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HUMANISTIC TECHNOLOGY: AN OPERATIONAL DEFINITION
AND EVALUATION OF AN EDUCATIONAL PHILOSOPHY
TO SERVE AS A MODEL FOR TECHNICAL
EDUCATOR BEHAVIOR

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

T. Norman Tomazic, B.S.Ed., M.A.Ed.

* * * * *

The Ohio State University
1975

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ACKNOWLEDGEMENTS

The investigator gratefully acknowledges the assistance and continued encouragement received from Professor D. G. Lux, Chairman and the other members of the reading committee; Professors Elsie J. Alberty, James J. Buffer, and William Umstattd.

Sincere appreciations are hereby tendered to Martha A. Tomazic who managed to remain a loving wife while playing the roles of proofreader, counselor, teacher, housekeeper, cook, mother, and best friend. Without my Martha, this work would not have been done.

Thanks are also due to the members of the evaluation team; Drs. Paul W. DeVore, Clyde M. Hackler, Marshall Hahn, Melvin Kranzberg, Donald P. Lauda, Michael S. Littleford, Donald Maley, Lloyd P. Nelson, Robert Swanson, and Ethan A. T. Svendsen. The time and effort that were contributed by the members of the evaluation team aided immeasurably to the investigator's understanding of the current setting for educational change and the potential that exists for the Humanistic Technology philosophy that was the subject of this dissertation.
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INTRODUCTION

Technology has been the subject of much erudite criticism by proponents of liberal education for many years. The general trend of criticism seems to suggest that technology is the virtual antithesis of the humanities. There seems to be an unproven assertion that technical education is not likely to aid man's understanding of his relationships with his fellow man.

The dichotomy between the humanists and the technologists is succinctly stated by Gerald Peil as he remarks:

The humanists, technologically and scientifically ignorant, despair at the ascending role of technology in the life of our culture. The technologists remain blissfully convinced that all will be well because man will somehow manage technology rationally, for the good of humanity (in Stover, 1963, p. 79).

It seems obvious that we can not afford to allow our schools to become purely humanistic any more than we can allow them to become purely technical. As Bruner states it, "The objective of education is not the production of self-confident fools." A philosophy of education in our society must direct the advances of science towards the fulfillment of man's purpose on earth -- toward an evolutionary end that, while not yet clearly defined, must be
achieved through the cooperative efforts and thought processes of all men.

Our systems of technical education must emphasize the technological advances which give man ever increasing opportunities to reflect upon his purposes and the direction that his evolution must follow to become ever more human. Those "advances" which remove possibilities for unity among man, or which drain the earth's resources for purposes of the well-being of a small segment of mankind, must be opposed or redirected for the benefit of all men and the preservation of opportunities for the eventual and ultimate totalization of mankind (Teilhard, 1964, p. 259).

We are living in an age where the choices made by an individual regarding the direction and pace of a technical advance may have sweeping, devastating or beneficial effects on the remainder of mankind. The manager of an industry providing products for human consumption must make sure that his forecasting accurately predicts immediate and long range benefits as well as the total effects of his product on man and the ecosystem.

Purely economic considerations, however attractive they may be to industrial management and corporate shareholders, must yield to the far more important human and social considerations if man is to survive on earth. The fantastic rate at which men in the advanced industrial
societies are consuming the raw materials of the earth must be slowed and the resources and energy producing matter must be equally distributed among all men. Technical advances in some fields may depend upon such conservation and distribution of resources.

Technology and culture are closely interwoven -- it would be difficult to separate the two in an attempt to show that one is more important than the other. It would seem that the only alternative would be to emphasize the relationships between technology and culture in order to make technological advances fit into a pattern of cultural advancement that will humanize technology rather than having technology dehumanize man.

Throughout history the greatest thinkers and doers have moved mankind forward and upward in technology, exploration, and social structuring. This development can be viewed as a natural evolutionary process with mankind improving at every step of the process. Each technological advance may carry a multitude of problems requiring solutions if man is to survive, but in moving toward those solutions man has become increasingly aware of the world society and less centered upon his own needs or upon regional or national concerns. He becomes more man, both singular and plural, as he recognizes the nature of mankind.
Thus it seems that technology may actually be permitting man to become more human. As posited by Pierre Teilhard De Chardin (1964):

The more free Man's mind is, the more does he reflect; and the more he reflects the further do his thoughts penetrate and the more intensively do they become arranged in closely related systems. That is why the great wave of modern technical progress is automatically accompanied by an ever spreading ripple of theoretical thought and speculation (p. 230).

What seems to be needed for our schools is a curriculum that will enable students to achieve a state of self-actualization that will place them at once at peace with themselves and with their fellow man. It does not seem that the above will be accomplished in a school system bifurcated into vocational and college oriented programs, but rather in schools serving individuals on their own terms to provide them with every opportunity to acquire the knowledge basic to good citizenship in a healthy democracy and necessary for survival in an increasingly complex and technologically humane society.

Dr. Donald P. Lauda (1972), of West Virginia University, has forecast the extinction of industrial arts from the public schools by the year 1990. Indications are that the process of that extinction has already begun -- as schools throughout the nation are changing the focus of their programs to receive federal funds. Dr. Lauda has suggested that there might be some hope for industrial arts
if immediate steps are taken to revise the curriculum and
to encourage nationwide acceptance of a new philosophy of
industrial arts education in the schools.

STATEMENT OF THE PROBLEM

The nature of the curriculum proposed by Dr. Lauda
and others seems to require an adjusted philosophical out­
look and reordering of values on the part of the indus­
trial educators who will be responsible for administering
that curriculum. Inherent in the new curriculum would be a
trend to technological assessment that would examine the
question of "What ought man do with his technology?"

The philosophy required might be labeled a philoso­
phy of Humanistic Technology. The problem addressed by
this study is that there is no organized series of
behavioral descriptors which might characterize a teacher
who acts consistently with such a philosophy. The pur­
pose of this study was to operationally define such a
philosophical position; to gain expert evaluation of the
definition; and to make recommendations for applying
that philosophy to the improvement of the industrial
arts curriculum.
QUESTIONS TO BE ANSWERED BY THE STUDY

In developing and evaluating the operational definition of a philosophy of Humanistic Technology, several questions will require answers. The questions that seem to have the greatest bearing on the success of the study include:

1. To what extent does the literature related to the issues of man and technology support the thesis that man can and should control the pace and direction of technological growth?

2. To what extent does the literature related to man and technology issues deny the thesis that man can and should control the direction and pace of technological growth?

3. To what extent do traditional philosophies of industrial arts reflect a philosophy of Humanistic Technology?

4. To what extent do the philosophies of innovative programs in industrial arts reflect a philosophy of Humanistic Technology?

5. To what extent does a selected group of professional educators agree on the basic issue of the need for establishing a philosophy of Humanistic Technology for industrial arts education?

6. Can an operational definition of an educational philosophy be developed that may emphasize ties between technology and culture and which may characterize an educator for future industrial arts curricula?

7. Can a selected group of professional educators who advocate greater understanding of the relationship between technology and man agree on a set of behavioral descriptors that comprise an
operational definition of an educational philosophy labeled Humanistic Technology?

8. What recommendations might be made by a group of professional educators who support a philosophy of Humanistic Technology for curriculum changes in industrial arts?

DEFINITION OF TERMS

The following definitions were developed by the investigator to clarify meanings for words or phrases within the body of this study. Other definitions for these words or phrases are possible but might not be consistent with the usage intended herein.

Technology

A domain of man's knowledge that is concerned with the knowledge of practice. While it relates to the descriptive, formal, and prescriptive domains of knowledge, it is more than simply an application of such knowledge to practical problems. It may be equated with praxiology or the evolving science of efficient action.

Industry

That phase of the economic institution of man that converts raw materials or component parts (through the use of industrial technology) into useful structures that may satisfy human needs.
**Industrial Technology**

Those management, production, and personnel practices which are utilized in the economic institution of man and which result in constructed and manufactured material goods for human use.

**Humanistic Technology**

An application of technology which emphasizes its controlled direction and pace to the extent that every effort is made to ascertain the human effects of each technical advance and to reject those "advances" which would be detrimental to the overall ecosystem or to the satisfaction of the needs of mankind.

**Industrial Arts**

A subject area in the school curriculum that is concerned with man's application of technology to produce, consume, or service useful products. It includes not only knowledge of those practices, but actual use of the materials, tools, machines, and processes of industry. Correlative to the above is a study of the human and social consequences of those practices of industry.

**Technological Assessment**

The process of determining the factors leading to a projected practice of man and the prediction of possible effects of that practice on man and the ecosystem. The
procedure considers factors related to the (1) context in which the practice will operate, (2) possible alternative practices, and (3) an analysis of the expected efficiency of the proposed action.

Operational Definition of a Philosophy

A definition of an abstract philosophical concept that attempts to concretize the abstraction through a series of human behavioral descriptors which might characterize an individual who embraces the philosophy to be defined.

Efficient Action

For the purposes of this study, the criterion of efficiency for any action is not merely economic, but is also concerned with the humane use of techniques in the environment of man.

ASSUMPTIONS

The assumptions that served to establish parameters for the investigator included the following:

1. Most contemporary programs in industrial arts are principally crafts and economics oriented.

2. A review of the literature related to man - technology issues will reveal the essential nature of man's concern for controlling technological growth.

3. Affective learning related to humanistic concerns for the use of technology can take place even though precise measurement of that learning
may not be possible.

4. Affective learning which takes place in an individual's growing years will influence that individual's later real life choices related to that learning.

5. A curriculum that attempts to illustrate the close relationships between man's culture and his technology will narrow the gap that presently exists between humanistic and technological concerns.

6. An operational definition of an abstract philosophical concept will aid in the understanding of, and possible acquisition of, that philosophy by persons concerned with the purposes projected for that philosophy.

METHODOLOGY, PROCEDURES OR TECHNIQUES

A review of the literature was the first phase of the study. The materials reviewed for Chapter II were selected for their bearing on the resultant effects of man's power (or lack of power) to control his technological growth. The readings were analyzed to provide a foundation for a synthesis of the total readings. The investigator developed the operational definition for a philosophy of Humanistic Technology through evaluations and judgments made concerning the groundwork thus prepared, and through application of techniques reported in other accounts of the development of operational definitions for educational philosophies.

In Chapter III an operational definition of a philosophy of education reflecting a Humanistic Technology
orientation was constructed by the investigator using procedures adapted from Swanson (1955). Within Chapter III the investigator attempted to:

1. Define general categories of teacher behavior.

2. Define those teacher behaviors that may be encompassed within educational philosophy.

3. List and define specific teacher behaviors based on educational philosophy and related to general categories of teacher behavior.

4. Illustrate each specific behavior with examples descriptive of the philosophy of Humanistic Technology.

Swanson's (1955) procedure was modified to suit the purpose of this study, and general categories of teacher behavior were developed from a teacher-as-manager model adapted from Towers et al (1966) to derive the behavioral descriptors used in the operational definition. Following the above, the operational definition was evaluated by a panel of professional educators. The twelve members of the panel of judges were selected on the basis of their past writing, speeches or personal contacts with the investigator. Indications of willingness to participate were solicited from all the judges, and every person who was sent an evaluation packet expressed a willingness to serve on the panel, however, two judges later declined to participate in the evaluation due to definitional problems that they felt were too numerous to overcome. The evaluation team is listed in Appendix D, and results of the
evaluation are reported in Chapter IV.

The evaluation team was asked to examine the 120 item operational definition and to make judgments as to whether individual items should be included, omitted, or changed for the final operational definition as developed for Chapter V. A simple majority of the evaluators was established by the investigator as the criterion level for inclusion, omission or alteration of the items used in the final definition.

Following the evaluation of the operational definition, experts were interviewed to determine their positions regarding the desirability of a philosophy reflecting Humanistic Technology as a basis for the Industrial Arts curriculum, the appropriateness of the elements of the operational definition, and recommendations for the implementation of that philosophy.

Opinions of the panel of experts were taped and transcribed by the investigator. Transcripts of the tapes were sent to individual panel members for their examination and corrections before they were placed in final draft form for the study. See Appendix E.

The interviews were analyzed to determine the degree to which the experts agreed or disagreed with the elements of the behavioral descriptors that make up the operational definition, and with the desirability of basing industrial arts curricula on a philosophy of Humanistic Technology.
Results of the above analysis are reported in Chapter IV.

LIMITATIONS

The evaluation of the philosophical position that is operationally defined in this study was limited to several educators who have indicated an orientation toward such a philosophical outlook. The investigator is aware that such an evaluation team might not present much divergence from the philosophical position defined, but the inclusion of evaluators from an opposing philosophical camp would do little to clarify the meaning of Humanistic Technology.

The value orientation necessary to accept the philosophical position defined in this study conflicts with some of the basic tenets of our economic system. A primary difficulty may lie in the values that are projected as essential for man's survival in a technological world. Ferkiss (1969) points out a problem in the adoption of values for directing technology with the statement:

...granted that health and survival are both desirable, what happens if society must risk the health of all, or even just of some, in order to ensure its survival (p. 249)?

