results, but more important they learn how to interact. They learn how to learn. They come to see the significance of their learning.

Third, children are helped to become involved in activities from the world of technology - the world of work - not merely to equip them for a job or occupation therein but on a whole basis. They are helped to see that their career consists of understanding how people relate to people in everyday living and how they personally relate to this social scene. They come to understand they are free to accept, reject and/or modify the surroundings with which they come in contact.[1]

For many years, noted authors and educators have been aware of the need for a type of play activity, or learn by doing philosophy. These scholars also strongly argued the fact that the schools were not complying with the needs of the child. Many styles of learning or alternatives to the traditional mode of education have been developed and executed throughout history, but still educators are falling short of their goal. The education process must be constantly scrutinized and evaluated if each child is to

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[1]Fred J. Dreves, Basic Principles of Technology for Children (New Jersey: Division of Vocational Education, New Jersey Department of Education, October, 1973), p. 1.

reach his potential as a human being. This study will contribute to that evaluation procedure, thereby assisting in the educational process.

Purpose of the Study

This study explored the efficacy of the Technology for Children Program. Specifically, teachers recorded their perceptions of students under their tutelage in the following three areas: 1) Achievement of self-awareness, 2) Development of an understanding of technology, 3) Attainment level of academic skills.

The search of literature concerned itself with tracing the origins of the T4C concept through investigators and the program's creators, dealing with idealogies and rationales. Also, parallels between T4C and other styles of alternative educational systems were presented. It is intended that this study will provide an assessment of the Technology for Children Program for educators allowing them to further evaluate the program.

Design of the Study

A sample of twenty-four teachers was derived from 215 elementary school teachers employed by the Bayonne Board of Education, Bayonne, New Jersey. These teachers were then divided into two components.

The first of these components was composed of teachers who had completed the prescribed T4C training and introduced the variable T4C into their curriculum (population

97). From this component was derived the experimental group.

The second component did not possess T4C training and consequently could not introduce the T4C concept into their curriculum (population 118). From this component was derived the control group. Their instruction was conducted in the traditional manner throughout the entire period of the study (September, 1976 - January, 1977).

The teachers who participated in this study were chosen from their respective populations randomly according to grade level (two teachers per grade level; twelve in each sub-group). The grade levels which were utilized within the study were grades one through six.

Teachers in the experimental group utilized a selection of prescribed "episodes" or "unit kits"[1] in their instructions, and were required to keep a log as to the specific kits chosen and the number of times each particular kit was utilized.[2] This, along with observations by the T4C supervisor, ensured that the style of education being conducted by the T4C teacher truly espoused the T4C philosophy.

A questionnaire was pretested during the summer of 1976 by a sampling of teachers employed by the Bayonne Board of Education who were not involved in the study itself. Revisions were made in order to obtain all necessary data while requiring only a minimum of time on the part of the teachers

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[1]See Appendix A.

[2]See Appendix B.

to complete the questionnaire. (Number values were given to the ratings.)[1]

During the month of September, half of the teachers in the experimental group and half in the control group were issued a packet of questionnaires (one questionnaire for each student in the class) and a letter of transmittal.[2] The teachers then were asked to rate each of the students under their tutelage in the three areas outlined by Dreves as T4C objectives. The questionnaire was a five point attitude scale, and following common practice, the researcher placed the average reaction in the center of the scale and the most extreme reactions at the ends.[3]

At the end of a semester's time (January, 1977), a second questionnaire[4] or post-test, and letter of transmittal[5] were administered to the entire sample of teachers, both experimental (twelve) and control (twelve). Once again the teachers were instructed to rate each of their students concerning the three objectives of the T4C Program.

The design which was utilized within the study was termed the Solomon Four-Group Design which entails explicit

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[1]See Appendix C.

[2]See Appendix D.

[3]Mildred Parten, Surveys, Polls, and Samples: Practical Procedures (New York: Cooper Square Publishers, Inc., 1966), p. 190.

[4]See Appendix E.

[5]See Appendix F and G.

considerations of external validity factors. Its form is as follows:

R O_1 X O_2
R O_3 O_4
R X O_5
R O_6

. . . with experimental and control groups lacking the pretest, both the main effects of testing and the interaction of testing and X are determinable.[1]

A two way analysis of variance was carried out followed by planned comparisons using the t-test. The format of the 2 X 2 analysis was as follows:

	Non T4C	T4C
Pretested	O_4	O_2
Unpretested	O_6	O_5

These comparisons will indicate differences between groups concerning the effects of T4C and pretesting.

Limitations

This study was limited to the Bayonne School District, Bayonne, New Jersey. The grades from which the sample was derived were one through six, and out of eleven elementary schools, six were randomly chosen to participate in the study.

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[1]Donald T. Campbell and Julian C. Stanley, Experimental and Quasi-Experimental Designs for Research (Chicago; Rand McNally College Publishing Company, 1973), pp. 24-25.

A total of twenty-four teachers participated in the study and results of their professional ratings of the 509 students under their tutelage were presented.

While it is true teachers did the ratings, it is important to note that the researcher is concerned with teachers' perceptions of the T4C Program as it affected students. Furthermore, ratings of the child by the teacher provided the dimension from which conclusions could be drawn. For all during a teacher's training and throughout his ensuing career, judgments and evaluations must be made. Teachers are trained in evaluative procedures and deal with rating students daily. Therefore, even though teachers provided the ratings upon which the data is based, certain assumptions about the efficacy of the T4C Program could be drawn.

The time span of the study was limited to one full semester. Questionnaires were administered during early September, 1976 and early January, 1977.

Definitions

Technology for Children . . . an organized approach to provide children with individualized experimental learning and opportunities to develop interests and self-awareness. Against a classroom back-drop of technological world-of-work activities, teachers thoroughly integrate the traditional curriculum through thoughtful consideration for the needs of individual pupils.[1]

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[1]Dreves, Basic Principles, p. 1.

Technology for Children. . . . an elementary school K-6 statewide program which reflects a view of childhood. It draws upon technology to enlarge and alter the learning options for children.[1]

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[1]Laddie Gribick and Wesley Perusek, Getting Started T4C in the Classroom (Trenton: Division of Vocational Education, New Jersey State Department of Education, Summer, 1973), p. 2.

CHAPTER II

Review of the Literature

The review of the related literature was divided into two major sections. The first was a historical account of the Technology for Children Program, which traced its development from its inception in 1966 up to 1976. This section was followed by literature which dealt with the specific rationale of the program and the comparison of parallels which existed between T4C and other alternative styles of education.

Early in the development of the project, the following information explaining the T4C Program was offered by Dr. Fred J. Dreves, Director of the Project.

> Technology for Children is an elementary school curriculum, new in its relevance to society by virtue of its primary focus on modern technology and occupational implications, and old because of its sine qua non "learning by doing." It has been developed by the Division of Vocational Education in New Jersey to provide elementary teachers with a means of introducing world of work concepts and modern technology into their classrooms. It purports to provide another "bridge between school and earning a living for young people" to quote the language of PL 90.567 Vocational Education Amendments of 1968.[1]

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[1] Fred J. Dreves, Implementation of Technology for Children Curriculum in New Jersey Elementary Schools (Trenton: New Jersey Department of Education, Bureau of Occupational Research Development, Division of Vocational Education, March, 1970), p. 1.

Historical Background

Technology for Children began as the brainstorm of Elizabeth Hunt in 1966 after the Assistant Commissioner, Division of Vocational Education, Dr. Robert M. Worthington, requested that a systematic program be set up in order to encompass kindergarten through twelfth grade in the area of Career Education. Hunt was an elementary Industrial Arts supervisor who made a proposal and named it T4C, incorporating a hands-on-approach to learning in a heavily academic atmosphere created by the post-Sputnick era.

> The primary objective of T4C was to enhance the learning process at the elementary level by introducing tools and technological activities into the classroom, and to provide elementary school children with a better understanding and appreciation of their future career role.[1]

Children were not getting the "real world" type of experience in school and this program being directed to the nature of the child was material centered on "now" student activities rather than on "for later" learning.

The proposal was accepted by the State and a $166,000 Ford Foundation grant was awarded for a staff of six to develop this idea. Each summer (1966-68), approximately 25 to 30 teachers were trained in this philosophy at the summer institute located at Camp Kilmer, Edison, New Jersey. At this summer session teachers tried different physical experiences (action

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[1]Fred J. Dreves, Technology for Children (New Jersey: Division of Vocational Education, New Jersey Department of Education, July, 1972) p. 1.

activities for the classroom). These summer institutes actually were T4C activity demonstration centers. Upon completion of this training, they received a tool board and supplies to bring back to their classes.

In 1969, Hunt left the project and Dreves took over as its Director, instructing the teachers to keep anecdotal notes on students in their program. These case studies were analyzed in terms of content, outcome, and attitudinal acceptance to the elementary curriculum. It was noted that a child would learn math even though it was not the programmed area to be covered, but the knowledge was gained by an experience in rocketry, making kites, or building stilts. Thus, it became evident to the teachers that a child's learning could be facilitated by actually experiencing a concept rather than by just being exposed to ambiguous terminologies.

During this period, a second Ford Foundation grant was issued for another three years in the amount of $303,460, in order to move this approach into more schools, especially the urban areas covering each of New Jersey's twenty-one counties. But due to the absence of records concerning the project, there was a great concern that the program would become an "add on" rather than an approach to learning --"a way of working with students" - or a style.

Integrating this new aspect into the curriculum had some drawbacks such as: teachers coming from a traditionally based classroom to more of an individualized or child-

centered approach; teachers who were secure in a subject centered curriculum now were to be involved in a kind of nebulous concept; and the disarrangement of a structured seating plan to that of clustered groupings. But the majority of teachers involved had a most positive reaction and because of this support, the team was able to forge ahead.

> The Aerospace Education Foundation awarded the Technology for Children Project a Medal of Achievement at the 1970 National Laboratory for the Advancement of Education. During the summer of 1970, the United States Office of Education awarded the project an Education Professions Development Act Grant for the training of twenty New Jersey elementary supervisory personnel. In the fall of 1970, Governor Cahill's Career Development Vocational Pilot Project created the establishment of three entire elementary Technology for Children schools in Camden, New Brunswick, and Rahway.[1]

Materials continued to be distributed to the classrooms, but many teachers were not properly trained in their correct use and consequently, an "artsy crafty" stigma was attached to the program, causing administrative and teacher support to dwindle.

The State administrators felt that a substantial amount of money had been poured into the schools on this program and they were optimistic concerning its potentials. Therefore, during this era, matching money was made available by the State to local districts for their T4C Program. When a district allocated a certain amount of money, the matching funds from the State allowed for more teacher training, supplies, and college credit for training.

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[1]Robert Worthington, "A Special Message," T4C Happenings. Vol. 4, No. 1, January, 1971. (Pages not numbered.)

> To further assist the teachers and to aid in training new T4C teachers, the T4C staff in cooperation with experienced practitioners prepared forty-seven instructional units for use as curriculum models. These "Episodes," as they were called, provided necessary directions for the successful introduction and implementation of selected technological activities into the classroom.[1]

The range of these exposures began at the very simple and extended to the fairly complex. A simple exposure could be kindergarteners pounding nails into a board making a trivet (thus showing the child the proper handling of the tool and special relationships). While a fairly complex exposure could be a sixth grade class writing out a script and then performing the finished product for a video tape crew of their peers (teaching the technology of video taping plus language arts and social interactions). Even though these "Episodes" were designed to be utilized in one of the major academic subject matter areas providing for flexibility, it was found that the T4C teacher, on becoming more effective in the implementation of the program, the more the "Episodes" became merely source materials for ideas.

> One of the few rules given T4C teachers is that they must select episodes for their academic value rather than for their technical importance. No one says a teacher must have her children make an electric buzzer for the store, any more than she must have them build a store in the first place. The teacher uses an episode only when it serves a purpose, and if the supplied episode doesn't serve the purpose she has in mind, she's free to think up her own.[2]

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[1]Dreves, T4C, p. 2.

[2]Ian Elliot, "Occupational Orientation Means Work For You," Grade Teacher Magazine, (Greenwich, Connecticut: CCM Professional Magazine Inc., April, 1971), p. 80.

In order to help spread the concept faster, the school commitment had to be expanded. This expansion was achieved by the formulation of four teams representative of the total educational community - Administrators, Teachers, the Curriculum-Developers, and the Community in the participating district.

1. Administrators - this segment included the Superintendent, the Board of Education, and pupil personnel services.

2. Teachers' - a committee of teachers who were responsible for the teacher-training program, including a three day release time orientation.

3. Curriculum-Developers - their job involved placement of the proper emphasis on the most effective personal development of the individual. Here attention was to be given towards the best of self-awareness rather than to program development.

4. Community - representatives of the world-of-work society who would relate and react to the program.

By July of 1972, the Technology for Children Project was spread to 577 New Jersey elementary classroom teachers from eight rural districts, fifty-six suburban districts and the fourteen urban districts of Asbury Park, Bridgeton, Camden, Carteret, East Orange, Montclair, New Brunswick, Newark, Orange, Rahway, Salem, Secaucus, Trenton, and Vineland.[1]

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[1]Dreves, T4C, p. 8.

The program continued to grow with additional support coming about in 1973 when "The Open Classroom Reader" carried a passage which depicted an open classroom. Descriptions were given explaining that an open type of setup is a disorienting experience for anyone accustomed to the traditional formal school. The familiar rows of desks are replaced by interest areas and the child is afforded individualized instruction.

> The arithmetic area (or "maths area," as the English call it) most likely will have several tables pushed together to form a large working space. On the tables, in addition to a variety of math texts and workbooks, will be a box containing rulers, measuring tapes and sticks, string, and the like; other boxes, containing pebbles, shells, stones, rocks, acorns, bottle tops, and anything else that can be used for counting; several balance scales, with boxes of weights as well as more pebbles, stones, rocks, feathers, and anything else that can be used for weighing.
>
> Somewhere in the room (probably near the art area), there will be a table, or perhaps several cartons on the floor, containing blocks, Tinkertoys, "junk" (so marked), i.e., empty cereal and soap boxes, egg cartons, the rollers from used-up rolls of toilet paper and paper towels, pieces of wood and cardboard, scraps of wallpaper and fabric, oaktag, cigar boxes--anything children might use for constructing airplanes, trucks, cars, steamrollers, robots, spaceships, houses, office buildings, bridges, or for making collages or murals.[1]

It became evident that the British Open Classroom's use of interest centers such as separate areas for math and construction, and New Jersey's use of "Episodes" such as; Weights and Balances (math) and Cardboard Carpentry

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[1]Charles E. Silberman, ed., The Open Classroom Reader (New York: Vintage Books, 1973), pp. 295-296.

