DOCUMENT RESUME

ED 048 505 VT 012 866

TITLE	Industrial Arts Teacher Education Fellowship Program in the Technologies, 1969-1970.
INSTITUTION	West Virginia Univ., Morgantown. Coll. of Human Resources and Education.
PUB DATE	[70]
NOTE	76p.
AVAILABLE FROM	College of Human Resources and Education, Division of Education, West Virginia University, Morgantown, West Virginia 26506 (Single copies without charge; send stamped self-addressed mailing envelope, size 7x10)
EDRS PRICE	EDRS Price MF-$0.65 HC-$3.29
DESCRIPTORS	Educational Planning, Fellowships, Industrial Arts, *Industrial Arts Teachers, *Leadership Training, Models, *Program Development, *Teacher Education, Teacher Educators, *Teacher Programs, Technology

ABSTRACT

Ten teacher educators took part in the 1-year fellowship program which focused on leadership and program development for teacher education in the technologies. The implications of the content and knowledge structures of current technology for teacher preparation, and the establishment of learner-oriented programs for a technological society were the primary concerns of the program. Two program models were developed, entitled: (1) Rationale and Structure of a Model Program for the Education of Teacher-Scholars in Technology, and (2) Technology--A Base for Industrial Arts Teacher Education. These models should provide industrial arts teacher educators with new insights for changing current programs. (GEB)

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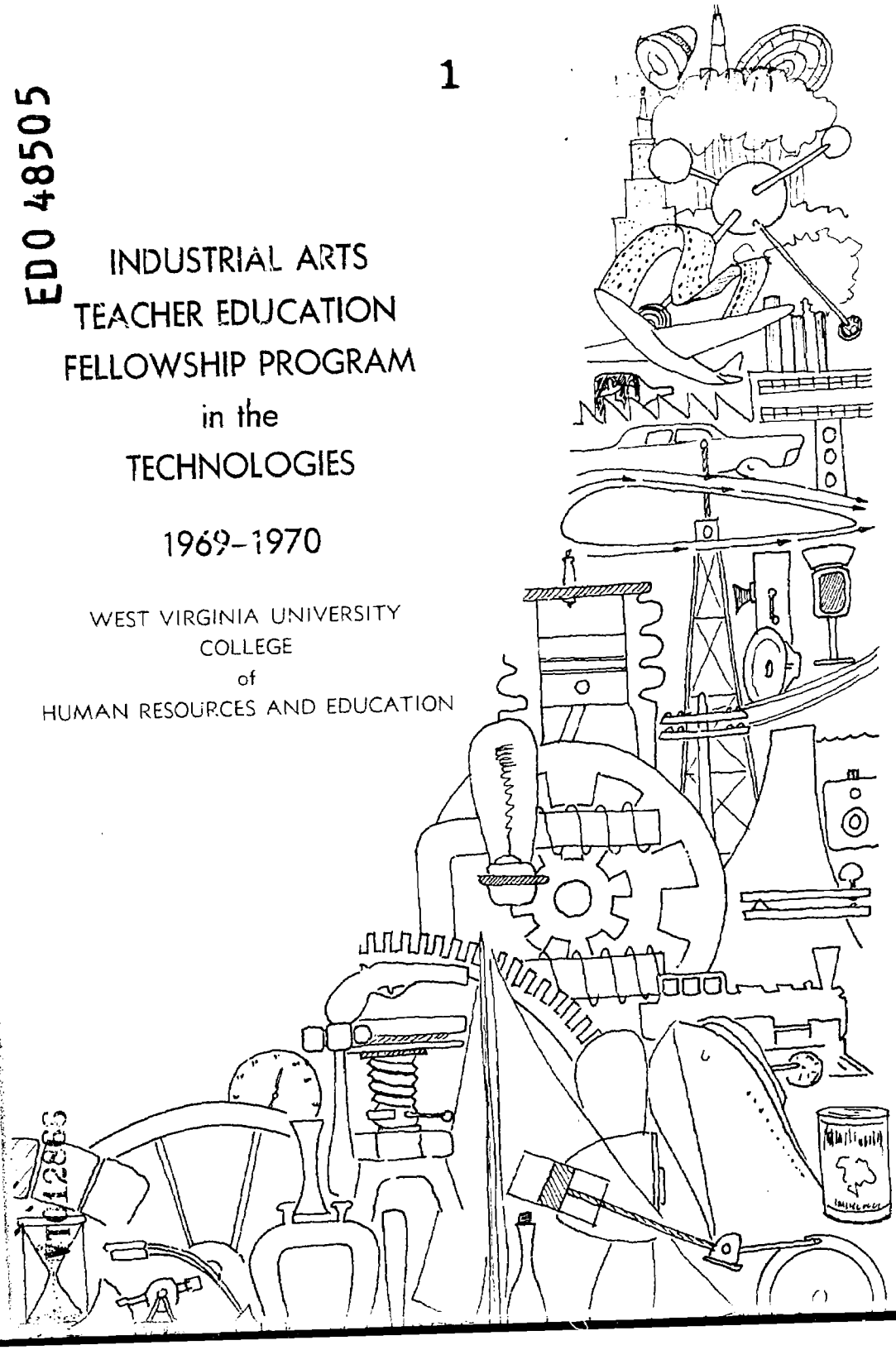
INDUSTRIAL ARTS TEACHER EDUCATION FELLOWSHIP PROGRAM in the TECHNOLOGIES

1969–1970

WEST VIRGINIA UNIVERSITY
COLLEGE
of
HUMAN RESOURCES AND EDUCATION



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WEST VIRGINIA UNIVERSITY
College of Human Resources and Education
Morgantown, West Virginia 26506

PREFACE

A unique experience was begun by ten teacher educators August 28, 1969, on the campus of West Virginia University. Ten teacher educators, selected from over three-hundred applicants, came to West Virginia University to take part in a fellowship program for teacher education in the technologies. Each participant came for different reasons, from diverse backgrounds, with varying levels of competence and certainly with a diversity of value orientations.

Each participant was highly motivated and concerned with the mission of the program. Essentially the program focused on leadership development and the critical problem of program development for teacher education in the technologies. Attention was directed toward the development of curricula which would meet the technical and social/cultural needs of youth in a technological society. Specific attention was directed to the problem of technological literacy for disadvantaged youth, both urban and rural.

"But renewal—of societies or of individuals—depends in some measure on motivation, commitment, conviction, the values men live by, the things that give meaning to their lives."

JOHN W. GARDNER
Self-Renewal

The full-time fellowship program was development oriented. It was concerned not only with the complex content and knowledge structures of today's technology and the implications for the preparation of teachers, but also the essential question of establishing learner-oriented programs which would enable all youth to enter the mainstream of our technological society.

The participants have attempted to communicate with their colleagues through the report which follows. However, it should be noted that the critical element of the fellowship program was people and not programs. The program was designed to provide each fellow with a higher level of competency in curriculum development in the technologies and actual experiences with disadvantaged youth and their environment. In addition, solutions to the problems of curriculum structures for the preparation of teachers capable of meeting the needs of youth in a changing technological society were proposed and outlined.

"One must be willing to express oneself without reserve. This does not mean that one always says everything; but dialogue is a relationship in which one is willing to be completely open. Sometimes silence itself is an important part of genuine dialogue."

M. BUBER
Understandings of Man

Each participant developed a much higher level of scholarship, became more knowledgeable about technology, society and education and learned first hand the extent to which individual value orientation determines curricular decisions. The latter discovery is evident in the report which follows. The reader will discover two separate approaches prepared by two groups.

Even though both approaches were developed over many months of study, reflection and dialogue, it must be noted that total agreement was not reached at the completion of the program. New curricular approaches supported by different rationale are still to be written by those who, at the completion of the program, continued to reserve judgment and commitment to solutions to the problem. Hopefully, the participants have contributed a unity of direction for teacher education in the technologies while at the same time suggesting a diversity of means.

PARTICIPANTS

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SECTION I

RATIONALE AND STRUCTURE OF A MODEL PROGRAM FOR THE EDUCATION OF TEACHER-SCHOLARS IN TECHOLOGY

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I. THE TECHNOLOGICAL ORDER

"Future shock is more than an arresting phase. It may prove to be the most obstinate and deliberating social problem of the future."

ALVIN TOFFLER
Future Shock

To analyze or even to enumerate man's achievements in the past several decades seems an endless task. How can one measure technological change and its consequences? In the midst of technological success we find ourselves involved in a shrinking world created by the collapse of space and time, and continually confronted with the possibility of absolute destruction. Change is so rapid that it appears to be our only constant, while any translation of the phenomena we call technology is, at best, an inadequate portrayal of the moment. Nevertheless, it must be understood for it is all about us—malignant and quiescent, destructive and provident, encapsulating and liberating, eternally damning and Messianic.

That there is little semblance of similarity between the technology of today and that of primitive man is a foregone conclusion. It is true that man and his environment are constants in both settings, but there the similarity ends, for earliest man had a lack of scientific knowledge and only rudimentary tools. In the 1970's man finds himself equipped with 42,000 computers which now are ten times smaller, 100 times faster, and 1,000 times less expensive to operate than the computers of seventeen years ago. At a time when 95 per cent of all scientists in earth's history are living and at a time when scientific knowledge doubles every ten years, the ability of man to achieve his Utopia is well within the realm of possibility.

"What then is the real problem posed to men by the development of the technological society? It comprises two parts: 1. Is man able to remain master in a world of means? 2. Can a new civilization appear inclusive of Technique?"

JACQUES ELLUL
The Technological Order

One can tell much about any given society by analyzing the use of tools and materials of that society and the resulting social consequences. Universal to all technological societies is the failure to achieve optimum social control. This failure represents a dichotomy between the ideal and the actual. A social system requires cohesion, flexibility, tolerance and consistency if it is to survive, However, scientific developments have progressed to a point where this task seems almost impossible. Man's problems have become economic, political, social, and psychological in spite of his technological prowess. The solution to achieving the

ultimate lies in a blending of technology with socio-cultural elements and an understanding of these by all people of all groups in every society. This can only come about by a redirection of all goals: national, regional, state and individual.

Some form of technology was on earth when man first began to struggle for survival thousands of years ago. In the beginning his tools were primitive and designed for facilitating survival. Production was not for the sake of quantity or for profit, but was for the perpetuation of life. This is unlike the human of today who is so immersed in his culture that he is scarcely aware of restrictions imposed upon him by nature and other men, or of his conscious diligence to adhere to them. Humans of the last three decades of the 20th century are left with the power of modern science which can alternately create a demand for an environmental teach-in, dehumanize, or raise issues seemingly beyond man's capacities to solve. Man's salvation in the past was the power of knowledge, his ability to adapt, and his ability to synthesize information. Where is this power today? Has man's ability failed to keep pace with the growth of technology?

For primitive man nature was holy and man was a part of it. Today we have lost touch with the natural and are fashioning an environment of our own making. Primitive man used tools for survival, thus restricting his taxonomy of technology to his local culture. Products were produced within a locale according to the needs of an extremely small group. Only a few miles away his human conterparts might have produced a tool for the same function in a totally different manner. Little did these people realize that technological growth was to become exponential and irreversible in the very near future. This does not imply that technology progressed without interruption, nor that it has been perpetuated by all men. There have been periods of stagnation when progress has literally stopped. However, since the 1950's man's growth has progressed to the point where all that is desired can be achieved, provided man can mobilize his institutions

"No great advance has ever been made in science, politics, or religion without controversy."

LYMAN BEECHER

to work in a cohesive manner.

"Man is a technological animal, and technological change is the fundamental factor in human evoluation."

VICTOR C. FERKISS
The Technological Man

The conviction should be expressed that the growth of technology has undoubtedly yielded advantages that greatly outweigh the harm done. There is much to be said for the positive contributions of technology. However, little effort is being made to halt the perpetration of one devastating technological atrocity after another against both man and the larger ecology.

"The civilized man has built a coach, but has lost the use of his feet; he has a fine Geneva watch, but cannot tell the hour by the sun."

RALPH W. EMERSON

In practical terms, the most important task facing people of technological nations today is that of developing a clear understanding of our omnipotent technology and the complex associations existing between it and societal structures. What is to be tomorrow must now be ordered with reverence and deliberation if it is to have significance for the living and abundant life-supporting elements for the young and unborn.

II. THE TASK

It is proposed that from technology there be derived a realm of study which should become a major concern of all public education. Its scope should encompass the interrelationship of man with his institutions, understandings and abilities as positive forces in becoming all he is capable of being. We have been endeavoring to identify the role of industrial arts teacher education in this context. If we succeed in this, much will be accomplished. There is a vast number of directions in which a goal does not lie, and the profession must find one in which a goal does lie. So if we can decide upon a plausible approach, we may at least with some degree of security set our efforts resolutely in that direction.

"I keep six honest serving men
(They taught me all I know)
Their names are What and Why and When and How and Where and Who"

RUDYARD KIPLING
The Elephant's Child

III. INDUSTRIAL ARTS IN THE CYBERNETIC ERA

There is little necessity to describe the changes that have taken place in our society. They are all about us, encompassing, frustrating and challenging.

In some cases, change is stifled by tradition, bureaucratic structure or institutional norms, to name a few. Institutions somehow have the ability to remain isolated from changes while they are occurring. Education falls into this category. People find themselves experiencing a different social environment every few years due primarily to advancing technology. If man is to survive, he must change. He must alter the entire system—political, religious, economic, familial, and last but not least, educational.

". . . there is a vast difference between letting changes occur and choosing the changes we want to bring about by our technological means."

BERTRAND de JOUVENEL
Utopia for Practical Purposes

Questions that may be raised are: Has industrial arts education adapted to this changing environment? Has this field of study been integrated into the total educational system so as to contribute the needed cohesiveness and add to the Gestalt of the understanding of man and his environment? Industrial arts has been extremely valuable in its own right and needs no defense or apologies for its past. However, now that man has been forced into what might be called "the era of radical change," questions must be raised. Where does industrial arts education fit into the total system of education? Should industrial arts education be concerned with social prescription and value decisions? Can it make a contribution to the understanding of technology?

"Truth has no special time of its own. Its hour is now —always."