The bias of the investigator has undoubtedly affected the definition developed in this study. The problems of defining terms such as health, survival, or even death have a direct bearing on the values that individuals accept. Recent developments in medical technology involving human
organ transplants have required a new definition of death to make the latest technological developments compatible with the moral values of present day man. It is obvious that the investigator's definition, even if approved by a panel of experts, will not be acceptable to all.

Another limitation on the study is in selection of readings made by the investigator. Only a sampling of the very extensive materials available could be made, and new volumes appear almost daily. Judgments made as a result of the sampling made could be completely erroneous.
CHAPTER II

REVIEW OF RELATED LITERATURE
INTRODUCTION

Literature related to the topic of this study is quite extensive and is growing rapidly as researchers and scholars, in increasing numbers, focus on man's new need for survival in the technological milieu. Authors consulted for this chapter include educators, environmentalists, sociologists, philosophers, economists, labor leaders, industrial managers, journalists, fictionalists, forecasters, politicians, theists, and surveyors of public opinion. Therefore, the literature tends to follow divergent lines.

The optimistic thinkers seem to be in the majority — asserting that man's technological dilemma can be solved through technological controls or a more intelligent application of technology to man's needs. The pessimistic camp holds little faith in man's ability to survive his technological errors. Still another group seems to think that man must change to accommodate his new technologies rather than having the technologies change to suit the human condition. Few writers suggest that it is technology alone that is responsible for man's dilemma -- most assert the fault to lie with man's uses of technological
innovations.

This chapter has been organized under subheadings to clarify the dimensions of the problem of defining a philosophy of Humanistic Technology. The subheadings further serve to organize the synthesizing of readings for Chapter III.

TECHNOLOGY AS A CONTROLLABLE FORCE

If the direction and pace of technology could not be controlled by man, then technological research and development would be pure science fiction. Huge corporations that are a reality disprove the latter, and would suggest that technology is controllable. Perhaps we can never act with complete assurance of the outcome of our actions as suggested by critics of technology, but we can direct our action toward the maximum probable good. We can attempt to foresee the consequences of our actions and base the action on our understanding of the probable consequences. Such a position would negate any impulsive technological act, and would prevent the opportunistic development and exploitation of technology for purely economic benefits.

Federal agencies have been incorporating technology assessment and have, since 1966, made significant improvements in planning, programming, and evaluating processes concerned with proposed technological innovation.
Various kinds of assessments are in current use — wide scope assessment, narrow or partial assessment, problem oriented assessment, environmental impact statements, futures research, and methodological studies all have found currency in governmental programs (Coates, 1972).

Moves to project future outcomes of technology seem to provide the best foundation for technological decision making. Michael Michaelis (1974) insists that decision making must move from the shorter view to the long term view. Michaelis also urges a more humane technology that focuses on better use of resources, less waste, less reactive technology, less pollution, and more foresight. Michaelis cites a need to orchestrate our system of choices, rewards and restraints.

However, our predictions and scenarios would have little purpose if we failed to impose our values on preferable futures. As McHale (1969) suggests, we need, "...future predictions within a credible framework of humanist concerns (p. 245)." We must be certain that our activities in the technological domain are practical in the sense that we have exerted every effort to determine their consequences.

Engaging in technical activity that satisfies short term goals may make little more sense than the ancient Chinese practice of beating gongs to scare away the big dog that was swallowing the sun or moon during their
respective eclipses. The practice seemed to work, but was rooted in ignorance of natural causes. Our technologi­cal practices may seem to solve problems for us now, but our ignorance of some of the natural phenomena that we may be irreparably damaging may cause our sun to be swallowed up after all.

Robert Theobald (1974) suggests that the world is changing -- and that, "Our survival seems to demand that man become the missing link between ape and humanity" (p. 5). Theobald believes that our systems require value education in order to survive, and that, most of us grossly underestimate our ability to change things through reasoned, intelligent, hopeful argument and discussion.

Today's technology necessitates human choices, but, more importantly, it also makes some choices possible that were not possible before.

Yet there remains the obvious advantages they [Technology and Science] give us, begin­ning with a much wider range of choices than men ever had before, and much more effective means of realizing our choices. Having repeatedly emphasized that computers and systems analysis cannot make value-judgements necessary in determining our social goals, or cannot tell us what we ought to do, I should now emphasize that they are very help­ful in estimating costs which must be con­sidered when making choices, and in assisting us in what we can do. Above all, we have the plain advantage of much more conscious effort at planning and control (Muller, 1970, p. 379).

Control of technological growth is demanded in many ways. Control is demanded by the absolutely finite
resources available on earth, by the cumulative effects of pollutants in our environment, by the possibility of negative effects on our value structure, by the complex interrelationships of man living in harmony with other men, by the satisfactions that individuals get from life, and by the unknown effects of uncontrolled technological growth on the future of mankind.

Walter Buckingham (in Sommers, 1963) suggests that technological growth is absolutely essential, but that not all such growth will result in a net gain for man -- some new technology will be needed just to cure ills created by past technology. But it is the new possibilities that make technological innovation most attractive.

Technology is in the end an enterprise of making possible what was not possible before, as, for example, it was not possible before rocket technology to go to the moon or to communicate by satellite. Science, which is comprehended by technology in the broadest sense in which I am construing it, also creates new possibilities: new attitudes and perceptions, new belief systems, new ways of approaching and dealing with the world (Mesthene in Kaplan, 1971, p. 50).

Man must be educated as to his place in a cooperative society, his purpose in life, and to values and attitudes that will enhance that cooperation and purpose. Without such education a humane existence would not seem to be possible. As Snow (1965) suggests:
Escaping the dangers of applied science is one thing. Doing the simple and manifest good is another, more difficult, more demanding of human qualities, and in the long run far more enriching to us all (p. 99).

In his book *Technics and Civilization*, Lewis Mumford (1934) points out a difference between the "neotechnic" and "paleotechnic" phases of the industrial revolution — the neotechnic phase was distinguished by an increased concern for human values, but not by an exclusion of problems of daily living in the paleotechnic phase. Problems of living would exist with or without advanced technology, but with advanced technology, man is able to seek new solutions to problems of man living in community with man. Resources can be dispersed, through technology, and common needs can be recognized and provided for.

There can be no civilized society — market, mixed, planned — unless the more fortunate and better-paid members of that society make a proportionate contribution to the broad social goods represented by services and amenities the individual citizen cannot provide for himself. The time has come for society to recognize that the needs of a healthy environment — clean air, clean water, unpolluted soil, decent cities — are public, social goods on a par with good order and good education and must be provided because communities cannot survive without them (Ward, 1972, p. 59).

The dispersal of values can also be enhanced through technology.

...here our technological means of communication can be made to play a humanizing role. Technology has now made it possible for diasporas, "dispersions" — a word taken from the dispersed Jewish
community all over the world — to establish a community life which can be as close and as genuine as the companionship among the members of local communities (Toynbee, 1971, p. 143).

Kelly (1972) suggests that the family of the future will probably tend towards the commune. Such arrangements will require less energy consumption, and fewer products, but some moral or value adjustments would be required. That man must change his values seems to be an almost foregone conclusion for our technological society.

...we want what the machines can furnish and so we must compromise. We must alter the rules of society, so that we and they can be compatible (Ramos, 1970, p. 12).

Our schools must prepare individuals to be adaptive -- to technological change -- to value changes -- and to new social structures.

Intellectual strategies for nuclear-space-age survival -- in all dimensions of human activity -- include such concepts as relativity, probability, contingency, uncertainty, function, structure as process, multiple causality (or noncausality), nonsymmetrical relationships, degrees of difference, and incongruity (or simultaneously appropriate difference).

Concepts such as these, as well as others both implicit in and contingent upon them, comprise the ingredients for changing ourselves in ways that complement the environmental demands that we all must face. The learning of such concepts will produce the kinds of people we will need to deal effectively with a future full of drastic change.
The new education has as its purpose the development of a new kind of person, one who as a result of internalizing a different series of concepts is an actively inquiring, flexible, creative, innovative, tolerant, liberal personality who can face uncertainty and ambiguity without disorientation, who can formulate viable new meanings to meet changes in the environment which threaten individual and mutual survival (Postman, 1969, p. 218).

With a more humanistic education, individuals can understand that choice plays an important role in human interactions with technology, the environment, and with other human beings. It is only when individuals or groups assume an attitude of forced choice that law-breaking, anarchy, and the degradation of mankind will prevail. It is only through the exercise of free will making choices that are positively directed toward the advancement of mankind to an ever more perfect existence that the term "mankind" has any meaning (Teilhard, 1965).

Paul DeVore (1969) also calls for a change in the individual to help the individual to cope with advanced technology.

Our concern in a highly complex technological society dependent upon the intelligent functioning of all citizens, must be the development of intelligent self-functioning individuals and not individuals trained for inflexibility in a world of fluid possibilities where the only goal of technology is the disemployment of human labor (p. 77).

The readings cited above seem to support the position that man's technology is controllable, but many authorities
hold an opposing view.

TECHNOLOGY AS AN UNCONTROLLED FORCE

Toffler (1971) warns of a dangerous condition of alienation to change that faces every human being as a result of a technological system that is growing out of control. Ellul (1964) suggests that the system is not only out of control, but is completely uncontrollable.

Boulding (1968) suggests that some pessimists regard original sin as genetic and thus feel that any extension of man's power through technology is merely an increase in man's opportunities to do harm. Along such lines Hannah Arendt (1958) suggests that:

Only the modern age's conviction that man can know only what he makes, that his allegedly higher capacities depend upon making and that he therefore is primarily homeo faber and not an animal rationale, brought forth the much older implications of violence inherent in all interpretations of the realm of human affairs as a sphere of making (p. 228).

As early as 1934, Lewis Mumford was moved to write:

...mechanization and regimentation are not new phenomena in history; what is new is the fact that these functions have been projected and embodied in organized forms which dominate every aspect of our existence (p. 4).

And as recently as 1972, Kelly suggests:

Above and beyond the subsistence level where perhaps they were necessary, activities are done for extrinsic rewards through jobholding, and the value of the rewards
depends upon unfulfilled need for self-acceptance. Further, the excess consumption that then results helps, under the Keynesian model of the economy, to ensure full employment (which, of course, is seen as an end in itself). Full employment keeps everyone busy (thus preventing leisure) and also provides funds for additional consumption in the quest for indirect self-acceptance. And so, round and round we go on the merry-go-round. The entire system that human beings have created (technology and institutions) becomes reified and confronts men as something which exists outside themselves. A vast dehumanized world is created in which man's own creations dominate him (pp. 44-45).

Some writers see grave dangers in the choices that confront man through his technological advances.

Now that our progress in technology has armed us with annihilating weapons, it is conceivable that we may come to the conclusion that we cannot afford to let nature take its course in the production of human beings; that we cannot afford to have anti-social behavior in an age in which we have equipped ourselves with atomic weapons. We might decide that we must sterilize all human males and females before the age of puberty, and must breed children exclusively from test-tubes out of selected genes, from which we shall have eliminated those genes that generate self-centeredness, aggressiveness, pugnacity, and anti-social behavior of all kinds (Toynbee, 1971, p. 131).

It is felt that man's process of making has created an almost insurmountable imbalance.

In short, the two worlds of man -- the biosphere of his inheritance, the technosphere of his creation -- are out of balance, indeed potentially in deep conflict. And man is in the middle. This is the hinge of history at which we stand, the door of the future opening on to a crisis more sudden, more global, more inescapable, and more
bewildering than any ever encountered by the human species and one which will take decisive shape within the life span of children who are already born (Ward, 1972, p. 12).

The divisions between those who understand the new technology and those who do not has created fears of a new "technocracy" movement.

Ideals of equality are not incompatible, either, with the new professional elite, an aristocracy of technicians that most Americans fear is against the common man. Democracy, of course, requires some sort of elite as do all other kinds of government. ...The chief reason for worrying about this new elite is not that it is an aristocracy, but that it is a technocracy. It may put efficiency above all other values, or with the help of computers and systems analysis it may make policy on the basis simply of economic factors, the only factors that these techniques can now deal with (Muller, 1970, pp. 165-166).

Muller insists that in spite of all of the appearances of planning and control for our technological system, it is a mechanical, almost blind drive to do whatever is technologically feasible no matter what the cost to humanity. Muller questions whether control by civilized humans is at all possible under technology's mantle of efficient action.

Some writers seem to feel that technology denies self-realization, personal freedom and other of man's higher needs. Technology is seen as a force that requires more and more adaptiveness by man until all men are molded into a single type. Mumford (1934) suggests that if man were made to conform to uniform standards in
every respect, uniform environment, uniform goods, uniform behavior, a "uniformly lifeless existence," the only problem would be in finding a reason for keeping the uniform creature alive.