(construction) were in concert, and in fact actually paralleled each other.

During the 1974-75 school year, the ever increasing number of teachers requesting T4C information became so great that the training center at Edison became overburdened; consequently, the State Department began encouraging local training.

> Because of the many numbers of people and schools involved, we are no longer able to train T4C teachers at Edison. More than ever before, we are convinced that "hands-on" learning experiences are invaluable to both beginning and experienced T4C teachers. Therefore, we are urging you to send one or two teachers from each T4C unit to Edison to receive our help in preparing and conducting "hands-on" workshops for your teachers.[1]

After urging administrative teams to direct special attention towards accountability, Dreves went on to affirm the need for local teacher centers:

> A primary goal of all T4C units this year should be to set up a teacher center -- a facility wherein teachers can together work on curriculum material development. Models of teacher centers exist in Princeton, Lakewood, Parsippany-Troy Hills, and Camden, and are proving to be most beneficial to teachers.[2]

It is interesting to note that the central staff, both in Trenton and in Edison, asked all T4C personnel to dedicate themselves to . . . "the more comprehensive

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[1]Fred Dreves, T4C Happenings Vol. 8, No. 1 (New Jersey: Division of Vocational Education, New Jersey State Department of Education, September, 1974), p. 1.

[2]Ibid., p. 1.

elementary school education"[1] . . . during the upcoming year (1974).

> "More Comprehensive" means: (1) using interesting activities that relate to the world of work, and at the same time, also "turn on" a greater percentage of our pupils to school. This then makes them become more responsible for their learning; (2) reflecting the classroom's growing attention to newer technologies, and; (3) developing academic skills by their practical utilization will increase meaningful situations.[2]

This passage can be broken down into the three goals of T4C which were outlined by the Statewide Director in a special paper at the beginning of the previous school year.

> Objectives:
> 1. Achieve better self-awareness
> 2. Develop a better understanding of technology
> 3. Attain a more meaningful level of academic skills.[3]

During the following school year (1975-76), a directory of the New Jersey T4C schools was distributed to all districts in order to afford specific districts the opportunity to contact programs within close proximities. This directory facilitated more feedback and exchanges between participating districts. There were now 289 districts spanning twenty-one counties active in the T4C Program.

Technology for Children Listing
1975-76

County	# Districts
Atlantic	16
Bergen	31
Burlington	20
Camden	19
Cape May	4
Cumberland	11

[1]Dreves, T4C Happenings, p. 1.

[2]Dreves, Basic Principles, p. 1.

[3]Ibid., p. 1.

County	# Districts
Essex	8
Gloucester	16
Hudson	8
Hunterdon	18
Mercer	6
Middlesex	13
Monmouth	24
Morris	23
Ocean	11
Passaic	8
Salem	14
Somerset	8
Sussex	12
Union	10
Warren	9
Total Listing	289[1]

In addition to this listing, regional chairpersons for 1975-76 were also included in the directory with an outline of their functions.

FUNCTIONS:
1. Planning and Conducting Meetings for Regional Supervisors.
2. Provides Leadership for Regional Dissemination of Information.
3. Performs Other Regional Leadership Functions as Necessary.

TERM: One Year[2]

The T4C Program had come a long way from its humble beginnings in 1966. Its philosophy was being accepted by ever increasing numbers of educators who were interested in and anxious to achieve individualized student learning. The small teacher-training groups at Edison had now become satellites, and like amoeba, began reproducing their kind.

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[1]Bureau of Special Programs, Directory of New Jersey Technology for Children Schools (New Jersey: Department of Education, Division of Vocational Education 1975-76), p. 2.

[2]Ibid., p. 2.

Throughout the State, educators were reminded that there was no minimal body of knowledge necessary for all children to learn, but rather each individual student should be helped to find an area of interest upon which his strengths and successes could be developed.

Rationale

The Technology for Children Program was designed to serve the best interest of the child. Naturally, all children were to be involved in this matrix which provides educators with another way or style to bring basic educational concepts successfully to the largest proportion of students.

Most teachers agreed that excellence in basic academic skills is of initial importance to education in order for a person to function in present society. Since most agreed that these basic goals are valid (3 R's), the next concern should be directed toward discovering the proper avenues along which children should travel in order to achieve these goals. Stating that the T4C concept was the "only" or the "best" way for all would be a statement of high educational bigotry. For if a certain method or style of teaching works in a given situation, it would be of consequence. This variety in the field of education helped to keep practitioners abreast as to better ways of learning. T4C allowed the child to follow his natural instincts of discovery. The teacher acted in a guiding capacity allowing

the child to follow his innate instincts of discovery. Naturally, teachers could not be knowledgeable in all areas, but by using the technique of direction, they could inform the child of the proper methods of seeking out the information needed.

These multi-centers of activity called T4C afforded the teachers with still another option in this age of individualized instruction, providing a learning sequence designed to meet the specific wants or needs of the student. It is important to note that the child or "learner" was the person directed by the teacher consultant to assume the leadership role in the process of learning. This curriculum design placed the emphasis of learning on the child with both method and content included. T4C should not be mistaken for a mere course or subject which is to be incorporated in the existing curriculum, but its scope should be recognized for what it is ..."an organized approach to provide children with individualized experimental learning and opportunities to develop interests and self-awareness."[1]

The program's task, therefore, was not to provide final solutions for all problems, but rather to equip students to face life and its problems effectively and intelligently. The skills necessary for obtaining and using

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[1]Dreves, Basic Principles, p. 1.

knowledge should be one of the end results of T4C as well as a desire and respect for knowledge. Along with these would come competence in language, formation and communication of ideas, and the ability to read and write.

This concept of problem solving is particularly vital in our society, for rather than the student learning facts that are detailed and which soon may be forgotten, basic intellectual and technical skills are of far more worth than the mastering of a single specialized technique. Now, evermore, when economic demands of business and industry are changing rapidly and the practice of mobility in vocation, with higher interest in avocation, seems to be the accepted mode of behavior, knowledge and reason must be at the basis of our educational goals.

Proponents of the program believed that through T4C, the child will have acquired a more meaningful level of academic skills, plus a better self-awareness due to his exposure to technology. Also, the concept of self would be developed in a most positive way and self-respect will be achieved. This strong self-concept should develop due to the child's ability to actively explore his own interests and the related learning experiences acquired during this exploring period.

The child in T4C was involved in active, hands-on participation and was encouraged to spend a portion of the

school day in the pursuit of his own individual interests. This type of program recognized and fostered all natural drives of a child and his innate curiosity and exploratory behavior, providing positive steps to develop them relatively separate of adult intervention.

> Technology for Children recognized that all youngsters, particularly those less able to verbalize and less adept at grasping abstractions, can learn more of the content of general education if it is introduced as it would be applied in occupational situations. T4C integrates work and technological concepts into the traditional academic curriculum as continuous, rather than sporadic activities. The sights, sounds and physical activity associated with "hands-on" experiences improve the student's comprehension and retention of classroom experiences and hold the interest of the student for longer periods of time.
>
> Under the guidance of the elementary teacher, students are organized in small groups, each of which selects a group project or some aspect of a class project relating to technology.[1]

These small groups encouraged discussions and constituted the working unit allowing for increased self-expression, and vocabulary.

T4C's rational could be further explained through examination of the student's role as it related to the project.

> Under the Technology for Children program, the student learns as early as possible how man has employed technology in solving the problem of his needs.

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[1]Robert A. Woodford, "Classrooms: Tooling Up," New Jersey Business (New Jersey: Manufacturers' Association) Trenton, February, 1971, p. 19.

> The ever-evolving nature of technology demands complete facility in problem-solving abilities with tools, machines, materials, and concepts as they relate to technology.[1]

The teacher's role in the T4C program must be akin to the British Open System. An explanation of the teacher's role in terms of the learning process can be stated succinctly.

> To achieve this type of learning, teachers are trained to "unrestrict" and unstructure their classrooms much like the British Open System. Creating a dynamic and stimulating environment is basic to this philosophy.[2]

In order to allow children to attain a more meaningful level of academic skills through T4C, the philosophy behind the open education movement shoud be explored. Charles E. Silberman stated:

> Indeed, the "free day" or "informal education" to use a more inclusive term, is less an approach or method than a set of shared attitudes and convictions about the nature of childhood, learning, and schooling. Advocates of informal education begin with a conception of childhood as something to be cherished, a conception that leads, in turn, to a concern with the quality of the school experience in its own right, not merely as preparation for later schooling or for later life.[3]

British education has served as a sort of bandwagon for American education and in certain circles, the terms "open plan" and "open school" seemed to be the correct edu-

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[1]Richard Harnach, and Flory Naticchia, "Children and the World of Work," N.J.E.A. Review, Vol. 44 (September, 1970), p. 22.

[2]Ibid., p. 22.

[3]Charles E. Silberman, Crisis in the Classroom (New York: Random House, 1970), p. 208.

cational policy. But Americans should examine England's educational policies realistically and adapt only aspects which fit their local situation. For British Approaches are not the end-all or be-all of educational success. Consequently, by exercising stringent demands on the selection process an educational program could be designed which would meet local objectives. This is what T4C also advocated, educators should examine and select aspects of the program which supplement educational gaps. A further examination on the parallel which exists between the two concepts can be noted in an article by Thomas C. O'Brien.

> A random look at classroom activity gives a clear evidence of the organic nature of primary education. Children's activity is simply not neat and orderly, at least from the point of view of the lay adult. Children walk around; they ask questions of one another, of the teacher, and of visitors. They are doing--weighing things, reading books, tossing coins in a probability experiment, pouring liquids, sometimes just walking around looking at other children's work--rather than listening to knowledge poured forth by a teacher. (The teacher, of course, is at the heart of things, having planned the experiments and the projects. Some teachers plan each night for each pupil's work the next day.) Classrooms are anything but antiseptic. Water and paint are out and in use, and, of course, things get spilled. With no undue distress, children clean things up and go on with their work.[1]

Upon examining this passage, one could not ascertain if it was written concerning T4C or the British Open System. O'Brien wrote this passage as part of his obser-

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[1]Thomas C. O'Brien, "Some Comments on British Education" The Elementary School Journal (Chicago: University of Chicago Press, October, 1974), p. 48.

vations, anecdotes, and reactions resulting from a three month exploration of British educational approaches.

It became evident that this type or style of education was a very valid way of teaching the young. T4C allowed for classroom experiences to contain occasion for various learning activities. This concept has been noted as a prime means of reducing pressures on the child.

> What seems to be required for a proper growth of respect for the requirements of problem solving is a "defusing' of intellectual activity from the demands of immediate action, affect and drive . . . Such a defusing depends upon a child's having the conditions necessary for playfulness to develop, upon his having an adequate competence model, and upon the experience of intrinsic reward from increased competence that can start a career of "learning for its own sake."[1]

T4C provided exactly this type of climate for the learner. The episodes were rich in manipulative materials and designed to be appealing for the pupil. The pupil's interests rather than the teacher's demands and the need for immediate solution, were the moving forces in the quest for learning, thus eliminating the pressure on the child.

> Learning that depends on goals set entirely by teachers is goal centered and often puts pressures on students to produce immediate results. These pressures can be reduced by appropriate classroom organization.[2]

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[1]Jerome S. Bruner, Towards a Theory of Instruction, (New York: W. W. Norton & Company, Inc., 1966), p. 147.

[2]Stephen V. Dillon, David D. Franks, & Joseph Marolla, "In Defense of Playfulness," The Elementary School Journal (Chicago: University of Chicago Press, January, 1975), p. 210.

Whether they are called learning centers, interest centers, or, episodes, they strive for the same goal - the desire to learn. This desire to learn is what educators are to produce in the students if true intelligence is the goal of modern educators.

The emphasis of much of traditional education was based on the humanities and mathematics. The child was not afforded the opportunity to experiment. Rather the child was an observer, watching the demonstration of experiments conducted by his teacher. This method of providing experimental training by introducing the student to the results of past experiments or observations of the teacher was attacked by Jean Piaget in his work, Science of Education and the Psychology of the Child.

Piaget made an analogy of the child's type of learning in schools to that of the ability of learning how to swim; ". . . as though it were possible to sit in rows on a wharf and learn to swim merely by watching grown-up swimmers in the water."[1]

T4C advocated this same "learn by doing" theory. The child was afforded the opportunity to explore, through the use of episodes, and experimentation by himself. The child explored through the manipulation of materials and

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[1]Piaget, Science of Education, p. 50.

recorded in his mind the results of these efforts. By this method, the child experienced the spirit of invention rather than the training of repetition of past experiments, thereby developing intelligence.

> It is true that this form of instruction by lecture and demonstration has often been supplemented by laboratory work by the students, but the repetition of past experiments is still a long way from being the best way of exciting the spirit of invention, and even of training students in the necessity for checking or verification.
>
> In which case, if the aim of intellectual training is to form the intelligence rather than to stock the memory, and to produce intellectual explorers rather than mere erudition, then traditional education is manifestly guilty of a grave deficiency.[1]

Wesley Perusek, a Research Associate for the Technology for Children Program, had many interesting comments concerning the philosophy of the British Open System and the T4C Program. He believed that although the word technology did not appear in the literature regarding open education, it was central to the infant and junior school practice. For example, he stated that "technology derived from history establishes the range of accumulated environmental information and knowledge and the techniques for developing, modifying and extending it."[2]

Thus, technology became a primary human resource providing the children with environmental experiences ob-

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[1]Ibid., p. 50-51.

[2]Wesley Perusek, "Open Education and Technology for Children," T4C Happenings, 3:2 November/December, 1969. (Pages not numbered.)

tained through their play. Used in this sense, technology was not representative of an area of human achievement which was to be divided and studied by the child. Technology, therefore, was akin to a reservoir from which the child could draw.

> Both our understanding and our technology change accumulatively, reflecting the dynamic character of each. Anthropologists report that new technology was often the cause of man's development rather than the result of it. In the literature, open education gives evidence of this view of technology.[1]

A diary account by Mary T. Garry depicted a primary school in a slum section of South London. She gave an account of how the school, under the direction of a new Head, Mrs. Kay, instituted what Kay called "our free way of working."[2]

> The room I'm in, and it's similar to the others, is divided into areas by low, two-shelved bookcases and by corrugated paper roll, attached to the backs of tables, or to what looks like clothing racks strung together. There are several desk clusters, a sand table, a water table, a play house in the corner, a puppet box, painting and construction tables over by the sink. One floor area is large enough to hold the whole group, with a rug, small foam mattress and chairs, and books on shelves and holders on a peg board wall. There is no blackboard.[3]

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[1]Ibid., p. 2.