ALBERT SCHWITZER

Education has failed to keep pace with change and industrial arts is no exception. If one wants to place this form of education into historical and technological perspective, he finds himself forced to admit that it exemplifies the modern craft era which occurred from 1,000 A.D. to approximately 1776. It also includes some aspects of the machine and power areas which existed up until 1953. However, 1953 ushered in the atomic and cybernetic era composed of computers, transistors, lasers, space exploration, synthetics and the products introduced through the over 50,000 patents granted yearly. Included in the backwash is a shortened work week, more free time, new mobility patterns, urbanization, new occupational patterns, automation, dehumanization, and a credential society. The list becomes endless. Technology is an evolving

"Like every important invention in the history of mankind, cybernation was born when necessary and sufficient conditions were united by the catalyst of motivation."

ALICE MARY HILTON
The Evolving Society

process, one of synthesis and exploration, and one which requires compendious decision-making. Each development is dependent upon a host of predecessors and the information gained from their successes and failures. It has been this exponential growth that has led our society into the morass of mandated change, realignment of values, and ever-widening choices.

"The masterful mind is always positive."

O. S. MARDEN
Conquest of Worry

It is time for the profession to question industrial arts education with great honesty, clarity and humility. Educators need not only the right answers but the appropriate information to ask the right questions. This may be the solution to the future of industrial arts education. Since technology is a concept that escapes definition, man must become immersed in it—he must live it and study each concept in depth with every resource available. Only then can man understand this process that dominates our lives. Only then can our society have people who can objectively identify their role in this web of tangibles, values, ideas and norms we claim to have been interpreting in industrial arts programs.

"It takes inordinate self-confidence to face dramatic change without inner tumbling."

JOHN W. GARDNER
Self-Renewal

Possibly the following questions will direct the reader to review his concept of industrial arts:

1. Are your programs based around the project method?

If your answer is "yes," you have identified with a craft orientation, a period of history when man produced items individually with basic tools and processes. At a time when the sale of numerical control equipment exceeds $200 million annually and at a time when blue-collar jobs are in a minority, this approach seems totally inadequate and relevant only for leisure time activities. If your answer is "no," can you truthfully state to the profession that you are interpreting a cybernetic era, an era which requires people who can adapt to change, who solve problems, who can find self-identity?

2. Are you incorporating other disciplines within your own?

If your answer is "no" and you feel comfortable with that decision, you do not understand the concept of technology. Technological growth is based upon the efforts of a vast array of talents. It has become

a synthesis of the totality of man; it is a process that requires decision-making models which incorporate all disciplines, all institutions, all men.

3. Do you work with tools and materials of a contemporary nature?

If your answer is "yes," do you feel that you are necessarily interpreting technology? You must ask yourself one more question: Do you interpret the social consequences involved with these tools and materials? You do not understand technology if your answer is "no." If your answer is, "What do we mean by social consequences?," not only do you not understand technology per se, but neither are you helping your students to understand it.

Man has placed total emphasis on the technical aspects of technology and consequently finds himself with pollution, social unrest, unchanging value systems, lack of identity and a refined inability to solve problems. He lives with the systems of the 1920's or some other era that gives him a false sense of security. To study the technical without the socio-cultural is sheer suicide in a technological society.

4. Do you feel secure when you interpret an era that is now history? Do you feel secure with projects? Are you most content when dissidence is conspicuously absent from your students and fellow teachers?

If your answer is "yes," industrial arts is doomed, deserves suspect, and must be eradicated. Where there is an element of doubt there is an element of hope; where there is a willingness to study, to research, to become involved in active dialogue with the issues, logical frameworks for industrial arts can develop.

It is not the intent of this discussion to criticize negatively the field of industrial arts education, but to raise the questions needed for ensuring that our programs are contemporary, yet futuristic, relevant, and serving a worthwhile purpose. The area of industrial arts has been questioned since its very conception, which indicates a healthy situation. To conclude at this point in the reading that this discourse is overly negative may reveal a basic insecurity on the part of the profession. Since 1960, thousands of dollars and as many man-hours have been spent in research in hopes that industrial arts may make a contribution to

"It's not the things that
I failed to do
That makes me wipe the
eye—
It's things I should and
could have done
And simply failed to try."

REBECCA McCANN
Cheerful Cherub

society. To state that a program has all of the answers would be to admit defeat since, like technology, programs must be ever-changing and must utilize the totality of research and social innovation. At the same time we must keep in mind that the development of people is our fundamental goal.

"A man would do nothing, if he waited until he could do it so well that no one would find fault with what he has done."

JOHN HENRY NEWMAN

The preceding paragraph infers that the research of ten full-time people, for one full year, did not produce *the* answer. However, it does imply that ten professionals have been willing to engage the question, to critically analyze their profession, their personal values, and to develop that security needed to proceed in what appears to be the proper direction. What is advocated by this group seems relevant and necessary at this point in time. Again, like technology, education is a process that is in constant flux. As society changes, man and his institutions must change. Therefore, the following basic assumption, derived from intensive research, is presentaed to the profession:

> *The study of man and technology is the most valid discipline base for industrial arts education.*

IV. MAN-TECHNOLOGY . . . A MODEL FOR EDUCATIONAL DESIGN AT THE TEACHER EDUCATION LEVEL

This proposal is designed for the preparation of teachers in the area called Man-Technology. In the past, research projects have spent their time and effort designing programs for the elementary and secondary schools. It is obvious that what is needed is a new teacher education program. As a matter of fact, the ultimate is to go one step further and re-educate the teachers of teachers. It is extremely important that the reader realize that this model is for an industrial arts teacher education program.

Having made the assumption that the logical base for industrial arts is to study man and technology, three fundamental questions must be asked:

1. What should be known about the universe and the people who inhabit it?

2. What is the potential of this knowledge?

3. What use should we make of this knowledge?

The constant dialogue and debate, or the lack of same, between the scientific community and the humanist results in those decisions that develop the universe, materially as well as socially. The answer to these three questions must be molded into the Gestalt we call Man-Technology if our basic assumption is to be valid.

"The revolution of modernization involves transformation—the transformation of all systems by which man organizes his society, that is, his political, social, economic, intellectual, and religious and psychological systems."

M. HALPERN
The Rate and Costs of Political Development

It has been stated that technology is comprised of a technical element and a socio-cultural element, and that studying one without the other is wasted effort. This tendency toward fragmentation has been the weak point of all previous disciplines.

"Ours is possibly one of the most critical periods in human experience up till this time. Poised in the transition between one kind of world to another, we are literally on the hinge of a great transformation in the whole human condition. The next fifty years may be the most crucial in all of man's history. We have few guides to follow and almost no historical precedents.

R. BUCKMINSTER FULLER
World Resources Inventory

Figure I represents the proposed model for teacher education. It represents an interwoven network of experiences for each student. General education and professional education are of undeniable value in the process of educating for a technological age. However, these two phases of teacher education usually are separate entities and fail to provide relationships between the student's major program and professional and general education. All knowledge must become integrated into a meaningful whole in order that the student can see the "gestalt" of teaching, the "gestalt" of life. To deny this would be to deny the entire concept of technology which itself is the totality of our man-made environment, technical and social.

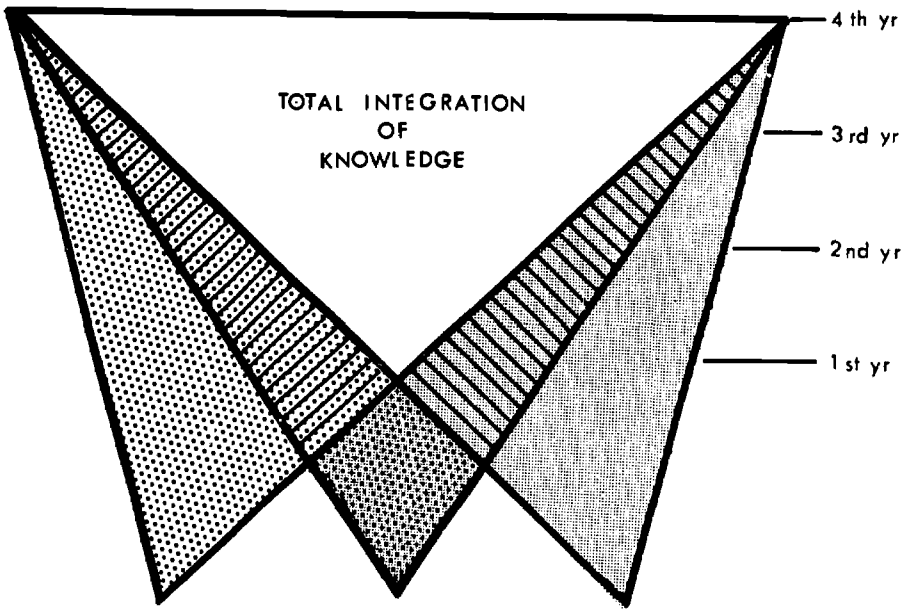
A. GENERAL EDUCATION PREPARATION

General education is that part of education which contributes breadth. It is popularly concevied of as meaning education in the broad areas of the humanities, the social sciences and the natural sciences. This proposal suggests that the content of general education involves five basic areas:

1. Physical sciences

FIGURE 1

MAN – TECHNOLOGY TEACHER EDUCATION MODEL



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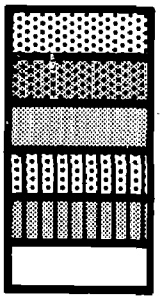


PROFESSIONAL EDUCATION

MAN–TECHNOLOGY

GENERAL EDUCATION

MAN–TECHNOLOGY & PROFESSIONAL EDUCATION

MAN–TECHNOLOGY & GENERAL EDUCATION

TOTAL INTEGRATION OF KNOWLEGE

EACH YEAR IS EQUIVALENT TO A TRADITIONAL YEAR IN COLLEGE. HOWEVER A TYPICAL STUDENT SHOULD BE ABLE TO COMPLETE THE PROGRAM IN FOUR YEARS OR LESS.

2. Biological sciences

3. Social and Behavorial Sciences

4. The Fine Arts

5. The Humanities

The primary concern here is not only to educate the intellect but the imagination as well—to cultivate certain aptitudes and attitudes such as thinking effectively, communicating thought, and discriminating among values.

"The great aim of education is not knowledge, but action."

HERBERT SPENCER

The initial goals of general education are: a general introduction to and an appreciation of the elements of our common cultural heritage; the inculcation of certain common skills; and the formation of the individual with values, attitudes, tastes and traits associated with the educated man.

Issue is taken with the type of approach suggested by James B. Conant in his book *The Education of American Teachers* wherein he has suggested increasing the credit hour requirements in the general education area. Issue is also taken with an approach that would have special courses taught by various other departments specifically for technology majors. With these approaches there is little attempt to break down the departmentalization of the educational process and students are forced to accept courses for a variety of spurious reasons: expediency, convenience and least demanding.

"General and special education are not, and must not be placed, in competition with each other."

Harvard Committee Report

The development of a "teacher-scholar" as a broadly educated person must be the intent of general education. In order to accomplish this a definite interrelationship must be established among general education, professional education and the man-technology area. This interrelationship must be patent to the student if he is to benefit from his total program. This close functional relationship as depicted in Figure I is of primary importance in our educational program.

". . . Technology is inseparable from humanism . . . the technologist is up to his neck in human problems whether he likes it or not."

SIR ERIC ASHBY
Technology and the Academics

The emphasis then is on the relationships of various concepts rather than on specific courses. It is not

"What we desperately need is an integrated, liberal, practical education for the same person."

DWIGHT D. EISENHOWER

the intent of this proposal to suggest a specific course or courses of action in the general education area, but rather to relate a position consistent with the basic philosophy of this paper. Such a viable general education program can exist only with the establishment of an administrative structure capable of enlisting an effective faculty, capable of providing generous budgetary support for effective teaching and learning, and capable of generating a worthwhile curriculum.

B. PROFESSIONAL EDUCATION OF TEACHERS

"Science can tell us what we can do but not what we should do."

E. FULLER TORREY
Toward Century 21

In recent years, the American society has increased the importance and responsibilities of the nation's schools, teachers and teacher educators. Indeed, even though some individuals may despair, education through our schools may be the only method of survival for mankind. Although education has usually reflected the past and the whims of society, this need not be true today. It is possible for education to deal with the philosophical needs of the clientele it serves. Education must not be stagnated, compartmentalized predications or myths. Education thus composed has given us serious problems today. If those who direct teacher education would accept some of the implications of research and current conditions that point to change, then professional education would become more viable and relevant.

"Failure is often the insult of repitition with no reason."

UNKNOWN

It is no overstatement that high school teachers teach as they were taught and it is probably quite true also for teacher educators. In the teachers colleges and universities many desirable possibilities for change have been disregarded because of pressures of subject matter specialization and the grandiose empires that have been built. These empires have been built over the years of transition from the early institutes to normal schools, and to teachers colleges and universities. The courses taught in these empires do little to acquaint the future teacher with the problems and questions of the real world. Such problems often cannot normally be answered by the traditional lecture method of instruction. However, these questions could

"A good teacher makes it possible for children to learn what they need to know."

UNKNOWN

be answered by close association and actual experiences in both simulated and real-life situations.

In short, this proposal suggests that experiences be provided by which future teachers can relate to students and help them to learn. These experiences in relating to students should take place from the first day the future teacher enters the teacher education program. In so doing, it is expected that competent teacher educators would be available to interpret, discuss and analyze the actual happenings on the basis of concepts and principles from sociology, anthropology, psychology and other fields. Thus, very early in the future teacher's preparation, he would become acquainted with the integration of knowledge through planned practical experiences. Referring to Figure I, it may be seen that professional experiences begin at the freshman equivalent level and continue to be integrated throughout college.

It is the purpose of professional education to educate a teacher-scholar who is truly committed to the scholarly endeavor of teaching and one who is able to see the entire spectrum of education and its relevance to a technological society. Professional education must be a unifying element in the education of all teachers.

It is highly recommended that not only should the integration of subject matter begin at the very beginning of the future teacher's professional preparation, but also that he have integrative experiences with other professionals who have specialized in a wide variety of subject matter areas. These professionals must be people who have agreed to and understand the concept of integration of knowledge as it affects education. The student of education must become involved with and immersed in the pursuit of truth and excellence.