The future seems to hold the greatest dangers for our technological society. Authors speak of "the button" (Kahn and Briggs, 1972), eco-disaster (Commoner, 1971), repression of social change (Toffler, 1971), and superindustrialism (Kelly, 1972). Some of these authors suggest that we can prepare ourselves for these and other future eventualities, but complete avoidance of "future shock" is probably not possible for as Boulding (1968) suggests:

...if we knew what we were going to know in twenty-five years, we would not have to wait twenty-five years for it. Consequently the growth of knowledge must always contain surprises, simply because the process itself represents the growth of improbable structures, and the improbability always implies potential surprise (p. 165).

Arendt (1958) supports Boulding's premise with the statement that:

The reason why we are never able to foretell with certainty the outcome of any action is simply that action has no end. The process of a single deed can quite literally endure throughout time until mankind itself has come to an end (p. 233).

Thus the pessimistic point of view maintains that our technology is not likely to respond to controls based on projections for the future founded on present
technological knowledge and present values. Such a divergent position held by credible writers seems to make it necessary to examine the effects that technology has on man, on his environment and on his values.

THE EFFECTS OF TECHNOLOGY ON MAN

Technology has moved man from a primitive, survival dominated existence to an advanced leisure dominated existence. Men are free of most of the worries of survival in advanced technology countries, but are rarely happy with their work or their self-image (Kelly, 1972).

In spite of man's apparent dissatisfaction with his high technology society, it is apparent that man's condition has been markedly improved through his applications of technology.

It is all very well for us, sitting pretty, to think that material standards of living don't matter all that much. It is all very well for one, as a personal choice, to reject industrialization -- do a modern Walden, if you like, and you go without much food, see most of your children die in infancy, despise the comfort of literacy, accept twenty years off your own life, then I respect you for the strength of your aesthetic revulsion. But I don't respect you in the slightest if, even passively, you try to impose the same choice on others who are not free to choose (Snow, 1961, p. 27).

Man has great advantages gained through his technology, but he has great problems that result from misuse of technological powers. Whitney Young (in Hodges, 1970) suggests that;
Technology holds the promise of freeing man from the tedium of repetitious, alienating work, and of freeing his energies and his spirit for creative and satisfying tasks that affirm his humanity and his labor. On the other hand, it can destroy the fabric of democratic society by concentrating power in an educated elite who, possessing the computerized tools of the new technology, will insecurely rule over a mass of dispossessed citizens, excluded from the fruits of the new era. We possess the tools to make technology work for us, and if it turns into a nightmare, it will not be the fault of technology, but of the greed and stupidity of men (p. 69).

Man can, through his choices, use technology to the advantage of all men. Canel (1973) suggests that humanity and inhumanity become redefined as man improves his technology.

In much of the world a thousand years ago, poverty, misery, pestilence and disease were looked on as the NATURAL condition of man on earth. Until two hundred years ago, many people in this part of the planet saw nothing INHUMAN about buying and selling other people; here, the human retina saw the datum HUMAN as white (p. 103).

Thus technology can make slavery an unacceptable practice as machines become more practical to use than men. But problems arise for man when decisions must be made regarding new applications of technology or the solution of problems created by past applications of technology. Thedosius Dobzhansky (in Burke, 1966) suggests that man has developed a genetic dependency on technological and medicinal crutches, and that;
The remedy for our genetic dependence on technology and medicine is more, not less, technology and medicine. You may, if you wish, feel nostalgic for the good old days of our cave-dwelling ancestors; the point of no return was passed in the evolution of our species many millennia before anyone could know what was happening (p. 324).

But the conscious application of technology to alter our genetic evolution is difficult to accept.

Ordinary eugenics, even by such modern techniques as artificial insemination, is a very slow, inefficient way of improving the genetic stock, but the new knowledge of the chemistry of heredity may make it possible directly to alter particular genes and achieve an enormous gain in speed and economy. Such powers may excite scientists because of their obvious beneficial possibilities, or simply as another triumphant demonstration of the power of science. This is, nevertheless, a pretty dangerous kind of power to give men, especially when one considers the possibility that it might be exercised by a Hitler and the kind of scientists who experimented on his victims in the concentration camps (Muller, 1970, p. 136).

It is such applications of scientific knowledge to practical problems that pose severe moral dilemmas for modern man.

Suppose that science were to succeed one day in making human beings immortal; the dread of death would then be removed, but it might be replaced by a longing for death. Death sets a time-limit to the liability created by human life for the person himself and for his contemporaries... so far science has only succeeded in lengthening the expectation of life... it has not yet discovered how to make the aged immune from senility, or how to shield them from loneliness and from anxiety if they still retain their wits (Toynbee, 1971, p. 46).
Even greater moral problems might develop out of man's attempts to find pleasure through technological devices. Kahn and Briggs (1972) discusses recent experiments with rats that involve electrical stimulation of the rat's pleasure center. The rats seemed to prefer the artificial stimulation to basic needs of food, water, and rest.

Scientists believe that human beings have many more pleasure centers than rats -- perhaps ten. Imagine a human being with his pleasure centers wired to a console fitted on his chest: just begin to think of the moral questions this would raise. Would it be necessary to be married to play the console of a member of the opposite sex? Would playing the console of a member of the same sex constitute homosexuality? Perhaps society would agree that any two consenting adults could play each others consoles, ... If you were really "square", you would be disgusted by the idea of playing your own console... people may well be presented with extremely complicated moral dilemmas (Kahn and Briggs, 1972, p. 209).

Although problems such as those above might seem farfetched, it does seem to be true that man has a built-in bias for undertaking activity for which the best tools are available. What can be done is frequently seen as that which needs to be done.

Kelly (1972) suggests that man creates material items and institutions, and that man's institutions create the patterns for use of energy, resources, and technology. When the institutions become reified by man they direct him toward actions that may be contradictory to his best interests. At one time most of man's action was devoted
to productive efforts that enhanced his chances for survival, but the productive system made possible by advanced technology has altered the human factor to the extent that man now spends less and less time in productive effort and more and more time as a consumer.

There are two factors in any system of production: the human and the nonhuman. The human factor consists of man's labor, both manual and intellectual. The nonhuman factor originally consisted of resources in the natural environment, such as productive land, animal power, etc. As human history unfolded the power and skills of machines were added to this nonhuman factor (Kelly, 1972, p. 26). Kelly (1972) asserts that we are already in a "post-industrial" society where less than half the population is engaged in industrial production (p. 114). The industrial revolution combined machine power with human skills, but now machine power is united with machine skills for a productive system of unlimited capacity (Theobald, 1963).

The effects of technology on farming and agriculture are such that a mere five million farm laborers can now raise sufficient food to nurture the rest of the citizens of the United States and still provide a surplus for overseas trade or charity. Mining has seen a similar labor reduction with cuts of approximately 50% in personnel attended by increases in production. Similar losses in basic manpower needs are to be found in manufacturing and construction. It is the service area that seems to show
some possibilities for growth in manpower needs, but technology is now entering the service sector to the extent that certain service areas are far less important now than they were only a few years ago (Kahn and Briggs, 1972). Improved television and appliance designs have drastically reduced the numbers of repair persons needed to maintain them.

A further problem with service occupations is that few people are satisfied with such activity as a life career.

There is one curious result in all major industrialized societies. The amount of talent one requires for the primary tasks is greater than any country can comfortably produce, and this will become increasingly obvious. The consequence is that there are no people left, clever, competent and resigned to a humble job, to keep the wheels of social amenities going smoothly round. Postal services, railway services, are likely slowly to deteriorate just because the people who once ran them are now educated for different things (Snow, 1959, p. 58).

Man's occupational life in advanced technological environments has thus changed from primary occupations in agriculture, mining, and fishing to secondary occupations in manufacture and construction and then to tertiary occupations in providing services for manufactured and constructed objects. Now quadrary activities associated with leisure are occupying more and more citizens of advanced technology countries (Kahn and Briggs, 1972). Automation may be making our old concept of "work"
obsolete. Our society may be locked into a Judeo-Christian "work-ethic" when work is becoming increasingly obsolete.

There has been some worker resistance to the above trend. Some unions have tried to halt the advance of automation to protect jobs or to prevent a dehumanized work environment. But as Elmer Klassen suggests;

Unions cannot bargain successfully with an employer who is not profitable; employers who fail to develop and accept new technology will not survive. The American standard of living is the highest in the world, and this has been elevated substantially by our improved technology (in Hodges, 1970, p. 206).

Industrial workers have been aided by advances in technology, backbreaking tasks have been eased, monotonous activity has been taken over by machines, but, in some cases, hazards have been increased (Buckingham, in Sommers, 1963, p. 23). Workers are subjected to more noise, toxic environments, radiation hazards, and unsatisfying labor than before the new technology was available. In addition, workers are faced with the constant threat of job obsolescence as technological advances replace human skills and labor (Brickman and Lehrer, 1969).

The simple economics of replacing people with machines is difficult to resist. A computer and thirty clerks can do more than fifty clerks. There are over 21,000 firms in the United States with over fifty clerks; so there is a substantial market for computers that would
rent for considerably less than the $100,000 in salaries plus overhead that would be saved in each company that could eliminate twenty clerks (Sommers, 1963, p. 22). Thus the direct effects of advanced technology through mechanization, continuous processing, and automatic controls seem to make human skills unimportant, and the machine skills can be controlled by a relatively few technicians.

The indirect effects of technological growth are more difficult to predict. Charles Killingsworth (in Sommers, 1963) suggests that:

Increases in man-hour productivity which exceed the growth of demand for our industry's products result in job attrition. Differing rates of technological change in industries producing products which are close substitutes may drastically alter competitive relationships, the distribution of job opportunities as between industries, and the pressures on various managements to achieve greater efficiency in the use of manpower (p. 123).

Thus technological advance breeds technological advance, and the welfare of the worker is secondary to the welfare of the corporation. Efficient production often does not take into consideration the efficient use of human resources.

Many workers in the suburbs continue to rely on the center city for employment. Yet a number of workers living in the city are quite as likely to be traveling outward for the new opportunities of suburban work. Either way, enormous amounts of commuting time have to be absorbed. If workers drive themselves to work, the sheer loss of time,
the fatigue, and the strain are far indeed from the leisure and variety of which the car is supposedly the symbol (Ward, 1972, p. 102).

Boulding (1968) discusses several different types of systems. Mechanical systems such as the solar system are virtually surprise free and predictable -- pattern systems such as those of little boys and girls growing up to be men and women contain relatively few surprises -- equilibrium systems such as the ecological and economic systems may contain many surprises as various natural and man-made forces impact upon them, and evolutionary systems such as genetic mutation and ecological selection are in a constant state of change -- where surprises may occur at a very slow rate (Boulding, 1968).

Boulding (1969) suggests that breaks may occur in any of the above systems, but that they are most likely to occur in the equilibrium systems where human intervention and natural disaster play the greatest role. The invention of the automobile is cited as a form of system break.

The automobile left practically no human institution unchanged as a result of the increase in human mobility which it permitted (p. 169).

Man has come to value the automobile very highly in advanced technology countries. The sense of freedom that man enjoys with the personal automobile will not be given up lightly.

But the sheer scale of the demand for petroleum -- in transport, for power stations,
for the production of petrochemicals of all kinds -- almost certainly means that, by the next century, it will not be available to power anything like a world population of motorcars at American densities of ownership (Ward, 1972, p. 127).

The emergence of the youth culture may be a form of system break created by advanced technology. As Kelly (1972) has suggested, young people have been affected by affluence, the mass media, rock music, diverse ideas of social and institutional critics, bombarded by consciousness changing chemicals and isolated from self-identification in work during a period of their lives when self-identification is most important. Kelly (1972) suggests that;

The assumption of scarcity or the assumption of abundance affects a person's entire way of life and his way of looking at the world. It is a central aspect of the difference between the mainstream culture and the youth culture (p. 75).

The technological reality of today has produced a younger generation that denies scarcity, is disinterested in work, has fewer guilt feelings, questions authority, is less rational, and which views commitment with some skepticism (Kelly, 1972, pp. 74-81).

The youth culture may fail to realize how dependent modern man is on the technological juggernaut. When a young man sits down to breakfast he may fail to appreciate that;
...the intricacy of one breakfast, if every process that brought it to the table had to be planned, would be beyond understanding of any mind. Only because he can count upon our infinitely complex system of working routines can a man eat his breakfast and then think about a new social order (Lippmann, in Lundborg, 1974, p. 89).

A possible casualty of the new technology may be simple business integrity. Muller (1970) discusses a carpet manufacturer who bemoaned the fallacy that carpets should last a lifetime. With all the planned obsolescence in American manufacturing, it was felt that carpets should also be designed to last only a short time. We may be returning to a condition that existed in the early years of the industrial revolution where the industrial magnate asserted a basic right -- the right to be socially irresponsible (Muller, 1970, p. 57).

Lundborg (1974) suggests that no such right exists for the manufacturer and for a corporation to maintain its franchise, it must: 1) produce and deliver goods at a quality acceptable to the market; 2) carry on operations in a way fair to employees, customers, suppliers, and not damaging to the environment; and 3) aware of the problems of the total community and total society -- doing its share to solve these problems (p. 85).