[2]Mary T. Garry, Internship in a Primary School (U.S.A.: National Association of Industrial Schools, 1972), p. 5.

[3]Ibid., p. 10.

Garry further described the various materials which were found in certain sections of the room. There was a math area which possessed scales, objects to be weighed, measuring devices such as tape measures and rulers, and geometric shapes and puzzles. T4C also made use of a measurement area through use of the unit termed Weights and Balances[1]; in addition, this unit contained all associated elements such as cuisennare rods, weighing scales, and objects to weigh and measure. T4C took this concept one step further by adding Symmography[2] which afforded the child the opportunity to create a visually appealling design while employing the concepts of mathematics.

The primary school in South London also had sections for reading and construction, again a parallel to the American T4C concept. The difference here was in the fact that the London school used for construction things such as blocks, cardboard tubes, and sticks. The T4C Program made use of these small items and added 4' x 8' sheets of cardboard (tri-wall) from which the students could actually build classroom furniture.

Not only were philosophies of different styles of education occurring in England that closely paralleled the T4C happenings in New Jersey, but similar alternatives to

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[1]See Appendix A.

[2]See Appendix B.

education were also being sought in the states of Washington, Vermont, Iowa, Florida, North Dakota, South Carolina, and Connecticut. This literature suggested that a movement was taking place in many school systems, not only abroad, but in the United States as well, that expanded the traditional structures, allowing for individual differences, and transferred them into an integrated approach designed to meet the needs of all students.

> Alternative education perhaps should be changed to alternatives in education. We should work on the questions, the strategies and the means of assessment in relation to the general goals of education. We need to consider ourselves not as maverick educators creating something outside the system, but rather as educators working within the system to make it more responsive to the needs of all students, introducing students to new horizons, and enabling students to have a significant role in determining their futures.[1]

These comments were made by Janet Taggart in 1972 concerning an Alternative Education Workshop held in Issaquah, Washington. The "alternatives in education" of which she spoke allowed for a greater expansion of a student centered type of education, permitting fuller achievement of personal development on the part of the student.

The State of Vermont in 1969 proposed a Design for Education representing the State Department of Education's position on the process of education. Within this design, education was viewed as a process conceived to benefit the

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[1]Janet Taggart, Washington State's Alternative Education (Olympia, Washington: Washington Office of the State Superintendent of Public Instruction, 1972), p. 8.

learner. The individual was the central focus of the learning process and his feelings deserved much consideration. Desire to learn was also accentuated, allowing the child to fill gaps in his knowledge by discovering answers for himself.

As with the T4C concept, the Vermont Design also provided for the need to succeed. For if a series of failures is allowed to continue in school, a negative self-image could develop in the child. By providing a school setting which was flexible and divergent enough to allow each child to experience success, the self-image would improve.

Discovery learning through real experiences was also cited as a meaningful learning mode. Early childhood provides the best opportunity for learning through exploring, testing, and manipulating. Naturally, this type of experience should be afforded to the child within the confines of the school, for it is far more meaningful to a child to see the relationship in a numerical system expressed in concrete objects which he can manipulate, rather than a nebulous set of numbers in a textbook.

The following is an outline of the premises of the Vermont Design which most closely paralleled the New Jersey's T4C Program.

1. The Emphasis Must Be Upon Learning, Rather Than Teaching.

2. A Student Must Be Accepted As a Person.

3. Education Should Be Based Upon the Individual's Strong, Inherent Desire to Learn and to Make Sense of His Environment.

4. All People Need Success to Prosper.

6. Emphasis Should Be Upon a Child's Own Way of Learning - Through Discovery and Exploration - Through Real Rather Than Abstract Experiences.

7. The Development of an Individual's Thought Process Should be Primary.

9. An Individual Must be Allowed to Work According to His Own Abilities.

10. The Teacher's Role Must be That of a Partner and Guide in the Learning Process.

11. The Development of a Personal Philosophy, A Basic Set of Values, Is Perhaps One of the Most Important of Human Achievements.

16. Schools Should be Compatible with Reality. Learning Which is Compartmentalized into Artificial Subject Fields by Teachers and Administrators is Contrary to What is Known About the Learning Process.[1]

The preceding student-centered philosophy seemed to closely match the rationale of TAC which was developed in 1969. The concept of the teacher's role changing from the authoritative imparter of knowledge to a facilitator, one who acts as a resource person guiding the student into self-discovery, was a major element in both philosophies. Also, the de-emphasizing of rote learning so that facts can become building blocks for generalities and processes was

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[1] Vermont State Department of Education, Vermont Design for Education (Montpelier, Vermont: Vermont State Department of Education, 1969), pp. 2-18.

evident throughout both programs.

Although these programs share many common elements, the Vermont Design did not specifically suggest that a program such as T4C be set up, rather the philosophy was to serve as a guideline directed towards the improvement of education. One of the ways outlined in order to implement the Vermont Design paralleled a concept of T4C exactly.

> F. Students Must Be Provided with a Stimulating Environment Consisting of a Wide and Appropriate Selection of Challenging Equipment. Materials, and Reading Matter Suited to Their Particular Interests and Ability Levels.
>
> Equipment need not be particularly expensive or elaborate - often those items made by the teacher or students are best suited. The equipment should not be classified according to subject matter, such as math or science, but students shoule be allowed to develop and use equipment for a variety of purposes. Schools must be prepared to support teachers by providing at least a minimum of basic equipment and materials appropriate to encourage the kind of learning compatible with this philosophy.[1]

Project Impact, which was a locally initiated federally-funded concept in Polk County, Des Moines, Iowa, presented still another parallel to New Jersey's T4C Program. Through what Polk County educators called "Creativity, Discovery Learning," the students were to become more self-reliant.

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[1]Ibid, p. 22.

> . . . the student's role in discovery learning prepares him for becoming an autonomous learner - one who can satisfy his own needs for information, understanding and intellectual stimulation. He develops an image of self-capability and individual accomplishment. He is a product of a learning environment which allows for and enhances his own thinking - an environment which encourages achievement of IMPACT's other goal, teaching for thinking.[1]

The teachers in Polk County applied Impact's theories in ways which could also be considered T4C. A typical lesson evolved from a question directed about the decorations in a classroom. The fact that some balloons were deflated suggested the problem of "what is air?" This type of discovery learning allowed for the class to be divided into groups where exploration of the phenomenon of air could take place on more than one level. The groups could then conduct various experiments with air and share the results.

> There was so much interest on the children's part that we could easily have continued the study the following day. In the interests of time, however, we limited the second day's session to a period of brainstorming. In this the children thought fluently, naming and recording all the places where air can be found. In doing so, they established such concepts as the existence of a vacuum inside a tornado.[2]

Another type or style of Discovery Learning or Learning Activities was instituted in 1973, Gainesville, Florida. Again, this concept closely paralleled T4C. Ideas, materials,

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[1]Joseph P. Ronson, Editor, - Helen Coe "Discovery Learning" Impact 70 (Iowa: Polk County Board of Education, 1970), p. 21.

[2]Ibid., pp. 42-43.

and activities were presented on a variety of levels for the students and after consulting with the teacher, the child was free to explore the areas.

Paul S. George, who prepared the research bulletin on these learning centers, offered the following definition:

> In this bulletin a learning center refers to an area for study and activity, in or near the classroom, that has been provided for the structured exploration of a particular subject, topic, skill, or interest. It is a place for using and storing materials that relate to a special interest or curriculum area. It may be in a corner, on a wall, next to a bookcase, or on a table; but it exists somewhere in the physical space of the classroom or school.[1]

George went on to list important characteristics of a learning center which are also important characteristics of T4C's episodes. Among these were the concept that a learning center was auto-instructional. Therefore, it did not demand the direct and continuous presence of the teacher as an information giver. These centers had clear, easily-discovered objects and plainly written directions.

The episodes utilized in T4C also were used in a learning center type of arena. Brief instruction was given by the teacher or received from another student or described in print. Auto cassettes provided still another method of transferring instructional information to the students.

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[1]Paul S. George "The Learning Center's Approach to Instruction" Research Bulletin Vol. 8, No. 4 (Florida, Florida Educational Research and Development Council, Gainesville, 1973), p. 4.

Another point George brought out which was true for the T4C project as well, was that each center or station could present activities on a variety of levels of difficulty.[1] Therefore, the child was afforded some choice in the direction he wished to go. For each episode or center could present its tasks with different versions for various ability levels, allowing for the achievement of success on the part of the student.

Fifty-four approaches to alternatives in education were outlined by Jerome R. Jekel and Robert E. Johnson in 1973 at Mary College, Bismarck, North Dakota. The material presented was not necessarily new, but an attempt to identify ways or styles by which students could learn was evident. The right of each person to find out who he is, what he is and why he is, and to know that he is what he can become was basic to the Bismark matrix.[2] Jekel and Johnson also espoused a conjugal relationship between the student and teacher, meaningful when each viewed the other as an extension of himself. This mode would mean that all learning would be done for the betterment of both the student and the teacher. This relationship would then diminish the role of the teacher as the precursor of all knowledge and the student merely a receptacle. Of the fifty-four approaches, the following four

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[1]Ibid., pp. 4-5.

[2]Jerome R. Jekel and Robert E. Johnson Alternatives in Education - 54 Approaches (Bismarck, North Dakota: St. Alexius Hospital Printshop, 1973), p. 3.

most closely paralleled the T4C Program.

INTEREST CENTERS APPROACH

Purpose

The purpose of the Interest Centers Approach is to make available places that are designed around and reflect specific expressed interests of students.

LAB APPROACH

Purpose

The Lab Approach is to allow students to build, construct, experiment and generally employ psychomotor devices to academic disciplines.

PROJECT & ACTIVITY APPROACH

Purpose

The purpose of the Project and Activity Approach is to provide variety from the normal classroom routine. Moreover, a challenge to one or more students to bring into existence something directly related to the subject matter being studied is central to this approach. It is an excellent means to employ all domains during times of the year that may otherwise be periods of low productivity.

RESOURCE CENTERS APPROACH

Purpose

The purpose of the Resource Center is to have available areas of a given specialty designed around student needs. Centers specializing in print and non-print materials are examples of Resource Centers where students can pursue in-depth studies.[1]

The Interest Centers Approach simply was an availability of areas around a classroom which displayed and made

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[1]Ibid., pp. 75-103.

available materials on particular studies. These could be extremely similar to T4C's unit kits when in use. However, the Jekel and Johnson's approach afforded the child the opportunity to select his interest center as a privilege as well as during the prescribed time. T4C, on the other hand, was meant to be incorporated into the existing curriculum for use in a particular time slot similar to another subject discipline.

Jekel and Johnson's lab approach emphasized the cognitive or affective domains, thus making this approach primarily psychomotor in nature. The intent was to allow the child to experiment with materials and equipment, thereby developing new concepts.

T4C afforded the child similar experiences. A close example would be the rocketry kit.[1] Here students selected the challenge of materializing an idea. During construction, the child had to plan carefully the necessary stages and concepts. The model would be based on reason and the completed project would actually be launched and tracked.

The Project and Activity Approach provided variety from the normal classroom routine. The student was completely creative in this area. He would plan, organize, and report on any learning experience he wished to undertake. Although similar to the Lab Approach, Jekel and

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[1]See Appendix A

Johnson viewed the Project and Activity Approach "as an alternate approach to create a change of pace."[1]

T4C also afforded a certain change of pace for both the student and the teacher, for even as early as grade one, the students may utilize the concepts of role playing by presenting a play utilizing materials from T4C. Stick puppets, cloth, and paste could be made into a most pleasurable learning experience.

Resource centers were utilized heavily in both T4C and the Bismarck project. It was not uncommon to view three or four sections of a T4C classroom set up for various units. Jekel and Johnson suggested utilizing a contract type of arrangement or a modular schedule in this plan.[2] Also, a requirement that would have been imposed upon the students would be that he visit each center making arrangements to undertake and complete that commitment. The student could therefore spend a month in a given center or rotate during convenient intervals.

William Horne, T4C Coordinator for the Bayonne School District, described the T4C Interest Center Approach as "...kits set up throughout the room where students may wander in and out of, either participating or not."[3]

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[1]Jekel and Johnson, Alternatives, p. 103.

[2]Ibid., p. 118.

[3]Interview with William Horne, Bayonne Board of Education, Bayonne, New Jersey, 24 February, 1976.

Horne was quick to add that most students, while not compelled by the teacher, desire to participate. This self-motivation on the part of the student could be attributed to the appealing aspects of the kits themselves, or possibly to the peer relationships developing during this stage of the child's development.[1]

James Madison, Elementary School, Fargo, North Dakota, incorporated a prescriptive teaching program which was developed by the teachers employed at the school. The staff outlined our goals which would not only help the students to learn, but would also instill a liking for learning on the part of the students.

> The Madison approach to student learning centers on the question, "Is this the very best thing for this child?" This approach is distinguished from the more teacher-centered question, "Is this the very best thing for those children?" In determining what is best for each child the Madison staff has four goals:
>
> 1. To develop a positive self-concept
> 2. To develop enthusiasm for learning
> 3. To develop a self-reliant, self-motivated, independent pupil
> 4. To develop personal responsibility, particularly related to the functioning of the group as well as to the pupil's own actions
>
> To accomplish these goals, Madison teachers have sought to vent traditional educational requirements in untraditional ways.[2]

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[1] Havinghurst, Developmental Tasks, p. 19.

[2] Sharryl Hawke, Caring is Basic . . . at James Madison School Profiles of Promise 23 (Boulder, Colorado: ERIC Clearinghouse for Social Studies/Social Science Education, 1974), p. 1.

Upon close examination of the four goals developed by the Madison staff, it could be noted that those goals almost match the T4C goals exactly. Also, the activity-oriented learning packages used in the Fargo School system paralleled the episodes employed by New Jersey T4C teachers. These learning packages were developed by teachers working during the summer months. Each subject area was represented by groups of behavioral objectives based on the textbooks in use at that time. Also included in the packages were pre and post-tests which in turn were based on these behavioral objectives.