"Developing a curriculum theory consonant with the pluralism of the world of knowledge requires a generalized representation or model of that world."

ARTHUR R. KING, JR.
The Curriculum and the Disciplines of Knowledge

The writers of this proposal highly recommend that behavioral objectives with minimum competency levels be clearly established by the student and the teacher in cooperation. These goals should be clearly defined and agreed upon by both the student and the

"The reward of mastering something is the mastery, not the assurance that some day you will make more money or have more prestige."

JEROME BRUNER

teacher. These goals may not be the same for all future teachers. Thus, the student in preparation is able to see why and how they may be achieved. With this understanding, the student can set relevant personal goals and achieve satisfactory progress toward such self-attainment at his personal rate and in his own manner. Personal discovery and integration of knowledge have been and will continue to be positive alternatives to coersive control by test and retest, grades, failure and threats of punishment.

Many of the techniques and methods used in the preparation of teachers in the sequence known as professional education are similar to those described later in the resource center of this model. This proposal has been written with the understanding that professional education should be re-evaluated and brought up-to-date in light of changes in our evolving society. Some of the suggested changes are listed here as being important to make professional education viable and relevant.

1. Instruction should be individualized and learner-centered.

2. Individuals preparing for careers in teaching should become deeply involved and personally committed to their profession.

3. Future teachers should realize that change is inevitable and that learning is the basis for change.

4. Freedom and responsibility must be practiced as well as talked about.

Teacher educators should review their programs in view of the changes that are taking place in our technological society. Further, educators must prepare performance-oriented objectives as a reference point to insure competencies in future teachers. If these things are accomplished, progress will be made toward making professional education viable and relevant for the youth of a technological society.

Some sequences of experiences adovcated are listed here as suggestions:

1. *Integration of knowledge.* It is believed that there are basic ideas that unify all knowledge into systems. These systems have not been identified in most cases; however, more effective education will be achieved when the various social and technological taxonomies are completed.

". . . That which offers little opportunity for what is called cross-application, has no place in the school."

PARKER-RUBIN
Process as Content

2. *Management of learning.* The environment in which learning is to take place must be conducive to that learning. The teaching-learning situation is based on intensly personal, dynamic interrelationships between the student and the teacher. The role of the teacher is one of instigating and facilitating learning in the cognitive, affective and psychomotor spheres of both conscious and subconscious activities.

"The effective teacher is a person the student trusts."

B. OTHANEL SMITH
Teachers of the Real World

3. *Theories of behavior.* Most students' behavior can be interpreted and future behaviors predicted before these behaviors become destructive to the atmosphere necessary for learning. The future teachers should receive practice in the interpretation of human behavior through repeated classroom experiences and analyses, syntheses and interpretations by professionals from an interdisciplinary team. For too many years we have relied on the trial-and-error judgement of supervising teachers. These professional teachers have not had the necessary prerequisite background in theoretical knowledge to be generally effective.

4. *Freedom through sensitivity.* The experiences that most teachers have in their preparation and early lives do not allow them to understand, comprehend and cope with aggressive or other types of conduct problems. Most teachers do not understand and cannot interpret why students act the way they do. This sequence of experiences should help the future teacher understand new situations by providing him with a background of conceptual theory that will allow him to become sensitive to other humans as well as himself.

"All the child is ever to be and become, lies in the child, and can be attained only through development from within outward. The purpose of teaching and instruction is to bring ever more out of man rather than to put more and more into man."

FRIEDRICH W. FROEBEL

5. *Ways of interaction analysis.* Before a teacher can be effective and understand others, he must know himself. (This is a life-long process, but some never begin or even try.) The experiences in interaction

analysis should be designed to help the future teacher begin to analyze his prejudices, biases and insecurities that might have been heretofore undiscovered. For example, perhaps the future teacher has an authoritarian personality. He should be able to cope more effectively with his need to dominate others if he recognizes the fact and has practiced control of this need.

6. *Totality of environment and learning* The evidence is very clear that children from disadvantaged homes, who lack stimulus from home or environment, are behind others when they enter school. This proposal suggests that it is the teacher's duty to bridge this gap as much as possible. It is further noted that the personal relationship between the learner and the teacher is irreplaceable. Teaching or learning management involves a great number of immediate decisions because of the shifts of the learner's emotion. However, behind the decisions must lie a solid foundation in the conditions of learning and theories of behavior.

"Is there a Future for Yesterday's People?"
JACK WELLER
Saturday Review

The growth of knowledge is exponential. Professional educators can no longer keep up with the discoveries in either technical or sociological areas while they are on the job. Continued professional education must be achieved through sabbatical and mandatory leave policies that are so infrequently used and so often misused.

"Is there a Future for Yesterday's Teacher?"
MARSHALL HAHN

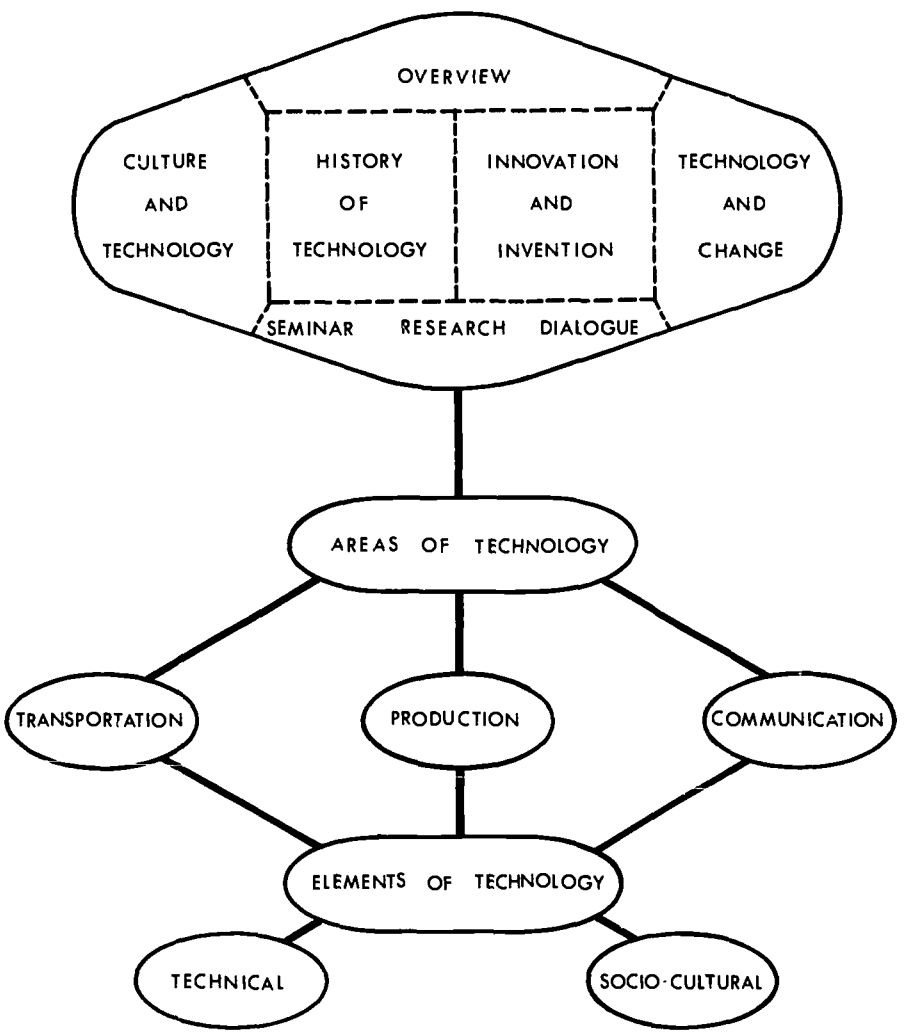
Professional education beyond the initial preparation should deepen, broaden and update knowledge and experiences. Further, professional education beyond initial preparation should lead to more effective performances in specified roles and positions.

C. MAN-TECHNOLOGY-EDUCATION

Figure II represents the Man-Technology phase of the program. It is obvious that what is presented is totally different from the traditional industrial arts program. The traditional areas of wood, metal, drafting and other additions of recent times are no longer in evidence. In their place are three basic areas—production, transportation, and communication. Since the

FIGURE II

MAN - TECHNOLOGY MODEL



beginning, man has functioned in these three areas. It is possible that other categories could be utilized; however, the research provided by the fellowship team indicates this to be a logical breakdown. Even then, there is overlap among the three which supports the idea that technology is a totality rather than a segmented phenomena.

"Anyone who is at all interested in understanding the past, in learning how the present got to be the way it is, or in speculating about the future—and this would include every thinking man —must be concerned with the development of technology and its relation to society and culture."

MELVIN KRANZBERG
At the Beginning

Beginning at the top of Figure II there is the heading, "Overview of Technology." In this overview, four basic topics have been identified which blanket the entire concept of technology and its relationships. These topics lend themselves well to materials now available for study and research. Man must understand himself and his culture, as well as the inevitable change that takes place. This must be approached from a historical standpoint and with a fresh look at the present with implications for the future. How these topics are presented is left up to the imagination and structure of the individual institution. Initially, they might be separate courses or seminars within a department, but as the program is phased into existence and traditions are overcome, it would be desirable to acquire these concepts through a total interdisciplinary approach. To immerse the student into these themes requires active dialogue, problem solving and in-depth research rather than the traditional lecture method. A department could incorporate these topics within the three areas of technology as each is studied.

"Instruction ends in the classroom, but education ends only with life."

F. W. ROBERTSON

As each student begins his study of the three areas (transportation, communication, and production), he would develop competencies in both the technical and the socio-cultural realms. In other words, he would study the tangibles of technology, but would also study the social consequences of these materials. Each student would specialize in one or more of the three areas, which means the profession would no longer have "wood men" or "metal men," but teacher-scholars in one of the three areas.

The term teacher-scholar is used to describe a teacher who understands his technological culture,

man, and himself—all three prerequisites for educating others. His cognitive skills and affective skills would be in-depth. This is not to say that he would not possess psychomotor skills, because this too is part of our technology. He would possess all three as a result of a conscious effort on the part of the total program.

With this background the teacher-scholar would be able to function in a program identical to the one he completed, or he could adapt to situations as they arise. Obviously, tradition cannot be broken instantly and many teachers will have to function in a traditional environment. At least this person could incorporate his background and modify as much as tradition will allow. Since the program does not incorporate the traditional memorization pattern and project method, but rather process as content, every graduate will be adaptable to change and capable of making rational decisions. There is the possibility that the new teacher-scholar may also have to identify with a new discipline that is willing to educate students for the technological order.

"There is no path but knowledge out of the jungles of life."

H. G. WELLS

Our attention must again be directed towards the two aspects of technology: technical and socio-cultural. Leaders of industrial arts have always placed their emphasis on the former, as has the industrial bureaucracy, and one need not reiterate the consequences man faces today. Time has not permitted the fellowship team to identify the body of knowledge in the areas and elements of technology. This implies that research is needed to identify those cultural universals that all individuals must understand. Unfortunately, most industrial arts teachers feel comfortable only with the technical side. They do not understand the relationship between the technical and the socio-cultural elements, nor do they, in many cases, consider that relationship important.

"The curriculum is interwoven with the social fabric that sustains it."

B. OTHANEL SMITH
Fundamentals of Curriculum Development

Efforts are being made to identify the concepts in both elements of each area. It is felt that taxonomies must be developed if man is to visualize the totality of technology. A taxonomy is designed to identify structure and should result in a base for long term

"To know where you can find a thing is in reality the best of learning."

UNKNOWN

research. Other disciplines, mainly the sciences, have developed taxonomies, but this has never been done in the technologies. This is why contemporary efforts to understand technology are fragmented. Since technology has exponential growth, a taxonomy would never be complete. It could be kept up-to-date however and would also help establish what should be studied by all students and how it should be studied. Thus its purpose becomes a means to determine the totality of technology rather than to limit the teacher or student. A logical approach appears to be:

1. Develop a taxonomy for the three areas which includes both the technical and socio-cultural elements.

2. Determine the relationships beween all areas and elements. This would produce a Gestalt of technology.

3. Determine those cultural universals that are necessary for life in the technology order.

4. Determine the most logical attack for educating people to live in our technological society.

This approach requires scholarly research, interdisciplinary inquiry and the willingness to change. This task is not insurmountable. If it is, technology has surely become master and we may as well succumb to its pressures this very moment.

"The world's interests are, under God, in the hands of the young."

JOHN TRUMBULL

D. METHODOLOGY IN THE MAN-TECHNOLOGY MODEL

"Most of us react to major changes with considerable reluctance and usually find the experience painful."

DON FABUN
Dynamics of Change

The foregoing has been offered to show the need for a man-technology program at the teacher education level. This proposal suggests that industrial arts can be instrumental in developing such a program, even though it does not now reflect this need.

A concern has been shown for an individual essential to the ultimate welfare of a future society. This individual must acquire a set of values which are closely aligned with the evidence now available as related to the society of tomorrow. The children of tomorrow will confront societal and technological problems which today are only speculative. Education

must accept this as a challenge and redesign and redirect its emphasis to the solution of some long-range problems related to man as an individual.

THE ECOLOGY OF EDUCATION

The present ecology of education does not appear to account for the future. Ecology in an educational context refers to the total schema and interdependence of all the parts. This emphasizes the learner. While industrial arts has always been activity-oriented, many of the classrooms remain teacher-centered where teaching is telling. There is evidence to seriously question the permanence and worth of information disseminated in the traditional manner. The structure frequently assumes that the same information has the same meaning and value for all individuals. This same structure often falsely assumes that all people can learn the same material at the same rate and even in the same way.

"If we seem to be hurried into the future by a runaway engine, it may be that the main reason it is running away is that we have not bothered yet to learn how it works, nor to steer it in the direction we want it to go."

DON FABUN
Dynamics of Change

Education today, especially at the college level, is oriented to the group. The individual capable of being unique and capable of a substantial contribution is seldom recognized. Partly because of the group orientation, the dissemination of facts is the prevailing methodology. Rote learning can be seriously questioned. Intrinsic in the total picture is the final examination which continues to measure the retention of facts, at least until that moment. Seldom does the educational ecology attempt to measure individual growth.