Another problem faced by man in a technological society is a form of "brain washing" that goes on under the name of commercial advertising. It is generally
recognized that advertising is a more determinant factor of a product's sales than the intrinsic value of the product to the consumer. Muller (1970) speaks of advertising as:

One of the forms of propaganda required by an advanced technological society, it is a reminder that the immense power man has achieved is increasingly power over not only nature but people, through ways of manipulating people. These may be for their own good, but thereby they raise again the question of what is good for people, and what people are good for (p. 11).

Muller further suggests that:

...we cannot give "propaganda" a precise meaning, but nevertheless need to distinguish its modern forms, which technology has made essentially new. It has become an organized, systematic, often high-powered effort to persuade or indoctrinate people on a large scale (p. 155).

The manipulation of man's mind through subliminal advertising is distasteful enough, but what seems to be potentially worse is the invasion of his privacy through advanced technology.

Personality tests have become routine with corporations. Computers with punch cards can readily make available all the information about people compiled by personnel men, credit bureaus, and government agencies. The telephone in one's home can easily be tapped, the living room bugged. Wide use is being made of high-fidelity snooping equipment, ranging from tiny cameras, telephoto cameras, sniper scopes, and radio transmitters installed in buttons to lie detectors built into upholstered chairs on which a person can be tested without his knowledge (Muller, 1970, p. 166).
The bad effects of advanced technology can be dealt with if men recognize the fact that individual choices can alter the direction of our technological efforts. Consumer advocate Ralph Nader (1971) made a tremendous impact on the automobile manufacturers by pointing out the abuses that they perpetuated with inferior products and poorly conceived designs. But even though individuals can and must resist technological abuses, a certain amount of conformity must also be accepted for technological man.

...we have to face the fact that human beings cannot exist in society without accepting a certain amount of discipline, whether it is self-imposed or imposed by others, in the interests both of society and of themselves. To take a modern example, the drivers of mechanically powered vehicles have to accept discipline imposed upon them by the police if they do not discipline themselves, because, without discipline, roads carrying high-powered, fast-moving mechanical vehicles become death traps. The tending of high-powered machines of any kind, implies discipline (Toynbee, 1971, p. 115).

Thus, the technology forces a type of unity of purpose to which all citizens of the technological society must subscribe to prevent wholesale disaster. But to say that man living in a technological society must have uniformity of purpose does not imply that he must have uniformity of action. As Ferkiss (1969) insists, "Uniformity is not necessary to unity (p. 258)." On the contrary, man must assure the capacity to be different for men living in society.
What is required is that all participants in technological civilization recognize that there is a whole that they do not totally represent, and that the one intolerable action is the claim of any individual or group within it to dominance and universality, for this would quite literally short-circuit the total cultural process (Ferkiss, 1969, p. 258).

At the 1974 American Industrial Arts Association convention in Seattle, Washington, Olaf Helmer presented ten issues that men living in technological societies must resolve in the near future. Each of the issues have diametrically opposed dimensions, and the choice to be made is not clearly evident in most cases.

Helmer's ten issues are: 1) a full employment economy vs. a leisure economy, 2) space exploration vs. social needs, 3) international cooperation vs. isolationism, 4) war as an instrument of foreign policy vs. the obsolescence of war, 5) bigger cities with dense populations vs. little cities with more uniform population density, 6) the "old" vs. the "new" vision of the "good life", 7) centralized vs. decentralized government, 8) integrated vs. polarized society, 9) continuing technological and economic expansion vs. a leveling off, and 10) competitive market ethics vs. public interest ethics. Technology will play an important part in all of the choices posed in the above issues. Boulding (1968) suggests that the ultimate product of society is people -- if we cannot produce people who feel intimately
part of mankind and in control of technology, we will have failed in our social structure.

Technology apparently has a significant impact on man's physical well being and upon his social-organizational structures. The effect technology has on man's environment, the earth's ecosystem, may be even more significant.

ECOLOGICAL EFFECTS OF TECHNOLOGY

Many volumes have been written about the damaging effects of technology on the earth's ecosystem. The problems currently faced by underdeveloped nations may be easier to solve than those faced by "overdeveloped" nations.

As long as we continue our present path, ecological disaster is highly likely. In many ways, the crucial factor may be whether or not we can begin building a human society before we are destroyed by our excess production (Kelly, 1972, p. 146).

Commoner (1971) points out that technology's principal fault is the fragmented nature of its scientific base. The cyclic nature of man, his technology, and ecological balance must be realized if man is to survive. Survival must be considered to be as important in our technological society as it was in primitive society.

It is not possible to overstate the fact that technologically wrought changes in the environment render virtually all of our traditional concepts (survival strategies) --
and the institutions developed to conserve and transmit them -- irrelevant, but not merely irrelevant. If we fail to detect the fact that they are irrelevant, these concepts themselves become threats to our survival (Postman, 1969, p. 208).

The effect of a closed circle in technology has been explained to be caused by the accelerated effect of action and reaction causing the spiral of technological development in the environment to become flatter and flatter until it seems to be a closed circle (Commoner, 1971).

A significant proportion of the general public seems to be aware of the problems technology has created for our environment. According to an April, 1970, Columbia Broadcasting System survey, approximately one-fifth of all Americans consider pollution to be the most important problem facing the United States, and 56% of those surveyed preferred to see conservation take preference over technological progress (Chandler, 1972, p. 186). Some writers question whether it is advanced technology that is causing our severe pollution problem.

Although power generation is a major pollutant, this is partly because it has taken to itself all the earlier pollutions produced by each industry working under its own steam with its own furnaces and by commercial premises and households heating and lighting themselves as in the days before power companies, central electricity boards, and high tension grids (Ward, 1972, p. 53).
Thus the suggestion is made that if the technology had not been improved, the sheer force of greater numbers of people using the older technology would give us greater problems than we now have. However, we must realize that population growth and the growth of the gross national product (GNP) lag far behind the growth of pollution.

Commoner (1971) cites a 46% population growth and a 126% growth in the GNP attended by a 1260% growth in pollution from all sources. Commoner suggests that the disparity between our growth in population and productivity as compared to our inclination to foul our environment is an indication that all of our most celebrated technological achievements are, in reality, failures.

We have been implementing new technology and proliferating our older technologies without regard for their full impact on our environment. The Aswan Dam was built to provide electrical power, but the engineers seemingly had no comprehension of the problems of silt accumulation, nutrients added to estuarine waters, and the loss of arrible land in the watershed. Unless the flow of land, in the form of silt, can be stopped, even the original purpose of power generation may be in jeopardy (Ward, 1972, pp. 161-163).

It is apparent that technological innovation must be preceded by thorough research into the environmental
effects of the innovation. Single faceted technical solutions to ecological problems, are, in fact, no solutions at all.

Technology demands the subdivision of tasks to accomplish desired ends -- the ecosystem cannot be so divided -- it is all linked together (Commoner, 1971, p. 187).

Most citizens would see little threat in the application of artificial fertilizers to farm fields, but a most insidious threat to human survival may exist in the continued practice in some areas of the United States.

...Dr. Abraham Gelperin of the University of Illinois, reported the result of a study of infant death rates in various Illinois counties. He reported that in five counties the death rate for baby girls (but not for boys) born during the months when nitrate levels were high (April, May, and June) was 5.5 per 1000 as compared to 2.5 per 1000 for the months when nitrate levels were low (August, September, and October). Dr. Gelperin concluded: The evidence indicated that high levels of nitrate in the water, as found in these counties, may increase the infant mortality rate among female babies (Commoner, 1971, p. 92).

The above study illustrates the result of the failure to accurately forecast the consequences of a technological advance. In the process of improving crop yields, the farmers of the world may be ensuring the extinction of their species. Technological practices that result in insults to the ecosystem may lead to its eventual collapse. And the deliberate augmentation of any one component of the ecosystem may lead to a
systemic collapse (Commoner, 1971).

Rachel Carson's (1962) *Silent Spring* served as an early warning of the harmful effects of indiscriminate use of chemicals to increase food production, but simple economics kept many toxic chemicals on the market until the weight of scientific evidence was sufficient to stimulate legislation prohibiting their use.

It is obvious that increased population demands an attendant increase in food production, but it is apparently not so obvious that fertilizers and pesticides harmful to man's environment cannot be justified. The technological answer to a problem of man is too often a fragmentary answer -- and while man's physical comfort may appear to be assured by the ready solution, his survival as a species may be threatened. Humanistic values are too frequently in conflict with pragmatic technological values, and a division of values concerning technological development could be disastrous.

THE SPLIT BETWEEN TECHNOLOGICAL AND HUMANISTIC VALUES

For years, writers have discussed a gulf that exists between the technically and the humanistically inclined individuals. The same kind of gap is said to exist between liberal and practical educators.

C. P. Snow's (1959) *Two Cultures* essay is perhaps one of the most widely discussed treatments of the
cultural gap between the scientific and library minds. He suggests that special technical schools for engineers are not as likely to produce engineers who can cope with men and technology as those schools which incorporate engineering education within the larger liberal education structure. Similarly, Snow decries the lack of awareness of the technical world by the so-called educated graduates of purely liberal arts institutions. He asks, "How many educated people know anything about productive industry, old-style of new? What is a machine tool (p. 32)?"

Snow's thesis goes on to answer that all too few do know, and the numbers of ignorant-educated are growing under the present educational structure. Snow (1959, pp. 11-12) suggests that scientists have "the future in their bones," and that literary intellectuals wish that the future did not exist. Snow's whole essay is a plea for an educational system that unites the two cultures to enable both science and the arts to evolve with wisdom.

Closing the gap between our cultures is a necessity in the most abstract and intellectual sense, as well as in the most practical. When those two senses have grown apart, then no society is going to be able to think with wisdom (Snow, 1959, p. 53).

Some years later, Snow (1965) discussed the rapid dissemination of his original statement into the world and deduced the reason to be that his thinking was not all that original, that at least the germ of his thesis
was sown throughout the thinking world. His second deduction — there must be some substance to his thesis.

The division between cultures is amplified as the technical elite becomes a smaller segment of the total population. Toynbee (1971) speaks of the problem of growing knowledge leading to increasing specialization. The problems derived from this are of great import to man's survival on earth. Each "expert" is very well versed in his unique specialty, but may be totally ignorant of the impact of his specialty on other specialities or on the totality of the ecosystem.

...when a field of either knowledge or action is insulated from its setting, from its environment, this insulation is artificial and arbitrary, and therefore the attempt to study or to take action about reality within these narrow limits is bound to miscarry. Our vision of reality is distorted when we do not see each patch in its general setting; so the specialist who sees the part but not the whole does not see correctly...What is equally serious, the specialist in action does not act right, because he is acting on behalf of the part only and not the whole of the universe (p. 83).

The technocracy movement was an example of an attempt to leave societal development to the "experts". Akin (1972) discusses the technocracy movement as an Utopian ideology that placed the technician at a higher social level than the non-technician -- and which predicted abundance, security, leisure, freedom from
arbitrary authority, and harmony through technology. Decisions were made by technological necessity rather than by subjective values. Yet paradoxically, the technocrats felt that all of the above would take place without the loss of individual freedom.

The technocracy movement may not be completely dead, Ben-Ami Friedrich (in Hodges, 1970) seems to propose a modern-day technocracy as he asserts:

What will be decisive in the matters of caste will be professional ability. Those who have such ability will be rulers in the establishment. It may also be that among those of a high level will be included, too, those parts of the population which until now have comprised the so-called humanistic class -- such as teachers, doctors, etc., who will be more and more affected in their work by the mechanization that is also penetrating these professions (pp. 108-109).

The implication that can be gathered from the above statement is that the humanistic individual will be licensed to operate to the extent that he becomes more like the technician.

In a satirical essay about the coming of a meritocracy, a system giving privileges to those with intelligence and technical abilities, Michael Young (1958) cites the dangers of human failings that would eventually place the meritocracy on an inheritance basis ultimately leading to an incompetent group of leaders, and eventual overthrow by the masses.
Most writers who acknowledge the gap between cultures agree that it must be narrowed before some social or environmental disaster results. John Wild (in Henry, 1955) suggests that;

The most dreadful evils are perpetrated by persons obsessed by some limited good, but oblivious to others much more important. The range of values open to man is very rich. His ultimate end is surely to achieve as many of these as is possible to the highest degree of intensity for everyone. How else may he be guided to his ultimate end except by a detached study of man as a whole and the world in which he lives? But this means an all inclusive view. It is a second derivative function of the school to interpret and to criticize the cultural pattern as a whole, to enable each student to understand its myriad functions and how they fit into meaningful structure and, where they do not, to point out why (p. 29).

It is the latter point that seems to need closer examination in our school programs, perhaps especially in our technical programs -- to enable students to deal with technological innovation, to express their desires to those who would impose an unrestricted technology upon them -- to inspire the student to establish control over the technological phenomenon.

Problems which result from attempts to integrate knowledge and practice are frequently philosophic problems -- problems of value -- ordering value against value -- establishing a hierarchy of values where perhaps should be a spectrum of values. It is apparent that we must examine our values in order to close the gap between
the cultures.