These learning packages were to be used as the basis for the curriculum, whereas, T4C kits were to be used in conjunction with the existing curriculum, making assimilation easier.

The Learning Centers concept was also utilized in the Madison School. These centers were very similar to the British system, as well as the T4C Program. The classrooms at Madison were divided into areas by panels of vividly painted, tri-wall cardboard. These areas were designed to accommodate only a limited number of students at one time.

> The learning centers are not used for basic instruction: such instruction is given to either the whole class or in small groups. Learning centers are used for motivation, broadening of practical interest, enrichment, and a tie between home and school. There are learning centers for math, social studies, creative writing, reading, art, and science,

as well as puzzle centers, sport centers, and special project centers.[1]

Wesley Perusek, Research Associate for the New Jersey State T4C Project, commented that instruction on a particular T4C unit could also be given to the entire class or to small groups, whichever the teacher viewed as most advantageous.[2]

An approach which incorporated Individually Guided Education and Career Education in the State of South Carolina seemed to focus on the New Jersey T4C's concept. Not only did the program stress career education, but the I.G.E. segment tried to develop a curriculum offering which would fit each individual's needs providing for more awareness.

> Through a fused Individually Guided Education and Career Education program, Blythewood is offering its four hundred pupils a cognitive, practical education. This integrative approach instills in the students awarenesses, understandings, and appreciations about careers and the responsibility, humaneness, and knowledge to function in our changing society.
>
> Three years ago the school began implementation of an IGE program in hopes of assuring each child that he would develop to his fullest extent as quickly as possible. This is facilitated through the assessment of each child's needs and the development of a curriculum which fits his unique educational requirements.[3]

Orange, Connecticut had been offering a wide variety of T4C type activities for the past few years to its K-6

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[1]Ibid., p. 3.

[2]Interview with Wesley Perusek, Division of Vocational Education, New Jersey State Department of Education, 23 January, 1976.

[3]Larry W. Duncan, "Integration of Career Education and IGE," Career Education Digest (California: Educational Properties, Inc. March/April, 1975 Vol. 2, No. 5), p. 10.

student population. The program was organized and operated by the local PTAs who were constantly searching for activities designed to serve the needs of their children. Although most PTA activities were limited to fund raising or programs which were to be presented at the schools, the Orange PTA wished to establish a more direct link between the PTA and the system.

> On a typical afternoon in an Orange elementary school, you might marvel at youthful grace in gymnastic drills, blink as you watch baton twirling in the hallways, smell the pungent aroma of wood being cut, watch a mass of clayforming on a potter's wheel, observe primary children hungrily making pizza, and see sticky-handed children slopping strips of paper mache on formless hunks of paper and wire. As they create the products of their imagination, the sights and sounds of active children fill the school. The process is repeated each afternoon.[1]

The activities provided by the Orange, Connecticut P.T.A. could present very desirable education alternatives. These activities also constitute a satisfying and self-reinforcing antidote for the isolation of surburban life style. Through this type of medium, children could socialize with each other and even interact in an informal setting with adults.

Summary

The review of literature has indicated that a current trend in a T4C type of classroom was on the increase.

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[1]Robert M. Valuk "Educational Alternatives, PTA Style" Phi Delta Kappan (Bloomington, Indiana: Vol. 57, No. 5, January, 1976), p. 331.

This program, while unique, contained many overtones of similar programs throughout the United States and Great Britain. The New Jersey T4C Program was shown to be a project which should be incorporated within the existing curriculum as a particular style of learning which offers a "real world" type of experience to the child. It has also been proposed that the hands-on approach is very relevant to modern education and deserves a prominent place in our educational system.

The T4C Program was developed in order to boast achievement in the areas of self-awareness, understanding of technology, and academic skills and although no substantiating studies have yet been completed, the literature would tend to support the claim of these action activities.

It was generally agreed that the lack of individualized instruction, which provided for a learning sequence designed to meet the specific wants or needs of the student, was a great disadvantage of today's elementary schools. The program's task, therefore, was to equip students to face life and its problems effectively and with intelligence. Also, the skills necessary for obtaining and using this knowledge became one of the end results of T4C.

The play or activity concept, which was one style of education that fosters attitudes congruent to the T4C philosophy, was heavily incorporated in New Jersey's program, and close parallels were discovered by the researcher

in Great Britain, as well as the States of Connecticut, Florida, Iowa, North Dakota, South Carolina, Vermont, and Washington. Among these parallels were activity centers, role playing, interest centers, work areas, learning centers, and hands-on learning.

Furthermore, the hands-on approach provided not only "real world" experiences, but a pleasurable exposure to learning in general. Naturally, if learning was pleasing to the child, he would become more receptive towards schooling. T4C advocated this type of approach in education, and proponents of the program believed that students gained more insights to learning through the T4C program.

CHAPTER III

Profile of the School System and Community

Bayonne is located in the Northeastern part of New Jersey in the County of Hudson. It is a peninsula three miles in length, one mile in width, with its land border being Jersey City. The 1970 census showed a decline of 1,472 people from the 1960 population of 74,215.[1]

The middle class white population of the city has progressively decreased, while poorer minority groups have been on the increase. The Black and Puerto Rican population of the city has increased 1.3 percent and .3 percent respectfully, bringing the 1970 report to 4.6 percent Blacks and .9 percent Puerto Ricans.[2]

The distribution of family income showed the majority of families earning between $5,000 and $9,999 per year, (31.5%) - 14.6% of the families earned less than $5,000 -

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[1]U. S. Department of Commerce, Bureau of the Census, Number of Inhabitants, U. S. Summary, 1970 Census of Population, December, 1971, Table 31, p. 148.

[2]U. S. Department of Commerce, Bureau of the Census, Number of Inhabitants, U. S. Summary, 1970 Census of Population, October, 1971, Table 16, p. 51, Table 24, p. 98.

18.9% earned between $15,000 and $24,999; and only 3.4% earned over $25,000.[1]

The Bayonne School District has eleven elementary schools, one Special Education Department, and one large four year comprehensive high school. The elementary school population ranged from 311 at Washington School to 697 at Horace Mann School, with a total elementary school population of 5,390.[2] The equalized evaluation per pupils in 1973 was $55,690, and the current cost per pupil was put at $1,108,[3] and eighty percent of the funds needed for education were supplied by local taxation.[4]

In addition to the public facilities for education in Bayonne, there is a large parochial school population. There are two parochial high schools and seven elementary schools located in the city.

A profile of workers in the city was as follows:

PERCENT DISTRIBUTION - MALE EMPLOYEES	
TOTAL WHITE COLLAR	35.4
Professional, Technical	10.1
Managerial, Administrative	7.1
Sales Workers	5.1
Clerical	13.1

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[1]U. S. Department of Commerce, Bureau of the Census, New Jersey Social and Economic Characteristics, 1970 Census of Population, April, 1972, Table 86, p. 308.

[2]"Elementary School Statistical Report," Office of Superintendent, June, 1976, (pages not numbered).

[3]Interview with Gabriel Stabile, Bayonne Board of Education, Bayonne, New Jersey, 5 January, 1976.

[4]"Financial Resources-Public Schools," Bayonne Public Schools, 1971, (mimeographed), p. 8.

TOTAL BLUE COLLAR	64.6
Craftsmen, Foremen	19.1
Operatives	17.3
Transport Equipment Operator	8.1
Laborers	9.1
Service Workers	11.0
PERCENT DISTRIBUTION - FEMALE EMPLOYEES	
Professional, Technical	10.9
Managerial	2.4
Sales	5.2
Clerical	41.9
Craftsmen, Foremen	1.9
Operatives	25.9
Service Workers	10.5
Private Household Workers	1.3[1]

The interest exhibited by these classifications of workers toward their children was reflected in the following statement of educational philosophy for the Bayonne School District:

> Accordingly, we must see "that the curriculum provides opportunities for the student to develop appreciation and understanding at a behavioral level of the dignity and worth of all individuals; knowledge, understanding, and appreciation of the fine and practical arts, the humanities, and the natural, physical and social sciences; basic skills such as reading, writing, and the use of numbers; special abilities and talents; a physical and mental health; ability to analyze critically and constructively; constructive civic attitudes, and appreciations basic to the worthy use of leisure time; insights into the ethnic and religious sources of American life; character, discipline, responsibilities, and commitment to spiritual, ethical, and moral values."[2]

It can be noted that the community of Bayonne was quite concerned with developing a sound educational system

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[1]"Career Development Report Abstract," Superintendent's Office Bayonne Board of Education, Bayonne, New Jersey, 1974.

[2]"Curriculum Committee Report," Office of Superintendent of Schools, Bayonne Public Schools, Bayonne, New Jersey, 1975. (Typewritten)

which would foster good citizenship in the student population.

Chronological Implementation of T4C

During the 1972-73 school year, Mr. Gregory Anthony, Director of Federal and State Funded Programs for the Bayonne Board of Education, was in attendance at a State meeting in Trenton. Technology for Children was discussed, and Mr. Anthony perceived merit in the program. After collecting and assembling all the data available, he acquired the services of the Hudson County Coordinator for Career Education, Mr. Edward Davis, in order to address a combined meeting of the Bayonne School Board and Administrators concerning the T4C Program. It was well accepted, but Mr. Anthony could not convince any principals to incorporate this program as part of their curriculum. Then, Mr. James Murphy, Principal of the Mary J. Donohoe School, decided to experiment. Sixteen teachers volunteered to attend a three day training workshop at Edison in order to become state certified T4C teachers. Upon their return, each was alloted three hundred dollars for materials to incorporate T4C in their classrooms. At first there was much resistance due to what many felt were "cluttered" and "noisy" rooms. However, when it was observed how the students in these classes began to like school and began showing an interest in learning, more teachers asked to be

trained in the T4C concept.

By June of 1973, six teachers had been trained and a T4C supervisor, Nikki Harrison, was assigned to the program. Mr. Murphy and Mrs. Harrison planned to have twenty trained T4C teachers by September, 1973, representing nine schools. It was further decided that the Mary J. Donohoe School was to become the resource center which would supply all schools with the materials. Mrs. Harrison was to be available after 3:30 P.M. on school days in order to help teachers plan and distribute materials.

The T4C concept seemed to be accepted by many faculty members, but some of the teachers became discouraged due to the lack of supplies. The following was a portion of a letter sent to Superintendent William G. Hin from Principal James Murphy.

> Many of the objectives of the T4C Programs are being met. However, lack of coordinated central office support will cause several important strategies to fail. . . . Some T4C trained teachers have become discouraged because of their inability to receive promised materials.[1]

Mr. Murphy went on to explain that Mr. Davis, the County Coordinator for Career Education, was planning to send an evaluator to Bayonne in April of 1973 to monitor

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[1]Murphy, Letter to Superintendent William G. Hin (Bayonne: December 10, 1973), p. 1.

the program. Mr. Murphy was concerned that the evaluator would find a narrow range of T4C activities and a reduction in the number of interested teachers. However, Mr. Murphy went on to list the positive aspects of the program such as the excellent teacher interest and the after-school workshops. After listing these achievements, Mr. Murphy asked that a meeting be held to discuss the T4C Program. Consequently, on December 20, 1973, a meeting was held in order to discuss any problems inherent in the program and, in addition, a bank account was to be implemented for the purpose of acquiring T4C supplies.

During the month of February, seventeen teachers enrolled in a three credit T4C graduate course at Jersey City State College with the Bayonne Board paying for materials and registration. Due to the fact of the ever-increasing participation in the program, the Bayonne District perceived the need for additional funding which was obtainable from the State Department of Education:

> BE IT RESOLVED, that this Board of Education does hereby authorize the Superintendent of Schools, and such other Board Officers and/or Board Counsel, as are required, to file the appropriate applications with the Federal/State/County Governmental Agencies applicable in each instance, for the programs set forth below:
>
> 1. - . . .
>
> 2. - Governor's Career Development Project; (commonly known as Career Education Program);
>
> 3. - . . .

AND, BE IT FURTHER RESOLVED, that the Superintendent of Schools be, and he is hereby authorized and directed, immediately upon the approval of each such application, to proceed with the implementation of such program.[1]

The proposal itself stated that Bayonne was seeking to become a leader in career and vocational education, citing the T4C Program and teacher training in that area which was then ongoing. A need for expansion of the program was outlined:

> The Bayonne School System is seeking to become a leader in career and vocational education. Of this end, the school system has recently embarked upon Career Education programs such as Technology for Children and Cooperative Industrial Education. Teachers are also currently being trained for implementation of Introduction to Vocation programs.
>
> Bayonne Public Schools need an enlarged and expanded Career Development Program because:
>
> 1. . . .
> 2. The Bayonne School system desires that all types of educational experiences, curriculum, instruction, and counseling will involve preparation for economic independence, personal fulfillment, and an appreciation for the dignity of work for all students.
> 3. . . .
> 4. Our ever increasingly technological society requires specialized individuals requiring a level of instruction not adequately available at present.
> 5. . . .[2]

It was further stated that T4C would be integrated within the elementary school programs for all students, thus

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[1]"Minutes of the Meeting of the Board of Education," Bayonne Board of Education, 14 February, 1974. (Typewritten)

[2]"Career Development Report," Bayonne. (Typewritten).

expanding the current T4C Program. This change-over from the traditionally tight schedule prescribed by plan books, to a child-centered teaching-learning program was to be done gradually. For Bayonne Administrators were cognitive of the factor that time was needed for the teacher as well as the child to adapt to the program.

> The move from the transmission of a preordained body of knowledge to children over into a bustling, multi-sensory, multi-interest classroom should be undertaken in small steps which encourage both teacher and learner.[1]

Also, a full-time T4C supervisor was written into the proposal:

T4C supervisor full-time 10 month

Reports and is accountable to the CE Project Director.
Primary responsibilities is the implementation of T4C concepts in the primary grades.
Supervises T4C teaching programs and the implementation methodology.
Responsible for recommending equipment and materials necessary for the T4C program.
Participate in self-evaluation of T4C program.
Recommend curriculum modifications in order to facilitate T4C implementation.
Conduct monthly meeting with T4C teachers.
Attend monthly New Jersey Department of Education meetings.
Assist - set up learning centers in classrooms.
Establish a liaison with State and County T4C facilities.
Organize workshops.
Supervise the functions and materials in the T4C Resource Center.

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[1]Fred J. Dreves, Technology for Children Project - Implementation (New Jersey: Division of Vocational Education, New Jersey Department of Education, July, 1972), p. 1.