"There is no reason to believe that the diploma certifies too much more than that the holder has sat a long time."

PETER DRUCKER
Age of Discontinuity

The textbook continues to be the dominant and far too often the only source of information. The individual emerges with a body of questionable information seldom related to anything of a truly tangible nature. If the desired interrelationship does develop, it is generally because the individual, in spite of it all, has somehow managed to piece the formerly unrelated elements together and arrive at his own conclusions. A conscious effort on the part of education to arrive at *synthesis* has rarely been encouraged.

"Too often, in the teaching process, the learning act has been the setting forth of information and testing for its mastery."

PARKER-RUBIN
Process as Content

"Technological man, imbued through education and constant experience with the conviction that this is what the universe is like, will discover techniques and construct guidelines for dealing with the problems created for humanity by the existential revolution."

VICTOR C. FERKISS
Technological Man

A change is needed. The emphasis must turn to the development of a technological man. This person should understand the total relationship of technology to social, economic, political, psychological and other related factors. With this understanding he can act rather than react in accordance with the prevailing conditions. His cause should be in the interests of a greater society. His value system would be complete and honest.

The design suggested here attempts to account for each of the educational faults mentioned above. A learner-centered curriculum is proposed. The textbook, as such, should be largely replaced by a planned interdisciplinary program encompassing all related elements of the environment. Learning should become active and oriented to learning how to learn.

"In order to move deliberately toward innovation, the organization must have a vision, vividly and broadly perceived, of what it can come to be."

DONALD SCHON
Technology and Change

There are varying educational needs for all people in society. At best, it is difficult to determine who should be educated, when this education can best take place, and how this learning can best be implemented. Simply stated, a technology program should reach all people. Technological relationships can be established in the early school years. The need is even greater in our colleges and continuing education programs. As shown earlier, the interrelationships with the general education and professional education elements of the total curriculum must be directed toward the integration of knowledge. A viable plan can allow and encourage this unity of learning to take place when individuals are best suited to accept and interpret this information.

The present programs are almost exclusively four-year programs. Why not consider a program which might take one person three years while someone else is taking five years to achieve a desired level of proficiency?

"The motivation, the incentive, the reward for the acquisition of information must be built into the program itself."

PETER DRUCKER
Age of Discontinuity

The prime emphasis in the remainder of this proposal will discuss some considerations for a man-technology teacher education program. This emphasis will direct itself to a methodology and physical structure fundamental to the program. A brief description

will also illustrate a possible staffing arrangement. The arrangement is considered practical and also concerns itself with the current emphasis on accountability.

INDIVIDUALIZING INSTRUCTION

"Individualized instruction and personal association of teacher and child . . . must now be made a reality."

B. OTHANEL SMITH
Teachers for the Real World

The individual should be afforded an opportunity to develop all his inherent potential. Instructional materials can be developed and organized in such a way as to allow each individual to learn in his own particular style and at his own pace. These materials can be performance-oriented and based upon concisely-stated behavioral objectives. When performance criteria are used to determine an acceptable level of proficiency, the need for grades as such disappears. As a result, this proposal does not endorse the concept of grading.

There is at present a wealth of information proclaiming and endorsing the concept of individualized instruction. To merely say that educators individualized their programs in many cases could mean that they have done the programs and individuals involved a disservice. Far too many programs have generously purchased a vast variety of sophisticated hardware to implement these programs. Next, naturally, is the acquisition of some questionable software. By this is meant that the materials acquired (loop films, transparencies, teaching kits, etc.) have little or no justifiable relationship to the objectives of the program in progress. Far too few have given serious thought to the development of software which is meaningfully related to the specified learning task.

"Emphasizing the individualization of instruction brings a new and personal dimension of education into the center of concern—the teacher's knowledge of the learner."

Innovation in Education

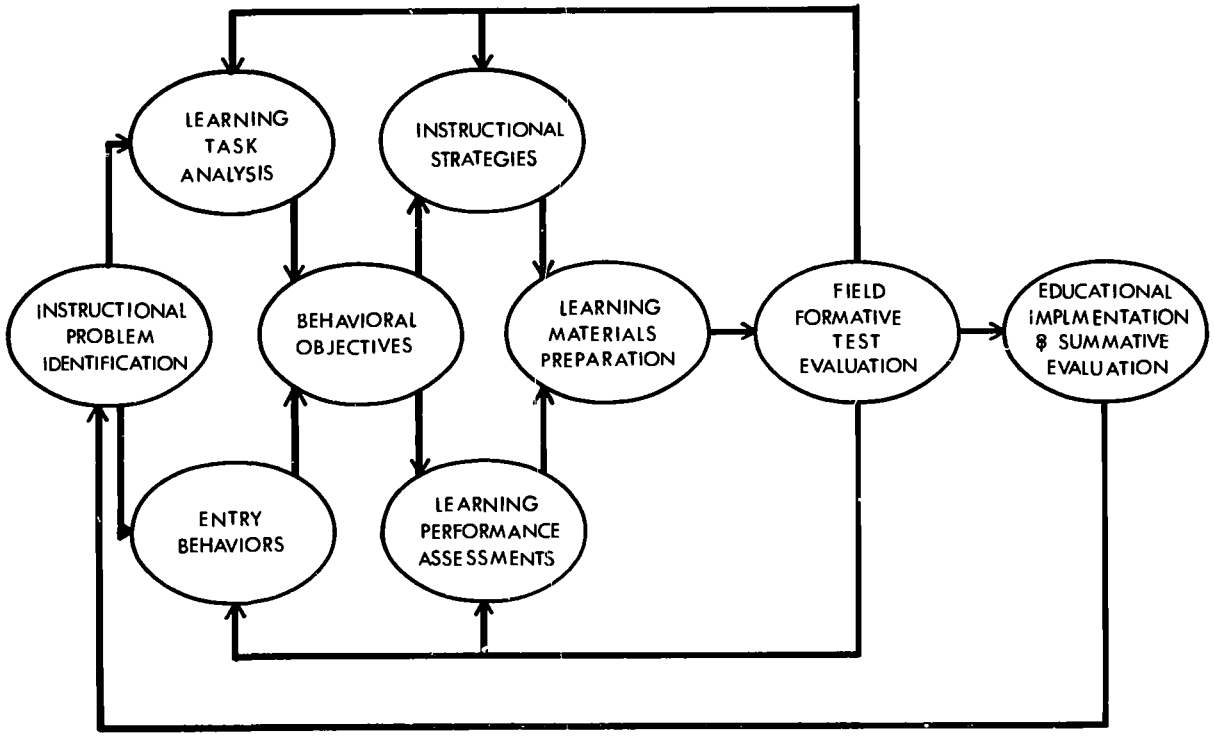
Many schools across the country have adapted and are using individualized instructional packages. This is in an effort to honestly individualize instruction and allow for self-paced programs. These instructional packages, when properly designed, account for the learning situation by taking into account the multiplicity of considerations essential to any effective learning. They can assume many configurations. A systems approach to the development of this material is suggested by Ehlers in Figure III.

"Teaching is the only major occupation of man for which we have not yet developed tools that make an average person capable of competence and performance."

PETER DRUCKER
Age of Discontinuity

FIGURE III

FLOW CHART OF TASK PROCEDURES



EHLERS, WALTER H. "COMPUTER ASSISTED INSTRUCTION SOCIAL WORK." EDUCATIONAL TECHNOLOGY, VOL. 18, NO. 9, SEPT 1969, P. 42-44.

The procedure suggested accounts for almost all that teachers and learners could desire if all factors are sincerely considered. However, when one is dealing with the block labled "learning task analysis," there are some possibilities not accounted for. This might also be true for other segments of the system.

There is concern that probably no one has consciously attempted to introduce *intellectual processes* to the *stated learning task.* Most educational efforts in the past seem to have been directed toward the learning of facts, concepts and principles, often out of context with the task at hand. Parker and Rubin (1966) have given considerable discussion to this need in their publication, *Process As Content: Curriculum Design and the Application of Knowledge.* Simply stated, process concerns itself with the many procedures which encompass the acquisition and use of knowledge. These procedures may be random or ordered and associate themselves with all forms of knowledge and human activity. Some of the process will deal with abstracting, estimating, experimenting, imagining, inferring, predicting, simulating, analyzing, synthesizing and evaluating. Seventy-five of these processes have been identified and are being used in the "Tool for Change" project (Borton, 1970, p. 70). Burns identifies twenty-four processes used in science education.

". . . What we are after, is an expanded preoccupation with the processes embodied in the phenomenon of human learning."

PARKER-RUBIN
Process As Content

". . . what we are after, . . . a well informed mind with the capacity to think and to continuously renew itself."

PARKER-RUBIN
Process As Content

It is not known how many of these processes could or should be employed in a man-technology program. Research is lacking. Certainly, much must be done to further define this exciting possibility for learning. The goals of inquiry, problem-solving, creativity and self-realization probably cannot be realized unless process is consciously involved in the learning task analysis. In the interim, educators must provide the learner with instructional materials that are in keeping with sound learning theory.

"There are a variety of affective functions which together constitute a process which has been labeled valuing the procedures involved in assessing, predicting, foreseeing, and determining consequences."

PARKER-RUBIN
Process As Content

Learning can also be individualized in the traditional group context, such as a seminar situation. A "process" approach can be employed. The topic might be "Technology and Culture." In the process approach

". . . whatever our words, our actions make clear that we consider application to be the purpose, or at least the test of knowledge."

PETER DRUCKER
Age of Discontinuity

the prime intention is to cause the learner to engage a number of intellectual processes. He can elect to read, visit, or interview any number of sources of information. From this he must engage the process of *analysis* of all the information he has acquired. These conclusions must then be *synthesized* into a composite in keeping with his personal value system. Following synthesis there should appear possibilities for *application* to a real life situation, and finally he should be able to intelligently *evaluate* the work he has done. For each member of the class the problem can differ. The objective is simply to encourage individual growth.

A total program for teacher education in the physical technologies is needed. This proposal only touches on the possible parameters for such a curriculum. Technical elements need to be identified. Concepts, principles and processes related to the technical elements must be described. The functional relationships to other disciplines need to be determined. Equally important, the socio-cultural elements inherent in all must come forth as an integral part of the total plan.

THE LABORATORIES

"The need is for a system of education that accepts it as its duty to enable each student to run as far and as fast as he possibly can."

PETER DRUCKER
Age of Discontinuity

Thus far, the proposed learning environment has not been considered. A somewhat stylized interpretation of a proposed man-technology facitity will be found in Figure IV. As can be seen, the suggested facility is not isolated. The college, the community and the environment are all sources of input to the technology student. This implies that the student will be actively engaged in community activity. This two-way interaction is considered essential.

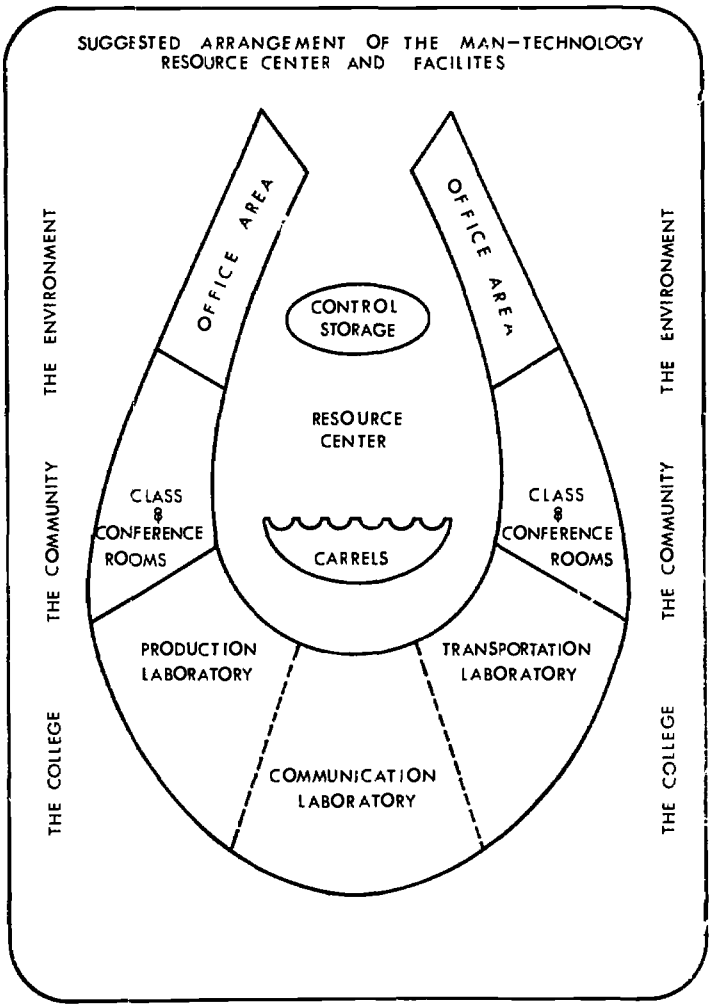
Three laboratories are suggested. The scope and nature of these laboratories should be determined by the intent of the program. They should allow the individual an opportunity to solve problems, to create, to test ideas, to experiment with materials, and should encourage the integration of observation.

"We need to 'work smarter.' We need to do different things and to do them differently."

PETER DRUCKER
Age of Discontinuity

There is also a need to allow for group action relating to a broad spectrum of problems. These prob-

FIGURE IV



lems could range from simulation of a proposed housing development to the re-enactment of an industrial process. They might also reconstruct, in model form, a chronic traffic situation with provisions for a variety of solutions.

This does not suggest that a sophisticated array of production equipment is necessary. The concern is with providing each student an opportunity to learn

"Man is an animal incapable of forgetting. The persistence of behavior patterns that were functional for a small band in a vast forest today increasingly threatens human survival."

VICTOR C. FERKISS
Technological Man

some basic concepts, principles and processes which encourage the broad understanding and internalization of each. The emphasis is directed to experimental and model building machines and the variety of laboratory equipment necessary to explore.