The heavy pragmatic stress on application of knowledge to the neglect of its development apart from incidental acquisition, has led many estimable folk in the educational profession to believe that a problem or project specifically designed to eventuate in the acquisition of subject matter, in the comprehension of an idea, in the achievement of a concept or generalization, represents the prostitution rather than the prosecution of an education. But is it not crystal clear that the problem of development versus use is really the familiar problem of liberal versus vocational study, or pure versus applied science — a problem whose roots descend into the field of value, where knowledge in the one case is regarded as intrinsically valuable, in the other extrinsically? (Breed, in Henry, 1942, p. 121).

Schools must educate individuals to aid them to deal with change — change in values, and change in technology to enable them to solve the problems of human choice that arise from such changes. Karr (1972) found that social studies was doing an inadequate job of preparing students for the 21st century. Current programs present a view more appropriate to a pre-technological society. Karr also suggests that a reflective methodology would be most appropriate to the teaching of social studies in the 21st century.
Our inherited propensities seem to be non-determinant and extremely open to outside influence or suggestion. The outside influences are what actually determine our direction initially and perhaps throughout our lives. For some, an internal force, generated through knowledge or understanding of society -- the environment, directs us toward individually satisfying and socially approved action.

For those who fail to acquire self-knowledge and knowledge of society, the environment and technology, action is more likely to be other-directed and imitative than self-directed. Imitative action is full of dangerous implications when the element of advanced technology is imposed on the individual. Svendsen's (1963) Thought and Action is an appeal for industrial educators to recognize the folly of perpetuating the dichotomy between industrial education and the so called "academic" curricula of the school. Svendsen's suggestions for proper direction of industrial education include: the use of problem solving with covert activity and reflective thought, a broadened content that embraces all of industrial technology and is devoid of any attempt to restrict industrial education to trade and fabrication activities or facts, the acceptance of rational powers of students as a focal point, and the recognition of and provision for individual differences in learning ability or learning rates.
The uniting of the two cultures should not be implied to suggest that opportunities for appreciating the unique qualities of each culture cannot still exist. For Feigle (in Pai, 1967) suggests:

While listening with rapture to great music it is unwise to remind ourselves of the physics of sound production, e.g., to think of the scraping of horse hairs against cat guts in the violins. Nevertheless, the sciences of acoustics and electronics have provided tremendously enlarged opportunities for the enjoyment of music... These remarks are simply to point the elementary wisdom of combining activities or attitudes simultaneously only if they do not interfere with one another (p. 174).

What many writers seem to suggest is that technology, in many ways, makes humanistic endeavor possible. It must be recognized that the conditions of abundance and the unimportance of physical labor create an atmosphere favorable to the development of humanistic values. As Kelly (1972) observes:

For any group to engage primarily in intrinsically rewarding activities and to stress a humanistic value-system as its primary value system, that group must enjoy affluence and a legitimate release from the labor market. Affluence and release from the labor market permit persons to engage in activities for their own sake and to develop a value-system which derives from, is consistent with, and provides justification for, those activities (pp. 81-82).

Kelly suggests that the humanistic value-system that has always been present as a secondary value-system may now -- through technology -- be capable of practice as a primary
value-system. It is apparent that the gap between humanistic and technological values can be narrowed if man is made aware of the effect that technology may have in shaping human values.

THE EFFECT OF TECHNOLOGY ON HUMAN VALUES

The connection between values and technology has received considerable attention from writers for many years. Frequently authors speak of the pernicious effects of technology on human values but they only rarely suggest that technology may exert some positive effect on values.

Dewey (1916) suggests that virtue dwells in action. Technology may be defined as the science of efficient action, so it is possible that virtue may lie in technological action. It appears that the value is determined by how we use the means of technology to reach the ends of human needs. As Muller (1970) suggests;

"Although money is often called a "false" value, it is plainly a real one. As plainly, however, it is only a means to some end. So too is our marvelous technology. The matrix of our problems, especially in America, is the common assumption in effect that it is an end in itself -- an assumption fortified by the immense energy that goes into it, the worship of efficiency as the sovereign ideal, the boasts about our material wealth and power, and the national goal of steady economic growth (pp. 4-5).

Man's actions have always raised value questions, but as technological knowledge increases, the value
questions come rapidly and may often be inadequately answered. Ancient philosophers would find it difficult to provide justification for moral rules to control man's use of some, as yet, undeveloped but possible technological devices.

In the face of severe shortages of fossil fuels some of today's experts suggest that the most obvious solution is to rush the development of nuclear power plants (Laird, 1975, p. 51). But, there are radiation risks, and we must be aware that;

...every exposure to radiation, however small carries with it some risk, in the form of genetic damage or cancer; that there is no absolutely "harmless" exposure to radiation. So that in the end, despite its complex scientific features, the problem of exposure to radiation becomes not a scientific matter, but one of public morality. For no one can say, on scientific grounds, how many children ought to risk thyroid cancer or genetic defects...(Commoner, 1971, p. 19).

Commoner was referring to nuclear weapons in the above quote, but it is equally applicable to the possible hazards of an "improbable" nuclear power plant accident.

Thus our technology forces us to make value judgments. Our apprehensions of the technological realities we have created cause us to act in certain ways. Humans are not endowed with a set of fixed, determined instincts within which behavior is guided. The human child is flexible and indeterminant. Humans are endowed with a complex faculty of apprehension with dimensions of
sense and reason (Wild, in Henry, 1955). This cognitive capacity enables all normal members of human society to understand group needs and the environment in which the group operates. More importantly, humans are able to communicate their understanding to one another and to direct individual and group action toward recognized goals (Wild, in Henry, 1955). However, an affective problem exists as technology conflicts with human values.

Thus we come to the fundamental question. Is the plunge into nuclear energy worth the danger? That citizens do regard death as a reasonable risk in return for some supposed good is quite clear. Otherwise the 50,000 deaths a year caused by the automobile in America would have long since lessened its attraction (Ward, 1972, p. 134).

It is obvious that technology poses problems that require human choices. The selections, once made, may have a lasting effect on other humans and their choices. Dr. J. Wilhelm Klüver (in Hodges, 1970) describes the problem:

The options in technology are tremendous: You can plan a system one way or another, so that the way the system interacts with the human being will be very different in each case. But once you start building your system and have a capital investment in it, you are stuck with it, and then the human being has to match himself to the system rather than vice-versa (p. 344).

Even the field of education is susceptible to the influences of technology along the above lines. Engel (1972) asserts that technologists in education emphasize
an approach that calls for all events to be measurable.
The approach restricts educational values to the level of externally controlled events. A "technological necessity" is substituted for a variety of human motives or purposes. In such systems, a greater value is placed on functional requirements of the system than on the human beings who are supposedly served by the system (Engel, 1972).

There seems to be considerable confusion over the school's purpose in value education. Muller (1970) states that:

Traditionally the humanities have served as the custodian of these (civilized) values, the ends of good life... and a liberal education is supposed to develop men, whole men -- not merely manpower (p. 219).

But Muller later laments that:

Most specialists in science do not have an adequate grounding in the humanities; most specialists in the humanities do not know enough about the fundamentals of science and technology. And the current stress on research and development is widening and deepening the gulf between them (p. 221).

Some writers suggest that the schools must educate youth to challenge conventional values.

One way of looking at the history of the human group is that it has been a continuing struggle against the veneration of "crap". Our intellectual history is a chronicle of the anguish and suffering of men who tried to help their contemporaries see that some part of their fondest beliefs were misconceptions, faulty assumptions, superstitions,
and even outright lies (Postman, 1969, p. 3).

John Wild (in Henry, 1955) suggests that organized formal education attempts to overcome a lack of theoretical grounds and reasons, a condition of inflexibility or of incoherence and disorder. But he cautions that;

> When reasonable questions cannot be answered, when certain practices seem to have no relation to basic cultural aims, and especially when these very aims become unjustifiable, then either reason itself must be discouraged, at the risk of social ignorance and error, or the common aspiration is dimmed and weakened (p. 27).

Thus actions must be examined to determine their relationship to perceived values. As Toynbee (1971) suggests;

> We cannot live together as a single family -- live under one roof, so to speak -- unless we have in common a minimum of manners and customs, ideas and ideals. Technology provides us with the physical means of arriving at a common way of life, but it cannot supply ideas and ideals (p. 140).

Man seems to be in a continual process of "making" and evaluating what he has made.

> I suspect that we may gain our most important insight into how tools -- technologies -- influence humanistic values. It is important to recall that every artistic process is a process of "making" and that an instrument or tool -- or technology -- is essential to any process of making (Mesthene in Kaplan, 1971, p. 56).

However as Hutchins (in Kaplan, 1971) points out;

> We can't always tell what the consequences of what we're making will be. The foundation of ethics is foresight, and, if you can't see the future, how can you tell if it's right or wrong? The most
innocent effort may turn out to have the most dreadful effects. At the present time, we do what we can, whether we need to or not, in order to show we can do it -- usually to keep ahead of the Russians (p. 125).

Muller (1970) suggests that scientists are far more likely to be affected by human values than engineers and technologists. The engineer is nearly always driven by the need to devise practical solutions to problems that exist. The technologist usually serves the business interests of the society with economic advantage as the primary factor determining his direction and purpose. The scientist is more likely to view his efforts as an end in themselves -- in the long run to serve the highest interests of man on earth.

In spite of the scientist's position of service to the higher needs of man, there is a problem that arises regarding the source of funding for scientific research.

Most of the scientists busy in research no doubt rejoice in the wealth of opportunities, all the money now available, and many have appeared quite willing to work for the military on projects such as chemical warfare, that scarcely further the highest interests of humanity (Muller, 1970, p. 130).

But Muller argues further that the scientist must be guided by deeper, more human, values.

One might add that if values are none of the business of scientists, why should they not sell their skills for commercial, political, or any other purposes? But however respectable this practice has become in America, where all kinds of
commercialized dishonesty are respectable, it can look like a scandalous betrayal of the traditional scientific ideals of a disinterested pursuit of truth, in the interests of humanity. It is another example of the danger of identifying science with technology (1970, p. 144).

Thus Muller seems to place technology outside the realm of values, but Toynbee (1971) suggests that:

Technology is concerned primarily with objects, but it does also affect human feelings and actions -- for instance, technological inventions like the oral contraceptive, which has introduced a new liberty for indulging in sexual relations without fear of the consequences for the female partner (p. 121).

We have definitely made some technological choices that have indicated values held. Kilpatrick (in Henry, 1942, p. 53) suggests that human values derive from human choices -- as we choose our values grow. Perhaps an error exists in choosing various technological directions. More emphasis must be placed on how the means of technology will be used. The technologist must be made to realize that:

If their only response to technology is to explore it for finer tools, they fail in that which we most demand of them; i.e., that they lead us to see -- in the Platonic sense of seeing -- what it is that technology imports for man; for his aspirations, his values, and his gods (Mesthene in Kaplan, 1971, p. 49).

Lundborg (1974) suggests that the economic institution must alter the corporate emphasis to embrace other than economic values.
Those in corporate life are going to be expected to do things for the good of society, just to earn their franchise, their corporate right to exist. That is why I am both amused and amazed that there should even be a question about the propriety of corporate social involvement, when it is to me so clearly an obligation. The corporation has to earn its right to exist and to function -- and it has to earn that right all over again every single day of its life. That is what we mean when we refer to "franchise": it is not a guaranteed right. It is a privilege that can be given -- has been given -- and can be taken away (p. 84).

Yankelovich (in Chandler, 1972) pointed out a striking difference in values between parents and children. Kelly (1972) suggests that this value difference or "secondary value-system" is a product of technological change. Young people, particularly college students, no longer believe as strongly in the virtue of hard work, in patriotism or in religion. Law and order is not seen to be as important as equality. And more liberal views on abortion, homosexuality, and premarital sex are becoming the norm for youth (Yankelovich in Chandler, 1972).

The Yankelovich survey indicated that most parents and youth felt that advanced technology was, at least, to some degree, creating an inhuman and impersonal world for man (in Chandler, 1972, p. 73). And yet most young people would welcome more emphasis on technological improvements (Chandler, 1972, p. 59). Following the "Pentagon Papers" incident, Americans seemed willing to give up freedoms of assembly, speech, and of the press
according to a Columbia Broadcasting System (CBS) survey in March, 1970 (Chandler, 1972, pp. 6-9). The survey results seem to indicate that conditions of the moment may cause people to relinquish cherished values if they feel that survival may be threatened.

If the surveys conducted by CBS are valid, there would seem to be a disintegration of a definite code of moral conduct. Such a condition makes choice increasingly difficult at a time when choices are thrust upon society at a rapidly increasing rate.

A society without definite norms to regulate morals and social conduct is called 'anomic'. In an anomic situation, like a sudden economic depression, when old rules no longer seem to apply and no new ones are immediately forthcoming, people do not know what is right and wrong or what the social expectations are, and they lose their sense of purpose (Mack, 1967, p. 26).

Van Til (1971) suggests that our operative values are what our actions demonstrate our real life to be. We are now faced with the possibility that few people will need to engage in productive action.