Certification

Elementary teaching certificate
Supervisor certificate
T4C training
Career Education Training[1]

The State Department of Education approved the Career Education proposal and on April 1, 1974, the Career Education four man team was approved (Director, Multi-media Coordinator, Job Placement Coordinator, and T4C Coordinator). William G. Horne, the newly appointed T4C Coordinator of the Bayonne School District, felt that the most important task before him was to organize the trained T4C teachers who were lacking in supplies and direction into a cohesive group.[2] Horne called a mass meeting of all T4C trained teachers at which he asked for a list from each, outlining the unit kits or episodes or any type of supplies they felt were needed to implement a good T4C Program for their individual class. They were cautioned about the reality that only three hundred dollars per teacher could be allocated for the upcoming school year. After compiling the data, Horne had to determine how best he could spend the $10,800 alloted him according to the bulk of popular episodes. Thirty units were decided upon after careful

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[1]"Career Development Report," Bayonne. (Typewritten)

[2]Interview with William Horne, Bayonne Board of Education, Bayonne, New Jersey, 29 February, 1976.

consideration of all requests.[1] These units could satisfy all of the teachers' requests in all areas if cross division of materials was implemented.

Horne devised a unique system of providing episodes or units to the teachers. He would order three or four kits rather than ten or twelve. These three or four kits would then be made available from the T4C center on a rotating basis, thereby assuring full utilization of the unit. Rather than ten units lying in ten different schools only to be used a few weeks during the year, units would be in almost constant use throughout the district. This type of "supply system" also enabled the purchasing of a greater variety of episodes for each teacher. Horne felt that the only drawback to this type of system was in the scarcity of popular units. This was remedied the following year by an increased purchase of the more popular episodes and a library card type of system was utilized for ordering kits. A teacher would request a certain kit for a particular date specifying how the episode could relate to the curriculum, and Horne would deliver the episode to the teacher's class where it would remain for a four or six week period.

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[1]See Appendix A.

After the program was well entrenched in the Bayonne District, Horne directed his efforts toward other areas. He developed a local teacher training program and center,[1] consisting of a sixteen hour, eight week period as opposed to the State's three day, fifteen hour workshop at Edison. This after school type of activity was developed due to the common problem of release time for the training of teachers in the district. During this training, the teachers were exposed to the philosophies of T4C, its rationale, and the local implementation. Besides this background type of instruction, eight of the more difficult episodes were "taught" to the teachers so that they could really conceive the "hands-on" approach.

The entire T4C Program was promoted on a completely voluntary basis on the part of the teachers in order to facilitate the program's highest potential. Because of the non-imposing status of the program, teachers implemented it to its fullest according to their own expertise and teaching situation.

Due to the local after school training program and increasing support of the program, the original thirty-

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[1]See Appendix H.

two practitioners of T4C were nearly tripled to a swelling ninety-three participating instructors by September, 1975. Also, during the time period of 1974-75, the student enrollment jumped from 568 boys, 519 girls[1] to 1,288 boys and 1,182 girls, placing the total T4C student population at 2,470 in June of 1975.[2]

In order to provide for easier access of the program, video tapes of T4C lessons were done at actual on-site areas. These tapes were catalogued and loaned out for individual class use.

Because of the difficulty of certain episodes being started at the same time, a parent training program was also set up. These people were parents who espoused to the T4C Program philosophy and were willing to give of their free time to be trained as resource people throughout the district, acting as teacher aides. Approximately fifty parents were trained in twelve different areas to provide this service. Along with parent training, seventh and eighth grade students who had shown great interest during their previous T4C training were also trained to assist in certain situations because of their availability.

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[1]Richard Entwistle, Yearly Report Governor's Career Development Project, Bayonne Public Schools, June, 1974.

[2]Richard Entwistle, Yearly Report Governor's Career Development Project, Bayonne Public Schools, June, 1975.

The Vocational Industrial Clubs of America (V.I.C.A.), Bayonne High School Chapter also availed its membership as resource personnel for the T4C Program. Therefore, middle school and vocational high school students as well as parents and teachers provided their services to the T4C Program.

The major 1975-76 school plan was to expand the existing program in relation to number of teachers trained and number of students exposed to T4C, plus the improvement of training facilities. Consequently, work began in late Spring and early Summer of 1975 to obtain recognition as a state T4C training center, for the Edison complex was only training T4C supervisors at that time. In December of 1975, Bayonne received the first group of forty-two teachers to be trained from the city of Elizabeth, New Jersey, thus making Bayonne the first city in the State to provide this type of training in the area of T4C. The teachers from Elizabeth received release time from their district and, consequently, Bayonne reverted to the three all day type of sessions. The cities of Wayne, Secaucus, and Jersey City also requested training for their teachers during the 1976 school year.

Horne felt that a special training course should be set up for Special Needs Institutes, for many Special

Education teachers were incorporating T4C into their programs. This course was offered in the Spring of 1976 with twenty-three "special needs" teachers being trained.

Summary

The Bayonne School District desiring a competent educational system, and the Bayonne community wanting the best for its children, combined their efforts and developed an educational philosophy which provided for good student development. The T4C concept was found to be in concert with the Bayonne philosophy of education; therefore, educators adopted the T4C Program on a small level to test its merits. After a trial period, it became evident that T4C would work in Bayonne; therefore, the program was expanded. As the program grew, the need for more trained personnel became evident and this need was met with great enthusiasm by the Bayonne faculty. The program continued to expand until State recognition became a reality and the term T4C became part of the Bayonne vernacular.

CHAPTER IV

Design and Operation of the Study

This chapter was divided into four sections. The first section included the research design, describing the type of experiment, problems of the designs and procedures employed in order to compensate for those problems. The second section was concerned with the development of the study. Here exact steps which the researcher followed in formulating the study and questionnaire were discussed. The third section included the methods of gathering and compiling the data, and the fourth section presented an analysis of the data collected.

Research Design

The design of this study was of the experimental type, termed the Solomon 4-Group Design. This design was chosen because of its utility in educational research and for its explicit considerations of external validity factors. The design was as follows:

R	O_1	X	O_2
R	O_3		O_4
R		X	O_5
R			O_6

[1]Campbell, Experimental and Quasi-Experimental Designs, pp. 24-25.

All designs contained factors which jeopardize internal and external validity, but the Solomon 4-Group Design deservedly possessed higher prestige in research.

A list of factors jeopardizing validity was presented by Donald T. Campbell:

1. History, the specific events occurring between the first and second measurement in addition to the experimental variable.

2. Maturation, processes within the respondents operating as a function of the passage of time per se (not specific to the particular events), including growing older, growing hungrier, growing more tired, and the like.

3. Testing, the effects of taking a test upon the scores of a second testing.

4. Instrumentation, in which changes in the calibration of a measuring instrument or changes in the observers or scorers used may produce changes in the obtained measurements.

5. Statistical regression, operating where groups have been selected on the basis of their extreme scores.

6. Biases resulting in differential selection of respondents from the comparison groups.

7. Experimental mortality, or differential loss of respondents from the comparison groups.

8. Selection-maturation interaction, etc., which in certain of the multiple-group quasi-experimental designs, such as Design 10, is confounded with, i.e., might be mistaken for, the effect of the experimental variable.

9. The reactive or interaction effect of testing, in which a pretest might increase or decrease the respondent's sensitivity or responsiveness to the experimental variable and thus make the results obtained for a pretested population unrepresentative of the effects of the experimental variable for the unpretested universe from which the experimental respondents were selected.

10. The interaction effects of selection biases and the experimental variable.

11. Reactive effects of experimental arrangements, which would preclude generalization about the effect of the experimental variable upon persons exposed to it in nonexperimental settings.

12. Multiple-treatment interference, likely to occur whenever multiple treatments are applied to the same respondents, because the effects of prior treatments are not usually erasable.[1]

Campbell then developed a table showing the sources of invalidity for six different designs. This summary table presented graphically the extent of which factors effecting validity were to be viewed.

Sources of Invalidity

	Internal								External				
	History	Maturation	Testing	Instrumentation	Regression	Selection	Mortality	Interaction of Selection and Maturation, etc.	Interaction of Testing and X	Interaction of Selection and X	Reactive Arrangements	Multiple-X Interference	
5. Solmon Four-Group Design R 0 X 0 R 0 0 R X 0 R 0	+	+	+	+	+	-	+	+	+	?	?		

Note: In the tables, a minus indicates a definite weakness, a plus indicates that the factor is controlled, a question mark indicates a possible source of concern, and a blank indicates that the factor is not relevant.[2]

[1]Campbell, Experimental and Quasi-Experimental Designs, pp. 5-6.

[2]Ibid., p. 8.

Concerning internal validity, jeopardizing factors were handled as follows:

1. History - this factor was easily controlled, for if a general historical event which might produce a difference in one group occurred, this same general event could produce similar differences on the second group as well.
2. Maturation - this factor was controlled due to the fact that maturation should have been manifested equally in both the experimental and control groups.
3. Testing - this factor also was controlled due to equality of the sampling instrument and its administration.
4. Instrumentation - there was no difference in the sampling instrument of either group; ergo, calibration should be constant.
5. Statistical regression - as far as near differences are concerned, both experimental and control groups were randomly assigned from the same extreme pool; consequently, both will have regressed equally.
6. Biases - this element has been eliminated due to urn selection of respondences.
7. Experimental mortality - differential loss of respondents was non-existent.
8. Selection maturation interaction, and so on - matching was used only as an adjunct to randomization,

and at time of treatment this randomization assumed group equality, which was tested in the pre-tested grouping.

The factors jeopardizing external validity were alleviated by the following methods:

9. Reactive or interaction effect of testing - the main effects of testing have been determinable due to the lack of a pretest in half of both the experimental and control groups, thus allowing for greater generalizability.
10. Interaction effects of selection biases and the experimental variable - urn selection was utilized for the selection of groupings to eliminate biases, and disruption of routine was kept to a minimum in all cases thereby lessening the experimental variable.
11. Reactive effects of experimental arrangements - the design of the experiment itself greatly diminished the reactive effects, for half of both groups did not participate in the pretest.
12. Multiple-treatment interference - was not relevant to this design.

Also, the Bayonne T4C teachers were required to keep a log stating which kits were used and on how many occasions.[1] This was done in order to insure that the T4C philosophy was carried out in the experimental groups.

[1]See Appendix B.

By placing strigent criteria on the factors which could jeopardize both the internal and external validity of this study, the researcher had developed an experiment which should allow for valid conclusions.

Development of the Study

The Solomon 4-Group Design called for a random selection of participants possibly through the urn system of selection. The researcher would randomly assign people to either the experimental or control group. This procedure was impossible to employ in the Bayonne School District, for teachers entered the T4C program on a purely volunteer basis. Therefore, the researcher had to achieve randomization in a slightly different manner. The following description relates the procedures taken by the researcher.

First, the researcher assigned a code number to all of the eleven elementary schools in the Bayonne School District. These code numbers were then chosen from a container one at a time until a random selection of six schools was made.

Second, all teachers were selected on a random basis by the urn method. The researcher placed the names and grade level of all T4C trained teachers for the six elementary schools into a container. True randomization was achieved in this fashion for all teachers shared equally in the chance of being selected for the study.

Third, a random selection of traditionally based instructors utilizing the code number of each school and

grade level participating in the study was made. This procedure allowed for characteristics of both groups; such as, age, geographic location, and socio-economic status to be similar, for if a fifth grade class located at a school in the northern section of town was to have T4C instruction this term, this fifth grade class would be compared to another fifth grade class in the same school but under a traditional type of instruction.

The following were the schools and grade levels selected:

School	Grade Level
#3 (W. F. Robinson)	1 & 2
#8 (Washington)	3 & 4
#5 (Lincoln)	4
#1 (Henry E. Harris)	5
#4 (Mary J. Donohoe)	5 & 6
#7 (S. A. Roberson)	5 & 6

Fourth, because the Solomon 4-Group Design called for only half of the sample to receive the pretest, the researcher randomly selected half of the population by a simple toss of a coin in order to establish the half of the sample which was to be included in the pretest. Heads signified the pretest grouping and tails denoted the post-test only grouping. The results deemed sections 1 and 2 as the groups which were to receive both the pre and post-tests and sections 3

and 4 as the grouping which would receive the post-test only label. The following was the matrix for all schools concerning these results:

School	Section	Treatment	Pretest	Post-Test
	1	+	+	+
	2		+	+
R				
	3	+		+
	4			+

Naturally, due to this type of randomization, the researcher might be open to criticism concerning a possible bias on the part of the T4C trained teachers. A skeptic might feel that because T4C teachers were all volunteers in a specific program that their perceptions to their students would be different compared to teachers selected randomly from the traditional mode of education. The researcher was well aware of this factor but felt that if the T4C teachers perceived growth in their students even with a bias, valid conclusions could be drawn because the analysis of variance showed no significant difference between the teachers' perceptions of their students during the pretest of both the experimental and control groups. Further, if a teacher viewed the students as progressing under the T4C program, it would create a positive atmosphere within the classroom setting; therefore, creating positive growth in child. Whether this growth was due to T4C alone cannot be completely indicated within this study. Nevertheless, what can be noted

is the differences in teachers' perceptions concerning the students under their tutelage before and after treatment.

At this point, even though school authorities at the central office had already approved the study, the researcher contacted all principals and teachers who were to be involved in the study and established their willingness to participate. The instrument used for the study was that of an attitudinal scale, for the researcher chose to measure the perceived differences in three specific areas. Teachers decided on the questionnaire by means of rating how they perceived each child in the areas of self-awareness, understanding of technology, and academic skills. The researcher designed this type of questionnaire specifically to determine if the teachers would perceive differences in their children, for if the teachers believed that students did better in these three areas, the teachers would rate the child accordingly, thereby actually rating the efficacy of the T4C program.