To insure that learning will be dynamic, the total man-technology facility begins from the premise that learning must be active rather than passive. The material found in books is not knowledge, but merely information. As Drucker has indicated, ". . . only when man applies the information to do something does it become knowledge." As the learning environment is conceived, in order for it to function properly, it should deal with processes which place the acquisition of knowledge into an active context and encourage integration and internalization.

THE RESOURCE CENTER

". . . we are that strange, culture-bound animal whose biological drive for survival expresses itself *generationally.*"

THEDORE ROSZAK
The Marking of a Counter Culture

The suggested facility places prime emphasis on the inclusion of a Curriculum Research and Resource Center (CRRC). The design of the CRRC should take into consideration all facets of the program. This is mission control. This is where the technology student can plan and direct his activities. It is here that the instructional and resource materials can be stored and used. Here, and in the adjacent rooms, students can come together as large groups, small seminar groups, or as individuals concerned with a problem or an ideal. It is here that a segment of the differentiated staff (discussed later) can provide the necessary guidance and direction. Here also can be found teacher-scholars, the researcher and the media specialist.

"We see no conflict between teachers and machines, but rather the opportunity for teachers to become more effective through the use of machines."

Innovation in Education

This facility should provide many opportunities for many people. In the control center one might find computer access to aperture cards, information concerning design and engineering problems, and the capability to customize a problem to an individual. Computer possibilities are almost unlimited.

Individual study carrels might be found in clusters in this resource center. These carrels could con-

tain provision for dial access to audio and video tapes. They might also contain facilities for loop-films and slide projection, or even a telephone for direct contact with external resources. The overall function of the study carrel will depend on the overall intent of the program. The carrels might be equipped in a variety of ways to eliminate duplication. One might even envision two-way television communication via satellite with information depositories in other parts of the world.

"Clearly, when modern youth are fully educated in the new psychopedagogic technique, many social and political differences will disappear."

JACQUES ELLUL
The Technological Society

While cost is a basic consideration in the minds of all in education, the primary concern must be effective, efficient and meaningful learning. The concept of the resource center as the core of learning is justifiable. The environment is such that there is freedom for an individual to engage problems of vital interest to him. The student can learn at his own rate and in a manner best suited to his particular learning needs.

"The total funds expended in the United States on educational research development and evaluation is a small fraction of one per cent of the total investment in education."

Innovation in Education

One cannot overemphasize the need for the future teacher to interrelate with the local community and the infinite environs as he progresses in the world of academia. When the experience will contribute to his personal development, self-realization and future competency as a teacher, involvement must be encouraged.

STAFFING

This proposal suggests that the total program be developed with a differentiated staffing approach. At the top of this ladder would be a team of five teacher-scholars. One of these would coordinate the total program and be responsible for implementation of research findings. A second scholar would be the resource center specialist, with specific skills in curriculum and instruction, media integration, and library functions. The three remaining scholars would be specialists in the sense that each has depth of understanding in one of the three areas of technology (transportation, communication and production).

"The differentiation of teaching staffs by introducing such categories as master teachers, teachers, assistant teachers, interns, and media technicians should improve teaching competence for specific tasks and raise the level of professional morale and dignity among teachers."

Innovation in Education

Graduate assistants may develop individual competencies and contribute to the program while serving

on the next rung of the ladder. They must know the total facility and would function in many of the more responsible roles. Below this, one might find upperclassmen who are helping other students with problems and who are engaged in developing instructional materials.

On the lower rung there might be beginning students working with others but who have been familiarzing themselves with the structure of the resource center. They could acquire materials for individuals, be engaged in filing, maintenance and the many other simple tasks which comsume so much of the teacher's time. Work-study help can also be used to assist in the overall operation of the technology program. In this structure the teacher-scholar would be available to the student for small group sessions and on a "one-to-one" basis as the situation dictates.

"Teacher education institutions should examine the value of the new tutorial and clinical program in the undergraduate education of teachers."

Innovation in Education

V. SUMMARY

In summary fashion, the basic tenets of this proposal are once again presented to reduce the possibility of misinterpretation:

". . . process—the cluster of diverse procedures which surround the acquisition and utilization of knowledge—is, in fact, the highest form of content and the most appropriate base for curriculum change."

PARKER-RUBIN
Process as Content

1. This is a proposal for a Man-Technology teacher education program.

2. The study of man and technology is the most valid discipline base for industrial arts education.

3. The teacher is being prepared to encounter the public school (K-12) and continuing education.

4. The program places prime emphasis on the interdisciplinary nature of technology.

5. Transportation, communication and production are the basic areas of study.

"The prospect of innovation carries with it the possibility, even the likelihood, of failure. It entails uncertainty."

DONALD SCHON
Technology and Change

6. Laboratories with research, experimentation and development as central themes are fundamental to the program.

7. The heart of the program is the curriculum research and resource center.

8. The total program is learner-oriented and activity-based.

9. General education, professional education and the Man-Technology curriculum must be presented as a total interdisciplinary approach.

10. Instruction is individualized, computer-assisted and self-paced, which encourages systems concepts.

11. Student movement through the program is based upon mutually agreeable performance criteria.

12. Seminar sessions using a process approach are essential.

13. The program empioys the services of a differentiated staff.

The composite mandates a radical departure from the existing teacher education programs. A plan to phase in this program is not included in this proposal. While this could be considered desirable, the variables related to each institutional situation could not be accounted for with any degree of reliability. As a result, implementation will require a research effort on the part of those wishing to adopt some or all of the concerns expressed here.

"But something happened on the way to today, a thunderous upheaval that sundered the path of time and cut yesterday adrift."

DON FABUN
Dynamics of Change

EPILOGUE

Changes in society have influenced public education. The growth from a rural-static society, dominated by varying motives, to a changing society affected by a science-based technology has not been without confusion and debate. The primary goal of educational research has always been for the purpose of developing programs which will serve human progress. In this decade such research continues, but it has one different characteristic: the sudden realization that whatever comes from educational research must take into account radical technological change.

Industrial arts education has been involved with much introspection. Recent research activities point out the inadequacies of current programs at the elementary and secondary level. These inadequacies cannot be placed solely on the teachers, but must also rest with the programs that prepared them to teach. Teacher education programs have failed to help the student understand his technology and the value questions created by that technology. While a technological environment involves technical elements, probably more important are the social consequences involved and which must be considered. For the most part, contemporary programs do not involve the student in active dialogue concerning values. Consequently, the industrial arts teacher and his students do not have the background to make rational decisions in a technological environment.

The static nature of current programs in a climate of change and technological influence impelled teacher educators from diverse backgrounds to explore their profession and to suggest models for teacher education. Throughout the entire experience full agreement was reached only twice. The first, and most important, was that the primary concern in any educational program must be the individual student. The needs, worth, importance and interests of the student were always considered above all else. An educational system must exist for the student rather than for the teacher. Secondly, it was agreed that the greatest contribution that industrial arts can make is to help prepare individuals for life in a complex technological age.

In the midst of debate and diversity, the fellowship team soon realized that the task was much larger than that of changing solely the industrial arts teacher education programs. To merely change this curriculum area, without considering others, would tend to perpetuate the fragmentation of our ultimate goal: to help individuals to live in a complex technological environment. This implies the need for soul-searching, commitment, rational decision-making, and a willingness to change by all disciplines. It is hoped that other disciplines as well will make serious attempts at pooling their efforts to help students, rather than perpetuating compartmentalization. This implies the need for the establishment of priorities in all disciplines that will help the student to see the concept of technology as a whole rather than as a segmented, unrelated phenomenon. To many, the fear of failure precludes such an attempt. This fear is at the expense of thousands of students who will be the decision-makers in the period of radical change in the future.

This task is a monumental one—even beyond the scope of ten full-time research fellows for a period of one year. It became difficult to make recommendations for the total profession because we too are products of our antiquated system of education. However, many questions were raised and tolerated in an atmosphere of freedom enhanced by dialogue. Many questions were answered in many different ways and many have yet to be answered.

This does not represent failure. What is important is that some of the "right" questions have been raised. Finally an attempt has been made to struggle with at least a portion of the necessity for understanding man and his technology.

Obviously, much is left to be done. The future is heavy with responsibility and only through active dialogue, research and changing the hazards of experimentation can industrial arts education hope to make a worthwhile contribution to the Gestalt of technological literacy.

SECTION II

TECHNOLOGY – A BASE FOR INDUSTRIAL ARTS TEACHER EDUCATION

Proposed Considerations, Goals, and Typical Model
For Multidisciplinary Programs

Julius Paster
assisted by:
Carl T. Melhorn
William C. Treadway

FOREWORD

This model has evolved with a basic conviction that the survival of industrial arts, as a component of general education, will be contingent upon the attainment of the following tenet:

Industrial arts teachers of the future will be comprised of those men and women whose demonstrable knowledge of society, and the role of technology in society, will at least equal their professional and technical competencies toward promoting relevant education for all children.

I. OVERVIEW

The development of this model or hypothesis, for purposes of clarity, was tempered by several observations and pertinent questions with respect to the real world of industrial arts teacher education circa 1970. Of course, these observations and questions may suggest some value judgments and cardinal assumptions.

"The students are alive, and the purpose of education is to stimulate and guide their self-development. It follows as a corollary from this premise that the teachers should also be alive with living thoughts. . . ."

A. H. WHITEHEAD
The Aims of Education

Observation I—The political, social, economic, urban, transportation, educational and overall technological characteristics of our society—1970—are significantly distinctive from those elements which circumscribed the world of Dewey, Kilpatrick, Richards, Bonser, Bennett and Snedden.

Question (A) How far has industrial arts education traveled toward the attainment of those valid and philosophical pronouncements that were substantively stated by those educational leaders during the early decades of this century?

"The critical question is not what ought to be taught, but whether the teaching-and-learning makes any difference."

PAUL GOODMAN
Compulsory Mis-education and the Community of Scholars

(B) As we move into the last third of this century, what are those unique features of industrial arts education (and industrial arts teacher education) programs that distinguish the present from the past?

(C) As we approach the year 2000, what changes do we envision for industrial arts teacher education?

Observation II—There is much clamor for additional legislation and federal support funding for industrial arts.

Question (A) Will new laboratory facilities or hardware provide the stimulus for educational and professional renewal in the innovative society that provides testimony to the beneficient and baneful consequences of technology?

"Professors in increasing numbers are bored. They teach in a perfunctory fashion not because they don't know any better but because they aren't motivated enough to do better."

W. B. MARTIN
Alternative to Irrelevance

(B) To what extent can legislation provide the empathy, dedication and human/intellectual qualities so necessary for teachers—particularly those in the inner city, Appalachia or the rural South?

Observation III—Many teachers and programs in industrial arts teacher education have been insulated

". . . Educators soft pedal or block change with a homily along these lines:
'We've tried that before . . .'
'We'll try it later . . .'
'The board will not go along . . .'
'It costs too much money . . .'
'We haven't the time . . .'
'It is too difficult an undertaking . . .'
'We need more research . . .'"

R. I. MILLER
Perspectives on Educational Change

from interaction with: (a) each other, (b) other disciplines, (c) contemporary technology, (d) students, (e) the community, (f) and in particular—the real problems of the public schools.

Question (A) With respect to an intellectual premise (a goal that always existed but infrequently attained in industrial arts programs), has irrelevancy flourished because accountability or criteria have been minimal, superficial or non-existent?

(B) To what degree has public education, with its many-faceted problems, patronized the presence and nurtured the existence of industrial arts regardless of what was or *is* going on in the laboratory or shop?

Observation IV—In several sectors of the nation, there has been strong interest in recruitment of teachers (regardless of capability) rather than refinement of content, process and community involvements that serve to promote dynamic educational experiences.

Question (A) Is there evidence of nullifying characteristics in present programs that tend to discourage young people from pursuing, by elective choice, industrial arts courses on the secondary level or perhaps to deter their interest in industrial arts teacher education?

(B) Can we infer a measure of student response to the relevancy of industrial arts?

(C) Will current expediencies in recruitment and staffing serve to enhance or undermine the professional-public images and student perceptions of industrial arts education and industrial arts teacher education?

"The unity of liberal education is Western culture; that of general education is the individual student."

H. T. MORSE
General Education

Observation V—There are many technologically related problems (environmental, educational, social, economic) that have besieged our society. A number among us proclaim that humanistic and socio-cultural relationships should provide the substantive base for the study of technology either as a distinct discipline or as the important component of industrial arts programs.

Question (A) When we examine curriculum goals for all disciplines in public education, do we not find broad reference to humanistic and socio-cultural values?

(B) Is it possible to teach humanistic and socio-cultural relationships? Or are these phenomena the outgrowth of worthy learning experiences?

(C) What are those characteristics that may identify the uniqueness of technology, past and present, in industrial arts programs?

In looking about the profession, one may ponder whether we are pursuing the path of romantic regression. A recent publication featured a 1970 sequel to the pump lamp—in the design of a chianti bottle lamp. In the Northeast, a new professional industrial arts association has elicited membership by promoting a yearbook of project ideas. Typical practices in industrial arts teacher education programs pursue a craft orientation coupled with professional preparation that is trade analysis-oriented, stereotyped and very pedantic.

These are tangible evidences of irrelevancies of the past that are nullifying the present—and most definitely they are factors that are dimming or damming the future. With respect to teacher education, far too frequently teacher educators have expounded the future, reveled in the present—and have exemplified modi operandi of the past. Many industrial arts teacher education programs throughout the country are being subjected to cost, credit and benefit factor studies by administrative officers. What criteria might one employ in defending the continuation of a program for the next five, ten or twenty years?

Interpretations of industry, in the broadest contexts, have not provided coherence of purpose, outlook, content and method. In a status report by Schmitt (1966, pp. 28-30) there are serious problems that require prudent consideration by the profession. From the implications of the study, the following concerns are most bearing:

"For we live in a time of such rapid change and growth in knowledge that only he who is in a fundamental sense a scholar—that is, a person who continues to learn and inquire—can hope to keep pace, let alone play the role of guide."

W. M. PUSEY
The Age of the Scholar

"The educated person today needs to be generally educated; he must also be a high-grade specialist and he needs a general education the most in the area of his specialty."