We will soon approach a state where virtually all of the necessities of life are produced by machines with no human intervention. Now, of course, people will be required to design machines and to oversee them in some way, but the actual necessary human intervention will dwindle into insignificance in the future. This is a fact of life we must recognize in the United States (Brown in Kaplan, 1971, p. 65).
The technology that gives man increased leisure will thus affect his values in yet another way. Mesthene (in Kaplan, 1971) suggests that leisure might provide greater activity in aesthetic pursuits.

The hypothesis to which I am led by these considerations is that there is a sense in which all values are ultimately aesthetic -- having to do with relationships of means and ends and deriving from man as creator; that is, from man as maker, whether he is making a painting, a rocket, a book, a polity, a good life, or his god. If there is substance to this hypothesis, and if this hypothesis can lead to a conception of a truly human view of the nature of leisure as contemplation, it will be a careful pondering by humanists on the nature and operation of technology that will lead to that conception (p. 57).

Kelly (1972) also sees advanced technology as an opportunity to engage in humanistic activity.

What I am emphasizing here is that the technology of postindustrial societies allows the development and expression of humanistic values among a large number of young people, and that the conditions that make this possible are likely to spread both to a greater number of persons under twenty-five and to persons in a increasing age-range as automation allows persons to stay out of the labor market for longer periods of time (p. 83).

We apparently must come to realize that every technical advance is not just an increased opportunity to do evil as some philosophers would have us believe. We are given choices in what technology to use and in how to use it. We must recognize that;
These are value judgements; they are determined not by scientific principle, but by the value that we place on economic advantage and on human life or by our belief in the wisdom of committing the nation to mass transportation or to biological warfare (Commoner, 1971, p. 198).

Our values are apparently influenced by our technology as our values shape that technology. It is relatively easy to see that our technological actions affect our value structure, but it is more difficult to determine what values must direct our technological actions.

**PHILOSOPHICAL BASIS FOR HUMAN ACTION**

An attempt was made by the investigator to provide a basis for human action that would reflect the current emphasis on controlled technological actions. Hobart W. Burns (in Pai, 1967) suggests that man's actions are founded on three basic propositions; (1) the psychological proposition which provides the reason for the act and the state of mind of the actor, (2) the empirical proposition that which has evidently caused the act to occur, and (3) the conditional proposition that which will follow if the act is completed (p. 44).

The above propositions lead to the desired or probable outcomes for the action. Pragmatically derived action is based on: (1) what prior knowledge has shown to be the consequences of similar acts, and (2) knowledge of the actor's purposes and the situation in which he
acts. The pragmatic act is full of means-ends inferences and is dependent upon purposive action involving the making of means and judgments about those means (Burns, in Pai, 1967, p. 49). John Dewey (1916) suggests that we do not know our ends until we have specified the means by which they are to be reached.

John Wild (in Henry, 1955) presents metaphysical, epistemological and ethical roots for action as follows; we and other entities exist independent of our opinions and desires, to know something is to become relationally identified with an existent reality as it is, and the invariable -- universal -- pattern of action, individual as well as social, required for the completion of human nature is called the moral law or natural law (pp. 17-18). Human nature seems to be an organized idea or working model or body of knowledge that tells you what things to pay attention to, where they begin and end, and what happens to them in between (Cannel, 1973, p. 271).

In discussing valued experiences, Theodore Green (in Henry, 1955) suggests that:

a) ...man is essentially a purposive being, with the capacity to approve or disapprove of everything that he encounters and does...

b) The value dimensions of reality are, therefore, just as "objective" as its "factual" or nonvalue dimensions...

c) ...The only values which concern us as men are the values which do, in fact, make a difference in our lives and which
we can, in principle, progressively ex-plore and apprehend... We actually en-counter or experience values, whether moral, aesthetic, or religious, only in concrete actualization -- in actual works of art, in actual religious experiences and manifestations of the holy...

d) The validity or truth of our evaluations can be determined, finally, only in the way in which the validity or truth of our non-evaluative or factual judgements are determined, namely, by using the conjoint criteria of "correspondence" and "coherence"... (pp. 103-105).

Thus, our valued patterns of behavior are derived as we see them to be consistent with our individual value-system. As long as we can "justify" our actions to ourselves -- as long as we believe such action to be consistent with our past and present values, the action itself becomes valued. An ideology develops out of an individual or group attempt to justify or explain a new pattern of behavior. New ideologies clash with existing ideologies to such an extent that existing values and goals are seen to be problematic by the dissenting group (Kelly, 1972, p. 53).

People seem to derive theory with experiences and views about facts and values. Action based on such theory is rational action. Herbert Feigle defines rationality as:

1) Clarity of thought. This implies the meaningful use of language,... as precise as the task at hand requires.
2) Consistency and conclusiveness of reasoning. This is "logicality"... Conformity with the principles of formal logic insures fulfillment of this requirement.

3) Factual adequacy and reliability of knowledge claims. These are the virtues of thought usually summarized under the caption of "truth"... Whenever the evidence is too weak, belief should be withheld until further evidence turns up to decide the issue on hand.

4) Objectivity of knowledge claims... testable by any person sufficiently equipped with intelligence and the instrumental devices for performing the test of the knowledge in question.

5) Rationality of purposive behavior. Rationality in this sense may be explicated as the main feature of behavior which achieves its purposes by a proper choice of means... we have here a conception of rationality which amounts to a minimum-maximum (minimax) principle according to which a maximum of positive value is to be produced by means which involve a minimum of negative value.

6) Moral rationality.
   a) adherence to principles of justice, equity, or impartiality...
   b) the abstention from coercion and violence in settlement of conflicts of interest (in Pai, 1967, pp. 171-172).

It is easy to see that such a view of rational action would provide a more sound guide for technological innovation that the current view which seems to assume that it should be done if it is possible to do.

Even if the act does not result in the intended end, the rational act is defensible over the irrational act.

The problem of what man ought to do is discussed by
Kilpatrick (in Henry, 1942) and a checklist is provided for doubtful situations.

1) Examine the situation for options.

2) Develop future consequences as best as possible.

3) Hold decision in suspense to examine all alternatives.

4) Follow the choice that seems "most correct (p. 51)."

The determination of the "most correct" choice requires the decision maker to check the opinions of others, to read up on the problem, to sleep on it, to delve into past experiences and to weigh any decisions against personal "life values (Kilpatrick, in Henry, 1942, p. 51)."

The above procedure sounds remarkably similar to the practices followed in "technological assessment" currently advocated to prevent serious environmental or social consequences from technological innovations.

In discussing man's action, Kenneth Burke (in Henry, 1955) distinguishes between practical and symbolic action.

Though all action involves motion, we may next make a distinction between practical and symbolic action (each of which requires a mediatory ground for motion). Practical action would be ethical (the doing of good), political (the wielding and obeying of authority), economic (the construction and operation of utilities, or powers). To say as much, however, is to realize that the practical realm is strongly infused by the symbolic element (since ideas of goodness, right, and expediency so obviously play a part in these practical acts). Yet in extreme
cases at least, there is conceivable a clear distinction between practical and symbolic activity. It is a practical act to get in out of the rain, and a symbolic act to write a poem about getting in out of the rain; it is a practical act to eat, and a symbolic act to speak of eating (p. 280).

Burke recognizes that some of his "symbolic acts" may, at times, become practical, i.e., payment for poetry or public speaking. Symbolic action might include the "plan" for practical action. Thinking of murder is no crime, but saying that you will murder is. The plan for the action once verbalized is considered morally judge-able by society.

Thus our plans for future action appear to be conspicuously open to public examination with regard to their effect on the present value-system. The technological assessment procedures must consider values and value changes. Frederick S. Breed (in Henry, 1942) defines the conservatist position as "a healthy respect for the human values realized to date (p. 96)." Educators must apparently try to aid students in establishing a value-system that includes:

1) Appreciation for the rights and feelings of others.
2) Acceptance of fair play -- ethical equality of treatment as a proper characteristic of group life.
3) Regard for the common good... (Kilpatrick, in Henry, 1942, pp. 45-47).
Broudy (1954) cites four levels of discourse for educational philosophy — the emotional, the factual, the theoretical, and the philosophical. The emotional consists of unreflective impulse or rationalizations of it, the factual consists of information collected to show the status of one assumption as related to another assumption, the theoretical consists of foundation and organizations of facts, and the philosophical consists of attempts to resolve problems to their bases in epistemology, metaphysics, and ethics (p. 25).

Philosophers seem to agree that education is inescapably moral -- normative -- and value laden.

The teacher operates not only in loco parentis, more fundamentally still he operates in loco naturae... The basis for discipline in life is nothing more than the requirements implicit in reum naturam, the demands of the laws of nature (Breed, in Henry, 1942, p. 102).

Breed (in Henry, 1942) develops the above statement by discussing "The doctrine of consent" through which the teacher makes a rational presentation of the content to be explored -- and the student and community, realizing the importance of the content presented, then give their consent to and interest in the activities required for the learning to take place (p. 103). Thus the values of the teacher become intimately involved with the development of the curriculum. Many teachers of the so-called academic subject areas do not value the "practical"
subjects and therefore they transmit such values to their students -- on the other hand, teachers of practical subjects impart their prejudices as well. Teachers of both domains must realize that;

Mankind has embarked on the adventure of civilization in which scientific knowledge plays the major guiding role. It is unlikely that we shall ever wish to return to a more primitive way of life. A sustained educational effort, for many generations to come, is urgently needed in order to adapt humanity to the new ways of thinking necessitated by this age of science. A philosophy which does full justice to the scientific outlook can be a powerful ally in our endeavors toward a more mature and fully integrated life (Feigle, in Pai, 1967, p. 175).

The pragmatist view of knowledge suggests that truth is in process, yesterday's facts are today's fiction -- today's fiction may be tomorrow's facts. Knowledge may be viewed as though united with reality (MacDonald, 1973). Thus a processive educational system becomes one of the most viable systems for educating a child who is himself in process. J. D. Butler (in Pai, 1967) suggests that all philosophies are concerned with the nature of self. The student must find his self-image and his concept of reality through the school curriculum.

Thus, all of us, whether we are aware of it or not, are engaged throughout life in solving the question as to what truly is (Frank, 1966, p. 1).

The reality that surrounds man is a natural reality and a man-made reality. Frank (1966) suggests that man
must create an inner bond with primary reality to free himself from the world's power and to enable him to take a creative part in the world.

The readings above seem to suggest that technological action shapes man as man shapes technological action, that values of the teacher may heavily influence subject matter content, and that rational action is to be preferred over irrational action. It would seem that a philosophical basis for the shaping of man's technological action can be established, and that an operational definition of that basis might aid teachers of technological subject matter to transmit values conducive to rational technological action.

OPERATIONAL DEFINITIONS OF PHILOSOPHIES

The investigator reviewed several operationally defined philosophies, and judged that Robert S. Swanson's (1955) study contained the clearest and most comprehensive explanation of the methodology used to derive the operational definition. Swanson (1955) cited five distinct steps to be followed in establishing the operational definition;

1) the definition of general categories of the behavior of teachers as teachers,

2) the definition of areas of teachers' behavior encompassed within educational philosophy,
3) the choice and definition of a system of classifying various positions on educational philosophy,

4) the listing and classification of specific teachers' behaviors based in educational philosophy and definitive of the general categories of teachers' behaviors,

5) the illustration of each specific behavior with examples descriptive of the particular philosophical positions chosen in step 3 (pp. 52-53).

Swanson developed operational definitions for progressive and essentialist positions in educational philosophy and then developed an "Inventory of Viewpoints on Education" which was administered to graduate students from three different educational institutions. Some variation in response was noted among the three institutions that may have been a reflection of the philosophic position of the institutions from which the subjects were chosen.

Rappoport (1953) suggests that a man's philosophical position can not be known without observing his actions. Rappoport discusses "Operational Philosophy" as a process of integrating knowledge with action, and provides a number of behavioral examples for philosophical positions.

Henry (1942) was the editor of a collection of philosophic viewpoints that approached operational definitions, but which were generally not as precise or complete as were the definitions in Swanson's study. A number of the authors in the Henry compilation were cited elsewhere in
this review. In a later publication, Henry (1955) edited further definitions of educational philosophies, but again these definitions followed a narrative form that did not allow for ready analysis of specific behaviors that would tend to operationalize the philosophies defined.

The American Vocational Association (1953) provided a number of operationally slanted statements that were intended to serve as a self-evaluative guide for the improvement of instruction in industrial arts, but no methodology for deriving the statements was provided.

Broudy (1954) discussed a method of philosophic discourse that begins with specific teacher behaviors. Broudy suggested that teacher behavior be analyzed to determine its implications and foundations, to measure internal consistency among views expressed, and to clarify the meanings of terms used in defining a philosophic position.

Wahlquist (1942) provided operational clarity for philosophic positions of realism, idealism, and pragmatism, as he traced educational implications for each of the viewpoints, and discussed implications for administration, supervision, measurement and evaluation, and relationships between the school and society.

Towers et al (1966) provides an operational definition of management by establishing management as essentially consisting of planning practices, organizing practices, and controlling practices. The operational definition
in Chapter III applied these management practices to the role of the teacher -- viewing the teacher as a manager of learning activities in the classroom.