A five point rating scale was chosen for the study because of its wide usage in attitudinal measurements. Daniel D. Day found in the literature he examined that slightly more than three-fourths of the attitude scales were of the five point type.[1] On the scale developed for this study, the in-

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[1]Daniel D. Day; "Methods in Attitude Research," American Sociological Review, Vol. 5 (Ohio State University, 1940), p. 395.

formant was asked to choose among various degrees of opinion on three given questions concerning the students in his class. Following common practice, the researcher placed the average reactions in the center of the scale and the most extreme reactions at the ends.[1]

Considerations which the researcher had to take into account when designing the questionnaire were as follows:

1. Who will make the entries on the schedule?
2. Does the physical appearance of the schedule affect the cooperation the survey receives?
3. How are the questions to be worded?
4. Is the sequence of questions on the schedule to be followed exactly?
5. How many questions are to appear on the form?
6. Is the purpose of the questions to ascertain facts, test the knowledge of the informant, or discover his beliefs, opinions, or attitudes?
7. Is the schedule to be used in future or periodic surveys?
8. What manipulation and processing by the office staff will the schedules receive after the field collection is completed?[2]

After careful analysis of these eight parts, the researcher, due to the type of sampling and the purpose of the questions administered to the sample, developed a questionnaire within these guidelines.[3]

> In my first year, I watched the math and reading levels of my students improve by two grades. The attendance rate was very high and accomplishments

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[1]Mildred Parten, Surveys, Polls, and Samples: Practical Procedures (New York: Cooper Square Publishers, Inc., 1966), p. 190.

[2]Ibid., pp. 157-159.

[3]See Appendix C and E.

were also made in social attitudes. I found the beautiful quality of this program to be that it became what the teacher and her class wanted it to become. I learned that there were no formulas for success with this technique, and thus success could be achieved by the formula that seemed best.[1]

The questionnaire was developed in this specific manner in order to measure the perceived changes of lack of changes in a student because of that student's exposure to the Bayonne T4C Program, as noted by the teachers polled. Naturally, teachers rated students differently, but the teachers were chosen by a randomization process removing most of the concerns for bias responses.

Methods of Gathering Data

The data for this study were collected by return addressed inter-school mail carrier. The three letters of transmittal[2] explained in detail the reason and purpose for the study and specific instructions concerning the data and its collection.

Instructions for the actual completion of the survey were included on the questionnaire itself and editing was done by the researcher in order to detect errors and omissions on the schedule. The following were responsibilities of the editor as explained by Mildred Parten:

> The schedule editor is responsible for seeing that the data to be tabulated are: (1) as accurate

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[1]Virginia E. Simonson, "Technology for Children" School Shop (Ann Arbor, Michigan: Prakken Publications, November, 1972) pp. 28-29.

[2]See Appendix D, F, and G.

and reliable as possible: (2) consistent with other facts secured: (3) uniformly entered: (4) as complete as possible: (5) acceptable for tabulation: and (6) arranged so as to facilitate coding and tabulation. He also should spot comments that are useful in interpreting results.[1]

After checking the data for accuracy, a coding system was devised for use on "by class" tally sheets.[2] These sheets contained both the pre and post questionnaire results per pupil. A five digit code was developed for each student and the following was the breakdown of that code:

First digit - this number was representative of the school (1, 2, 3, 4, 5, 7, and Washington) in which the student was enrolled. (All schools had a single digit name except for Washington School which was assigned the number eight.)

Second digit - the grade level (1-6) of the student within a specific school was denoted by this digit.

Third digit - the odd digits (1, 3) were indicative of the experimental group sections while the even numbers (2, 4) in this column represented the section of the control group in a particular school.

Fourth and fifth digits - these numbers represented the child himself. (Two digits were allotted in this column due to the fact that all classes were in excess of nine pupils.)

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[1]Mildred Parten, Surveys, Polls, and Samples, p. 425.

[2]See Appendix I and J.

The information on these tally sheets was then key-punched onto cards which became the data banks (one record per card).

Next the researcher prepared the proper cards for programming the computer utilizing the SPSS program.[1] This material was then deciphered and put into table form (four tables per question). The first table in each area followed the comparison indicated by the Solomon 4-Group Design.

> Disregarding the pretests, except as another "treatment" coordinate with X, one can treat the post-test scores with a simple 2 X 2 analysis of variance design:
>
> | | No X | X |
> |---|---|---|
> | Pretested | O_4 | O_2 |
> | Unpretested | O_6 | O_5 |
>
> From the column means, one estimates the main effect of X, from row means, the main effect of pretesting, and from cell means, the interaction of testing with X.[2]

Basically, the comparison of O_2 vs. O_4 will indicate differences between the experimental and control groups with the pretest, while the analysis of O_5 vs. O_6 will show differences between the experimental and control groups without the pretest.

The comparison of O_4 vs. O_6 will show control group scores with and without a pretest, whereas the analysis of O_2 vs. O_5 will compare the experimental group scores with and without the pretest.

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[1]Norman H. Wheeler et al., SPSS Statistical Package for the Social Sciences New York: McGraw-Hill, 1975.

[2]Campbell, Experimental and Quasi-Experimental Designs, pp. 5-6.

The second table in each area presented a summary of the two-way ANOVA[1] of T4C for each question; the third table in each area contained a summary of Means and Standard Deviations; and the fourth table in each area represented T-Values for the various groups. The purposes for the various comparisons of T-Values were as follows:

O_1 vs. O_3 - this comparison was done in order to ensure that teachers rated students in a similar manner at the beginning of the study (September, 1976).

O_1 vs. O_2 - this analysis was done in order to present differences in teachers' perceptions due to the introduction of T4C determined by both a pre and post-test.

O_3 vs. O_4 - basically this comparison was done to show if there was any difference in teachers' perceptions due to the pretest and not because of T4C.

O_2 vs. O_4 - this analysis was done in order to show differences in teachers' perceptions due to exposure to T4C after participation in the pretest.

O_5 vs. O_6 - this comparison was done in order to show differences between teachers' perceptions of their students due to T4C without the pretest.

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[1]ANOVA - a sub-program of SPSS which stands for Analysis of Variance.

Analysis of Data

The following tables reflected the student ratings as perceived by teachers within the study. However, the questionnaires possessed a numeric value attached to each rating which was transferred to the data banks. The following is an example of that system of rating.

Very High	High	Average	Low	Very Low
1	2	3	4	5

Therefore, when interpreting the tables, the researcher related a very high rating with a numerically low score and a very low rating with a numerically high score.

TABLE 1

2X2 ANOVA ROW AND COLUMN SUMS CONCERNING STUDENTS' LEVEL OF SELF-AWARENESS

Group	Non-T4C	T4C
Pretested	$\bar{X}$ = 3.051 ΣX = 360 N = 118	$\bar{X}$ = 2.617 ΣX = 335 N = 128
Unpretested	$\bar{X}$ = 3.142 ΣX = 399 N = 127	$\bar{X}$ = 2.301 ΣX = 313 N = 136

Table 1 indicates the sum of X, the mean for each group, and the number of cases for each group concerning the pretested post-test scores in the area of students' level of self-awareness. From the column sums Non-T4C was 759 and T4C was 648, allowing for the main effects of T4C to be estimated. The row sums for the pretested group was 695 and for the unpretested group was 712, indicating the effects of pretesting. Also, the cell means provided the basis for the interaction of pretesting and T4C.

TABLE 2

SUMMARY OF TWO-WAY ANOVA OF T4C CONCERNING STUDENTS' LEVEL OF SELF-AWARENESS

Source	SS	df	MS	F	F.01 Expected
T4C	52.61	1	52.61	69.22	6.70
Pretested	1.77	1	1.77	2.33	6.70
T4C X Pretested	5.30	1	5.30	6.97	6.70
Error	385.61	505	.76	...	...

Table 2 indicates that there is a significant difference at the .01 level of confidence between the experimental and control groups when T4C was the only accounted factor. The analysis of factor two which ignored the treatment and only considered pretesting, showed no significant difference between groups at the level of significance of .01. Also, interaction effects, when T4C and pretesting were considered collectively, a significant difference at the .01 level was again indicated. Therefore, when considering factors one and two, the conclusions that T4C was the factor causing significant difference in the experimental group's rating, and not due to pretesting effects, could be made.

TABLE 3

SUMMARY OF MEANS AND STANDARD DEVIATIONS CONCERNING STUDENTS' LEVEL OF SELF-AWARENESS

Source	Pretest	Post-test
T4C/Pretested	$\bar{x}$=3.094, σ =.976	$\bar{x}$=2.617, σ =.906
T4C/Unpretested	. . . .	$\bar{x}$=2.301, σ =.863
Non-T4C - Pretested	$\bar{x}$=2.949, σ =.950	$\bar{x}$=3.051, σ =.856
Non-T4C - Unpretested	. . . .	$\bar{x}$=3.142, σ =.870

Table 3 indicates no significant difference between the pretest scores of the experimental and control groups concerning the students' level of self-awareness. For the pretest Mean score of the T4C group was $\bar{x}$ = 3.094, σ = .976 while the pretest Mean score for non-T4C group was $\bar{x}$ = 2.949 and σ = .950. Also, the T-value was 1.18 and the expected T.01 was 3.29 indicated by Table 4, thereby adding weight to the assumption that the experimental and control groups were rated similarly at the beginning of the study (September, 1976).

TABLE 4

SUMMARY OF T-VALUES MEASURING FOR SIGNIFICANT DIFFERENCE BETWEEN GROUPS CONCERNING STUDENTS' LEVEL OF SELF-AWARENESS

Groups	T-Value	df	Expected T.001	Significance
O_1 vs. O_3	1.18	244	3.291	NO
O_1 vs. O_2	8.43	127	3.370	YES
O_3 vs. O_4	-1.87	117	3.373	NO
O_2 vs. O_4	-3.86	244	3.291	YES
O_5 vs. O_6	-7.85	261	3.291	YES

Table 4 indicates a significant difference between the pretest and post-test scores concerning pretested T4C. For the mean score of pretested T4C (O_1) was $\bar{x}$ of 3.09 and 2.617 was recorded for the post-test (O_2). Also, the expected T.001 was 3.291, indicating a significant difference, therefore, signifying definite growth within this experimental group.

Whereas in the pretested non-T4C group the pretest mean was 2.949 while the post-test mean was 3.051, the T-value calculated was 1.87 and the expected T.001 was 3.37. Statistically, no significant difference between the pre and post-test ratings of the non-T4C group (O_3 vs. O_4)

was evident, indicating no growth in the control group.

The post-test score of the pretested T4C group (0_2) was 2.617 while the post-test mean score of the pretested control group (0_4) was 3.051. Also, the T-value was 3.86 while the expected T.001 was 3.291, indicating a significant difference between the post-test ratings between the experimental and control groups. Therefore, the T4C group was rated significantly better in the post-test at the conclusion of the study (January, 1977).

The unpretested groups' scores indicated the same results. The mean score for the unpretested experimental group (0_5) was 2.301 while the unpretested control group (0_6) was 3.142. The calculated T-value was - 7.85 and the expected T.001 was 3.291, indicating a significant difference between the two groups. Therefore, the assumption that exposure to T4C caused teachers to rate their students better in the area of self-awareness after a semester's time can be made.

TABLE 5

2X2 ANOVA ROW AND COLUMN SUMS CONCERNING STUDENTS' UNDERSTANDING OF TECHNOLOGY

Group	Non-T4C	T4C
Pretested	$\bar{x}$ = 3.22 ΣX = 380 N = 118	$\bar{x}$ = 2.742 ΣX = 351 N = 128
Unpretested	$\bar{x}$ = 3.331 ΣX = 423 N = 127	$\bar{x}$ = 2.309 ΣX = 314 N = 136

Table 5 indicates the sum of X, the mean for each group, and the number of cases in each group concerning the pretested post-test scores in the area of students' understanding of technology. The column sum of the non-T4C group was 803 and the T4C group had a sum of 665, allowing for the main effect of T4C to be estimated. The row sum for the pretested group was 731 and 737 for the unpretested group providing for the analysis of the effects of pretesting. Finally, the cell mean provided for the interaction of pretesting and T4C.

TABLE 5

2X2 ANOVA ROW AND COLUMN SUMS CONCERNING STUDENTS' UNDERSTANDING OF TECHNOLOGY

Group	Non-T4C	T4C
Pretested	$\bar{x}$ = 3.22 ΣX = 380 N = 118	$\bar{x}$ = 2.742 ΣX = 351 N = 128
Unpretested	$\bar{x}$ = 3.331 ΣX = 423 N = 127	$\bar{x}$ = 2.309 ΣX = 314 N = 136

Table 5 indicates the sum of X, the mean for each group, and the number of cases in each group concerning the pretested post-test scores in the area of students' understanding of technology. The column sum of the non-T4C group was 803 and the T4C group had a sum of 665, allowing for the main effect of T4C to be estimated. The row sum for the pretested group was 731 and 737 for the unpretested group providing for the analysis of the effects of pretesting. Finally, the cell mean provided for the interaction of pretesting and T4C.

TABLE 6

SUMMARY OF TWO-WAY ANOVA OF T4C CONCERNING STUDENTS' UNDERSTANDING OF TECHNOLOGY

Source	SS	df	MS	F	F.01 Expected
T4C	73.13	1	73.13	94.97	6.70
Pretested	3.64	1	3.64	4.72	6.70
T4C X Pretested	9.49	1	9.49	12.32	6.70
Error	386.6	505	.77	. . .	. . .

Table 6 indicates, through the use of a two-way analysis of variance, that a significant difference at the .01 level of confidence for factor one (T4C) was evident concerning the teachers' ratings of the students' understanding of technology. The calculated F-value was 94.97 and F.01 was 670. An analysis of factor two which ignored treatment (T4C) and only took into account pretesting, showed that a F value of 4.72 was calculated while the expected value F.01 = 6.70 indicated no dignificant difference between the pretested and unpretested groups. Further, when testing for interaction with T4C and pretesting an F value of 12.32 was calculated and an expected F.01 = 6.70

which showed a significant difference. Taking factors one and two into account and considering interaction effects, the assumption that a significant difference between the experimental and control groups can be made. Also, the conclusion can be stated that this difference was due to T4C and not the pretest.

TABLE 7

SUMMARY OF MEANS AND STANDARD DEVIATIONS CONCERNING STUDENTS' UNDERSTANDING OF TECHNOLOGY

Source	Pretest	Post-test
T4C/Pretested	$\bar{x}$=3.453, σ=.929	$\bar{x}$=2.742, σ=.844
T4C/Unpretested	. . . . .	$\bar{x}$=2.742, σ=.923
Non-T4C - Pretested	$\bar{x}$=3.288, σ=.935	$\bar{x}$=3.220, σ=.935
Non-T4C - Unpretested	. . . . .	$\bar{x}$=3.331, σ=.787

Table 7 indicates no significant difference between the pretest ratings of the experimental and control groups concerning the students' understanding of technology. The pretest mean score for the experimental group was $\bar{x}$=3.453, σ=.929, while the pretest mean score for the control group was $\bar{x}$= 3.288, σ=.935. This assumption was strenthened due to the calculated T-value being 1.39 and T.001 = 3.291 indicated by Table 8.