P. DRUCKER
Landmarks of Tomorrow

"Only eccentrics would fail to share the conviction of the majority of people that classroom teachers and the way in which they are prepared for teaching are matters of supreme importance in education, perhaps the greatest importance of all."

J. D. KOERNER
Reform in Education

1. Concentration of subject content in industrial arts is centered in the three areas of woodworking, metalworking and drafting.

2. The current industrial arts instructional program is too narrow in scope. Not only is the content narrow with respect to course offerings, but the instructional content within the courses themselves is not as broad as the professionals in the field recommend.

"Educators are currently asking a question that is becoming the challenge to the rethinking of industrial arts: 'Is there no more to industrial arts than just making things?'"

D. W. OLSON
Industrial Arts and Technology

3. More industrial arts teachers need to strengthen their science and mathematics backgrounds, and keep up with advances in technology.

4. The current industrial arts curriculum does not even measure up to the program recommended by the profession 10 to 20 years ago.

5. Massive efforts need to be taken before a new industrial arts curriculum or any other new approach to teaching the industrial arts can make much of an impact on the current program and eventually improve the technological literacy of the American public.

From the viewpoint of this observer, the 1966 study by the U. S. Office of Education was most conservative in noting the lag in industrial arts programs. Definitions, aims, analyses and practices of industrial arts have received varied interpretations. Some of the current professional publications in the field of industrial arts still persist in presenting isolated and trivial experiences that may be qualified with superficial objectives. There is some apparent agreement among educators in that there is a place and purpose for industrial arts programs within the broad conceptions of general education.

"Efficiency of learning clearly depends upon (1) the individual who does the learning; (2) the nature of the task to be learned, and (3) the conditions under which the particular learning occurs."

GAGNE and BOLLES
Human Learning in the School

The broader dilemma in education has been clearly articulated:

> Education is beyond repair! What is needed is radical reform. This reform is to include the nature of the schooling process, the systems which control educational policy, and the institutions which prepare persons to be teachers. In teacher training, reform must be undertaken in the selection of teachers. There must be more adequate representation of the

poor, the black, the Mexican, and the Indian in teaching ranks.

The current situation of remoteness of the prospective teacher from the realities of classroom practice must be brought into contact with reality through various training experiences and actual encounters with children in the classroom.

Anti-intellectualism of teachers can no longer be condoned. The reform of teacher education must be to further scholarship. Teachers must become avid readers consumed by history and by language, conversant with scientific principles, and at home with mathematical manipulations.

The schools must allow persons with different capabilities to function where they can be most useful. Teachers must be specifically trained for different positions in a program which recognizes the importance of a differentiated staff.

Teacher preparation reform must stress the ability to conceptualize and analyze, which is the essence of scholarship. The teacher must be prepared not only to diagnose problems, but also to devise programs to remedy the situation, and finally to evaluate the success of these programs.

Nothing short of these reforms will suffice.

Reform is distinguished from revolution. It is not asumed that reform will require a complete transfer of power. But in the absence of revolution, reform in control over education must take place. There must be some sharing of power with community leaders, teachers, and students. The reform must recognize the plurality of our society.

(Smith et al., *Teachers for the Real World*)

It is noteworthy that *Teachers for the Real World* calls attention to particular technological concerns that suggest inferential educational implications for prospective industrial arts teachers:

"The problem of the educator is to engage pupils in these activities in such ways that while manual skill and technical efficiency are gained and immediate satisfaction found in the work, together with preparation for later usefulness, these things shall be subordinated to *education*—that is, to intellectual results and the forming of a socialized disposition."

JOHN DEWEY
Democracy and Education

"The most important kind of invention for the future lies not, however, as in the nineteenth century, within the mechanical reach, but in another area: the way we are to deal with all the new conditions produced by the new machines and ideas."

E. E. MORISON
Men, Machines and Modern Times

The world we live in is declining in size daily. Through refinements in technology, people are now accessible to each other where not so long ago their remoteness precluded communication. Specialization generates interdependence and calls for cooperation. The activities of persons halfway around the globe are not only of economic interest but are vital for our survival.

(Smith et al., Supra)

II. RATIONALE

The basic assumptions that underlie the development of this model are noted under the broad categories of (A) Man and Society; (B) Technology; (C) Education; and (D) Industrial Arts.

A. Man and Society

1. Man's work, well-being and leisure have been affected by technology.

2. Man is the innovator and master of the machine.

3. The greatest threat and challenge to man is man.

4. The pride in man's work including fatigue, monotony, quality and output have been affected by the machine.

5. In the production of goods, man's roles and skills are diminishing.

6. The skilled artisan and craftsman will continue to flourish in specialized areas of work.

7. Man's intellect is so related to his body and emotions that one cannot be affected in isolation of the others.

8. Man is a responsive and responsible individual.

9. The uniqueness of man lies in his ability to think, to use tools effectively and in the capacity to extend his intellectual and tool-making-using capabilities.

1. "The technology of the twentieth century embraces and feeds off the entire array of human knowledges, the physical sciences as well as the humanities. Indeed in these new technologies there is no distinction between the two.

2. "Tools and the organization of work—the two elements of what we call technology—have always molded both what man does and what he can do.

3. "Knowledge does not eliminate skill. On the contrary, knowledge is fast becoming the foundation of skill. Knowledge without skill is unproductive."

P. DRUCKER
The Age of Discontinuity

10. The dignity of man as a human being supercedes all other considerations.

11. Technology has grown far beyond man's sociocultural awareness.

12. Man has abused, exploited and overpopulated his environment.

13. Society possesses the means to control the forces of our technological culture.

14. The mobility of society has been influenced by technology.

15. Society, as a whole, has achieved a higher standard of living due to technological change and greater productivity.

16. The tensions of society (individuals-nations) have mounted in the path of technological innovation.

17. Division of labor, prompted by technology, has produced an increased stratification of society.

18. The health of society has been impaired by the advancing technology.

19. The interaction of society has been affected adversely by an overt emphasis on materialism and demonstrable weaknesses in empathy.

20. Man is an *individual* in the complex of society.

"Technology begins with man, the first toolmaking primate. The earliest toolmaking efforts were accompanied by the development of speech. Speech and language fully joined the toolmaking man and the thinking man."

R. J. FORBES
The Conquest of Nature-Technology and Its Consequences

B. Technology

1. The machine has helped man to achieve visionary aspirations while concurrently bringing forth adverse dilemmas.

2. Technology is dependent upon man and the environment which surrounds it.

3. The machine has the potential for creating leisure and the production of goods which make it possible to enjoy leisure.

4. Technology has been with man since the dawn of civilization.

5. Technology has stimulated new forms of social integration.

"Technology means the systematic application of scientific or other organized knowledge to practical tasks."

J. K. GALBRAITH
The New Industrial State

"Technology refers to art or skill or way of doing something, whether or not it results in a physical product."

H. R. BOWEN
Technological Change and the Future of Higher Education

6. The greatest area of technological growth will be the information-computer industry.

7. Recent advances in technology have denied work to the unskilled or semi-skilled while utilizing the talents of a highly skilled minority.

8. Automation involves the application of technological devices and methods to manufacture and the repetition of any process without intervention by human hands.

9. The machine is useful, valuable and dangerous to man.

10. The evolution in technology has transformed the image of society.

11. Technology has influenced the modification of moral and spiritual values of man.

12. A prevailing characteristic of current technology is the adaptation of the computer within the spheres of communication, production, transportation and education.

"The overall change in the nature of technological work during the twentieth century has three separate though closely related aspects:

1. Structural changes—the professionalization, specialization, and institutionalization of technological work.

2. Changes in methods—the new relationship between technology and science; the emergence of systematic research; and the new concept of innovation.

3 The 'system approach.' Each of these is an aspect of the same fundamental trend. Technology has become something it never was before: an organized and systematic discipline."

P. F. DRUCKER
Technological Trends in the Twentieth Century in Technology in Western Civilization

C. Education

1. A teacher requires intellectual competence, mastery of a discipline, social awareness and dedication.

2. General education has as one of its purposes the identification of a common heritage for all students.

3. A mission of education is moving an individual from one stage of development to another in full realization of what is being attempted.

4. Learning theory is based on the belief that education evolves out of blending previous experience with new knowledge, skills and abilities.

5. Verbal and tool skills are significant components in learning.

6. Education is not confined to a formal school structure.

7. Education is life rather than a preparation for a nebulous future.

8. The needs of youth should determine educational content.

9. A teacher is expected to relate subject matter to the broader areas of culture.

10. Education is concerned with the learner, as a human being, who has certain needs and desires that make him distinct from his fellows.

11. General education is as concerned with the learner as it is with content.

12. All education should be tempered by relevant utility—intellectual, social, technical or leisure.

13. Education is contingent upon what a pupil can be encouraged to say, think, do and feel rather than by what the teacher says, thinks or does.

14. New dimensions in technology are nullifying the traditional patterns of vocational education.

15. Scholarship is the product of a continuous search for the sources of knowledge.

16. Quality education in the public schools is dependent upon relevancy in the pre-service and in-service preparation of teachers.

17. There is need for diversified field experiences and internships in teacher education programs to provide closer liaisons with the public schools.

18. Technological literacy is a worthy educational goal.

19. The adaptability to change should be inherent in educational programs.

20. Humanities, sciences and technologies comprise disciplines of knowledge for educational programs.

21. Education for leisure should be broadened in educational programs.

"The alienation of youth from school is a many-faceted phenomenon. Some of the components of alienation which tend to exclude disadvantaged youth from the benefits of education are: (1) the school's inability to tolerate differences; (2) the powerlessness imposed on students; (3) the meaninglessness of curriculum; (4) the lack of connection between school and other systems of society; and (5) the humiliation and degradation of students in the classroom."

A. PEARL
Among the People

"My proposal is that a fair number of universities and colleges—the academic as well as education faculties—high schools and elementary schools work together to devise experiments in learning by teaching . . . in any field which someone finds the inspiration that provides the courage to try something new."

J. R. ZACHARIAS
ESI Quarterly Report

"Education, as a sector of national life, has, for the most part, been cut off from technological advances enjoyed by industry, business, military establishments, etc. The American educational enterprise exists out of technological balance with great sectors of society."

J. D. FINN
The Bulletin

22. New techniques in the storage and retrieval of information need to be integrated in the learning process.

23. Important changes are required within public schools and teacher education if substantial improvement is to be made in the education of disadvantaged children.

"Any forward thrust in industral arts depends greatly upon the quality of te her education."

R. LEE HORNBAKE
New Horizons in Industrial Arts

D. Industrial Arts

1. Technology, as a discipline and curriculum base, provides unity and diversity for industrial arts.

2. The concepts of industrial arts can be structured and empirically related, within the scope of general education, by an integrated study of technology rather than vague interpretations of industry.

3. A general misunderstanding by teachers of tools, materials, machines and processes (as means rather than educational ends), has confused the nature, aims and emphases of industrial arts programs.

"Because it must be learned by very young children and by the children of very simple parents, this bndy of knowledge and experiences must bc expressed in clear and simple terms, using every graphic device available to us and relying more on models than on words, for in many languages appropriate words are lacking."

C.R. WALKER
Technology, Industry, and Man the Age of Acceleration

4. Technical experiences in shops or laboratories provides reinforcement for intellectual learning in technology.

5. The use and study of tools and materials, as concepts of technology, can provide broad insights into man's utilization and application of knowledge.

6. A technology-oriented industrial arts program provides for genuine interaction of the individual with human potential, the environment, knowledge and the social being of man.

7. Technological learning in industrial arts can serve as a bridge to the understanding of man's artifacts and revolutionary progress.

8. Field visitations should be unified with school experiences in technology.

9. Educational strategies in technology should be oriented in systems techniques and technological innovations that facilitate the learning-reinforcement processes.

10. All processes of communication are important for learning in the industrial arts program.

11. Industrial arts programs, reflecting changes and emphases in technology, should be designed for students of varying ability levels.

12. Present industrial arts teacher education programs:

a. Fail to provide an adequate cultural base for prospective teachers.
b. Present a narrow skill/process orientation of industry.
c. Perpetuate a dated methodology approach in professional preparation.
d. Fail to recognize the problems of the schools, community and in particular those students that have been relegated to current industrial arts programs.

"Man's drives, inasmuch as they are trans-utilitarian, are an expression of a fundamental and specifically human need: the need to be related to man and nature and to confirm himself in this relatedness."

E. FROMM
The Revelation of Hope—Toward a Humanized Technology

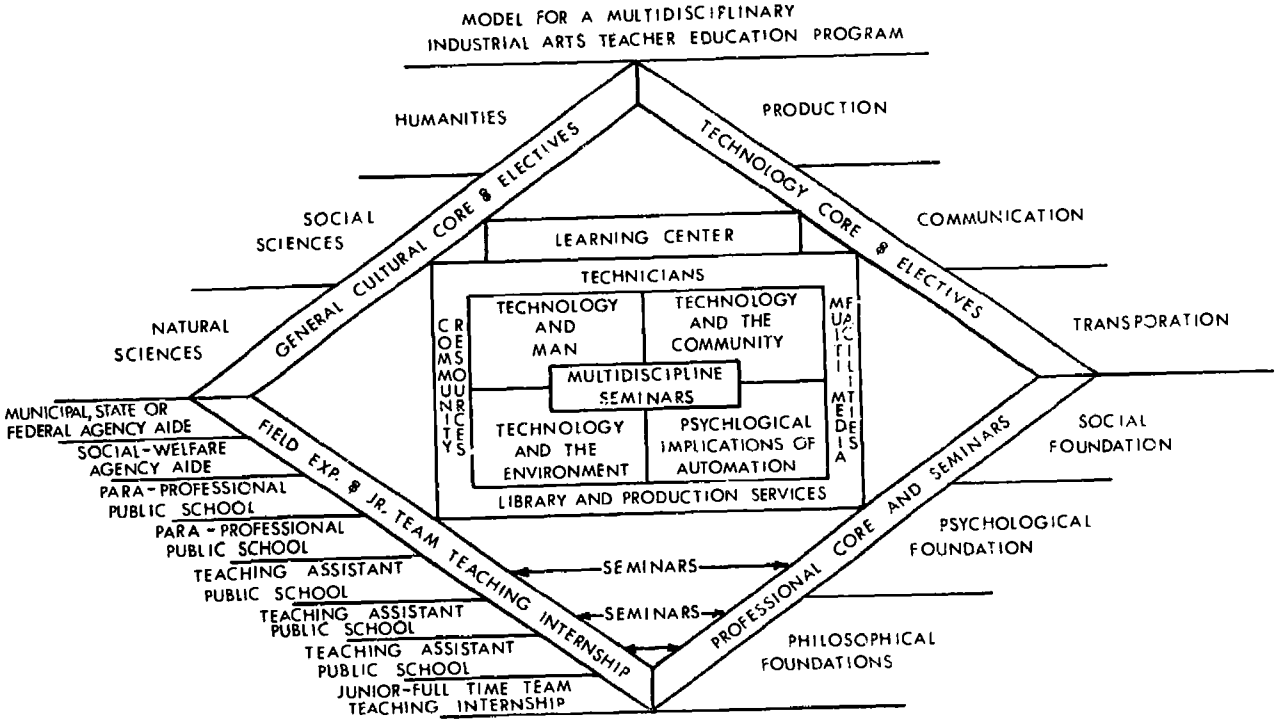
III. A PROPOSED MODEL

Within the context of the aforesaid contemplations, a new approach is set forth—a model (please note illustration of the model on the following page) for a multidisciplinary industrial arts teacher education program. With appropriate adaptations, this model may provide a new orientation for industrial arts programs in the secondary schools. At the moment this model reflects a hypothetical viewpoint. Implementation, time and experience, as an experimental pilot program may well determine credibility in comparison to the traditional approaches in industrial arts teacher education.