CONCLUSION

Our technology has presented us with countless opportunities -- opportunities that might result in great good or in incredible tragedy. We are faced with the question phrased by Bertrand De Jouvenal, "Now that every year we are able to achieve more and more of what we want -- what do we want?" We are troubled by the uncertainty of the future. We cannot know whether the future will be the nightmare that Orwell (1949) and Huxley (1932) have outlined, but we must prepare ourselves, and be alert to the choices that we can make that will prevent such predictions from becoming reality.

The processes of technological assessment seem to offer the most promise for man attempting to use his technology in the face of uncertainty. Our assessment process must ask questions such as:

1) Is there a need for the proposed innovation?
2) What framework surrounds the proposed innovation?
3) What technology does the innovation replace?
4) What advantages are inherent in the proposed innovation?
5) What disadvantages may be seen?
6) What are the possible long term effects of the innovation?

7) Will any insult to the ecosystem result from the implementation of the proposed innovation?

8) How will the innovation affect society?

9) How will the innovation affect individuals?

10) How will the innovation affect the value structure of individuals and society?

11) What alternative technologies exist?

12) Can the cost of the innovation be justified by the expected benefits to humans?

13) Who will profit most from the proposed innovation?

14) How much influence has been exerted by those who will profit most from the adoption of the innovation?

15) Who must bear the cost of the innovation?

16) How much influence has been exerted by those persons opposed to the proposed innovation?

17) Is the time right for implementation of the proposed innovation?

18) Will people need to be prepared for the proposed innovation to prevent unnecessary or undue difficulty in adjustment?

In spite of all these cautionary questions which require answering to prevent technological errors from occurring, we must be sure to encourage the development of new technological solutions to human problems. We cannot afford to stagnate in our present technology.

The secret seems to be in action -- purposeful, directed, controlled, action -- action that moves mankind forward through his evolutionary process rather than
backward to some previous state, or to a tendency to fixate development at the present state. There does seem to be an evolutionary process in the technologies of man -- not just in the production of industrial material goods -- though that segment may be most significant in the evolutionary thrust, but in resolving familial, political, educational, and theological problems of development as well. One of the problems in the use of technology that we must face is in the area of individual application and use. We are a society in which we blame the other guy for our energy problems and then buy beer in non-returnable bottles. We reorder our priorities daily -- what we choose to do -- what we buy -- how we pollute the environment carelessly -- a reordering that indicates our values, but such actions may not be conscious acts, and we may need to place greater emphasis on the conscious determination of values which will direct our uses of technology toward human ends.

National priorities must come from a collection of individual choices -- not from General Motors, U.S. Steel, Consolidated Edison, or from any corporation or agency with a vested interest in the outcome of priority decisions based on economic rather than human values. We need responsible, humane leadership from the present generation of adults.
We cannot be content with applying this to the oncoming generation of students. Our present adults right now are being called upon to make decisions, fraught with humanistic implications, and, hopefully, grounded upon humanistic values and norms, which will have far reaching implication for the future of modern man's -- that is, Faustian man's -- high and fateful romance with the Promethean fire of technology and its concommitant Protean social changes (Brickman et al, 1969, p. 24).

If any generalizations can be drawn from the readings reviewed herein, they would include at least the following:

1. We are living in a closed system -- a spaceship according to some writers -- with finite resources.
2. Our planet is a mere speck in the universe, but it is all that we have to work with.
3. The earth is not likely to endure as an habitable environment for man unless a population-resource balance is established -- unless resources are recycled whenever possible, and unless the ecosystem is guarded from incursions by man's technology.
4. Man is not likely to endure as a species on the earth unless human beings are treated humanely, unless the human condition is improved through man's technology, and unless the human intellect is advanced through an improved and readily available educational system.

A true liberal education for all men seems to be mandatory -- specialists in narrow areas are not as desirable as individuals with basic knowledge in all four domains -- prescriptive, descriptive, formal and
praxiological. Throughout the educational process there must be a heavy emphasis on value building. As Robert Hutchins (in Burke, 1966) points out:

The solution depends on moral and intellec­tual virtues rather than on specialized knowl­edge. It is a humbling thought to recall that 25 percent of the SS guards in Nazi Germany were holders of the doctor's degree (p. 100).

Our technology has created a condition of a constant­ly changing environment in which man must operate and must make choices.

What you have here is a totally new environment requiring a whole new reper­toire of survival strategies. In no case is this more certain than when the new elements are technological. Then, in no case will the new environment be more radically different from the old than in political and social forms of life. When you plug something into a wall, someone is getting plugged into you. Which means you need new patters of defense, per­ception, understanding, evaluation. You need a new kind of education (Postman, 1969, p. 7).

Considering the rapid changes in technology that have occurred in recent years and the projections which seem to indicate an accelerated pace for such changes, we must become conscious of the effect that these changes have had and will continue to have on our value system. It may be that the best way to accomplish such an awareness would be through our industrial education programs. In speaking of the purpose of Industrial Arts, Melvin Kranzberg (1964) suggests that it is the industrial arts teacher's responsibility to acquaint students with
technology, technological values, and the role that technology plays in human affairs now and in the future.

Can we continue to value work and at the same time pursue technological developments that are making work obsolete? Can we continue to value the privacy of the individual while making available the technology that enables individuals to listen to and observe the most private conversations and acts of other individuals? Can we continue to value freedom of individual action when such free action with advanced technology is likely to restrict the freedom of increasing numbers of other individuals? Can we continue to value the automobile in the face of air pollution, the energy crisis, the concrete jungle, and the rate of slaughter and dismemberment that now exists? Can we continue to value local, regional, national or hemispherical political units in the light of the finite resources of the world and the gross inequities that exist in the disbursement of those resources?

Faced with such value questions related to our technology and its growth, it would seem that our technical education programs must place a new emphasis on the effect of technology on human values. Paul DeVore has frequently suggested that there are three questions that curriculum builders ask. The three questions are; what is there to know in the world around us?, what use can
we make of this knowledge?, and what use ought we make of this knowledge?

It is the third question that seems to remain unanswered in most industrial arts curricula. It may well be that the question is unanswerable, but the answer should, nevertheless, be sought; and it should be sought at every level of human endeavor. It is never too soon for students to begin to examine their place and purpose on earth or to consider the values which direct their actions in the world society.

A technology controlled by human values would seem to be essential to man's survival. An uncontrolled technology may best be described by an analogy;

We are aboard a train which is gathering speed, racing down a track on which there are an unknown number of switches leading to unknown destinations. No single scientist is in the engine cab and there may be demons at the switch. Most of society is in the caboose looking backwards (Lapp, 1965, p. 29).

If those in the caboose can be educated to the implications of the runaway train for their survival, perhaps they could begin to communicate their concerns to those in the engine cab who might bring the train under control.

It is evident that the technical educator of the 1970's and beyond must be responsive to the demand for technological control. The function of the technical educator can not simply involve the act or process of
facilitating the acquisition of knowledge and skills related to man's practices, but must also include responsible consideration for the effects of those practices on man, on the environment, on social groups, on individuals, and on the future of man. Technical educators must not merely "push" technology, they must begin to "pull" technology and educate their students as to their responsibility to pull technology throughout their lives.
CHAPTER III

THE OPERATIONAL DEFINITION
INTRODUCTION

Industrial education has been devoted to the perpetuation and advancement of the technological ethic, an ethic which has been dominated by economic interests and objectives. Yet it is apparent that technology has far more than economic impact upon man's existence, and it seems incumbent upon industrial education, and upon industrial arts education in particular, to ensure the dissemination of knowledge regarding the full impact of industrial technology on man -- without the overwhelming emphasis on the purely economic impact of such technology and upon the preservation of a concept of unrestricted technological growth that seems to have been, and may continue to be, detrimental to the survival of man. Some form of value education that transcends the occupational-career-consumer values that are currently so much a part of industrial education must be incorporated into technological education. Every effort must be exerted to make students aware of the processes of technological assessment that reveal the possible, probable and improbably short-term and long-term effects of our technological heritage and of our technological innovations.
At the same time, however, technical educators cannot espouse a complete stagnation of technical innovation or exploration. Research and development efforts should be encouraged toward those ends which would fulfill the promise of a technologically humane society where individuality is not sacrificed for economic considerations or subjugated to governmental control for dubious social organizational ends.

Knowledge, action, and evaluation seem to be intricately related — action without knowledge is aimless, purposeless. Knowledge without action is useless, wasted. Action without evaluation would be pointless. Valued action based on knowledge is what man's technology should be all about. We value action for many reasons — selfish pleasure, service to others, satisfied curiosity, creative accomplishment and personal health are but a few of the values that we might apply to our actions.

With modern technology, the action of an individual has become increasingly important to the collective society. It is now conceivable that one man could destroy the world at the push of a button. The establishment of a manufacturing plant can affect the whole ecosystem. The distribution of consumer goods for unrestricted use can create enormous social, environmental, and personal-ethical problems.
There seems to be a close association between man's techniques and his purpose for existing. Man has experimented with techniques -- ways of doing things -- since the dawn of his presence on earth. In spite of some very serious consequences of some of those techniques, the human condition of man -- the ability to reflect on being -- the ability to empathize with others who are continents away from his immediate presence -- has been advanced by ever more efficient techniques. Aside from the economic aspects of the technological phenomenon, mankind is infinitely more humane now than prehistoric man could have been. Certainly the threat of unheard of inhumanity exists with the technology of thermonuclear weapons, but the bestiality of man against man, clan against clan, state against state, and country against country is diminishing as warfare is becoming increasingly unthinkable as an appropriate technique for resolving social, political or economic problems.

In addition to the problem of man's weapons technology is the problem of environmental damage through less lethal technological devices. Any action of man has some impact on the ecosystem. It is not entirely improbable that walking might threaten the environment, or at least the side effects of man walking might do so. Nature trails can become overused to the extent that pollution through human waste, non-biodegradable litter,
and erosion of trails can threaten the environment. Thus even walking might have to be restricted in certain areas -- this might seem to be a great loss of personal freedom, but "keep off the grass" signs have been with man in society for many years, and the great expanses of green grass made possible by such restrictions have somehow seemed worth the limits on freedom that have been imposed. It is incumbent upon man to foresee the limits that he must place on the use of technology -- to envision the kind of "keep off the environment" restrictions that will be needed to keep man from ruining the ecosystem of the future in the same way that he was kept from ruining the lawns of the past. The finite resources of the earth and the relative inflexibility of the ecosystem to recover from technological incursions has placed severe demands on responsible citizens to limit and control technological growth.

Some of the demands can be dealt with by educating the general public to the nature of the problem and/or by legislating for or dictating the means for resolving the problems. Some of the demands can be dealt with through educative and legislative means only if the nature of the demand allows the luxury of such avenues to resolution of the problem. When the demand is critical and requires dictatory action, the educative function is even more critical to prevent the population from
rebelling at the sudden restrictive nature of technological control. Many freedoms now enjoyed by citizens of technological societies will, of necessity, be foregone as legislative or dictatorial action limits the use of our technological capabilities. President Nixon's imposition of a nationwide 55 mile an hour speed limit in 1974 is an example of the kind of action that might be expected to control our use of technology. The action was initiated in response to fuel shortages, but some reduction in traffic deaths and automobile accident rates have caused a majority of Americans to value the restriction on their freedom, according to a Harris poll in May of 1974. Further restrictions may not read "thou shalt not travel," but might read "thou shalt not travel frivolously in vehicles that pollute the environment." Freedom to bicycle, sail, roller skate, walk, run, etc. would not be restricted unless these transportation modes also threatened the environment.

We are now in a period of great future orientation, many industries and government agencies spend considerable amounts of time and energy in forecasting possible futures. We cannot ignore the potential for such forecasting activity for industrial education. We must educate future citizens to cope with future eventualities in the technological domain. By casting many scenarios and exploring appropriate avenues to action and reaction,
industrial education can become as dynamic as the technological society in which it operates.

The scenario is not a prediction, it is a speculation about possible future eventualities. The scenario is more in the nature of a fire drill; we do not plan to have our buildings burn, but we feel that it would be foolhardy not to prepare for the possible eventuality that they might. Thus the fire drill scenario is not a prediction but a form of education that will permit effective and efficient action should that projected future become a reality.

Educational theorists have long held that education should be centered upon problems of youth, on social issues -- and should use the content of the academic disciplines as they become relevant to the issues or problems being studied. Approaches such as core, common learnings and the open classroom all reflect the above philosophical position. Problems with the implementation of such approaches usually center around the student's lack of ability to draw upon those disciplines that would be most helpful in solving the problem at hand. Students need some basic understanding of the structure of the various disciplines before they can abstract answers from disciplines, or perhaps even before they can ask appropriate questions related to the problem -- questions that may be answered by drawing on the content of the discipline.
In the realm of technological education, students must be brought to appreciate the practical application of knowledge toward human ends — preserving the dignity of man and the integrity of the environment. Any action that is not merely spastic or reflexive must be preceded by thought. The industrial education program must ensure that students understand that appropriate technological action is preceded by intensive thought concerning human and ecological consequences. Students must be brought to the position where they place themselves into the technological equation — where they see the personal impact of each proposed technological innovation — where they can extrapolate such understandings to the whole of society and to the environment as well.