TABLE 8

SUMMARY OF T-VALUES MEASURING FOR SIGNIFICANT DIFFERENCE BETWEEN GROUPS CONCERNING STUDENTS' UNDERSTANDING OF TECHNOLOGY

Groups	T-Value	df	Expected T.001	Significance
0_1 vs. 0_3	1.39	244	3.291	NO
0_1 vs. 0_2	10.57	127	3.370	YES
0_3 vs. 0_4	-1.38	117	3.373	NO
0_2 vs. 0_4	-4.22	244	3.291	YES
0_5 vs. 0_6	-9.63	261	3.291	YES

Table 8 indicates a significant difference between the pre and post-test ratings of the experimental group. For the pretested T4C group scored a $\bar{x}$ = 3.453 for the pre-test (0_1) and 2.742 for the post-test (0_2) and the calculated T-value was 10.57 and T.001 = 3.37, indicating a better rating for the experimental group after a semester's exposure to T4C.

However, concerning the pretested control group, no significant difference was indicated. For the pretest

(O_3) mean score was 3.288 and the post-test (O_4) mean score was 3.220, while the calculated T-value was 1.38 and T.001 was 3.37, indicating no growth without T4C.

Concerning the post-test scores of the pretested experimental and control groups, a significant difference was indicated. For the post-test mean score of the pretested T4C group (O_2) was 2.742 and the post-test mean score of the pretested non-T4C group (O_4) was 3.220, with the calculated T-value being -3.86 and T.001 being 3.291, thereby indicating a significantly better score on the post-test by the experimental group (O_2) in the area of students' understanding of technology.

Similar results were indicated for the unpretested groups. The mean score for the experimental group in this category (O_5) was 2.309 while the control group (O_6) was 3.331. The calculated T-value was -9.33 and T.001 was 3.291, indicating significantly higher ratings than the unpretested control group (O_6) in the area of students' understanding of technology.

TABLE 9

2X2 ANOVA ROW AND COLUMN SUMS CONCERNING STUDENTS' ACADEMIC SKILLS

Group	Non-T4C	T4C
Pretested	$\bar{x}$ = 2.949 ΣX = 348 N = 118	$\bar{x}$ = 2.69 ΣX = 344 N = 128
Unpretested	$\bar{x}$ = 3.244 ΣX = 412 N = 127	$\bar{x}$ = 2.721 ΣX = 370 N = 136

Table 9 indicates the sum of X, the mean for each group and the number of cases for each group concerning the students' academic skills. The column sums of non-T4C was 760, and for T4C 714, which allowed for the estimation of the main effects of treatment. The row sums for the pretested group was 692 and for the unpretested group 263, indicating the effects of the pretest. Also, the cell mean provided the basis for the interaction of pretesting and T4C.

TABLE 10

SUMMARY OF TWO-WAY ANOVA OF T4C CONCERNING STUDENTS' ACADEMIC SKILLS

Source	SS	df	MS	F	F.01 Expected
T4C	20.08	1	20.08	19.12	6.70
Pretested	3.27	1	3.27	3.11	6.70
T4C X Pretested	2.12	1	2.12	2.02	6.70
Error	532.89	505	1.05	. . .	. . .

Table 10 indicates that there was a significant difference between groups since F calculated was 19.12 and F.01 was 6.70. Concerning only factor two (pretesting), a calculated F ratio of 3.11 was evident and F.01 was 6.70, indicating no significant difference between groups. When testing for interaction using T4C and the pretest, a calculated F value of 2.02 was found while F.01 was 6.70, indicating no significant difference. Therefore, although significant differences were evident with T4C, the combined factors of T4C and pretesting showed no significant differences, indicating that differences found among the experimental and control groups were either due to chance or some other unidentified factor. Thus, the assumption that differences in teachers' ratings concerning the students' academic skills was due to T4C could not be stated here.

TABLE 11

SUMMARY OF MEANS AND STANDARD DEVIATIONS CONCERNING STUDENTS' ACADEMIC SKILLS

Source	Pretest	Post-test
T4C/Pretested	$\bar{x}$=3.016, σ=1.170	$\bar{x}$=2.695, σ=1.168
T4C/Unpretested	. . . . .	$\bar{x}$=2.721, σ=1.052
Non-T4C - Pretested	$\bar{x}$=2.771, σ= .973	$\bar{x}$=2.949, σ= .959
Non-T4C - Unpretested	. . . . .	$\bar{x}$=3.244, σ= .897

Table 11 indicates that there were no significant differences between pretest ratings of the experimental and control groups in the area of students' academic skills. For the mean score on the pretest T4C group (0_1) was $\bar{x}$ = 3.016, σ = 1.170 while the mean score for the pretest control group (0_3) was 2.771, σ = .973. The calculated T-value was 1.79 and T.001 = 3.370, indicated by Table 12. Further, the assumption that no significant difference between the experimental and control groups at the beginning of the study (September, 1976) was evident.

TABLE 12

SUMMARY OF T-VALUES MEASURING FOR SIGNIFICANT DIFFERENCE BETWEEN GROUPS CONCERNING STUDENTS' ACADEMIC SKILLS

Groups	T-Value	df	Expected T.001	Significance
0_1 vs. 0_3	1.79	244	3.291	NO
0_1 vs. 0_2	5.46	127	3.370	YES
0_3 vs. 0_4	-2.76	117	3.373	NO
0_2 vs. 0_4	-1.85	244	3.291	NO
0_5 vs. 0_6	-4.33	261	3.291	YES

Table 12 indicates a significant difference between the pre and post-test scores of the experimental group (0_1 vs. 0_2). For the mean score of the pretested group (0_1) was $\bar{x}$ = 3.016 and 2.695 for the post-tested group (0_2). The calculated T-value was 5.46 and T.001 was 3.370.

However, no significant difference was indicated in the pre and post-test scores of the control group (0_3 vs. 0_4). The pretest (0_3) mean score was 2.771 and the post-test mean score (0_4) was 2.9949, while the calculated T-value was -2.76 and T.001 was 3.37.

The comparison of the pretest groups' post-test scores (0_2 vs. 0_4) indicated no significant difference. The post-test mean score of the pretested T4C group (0_2) was 2.695 and the post-test mean score of the pretested control group (0_4) was 2.721, while the calculated T-value was -1.85 and T.001 was 3.291.

The unpretested experimental and control groups (0_5 vs. 0_6) showed a significant difference in the area of academic skills. The experimental group (0_5) had a mean score of 2.721 while the control group (0_6) had a mean score of 3.244. The calculated T-value was 4.33 and T.001 was 3.291.

Due to the fact that there was no significant difference between the pretested experimental and control groups' post-test rating (0_2 vs. 0_4) and even though there was a significant difference between the unpretested experimental and control groups' (0_5 vs. 0_6) ratings, the conclusion that this better rating by the experimental group (0_5) was due to T4C cannot be stated.

CHAPTER V

Summary, Conclusions, & Recommendations

Technology for Children was instituted in the Bayonne School System in 1973, seven years after its inception by the New Jersey Division of Vocational Education. This hands-on approach to learning was intended to be incorporated into a heavily academic atmosphere created by the post-Sputnick era. The Bayonne District began the program on a small level involving sixteen teachers and two administrators during the 1972-73 school year. By the end of that year, thirty-six teachers had received T4C training and a supervisor had also been assigned to the program. Then on February 14, 1974, the Bayonne Board of Education passed a resolution authorizing the Superintendent of Schools to implement the Governor's Career Development Project. This program called for a full time T4C supervisor as part of its components and on April 1, 1974, a T4C coordinator was appointed to that position.

During the next two years, T4C Coordinator William Horne devised a unique system of providing episodes or units to each T4C teacher, assuring full utilization of the unit. Teacher training was developed in the Bayonne area and a training center was established at Mary J. Donohoe School

in Bayonne. Horne brought the number of T4C trained teachers up to a swelling ninety-three practitioners by September, 1975, and the pupil population in excess of 2,400.

The entire T4C Program was promoted on a completely voluntary basis on the part of the teachers, allowing each to utilize his own expertise and teaching situation to the fullest.

This study had two purposes: 1) to establish a rationale for the positive efficacy of the T4C Program in the Bayonne School District by determining if the three objectives, as outlined by the New Jersey T4C Director, Fred J. Dreves, were indeed being achieved by the 2,470 students being exposed to the program and 2) to provide the only existing account of the T4C Program for all educators.

The three areas outlined by the State Department as objectives of T4C were improvement in the students' level of self-awareness, understanding of technology, and academic skills.

The study population consisted of twenty-four randomly selected classes in different geographic locations of the city (total 509 students). Half of these classes were exposed to T4C for a full semester's time (September, 1976 - January, 1977), while the remaining half continued in a traditionally based setting.

A questionnaire was developed and tested to serve as an attitudinal rating scale so that the teachers involved

in the study could rate each of the students in their classes accordingly. These questionnaires were administered to half of both the experimental and control groups following the procedures indicative of the Solomon 4-Group Design. At the end of a semester's time (January, 1977), a second questionnaire, identical to the first, was administered to the entire sample to determine the perceived changes or lack of changes in students.

Conclusions

This investigation attempted to determine the efficacy of the Bayonne T4C Program by gathering data through the use of questionnaires as to teachers' perceptions in the three areas outlined by the State Department of Education concerning T4C.

The following conclusions were reached based on the findings:

1. Students exposed to T4C were perceived by their instructors as possessing a higher level of self-awareness as opposed to the students who were not exposed to T4C during the same time span. In addition, experimental group teachers who participated in the pretest as well as the post-test viewed their students as growing more in the area of self-awareness as opposed to teachers participating in the pre and post-test in the control group. Virtually every child was rated higher after ex-

posure to T4C for a semester's time in this area.

2. Students exposed to T4C were perceived by their teachers as possessing a better understanding of technology as opposed to students in the control group. Again, a significant difference indicating a better rating of students exposed to T4C was evident in the total sample. Also, experimental group teachers who participated in both the pre and post-test perceived more growth in their students in this area than the control group teachers for the same time span.
3. Students exposed to T4C were viewed by their instructors as showing significant differences indicating a better rating in the pretested experimental group. However, this rating was not significantly different from the pretest control group's post-test rating at the conclusion of the study. In addition, the unpretested experimental group reported a better score than the unpretested control group. Considering these factors, it became evident that these ratings were in conflict and, therefore, the researcher could not state that T4C improved the teachers' perceptions of the students' academic skills.

Therefore, it could be concluded that teachers' perceptions of their students after exposure to T4C were generally

better than the teachers' perceptions of students receiving traditionally based instruction. Teachers believed and reported same on the attitudinal scales. Whether this growth was entirely due to T4C cannot be stated here (but this assumption can be made), for while the Solomon 4-Group Design carried a high prestige concerning external validity, the researcher cannot be totally sure that the teachers themselves gained a more positive attitude towards their students because of T4C. If this were the case, the ratings of the individual student might reflect the teacher's attitude. However, all teachers who utilized T4C during this study rated the bulk of their students significantly better in the areas of self-awareness and understanding of technology. Due to the randomization process, if T4C only effected the teacher, some reflection of this phenomenon would have become evident. Also, the pretest reported that there was no significant difference in teachers' perceptions at the beginning of the study. If teachers were biased due to T4C, some indications would have to be evident for the teachers involved in the study were pre-trained in the T4C philosophies before the beginning of the study. Nevertheless, if teachers perceived a positive growth in their classes, this attitude would be transmitted to the child thereby contributing to a sound educational environment.

Recommendations

The following recommendations were made based on the findings of this study:

1. The Bayonne T4C Program should be continued in the district in order to enhance the students' level of self-awareness and understanding of technology.
3. In-service teacher training should be continued and expanded in the area of T4C. Initial training efforts should be focused on philosophies as well as actual skills.
3. The New Jersey T4C Program should evaluate its current program and support its philosophies with hard data.
4. The findings of this study should be utilized as a basis for future studies of the T4C Program for the State of New Jersey.

Appendix A

Technology for Children

Unit Kits

Batteries and Bulbs - This ESS Unit explores the principles of electricity and circuitry through the use of batteries and bulbs. (5-6)

Bottle Recycling - We have a wide range of ideas to be used with this recycling project. Using old bottles, which are covered with any number of different decorative products, the students can produce vases as well as learn something about ecology. (4-6)

Candle Making - A unit used to produce colorful, scented candles in various shapes and sizes. Easily incorporated into social studies. (2-6)

Cardboard Carpantry - This unit works well with math and teaching geometric shapes and structures. 4' by 8' sheets of tri-wall are available for a multitude of projects. (3-6)

Ceramic Tiles - The students produce tivits or ashtrays by mounting ceramic tiles on plywood bases. Excellent for teaching shape and size relationships. (2-6)

Community Helpers - This unit focuses on people in the community who help us all. A combination of puzzles, flannel-board figures, stand-up figures, and puppets, makes this unit excellent for the primary grades. (K-3)

Constructo-Straws - This unit used straws and plastic hub-like connectors to teach structures. Build anything from simple geometric shapes to large self-standing structures. (1-5)

Craft Sticks - Popsicle sticks are used to form anything from simple geometric shapes to beautiful wooden sculptures. (K-6)

Cuisennaire Rods - Color-coded rods are used to teach fractions. (3-6)

Decoupage - We provide everything but the pictures. Glue, stain, antiqueing, and pine boards come with the unit. (3-6)

Fischertechnik - A nearly indestructable plastic erector-type set used to teach the fundamentals of physics. Motion, gear ratios, and leverage are explored. Motors are provided. (3-6)

Floralistics - Using wire, floral tape, artificial stemens, and a special liquid film, the students produce artificial plastic flowers. (4-6)

Geo Blocks - A unit containing a large assortment of wooden blocks, cards for working with them, and a special teacher's guide. Good for use in teaching geometric shapes and relationships. (3-5)

Glass Staining - There are two different types of units available in this area. One provides the students

with plastic sheets, liquid lead, and glass stain. The other provides bottles, lead strips, and glass stain. Both produce beautiful finished products. The one with the bottles is more difficult to master. (4-6)

Ice Cream - We have some electric ice cream freezers available, but we cannot provide the ingredients. (K-6)

Lacing and Braiding - Long, plastic, colorful laces may be used to make necklaces, bracelets, lanyards, etc. Instruction books included. (4-6)

Leathercraft - The students begin with pre-cut pieces of raw leather. They tool and stamp the leather into different patterns. The leather is then dyed and lacquered. The finished products are beautiful key fobs, wrist bands, and belts. (3-6)

Macramé - A unit which provides booklets and strings to do various macramé projects. Produce belts, curtains, and plant hangers. (4-6)

Paper recycling - Another ecology-oriented unit, paper recycling shows the students how old newspapers may be used again to make paper of sufficient quality to write on. (K-6)

Photography - Students take their own pictures and then develop, print, and enlarge them. No darkroom is necessary. (5-6)

Planting - We have soil, peat moss, and a wide variety of plant and vegetable seeds available. (K-6)

Printing Press - We have two of these units available. One used individual letters about a half inch wide to print. The other uses smaller individually mounted letters. These letters are put into a block to form sentences and paragraphs to print entire messages at one time. The first unit is good for grades 1 to 3. The other for grades 4 to 6.