The pursuit of knowledge runs the gamut from the simple to the complex—or from the abstract to the concrete. Particulars may be broken down to their simpler elements so that a phenomenon may be combined with other related input to form broader comprehension for knowing and understanding. The act of knowing implies the connecting of things and this effects a unity. The knowing of things is the knowing of them as related or in their unity; it is also the finding out of their unity. There may also be a distinction in

"Being an intelligent person, then, can be demonstrated by the possession of knowledge or by competence in its use. The importance of a person's possessing certain knowledge is pretty generally gauged in our culture by how it affects his behavior. Obviously, he who uses knowledge effectively must possess it."

W. FRENCH
Behavioral Goals of General Education in High School


MODEL FOR A MULTIDISCIPLINARY
INDUSTRIAL ARTS TEACHER EDUCATION PROGRAM
HUMANITIES
SOCIAL SCIENCES
NATURAL SCIENCES
GENERAL CULTURAL CORE & ELECTIVES
PRODUCTION
COMMUNICATION
TRANSPORATION
TECHNOLOGY CORE & ELECTIVES
LEARNING CENTER
TECHNICIANS
TECHNOLOGY AND MAN
TECHNOLOGY AND THE COMMUNITY
MULTIDISCIPLINE SEMINARS
TECHNOLOGY AND THE ENVIRONMENT
PSYCHOLOGICAL IMPLICATIONS OF AUTOMATION
COMMUNICATIONS
MULTIMEDIA
LIBRARY AND PRODUCTION SERVICES
SOCIAL FOUNDATION
PSYCHOLOGICAL FOUNDATION
PHILOSOPHICAL FOUNDATIONS
PROFESSIONAL CORE AND SEMINARS
FIELD EXP. & JR. TEAM TEACHING INTERNSHIP
SEMINARS
SEMINARS
MUNICIPAL, STATE OR FEDERAL AGENCY AIDE
SOCIAL-WELFARE AGENCY AIDE
PARA-PROFESSIONAL PUBLIC SCHOOL
PARA-PROFESSIONAL PUBLIC SCHOOL
TEACHING ASSISTANT PUBLIC SCHOOL
TEACHING ASSISTANT PUBLIC SCHOOL
TEACHING ASSISTANT PUBLIC SCHOOL
JUNIOR-FULL TIME TEAM TEACHING INTERNSHIP

things, but the distinction, allowing degrees of relationship, may also be considered as varying conditions of unity. Knowledge, as the associating or joining of things, is a classifying or generalizing, and from this there evolve various forms of knowledge structures. The knowledge structure of technology, in industrial arts education, can provide unity and meaningful interrelationships with other disciplines.

"Technological advance has two bedrock requisites: broad general knowledge, and modern managerial competence. It cannot come into being without improving the foundation of it all, which is education of the young, as well as adults."

J. J. SERVAN-SCHREIBER
The American Challenge

The basic premise for this model presupposes a reference base of technology. It is through the medium of technology that industrial arts programs may provide commonalities of understanding and knowledge within and beyond this curriculum area. A multidiscipline approach in the study of industrial arts, via a technological orientation, may well provide a curriculum breakthrough in eliminating the compartmentalization, departmental barriers and conventional course structures that lack timeliness and relevance. Still another valid approach in support of this model, is bringing into the central arena of industrial arts teacher education the various segments of the college, the public school and the rich resources of a community. For too long a period of time, industrial arts teachers and teacher educators have been perpetuating a myth of curriculum independence with little or no regard for other disciplines or change (social-cultural-economic-political) fostered by the varied influences of technology.

A. Characteristics of the Model

1. General Cultural Core—Overview

The intent of a broad cultural core in this area of teacher education is to promote the idea of a teacher-scholar. The prospective teacher of industrial arts education should be able to view his field of specialization, technology, in the context of the whole of knowledge. Learning transfer may reach fruition contingent upon effective planning and the dovetailing of general education with the specialized education curricula. A sound general education should provide

"When the humanities sciences, philosophies and technologies are brought together in a whole, functioning system, there emerge ethical imperatives which confirm and extend the noblest ideals that mankind has collected and treasured."

H. G. CASSIDY
Knowledge Experience and Action—An Essay on Education

"When we take the very long view of man's world in the next century we see that the main problems are less those of technology than they are those of men's getting along with other men, communicating with other men and organizing themselves in such a way that their genius and imagination can be vigorously applied to the problems that confront them. Our major problems involve the enriching, enlarging, improving and mobilizing of our intellectual forces."

BROWN, BONNER and WEIR
The Next Hundred Years

the individual with an assurance that learning does not necessitate knowing all the answers. On the contrary, it should provide students with an awareness of creativity, adaptability, flexibility and individual curiosity toward gaining further understanding of himself and society.

2. General Cultural Core—Goals

1. Effective fluency in written and verbal communication.

2. An awareness of authors and books that have influenced man and the universe.

3. A familiarity with the history of western and eastern civilizations.

4. A cognizance of political elements in a study of economics.

5. A consciousness of environment, living things and man's place in nature.

6. A familiarity with the results of the past—e.g. a museum field study.

7. Getting to know other Americans—the Indian, Black and Puerto Rican.

8. An understanding of constrasting political systems.

9. An awareness of the crucial domestic and international problems of our times.

10. Knowing the psychological conceptions of man —emotion, motivation, personality.

11. Cultural understanding via art, music, comedy, drama and opera.

12. Insights of man and his world—a basic study of philosophy and metaphysics.

13. A study of comparative religions.

14. Comprehending the interaction of science, technology and the individual.

15. A knowledge of the cycle of life in relation to environmental science.

16. Knowing mathematics as a means of communication and its application to the real world.

17. An awareness of communication and semantics —the art of transmitting and receiving information, ideas and attitudes from one person to another.

18. Contemplating for leisure—music, art, photography, crafts, writing, reading, technical tinkering.

19. A study in understanding human relations.

20. In a geographic area having a high ethnic density:

(1) A study of the ethnic culture.
(2) Communication with ethnic groups, e.g. conversational Spanish.

21. An awareness of anthropological influences upon change, culture, religion, communication, family, politics, economics, transportation, technology and education.

22. A study of cybernation—deployment of human potential in modern society.

23. A recognition of the inter-intra relationships of history and technology.

24. Methodology of scientific inquiry for the non-scientist.

25. The impact of technology upon work and society.

"Education for life and education for livelihood are equally significant; we must educate for the job of life, as well as for the job in life. An education which equips a man for his working hours only has been sadly defective."

A. R. WILLIAMS
General Education in Higher Education

"Man is a social animal, distinguished by culture: by the ability to make tools and communicate ideas."

K. P. OAKLEY
Man the Tool-Maker

3. Technology Core—Overview

The technology core underscores the basic uniqueness of industrial atrs education. It supports the basic characteristics of man's ability to make tools and use tools that is coupled with his perceptive capability of generating and communicating ideas. A study in depth and breadth will encourage self-discovery, development and confidence as a teacher education student makes the transition from learner to scholar with a degree of specialization mastery. In this core, there is no intent to promote mastery of technique that is insulated from intellectual involvement, integrated

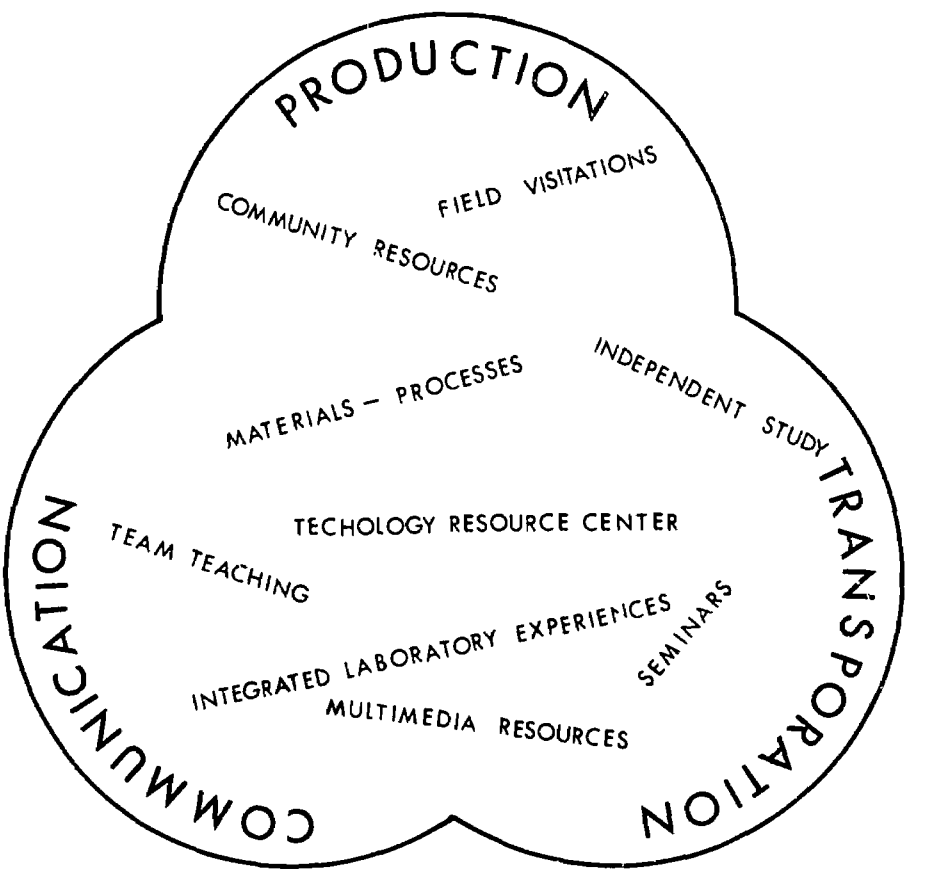
laboratory experiences, field visitations, team teaching, the use of multi-media resources and genuine involvement of other disciplines with a study of technology which will endorse the basic tenets of a liberal education.

4. **Technology Core—Goals**

1. The ability to direct and coordinate technological knowledge and skill learning experiences.

Figure 11

TECHNOLOGY CORE



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2. To be of educative value, technological content should:

a. Be capable of analysis.

b. Be capable of pedagogical structure.

c. Lend itself to conclusions and results.

d. Be integrated with other disciplines.

e. Promote intellectual thinking.

f. Promote habits and methods which will be of value to the individual.

g. Promote growth through planning and execution.

h. Have factors which are universal and permanently educative.

i. Foster achievement which can be evaluated by the teacher as well as the student.

"It is a philosophical task to indicate the place of value in a world of facts."

W. KOHLER
The Place of Value in a World of Facts

"Knowledge that may be termed understanding—that is knowledge that involves sympathetic insight and realization in experience—is better than knowledge that may be termed 'recognition' or 'acquaintance.'"

H. H. HUDSON
Education Liberally

3. Technical competencies in a laboratory setting should promote a social awareness of technology.

4. Laboratory learning activities in industrial arts embody a need, a problem, a plan for action, an execution and an evaluation. The problem is resolved into a logical, intellectual, technological concept—that requires action and genuine life experiences.

"Laboratories are contexts for learning in the midst of action; learning occurs not because it is planned, but only as an inevitable by-product of genuine participation in problem-and-task oriented activities."

NEWMAN AND OLIVER
Harvard Educational Review

5. The use of tools, machines and materials should provide the *means* for the attainment or reinforcement of learning.

6. Experiences in industrial arts should promote creativity and inventivity.

7. Pertinent resources in the community must be known and utilized by the industrial arts teacher and student.

8. The teacher must be cognizant of the theories and techniques that have contributed to our technological world.

1. "No social, human, or spiritual fact is so important as the fact of technique in the modern world.

2. "Whenever we use the word technology or technique, we automatically think of machines."

JACQUES ELLUL
The Technological Society

9. The teacher should promote student planning and capitalize upon student interest.

10. The laboratory in the industrial arts programs should be considered as a *resource* (one of many) toward the solution of problems.

11. Learning concepts in industrial arts should be broad and relate to the real world of the student.

"Innovation in education, whether it involves the use of new curriculum materials or new educational technology, has become essential if the schools are to be genuinely effective in achieving their aims and goals."

Committee on Economic Development
Innovation in Education: New Directions for the American School

12. Technological involvement in industrial arts mandates the use of analytic and scientific methodologies.

13. Laboratory experiences must provide for a diversity of technical processes and materials.

14. Programs should provide for clarifying the vertical and horizontal structures of technology.

15. Programs should consider the beneficial and baneful effects of technology.

16. Programs should include studies in the history of technology and emphasize man's seach for leisure.

17. The technical, scientific, philosophical, social, economic and political implications of cybernetics, in the context of man and society, must be considered in programs that prepare teachers for a technology-oriented industrial arts program.