Rocketry - This unit works well with almost any aspect of the curriculum. The students design, build, paint, launch, and recover their own rockets. We will also offer rockets which take movies and still photographs while in flight. (4-6)

Rock Polishing - We have rock tumbles and crushed rock packet. This unit takes three weeks and must be run on a twenty-four hour schedule. (3-6)

Sand Art - Colored sand is used to make decorative projects in small bowls. We provide everything. A difficult unit for all but upper grades. (5-6)

Silk Screen Printing - These units can be used to print anything from Christmas cards to T shirts. The student makes his own designs and messages. (4-6)

Symmography - Mathematical concepts are easily incorporated into this unit. The careful placement of nails on a pre-designed pattern is followed by connecting the nails with colored string. The geometric shapes used make this unit easy to incorporate. (3-6)

Tinkertoys - An extra large box of tinkertoys. Good for shapes and structures. (1-3)

Weaving - We have square frame looms and corsair looms available. Good for bicentennial projects. (3-6)

Weights and Balances - Not really a unit in itself, but a few different types of scales and balances for use in the classroom. (K-3)

Appendix B

Unit	# of Times Used	School	Grade	Section
Batteries & Bulbs	4	1 4 7	5 6 5 6	1 3 1 3
Bottle Recycling	2	5 7	4 5	1 3
Cardboard Carpentry	3	4 7	5 6 6	1 3 3
Candlemaking	1	3	2	3
Ceramic Tiles	2	8	3 4	1 3
Comm. Helpers	2	3	1 2	1 3
Craft Sticks	2	3	1 2	1 3
Cuisennaire Rods	2	1 8	5 4	3 3

Unit	# of Times Used	School	Grade	Section
Fishertecnik	2	5	4	1 3
Geo Blocks	1	7	5	1
Leathercraft	4	1 4	5 5 6	1 3 1 3
Rocketry	3	5 7	4 6	1 3 3
Symmography	2	5 4	4 6	3 3
Tinkertoys	3	3 8	1 2 3	1 3 1
Weights & Balances	3	3 8	1 2 3	1 3 1

Appendix C

TECHNOLOGY FOR CHILDREN

QUESTIONNAIRE #1 - SEPTEMBER, 1976

Teacher's Name _____

Student's Name/Number _____

Grade Level _____

DIRECTIONS: Please circle the description you perceive as most appropriate.

* *

1. Student's level of self-awareness

Very High	High	Average	Low	Very Low
1	2	3	4	5

2. Student's understanding of technology

Very High	High	Average	Low	Very Low
1	2	3	4	5

3. Student's academic skills

Very High	High	Average	Low	Very Low
1	2	3	4	5

* *

_____ School

Appendix D

Letter One: Sent to half the experimental and half the control groups.

GOVERNOR'S CAREER DEVELOPMENT PROGRAM

Bayonne Public Schools
Avenue A and 29th Street
Bayonne, N. J.

Richard W. Entwistle
PROJECT DIRECTOR
Michael A. Wanko
MULTI-MEDIA COORDINATOR
William D. Horne
TECHNOLOGY FOR CHILDREN COORDINATOR
Clifford G. Doll
JOB PLACEMENT COORDINATOR

BOARD OF EDUCATION CITY OF BAYONNE N.J.

September 8, 1976

Ext. 234-285
437-3000

Dear Colleague,

The attached questionnaire concerned with your perception of specific student characteristics is part of a district-wide study to determine the efficacy of the Technology for Children Program. The results of this study will help provide preliminary criteria to be used for developing a better T4C Program in the Bayonne District.

Your responses are particularly desirous because of your experience in elementary education. The enclosed questionnaire has been tested with a sampling of teachers, both T4C trained and traditionally based, and it has been revised in order to obtain all necessary data while requiring only a minimum of your time.

It will be appreciated if you will complete the questionnaire prior to September 21, 1976 and return it in the addressed inter-school envelope enclosed. Other phases of this research cannot be carried out until analysis of the questionnaire results will be mailed to you upon request.

Thank you for your cooperation.

Sincerely yours,

Michael A. Wanko

Enc.

msm:

Appendix E

TECHNOLOGY FOR CHILDREN

QUESTIONNAIRE #2 - JANUARY, 1977

Teacher's Name _____

Student's Name/Number _____

Grade Level _____

QUESTIONS: Please circle the description you perceive as most appropriate.

* *

1. Student's level of self-awareness

Very High	High	Average	Low	Very Low
1	2	3	4	5

2. Student's understanding of technology

Very High	High	Average	Low	Very Low
1	2	3	4	5

3. Student's academic skills

Very High	High	Average	Low	Very Low
1	2	3	4	

* *

_____ School

Appendix F

Letter Two: Sent to all who had participated in the pretest.

GOVERNOR'S CAREER DEVELOPMENT PROGRAM
Bayonne Public Schools
Avenue A and 29th Street
Bayonne, N. J.

Richard W. Entwistle
PROJECT DIRECTOR
Michael A. Wanko
MULTI-MEDIA COORDINATOR
William D. Horne
TECHNOLOGY FOR CHILDREN COORDINATOR
Clifford G. Doll
JOB-PLACEMENT COORDINATOR

Ext. 284-285
437-3000

January 5, 1977

Dear Colleague,

Attached is a follow-up questionnaire concerned with your perception of specific student characteristics in relation to the Bayonne T4C Program.

Your responses on the first questionnaire were most helpful and with your cooperation, this second sampling should provide the sufficient data required in order to complete the study.

Please complete the questionnaire prior to January 19, 1977 and return it in the addressed inter-school envelope enclosed. Again, if you desire a summary of questionnaire results, they will be mailed to you upon request.

Thank you for your cooperation.

Sincerely yours,

Michael A. Wanko

Enc.

msm:

Appendix G

Letter Three: Sent to all who had not received pretest.

GOVERNOR'S CAREER DEVELOPMENT PROGRAM

Bayonne Public Schools
Avenue A and 29th Street
Bayonne, N. J.

Richard W. Entwistle
PROJECT DIRECTOR
Michael A. Wanko
MULTI-MEDIA COORDINATOR
William D. Horne
TECHNOLOGY FOR CHILDREN COORDINATOR
Clifford G. Doll
JOB PLACEMENT COORDINATOR

Ext. 284-285
437-3000

January 5, 1977

Dear Colleague,

The attached questionnaire concerned with your perception of specific student characteristics is part of a district-wide study to determine the efficacy of the Technology for Children Program. The results of this study will help provide preliminary criteria to be used for developing a better T4C Program in the Bayonne District.

Your responses are particularly desirous because of your experience in elementary eduction. The enclosed questionnaire has been tested with a sampling of teachers, both T4C trained and traditionally based, and it has been revised in order to obtain all necessary data while requiring only a minimum of your time.

It will be appreciated if you will complete the questionnaire prior to January 19, 1977 and return it in the addressed inter-school envelope enclosed, Other phases of this research cannot be carried out until analysis of the questionnaire data is completed. A summary of questionnaire results will be mailed to you upon request.

Thank you for your cooperation.

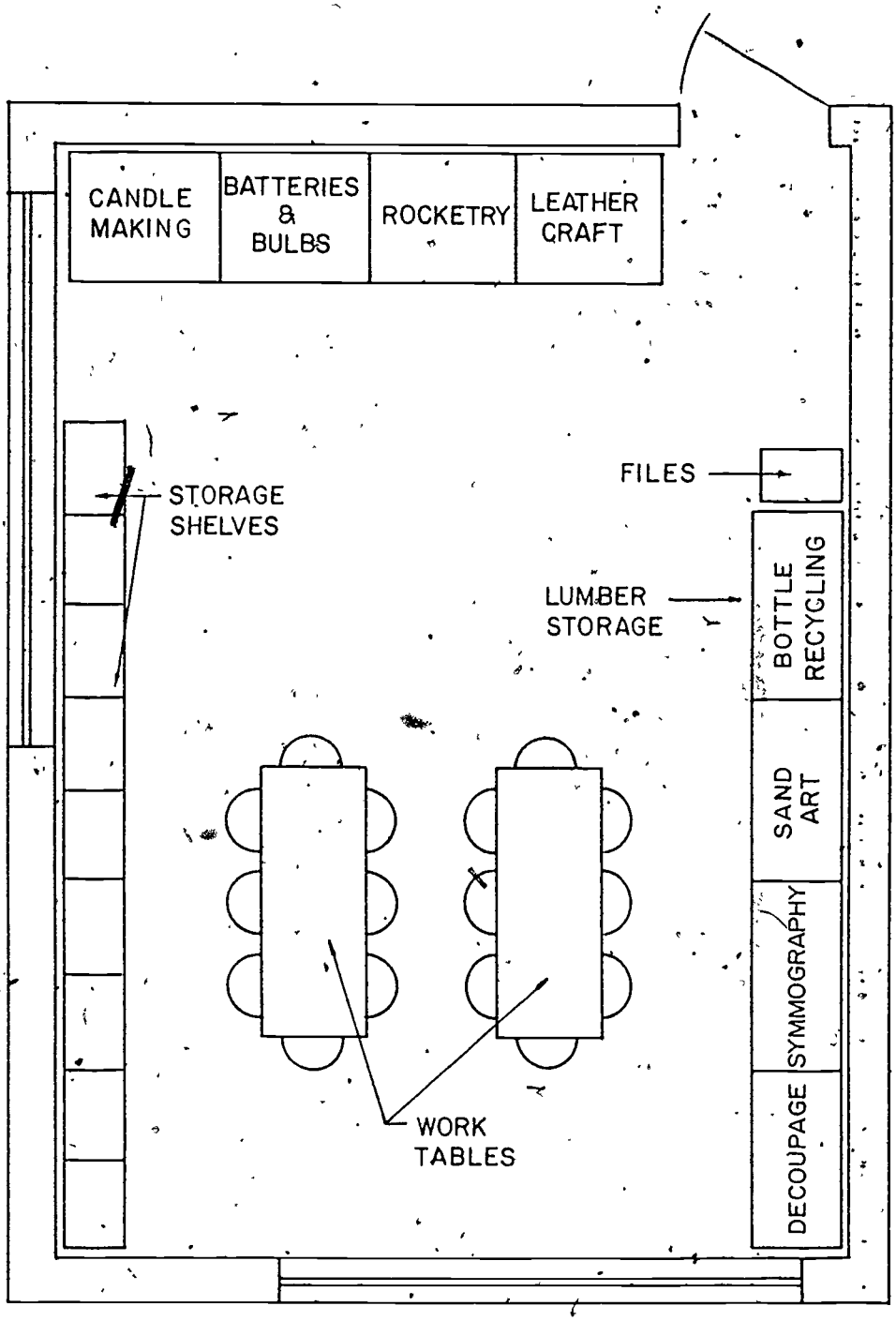
Sincerely yours,

Michael A. Wanko

Enc.

msm:

Appendix II



T 4 C TEACHER TRAINING CENTER

SCALE —— $\frac{1}{4}$" = 1'-0"

Appendix I

INDIVIDUAL RESULTS ON PRE & POST QUESTIONNAIRE

CLASS ________

	Questionnaire I		Questionnaire II	
Student Number	Question Number	Description	Question Number	Description
______	1	V H A L W	1	V H A L W
	2	V H A L W	2	V H A L W
	3	V H A L W	3	V H A L W
______	1	V H A L W	1	V H A L W
	2	V H A L W	2	V H A L W
	3	V H A L W	3	V H A L W
______	1	V H A L W	1	V H A L W
	2	V H A L W	2	V H A L W
	3	V H A L W	3	V H A L W
______	1	V H A L W	1	V H A L W
	2	V H A L W	2	V H A L W
	3	V H A L W	3	V H A L W
______	1	V H A L W	1	V H A L W
	2	V H A L W	2	V H A L W
	3	V H A L W	3	V H A L W
______	1	V H A L W	1	V H A L W
	2	V H A L W	2	V H A L W
	3	V H A L W	3	V H A L W
______	1	V H A L W	1	V H A L W
	2	V H A L W	2	V H A L W
	3	V H A L W	3	V H A L W
______	1	V H A L W	1	V H A L W
	2	V H A L W	2	V H A L W
	3	V H A L W	3	V H A L W
______	1	V H A L W	1	V H A L W
	2	V H A L W	2	V H A L W
	3	V H A L W	3	V H A L W
______	1	V H A L W	1	V H A L W
	2	V H A L W	2	V H A L W
	3	V H A L W	3	v h a l w
______	1	V H A L W	1	V H A L W
	2	V H A L W	2	V H A L W
	3	V H A L W	3	V H A L W

Appendix J

INDIVIDUAL RESULTS ON POST QUESTIONNAIRE

CLASS ____________

QUESTIONNAIRE II POST-TEST

Student Number	Question Number	Description
________	1	1 2 3 4 5
	2	1 2 3 4 5
	3	1 2 3 4 5
________	1	1 2 3 4 5
	2	1 2 3 4 5
	3	1 2 3 4 5
________	1	1 2 3 4 5
	2	1 2 3 4 5
	3	1 2 3 4 5
________	1	1 2 3 4 5
	2	1 2 3 4 5
	3	1 2 3 4 5
________	1	1 2 3 4 5
	2	1 2 3 4 5
	3	1 2 3 4 5
________	1	1 2 3 4 5
	2	1 2 3 4 5
	3	1 2 3 4 5
________	1	1 2 3 4 5
	2	1 2 3 4 5
	3	1 2 3 4 5
________	1	1 2 3 4 5
	2	1 2 3 4 5
	3	1 2 3 4 5
________	1	1 2 3 4 5
	2	1 2 3 4 5
	3	1 2 3 4 5
________	1	1 2 3 4 5
	2	1 2 3 4 5
	3	1 2 3 4 5

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