"In a culture like ours, long-accustomed to splitting and dividing all things as a means of control, it is sometimes a bit of a shock to be reminded that, in operational and practical fact, the medium is the message. This is merely to say that the personal and social consequences of any medium—that is, of any extension of ourselves—result from the scale that is introduced into our affairs by each extension of ourselves, or by any new technology."

MARSHALL McLUHAN
Understanding Media: The Extensions of Man

18. Technical preparation should include practical experiences in the use of the computer and programming.

19. Educational experiences in technology should embrace the *broad* areas of production, communication and transportation.

20. Programs should include a study of electronic miniaturization and applications in technology.

21. Programs and facilities should be designed with the flexibility to implement curriculum change in consonance with a changing technology.

The industrial arts teacher must be capable of:

a. Adapting a changing technology to the needs of education.

b. Utilizing a systems concept approach in the design of instruction.

c. Coordinating human resources, media and technology.

d. Making effective use of information storage and retrieval systems.

e. Identifying technical concepts within the range of basic tools and interactional machines.

f. Understanding the interrelationship of basic psychological learning theory with technological innovations.

g. Utilizing the tools of technology toward effective communication and human problem-solving.

"Technology requires literacy. Without literate workmen, modern machines and instruments cannot be efficiently operated, and without a very high degree of literacy and skill they could never be constructed or maintained in good condition. For this reason alone, therefore, education would have become a topic of importance in any advancing technological society. . . ."

R. A. BUCHANAN
Technology and Social Progress

5. Professional Preparation—Overview

Contemporary complexities that besiege education may be considered from many perspectives. One may choose to view the major educational problems within the context of funds, increasing student population, knowledge or society. Questions of good education, efficient education and relevant education are very much the concerns of educators and the lay public. In recent studies of disadvantaged youth, many questions have been raised concerning quality-inequality concepts that relate to basic human relationships that affect learning and teaching.

"The teacher of the seventies will necessarily come to terms with the essential humanity of students. He will realize that his own humanity is threatened only when he is himself insensitive to the needs and fears, pains and joys which youngsters experience as they learn."

FROST and ROWLAND
Curricula for the Seventies

The selection of a prospective teacher is a matter of serious concern. All who achieve scholastic attainment may not possess those human qualities necessary for the personal involvement with students, parents and the community. Several criteria that may be considered in the identification and selection of prospective industrial arts teacher education students are as follows:

A. Communication competency.

B. Personal characteristics:

(1) Displays empathy.

(2) Emotional equilibrium.

(3) Individuality coupled with gregarious qualities.

(4) Interest in cultural and community affairs.

"It is interesting to know that frequently teachers claim to have a modern outlook upon education and yet they perpetuate ancient errors. Are we self-satisfied and merely contented with our own advancement, or do we actually see the needs of the student? Are we authoritarian or permissive in our way of life? Do we regard ourselves as absolute authorities or are we willing to learn from our pupils? Do we regard education as a collection of facts or as an exploration of ideas and people?"

MAYER and BROWER
Education for Maturity

(5) Imagination.

(6) Accuracy of thought.

(7) Integrity of purpose.

(8) Capacity for judgment.

(9) Ingenuity and resourcefulness.

(10) Ability to analyze based on curiosity.

(11) Evidence of creative instinct.

(12) Interest in inventivity, cosmography and cosmology.

(13) Capacity for judgment.

(14) Adaptable to change.

(15) Ability to concentrate.

(16) Subordinate and leadership responsibilities in extra-curricular or work activities.

C. Scholarship capability.

6. Professional Preparation—Goals

"Culture essentially implies standards or norms; so does curriculum. Individual action within culture gains its coherence from the standards or norms which underlie it: so does the action of the teacher in the face of the curriculum. Both the teacher and the cultural sociologist are deeply concerned with the standards adopted by groups."

L. STEINHOUSE
Culture and Education

1. A teacher is primarily a director of learning experiences.

2. Understanding the how and why of learning is essential for the teacher.

3. The teacher must be an effective liaison between the school and community.

4. Learning and teaching should couple scholarship with a social awareness of a discipline.

5. Teaching involves those versatile techniques which clarify ideas, values, attitudes, thinking and planning that are meaningful to the student.

6. In helping others to learn how, with a degree of skill, exemplary performance by the teacher (e.g. in motor-perceptual learnings) conveys desirable levels of expectation for students.

7. In challenging situations of learning, there is need for the teacher to convey emotional assurance and feelings of security to *all* students.

8. A subject matter field, via teacher-directed activities, should embrace the unity of the students to the spectrum of society (national and international) and to the broader cultural relationships.

9. Teacher-student involvement with community problems, action, planning and betterment provides for real life learning situations.

10. The teacher should be capable of identifying and (with special assistance when necessary) correcting those impediments to learning.

"If the school does nothing to make the student feel more acceptable than he feels at home and in society, then it loses its ability to educate."

RICHARD WISNIEWSKI
New Teachers in Urban Schools: An Inside View

11. Purposeful involvement and interaction by the learner (with respect to goals, planning, relationships, outcomes and evaluations) is a requisite in the educational process.

12. The preparation of a teacher must encompass broad involvement via field experiences and internships in governmental operations, social welfare agencies, community action groups and the public schools.

13. The unity of a given subject class must not be misconstrued with the diversity of personalities and individuals in that class.

14. Teachers need to be aware of changes in the intellectual and social climate that challenge traditional morals and individual behavior patterns.

"Americans might be more concerned over the abundant evidence that their schools are on the whole doing a poor job in educating students to think clearly, critically, independently about fundamental issues."

H. J. MULLER
Freedom in the Modern World

15. The teacher should be an innovator for curricular, co-curricular and extra-curricular experiences.

16. The teacher as a professional should:

(a) Be concerned with raising standards of the profession.

(b) Present a positive self-perceptual image to students, colleagues and the public.

(c) Be concerned with the attainment of quality education.

(d) Experiment for more effective procedures and programs.

(e) Be actively involved in pre-professional and professional organizations toward the attainment of human betterment via educational programs that are relevant to the real world.

17. The teacher should consider with an open mind those contributions offered by diverse races, cultures and religions, and in conjunction with students discuss those contributions that promise enrichment of the individual and society.

18. The classroom should promote widespread respect for human personality and a recognition of each individual's right to live his own life so far as it does not interfere with the welfare and happiness of others.

"Thinking is the method of intelligent learning, of learning that employs and rewards the mind. We speak, legitimately enough, about the method of thinking, but the important thing to bear in mind about method is that thinking is method, the method of intelligent experience in the course which it takes."

JOHN DEWEY
Democracy and Education

19. The teacher should review the literature of community action and civil rights groups that call attention to the inferiority of ghetto schools and their teachers.

20. Teachers should develop realistic and attainable standards.

21. Structure, routines, planning and organization need not inhibit the creative abilities of teachers or students.

22. There is need for the teacher to convince children of their ability to achieve.

23. Regardless of the curriculum area, the teacher must generate and exemplify intellectual stimulation.

24. A teacher education program, by exemplary involvement with the public schools and the community, should provide the motivation for a young teacher to accept the challenges of education with a deep degree of personal and professional commitment.

"In addition to the lack of a change agent, schools are also handicapped in change activities by the weakness of the knowledge base about new educational practices."

R. O. CARLSEN
Change Processes in the Public Schools

7. Multidisciplinary Seminars—Goals

The innovation of multi-discipline seminars supports the premise that technology is not only concerned with the technique of doing, but in a much broader context it embraces the involvement of man with history, environment, elements of nature, education and culture. The eclectic resources of many disciplines can provide a rich understanding of the past, present and future implications of technology within a general education frame of reference. These seminars

will help the student to make inroads into other areas and to support the interrelationships of technology with other disciplines. Typical seminars are as follows:

1. Technology and Man.
2. Technology and the Community.
3. Technology and the Environment.
4. Cybernetics.
5. The Computer in Our Life.
6. Psychological Implications of Automation.

8. *Learning Center—Goals*

Recent achievements in technology have provided the school and the teacher with valuable instructional tools and resources to support meaningful and conceptual learning for individual students. The effective use of the learning center facility can provide for the total interaction of all disciplines in the industrial arts teacher education program. The learning center serving as an instructional laboratory, coupled with library and community resources, can provide educational enrichment for effective learning. A significant component in the learning center will be the use of computer devices and information storage-retrieval systems. In addition, the following resources should be available:

1. Educational television.
2. Laboratory for the preparation of audio-visual and related materials, e.g.
   a. motion pictures
   b. still picutres
   c. recordings
   d. models, specimens, mock-ups
3. Programmed instruction.

In the eyes of the public, the image of the teacher has been undergoing scrutiny and change. Another dimension of change requires the transformation of the traditional classroom/laboratory image to a facility that avails itself to many resources within and beyond the school.

"If one sets his sights on the shape of pedagogy and instruction in the schools of tomorrow, and tomorrow is not the distant future, what can be said about the forces that will influence educational systems? Some expectations: (1) individualization of instruction; (2) computer-assisted instruction; and (3) psychologically-based instructional design."

R. GLAZER
Instructional Technology

"The accent today is upon change, but change brings uncertainty and many educators must learn to live with both the challenges and the uncertain future."

N. C. POLOS
The Dynamics of Team Teaching

"Most important, team teaching has allowed us to introduce a rare ingredient in education. It is free time. . . . The whole point of free time is to fill it with repsonsibilities and have faculty available to guide the children."

E. J. ANDERSON
Life Magazine

"A child learns 'how to learn' only by learning something. . . . Some knowledge is important in itself and some is important because it develops independence in acquiring further education."

G. T. BUSWELL
Learning and the Teacher

C. Uniqueness of the Model:

1. Emphasis upon a firm cultural base in the humanities, social sciences and natural sciences.

2. The inclusion of multi-discipline seminars to promote wider integration of the cultural and technological elements in teacher education.

3. Field experiences, junior team teaching internships and seminars will provide the thrust in professional preparation by bridging educational theory and teaching practice toward promoting meaningful interaction between the college, public schools and the community.

4. Provision for a learning center facility that will provide necessary instructional resources for all disciplines and serve as the coordinating unit for professional orientation and kindred field work activities.

5. To enhance and correlate problem-solving and functional learnings in the technology areas of communication, production and transportation, the following approaches will provide new directions toward the attainment of positive educational responses:

(a) Team teaching.
(b) Field visitations and use of community resources.
(c) Integrated laboratory experiences.
(d) Use of varied instructional media.
(e) Employment of paraprofessionals.

6. College credit may be granted for technical work experience.

7. Special curriculum considerations (e.g. ethnic studies, conversational fluency in a foreign language) will determine programs of study for those prospective teachers that may teach in the inner city.

8. The technical area of communication will include course work in computer science, mathematics, programming and data processing.

9. Ample opportunity will be provided for electives in the cultural, technical and professional areas.

10. The model suggests broader dialogue and interaction between industrial arts educators and other members of a university, college or school faculty.

11. The model provides for a greater degree of involvement by students with human and societal concerns.

12. Industrial arts teacher educators could utilize the public schools to demonstrate the what, where, how and when of curriculum content.

13. The model suggests a greater degree of technological adaptability for the student.

14. The model proposes greater diversity in the integration of theory and practice.

15. The model supports a sense of realism and dynamism for a technology-oriented industrial arts teacher education program.

16. Disadvantaged students have a strong need for educational experiences that invite problem-solving, decision-making and logical thinking. For these students, a multidisciplinary study of technology in secondary schools will develop these abilities as well as enhance their understanding of a technical society.

17. The model presupposes a greater degree of student, faculty, college, public school and community involvement; hence, a greater degree of internal and external accountability may provide the stimuli for ongoing evaluation toward the improvement of curricula, learning and teaching.

"As the places of teaching and learning are opened spiritually to all, so will they be opened physically. Schools will no longer be simple destinations in the systems of circulation, holes in the fabric of the public domain, but will form an integral part of those systems and of that domain."

S. WOODS
Architecture and Education, Harvard Educational Review

"There is really not much use in having science and its knowledge confined to the laboratory unless it comes out into the mainstream of American and world life, and only those who are trained and educated to handle knowledge and the disciplines of knowledge can be expected to play a significant part in the life of their country."

JOHN KENNEDY
Public Papers

"There seems to be little doubt that the concern of teacher education in the next decade will be centered primarily upon problems arising from the emerging partnership of colleges and public schools in the preparation of teachers."

E. CLARK
Teacher Education and the Public Schools

IV. PROLOGUE FOR THE FUTURE

The considerations, goals and the typical model for multidisciplinary programs in industrial arts teacher education provide implications with some specificity for curriculum change. If anything, the rationale and model provide direction for broad liberating goals. By intent, the writer has avoided the mechanistic approaches of aims and objective. The pseudo nature of nondescript objectives (Thompson, 1943, p. 196) has been clearly noted:

"A scholar-educator, let it be explained, is not a mere technician or methodologist in education, but rather an individual who has a rich cultural background, a broad grounding in the humanistic-socio-aesthetic subjects, a clear conception of the content and influence of the account of the march of man from ancient times onward, a thorough preparation in at least one area of subject matter, and a comprehensive knowledge of the theoretical and the practical aspects of education."

W. W. BRICKMAN
Automation and Human Values

1. They lack comprehensiveness; they are too narrow in scope to include all the manifold aspects which properly belong to the field of education.

2. They are often listed as abstractions which cannot be made the goal of any desirable activity.

3. They lack dynamics; that is, their pursuit does not move men to action. No one desires them sufficiently to make any effort or sacrifice to attain them.

4. They lack a clear-cut organization so that one can distinguish among such levels as broad social objectives, concrete or specific social objectives, teachers' objectives and pupils' objectives.

The model provides a prologue to new insights for the transformation of static programs in industrial arts teacher education. With the acceptance of the premise that technology, rather than industry, is the common denominator for intellectual and technical knowledge in industrial arts education, (coupled with meaningful interaction with other disciplines), then one may proceed to validate the model hypothesis via a more detailed curriculum design, engendering philosophy, content, process and physical plant considerations.

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A Program Authorized by the
Education Professions Development Act