There is some evidence that children do not now see a role for themselves in the technological future (Shane and Shane, 1974, p. 74). Toffler (1971) cites such a condition as conducive to future shock — an inability to cope with change. It seems that we must emphasize learning experiences in technical or industrial education that involve the student with present and future technological reality. We must do this by engaging in technological assessment, through student involvement in speculation about the future, through activities that reflect a value orientation that places mankind above the machine, through a humanized delivery system that enables the student to
explore his values and feelings about the use of technology, and through an emphasis on humane technology throughout the instructional program in industrial education.

There does seem to be a "technological imperative" that dictates action in many spheres of human life. The awesome power of nuclear technology has placed war distant from the political sphere of activity, the latest medical technology has required new definitions of life and death, electronic technology has produced a new awareness of the meaning of "invasion of privacy", and communications technology has created a "world conscience" that makes it possible for an active, vocal minority to make a significant impact on the static, silent majority.

We seem to need a human commitment for our technological efforts -- an environment that is designed for man's purposes, self motivation, discipline, fulfillment of man's primary goals and with economic growth and profit as by-products.

What seems to be needed is a philosophy that will reveal both the tremendous changes that technology has caused our society to undergo and at the same time emphasizes the choices that society must face as a result. What is suggested is not a philosophical system of examining the axiological, epistemological, and ontological roots of man's knowledge but rather a mode of
approaching a particular problem. The problem being -- how shall man use his technological knowledge and powers?

Basis for the Definition

The philosophical position to be defined below has roots in materialistic determinism, in existentialism, and in pragmatism and is strongly related to the operational philosophy as defined by Rapoport (1953). Its metaphysical assertion is simply that man exists independent of reason -- but his existence is threatened unless his reason is brought to bear on his existence. Its epistemological assertion suggests that man's knowledge grows out of his experiences and upon his introspection related to his experiences. The axiological dimension of the philosophy suggests that man's values grow out of his actions. Those actions that give pleasure and satisfaction are valued over other actions which fail to give such satisfaction. Values are further affected by socialization. Those actions which are favorable to the society are valued over those which are detrimental to the society. And knowledge is valued as it aids in the humanization of man.

The Humanistic Technology philosophy makes man responsible for himself and what he becomes as a result of his free choice in all matters regarding action. It recognizes the pragmatic value of advanced technology as
opposed to man living in a more natural low technology
harmony with the ecosystem, but cautions against the
danger of man's repeated disregard for the impact of his
actions on the environment and on his fellow man.

Assumptions for the Definition

The development of the operational definition of
the Humanistic Technology philosophy proceeded under the
following assumptions which were derived from the review
of the literature.

1) The world of the future will be one in which
changes occur at an ever accelerated pace, and these
changes will continue to generate conflict.

2) The world of the future will see rapid and
fundamental change in the accepted norm for humans living
in society.

3) There will be profound developments in science
and technology with an increased emphasis on research and
the continued expansion of human knowledge through
improved information storage and retrieval capacities.

4) There will be increasing concern for human
welfare using the achievements of science and technology
for the benefit of mankind.

5) There will be an increased use made of automated
and cybernated devices, processes, and computers that will
change the nature of man's occupational endeavor, the
relationship between work and leisure, and the individual's ability to achieve self-fulfillment.

6) There will be greater emphasis placed on leisure time pursuits, travel, education, arts, crafts and other creative activities.

7) Man's life span will be lengthened, thus creating a need for continuing education and a periodic reestablishment of life goals.

8) A large portion of our reality is by definition technological, and man is not sufficiently aware of the impact of that reality on his values and his existence.

9) An understanding of technology is a prerequisite to its control.

10) All citizens must have an understanding of our industrial-technical system.

11) The future of industrial arts in the public schools may center upon the installation of curriculums designed to provide citizens with an understanding of industrial technology and its effects on man and the environment.

12) One must evolve from a condition of stability, into an unstable state, and to a new stable state in a continuing cyclic process in order to advance one's position.

13) Mankind has never lived in such an unstable state as he does at the present, and the social conditions
that result from that environment of change are full of anxiety and unrest.

14) Even though individuals can assert themselves in more ways now than ever before in history, they must face the threats that the new individuality poses because of the advanced technology of our age.

15) Although individual powers have been advanced beyond what most men have ever believed possible, most individuals are gripped by an almost overwhelming feeling of powerlessness to effect any meaningful global changes over the human condition.

Establishing General Categories for Teacher Behavior

To establish a base for the operational definition, a system of defining general categories of teacher behaviors must be established. Swanson (1955) lists five general categories of teacher behavior;

1) The teacher formulates or selects objectives for teaching.

2) The teacher formulates experiences through which pupils will go as a means of achieving their objectives.

3) The teacher arranges for the pupils to have the experiences formulated in step 2.

4) The teacher evaluates pupil's growth and achievement of the objectives.

5) The teacher reappraises the objectives and experiences in the light of pupil growth and achievement (p. 54).
In developing his operational definition, Swanson organized behavioral statements into five general categories of teacher behavior and then applied concepts of reality, knowledge, and values that were characteristic of the essentialist and progressive philosophies to the statements. Under each of the five categories of general teacher behavior were listed the three subcategories related to philosophical concepts. The more specific levels of philosophic concepts were directed toward application, analysis, synthesis, and evaluation.

Teacher behaviors may be categorized much the same as those of any manager of human activity. The manager is essentially involved in planning, organizing, and controlling the activities of personnel under his direction (Towers et al, 1966). In the IACP Rationale, the manager's functions of planning, organizing, and controlling are further structured as indicated below.

INDUSTRIAL MANAGEMENT TECHNOLOGY

1. Planning

1.1 Formulating
   1.1.1 Determining Goals
   1.1.2 Establishing Specific Objectives
   1.1.3 Setting Policies
   1.1.4 Forecasting
   1.1.5 Programming

1.2 Researching
   1.2.1 Retrieving
   1.2.2 Describing
   1.2.3 Experimenting
1.3 Designing
   1.3.1 Determining Function
   1.3.2 Preparing Performance Specifications
   1.3.3 Postulating a Solution-in-Principle
   1.3.4 Making Simple Models
   1.3.5 Postulating Alternate Solutions
   1.3.6 Making Working or Scale Models
   1.3.7 Selecting Solution
   1.3.8 Communicating Design Solution
   1.3.9 Making Prototype

1.4 Engineering
   1.4.1 Detailing Design Communication
   1.4.2 Detailing Specifications and Standards
   1.4.3 Work Design (methods, standards, processes)
   1.4.4 Scheduling

2. Organizing

2.1 Structuring
   2.1.1 Analyzing Work Tasks
   2.1.2 Determining Worker Functions
   2.1.3 Establishing Roles
   2.1.4 Setting Work Conditions

2.2 Supplying
   2.2.1 Requisitioning
   2.2.2 Procuring and Subcontracting
   2.2.3 Routing
   2.2.4 Storing

3. Controlling

3.1 Directing
   3.1.1 Supervising
   3.1.2 Coordinating

3.2 Monitoring
   3.2.1 Inspecting
   3.2.2 Inventorying
   3.2.3 Timekeeping

3.3 Reporting
   3.3.1 Compiling
   3.3.2 Appraising
   3.3.3 Notifying

3.4 Correcting
   3.4.1 Adjusting
   3.4.2 Expediting
   3.4.3 Restraining
3.4.4 Replanning
3.4.5 Redirecting
3.4.6 Retraining

(pp. 174-175)

If the teacher is viewed as a manager of educational activities, the above outline might be altered to read as follows:

1. Planning
   1.1 Formulating
      1.1.1 Determining educational goals
      1.1.2 Establishing specific educational objectives
      1.1.3 Setting instructional policies
      1.1.4 Forecasting the outcome of the instructional program
      1.1.5 Programming the instructional sequence
   1.2 Researching
      1.2.1 Retrieving subject matter content
      1.2.2 Describing learning strategies
      1.2.3 Experimenting with educational methods
   1.3 Designing
      1.3.1 Determining the function of instructional strategies
      1.3.2 Preparing student performance expectations
      1.3.3 Postulating a course outline or syllabus
   1.4 Engineering
      1.4.1 Detailing the instructional program
      1.4.2 Detailing specifications and standards
      1.4.3 Establishing methods and procedures
      1.4.4 Estimating costs
      1.4.5 Scheduling instructional activities

2. Organizing
   2.1 Structuring
      2.1.1 Analyzing learner tasks
      2.1.2 Determining learner functions
      2.1.3 Establishing learner roles
      2.1.4 Setting learning conditions
   2.2 Supplying
      2.2.1 Requisitioning learning materials
      2.2.2 Procuring materials and arranging
for team teaching

2.2.3 Routing the learner through the educational program

2.2.4 Storing educational materials

3. Controlling

3.1 Directing
   3.1.1 Supervising learning experiences
   3.1.2 Coordinating learning experiences

3.2 Monitoring
   3.2.1 Measuring student performance
   3.2.2 Establishing an inventory of student capabilities
   3.2.3 Keeping attendance records

3.3 Reporting
   3.3.1 Compiling performance records
   3.3.2 Appraising student achievement
   3.3.3 Notifying student of performance level

3.4 Correcting
   3.4.1 Adjusting the instructional system as indicated by its operation
   3.4.2 Expediting student movement through the system
   3.4.3 Restraining student movement when needed to meet educational objectives
   3.4.4 Replanning the instructional system in response to evaluations made
   3.4.5 Redirecting educational activities when deemed necessary
   3.4.6 Retraining of the teacher when limitations of ability are recognized
   3.4.7 Redirecting the student through the instructional system when necessary to accomplish the goals of the system.

The establishment of teacher functions based on the above management orientation shifts the educator's emphasis to planning, organizing, and controlling rather than transmitting knowledge of skills, materials, and processes. The function of the educator becomes that of facilitator of learning rather than the transmitter of
knowledge. The student will be expected to acquire knowledge, but will also be expected to demonstrate the intelligent use of such knowledge.

Establishing a System for Deriving Behavioral Statements

The operational definition of the philosophy of Humanistic Technology that follows is based on the teacher functions suggested in the above outline adapted from the IACP taxonomy of management functions and utilizes elements of Swanson's (1955) system of applying philosophical concepts of teacher behaviors directed toward student learning, see Figure 1, page 101. Figure 2, page 102, illustrates a second order matrix for the development of the operational definition with categories of teacher behavior divided into planning, organizing, and controlling; philosophical concepts divided into metaphysical assertions, epistemological assertions and axiological assertions; and expected student learning divided into psycho-motor learning, affective learning, and cognitive learning.

Using the above system for developing the operational definition, the investigator prepared the following set of 120 behaviors that attempt to bring the philosophy of Humanistic Technology within the range of a teacher's experience. The teacher behaviors categorization scheme outlined above has ten subheadings under the major headings of planning, organizing, and controlling. The
FIRST ORDER MATRIX FOR THE
DEVELOPMENT OF THE OPERATIONAL DEFINITION
OF HUMANISTIC TECHNOLOGY

PHILOSOPHICAL CONCEPTS
GUIDING TEACHER ACTION

EXPECTED LEARNING TO
BE ATTAINED BY STUDENTS

Figure 1
SECOND ORDER MATRIX FOR THE DEVELOPMENT OF THE OPERATIONAL DEFINITION OF HUMANISTIC TECHNOLOGY

Expected learning to be attained by students

Controlling cognitive learning as dictated by the teacher's view of knowledge.

Figure 2
investigator selected a subcategory of teacher behavior under each of the ten subheadings; see Figure 3, page 104, for a sample third order matrix for the development of behavioral statements. The investigator used the philosophical concepts of reality, knowledge, and values along with expected student learning in the cognitive domain to develop finer levels of specificity for the operational definition that follows. For example, the teacher behavior at 3.4.2 (Expediting student movement through the system) might have a behavioral statement applying the Humanistic Technology concept of knowledge directed toward analysis stated as:

3.4.2.2.2 The teacher will direct the student toward additional learning experiences when students are observed to be unable to analyze man's ability to control his technology.

THE OPERATIONAL DEFINITION

The operational definition which follows is numbered to allow easy reference to the complete outline of teacher behavior general categories above. The investigator did not attempt to develop behavioral statements related to student learning in the affective and psycho-motor domains, and development in the cognitive domain was limited to selected fourth order elements under the general categories of teacher behavior scheme.
SAMPLE THIRD ORDER MATRIX FOR THE DEVELOPMENT OF THE OPERATIONAL DEFINITION OF HUMANISTIC TECHNOLOGY

Directing students toward evaluations regarding the nature of knowledge.

Figure 3
The definition which follows is the product of assumptions outlined above and the application of those assumptions to the matrices illustrated in Figures 1-3. The evaluation team did not provide input to this initial definition, but did evaluate this definition and recommended changes or omissions for the final definitions developed for Chapter V.

AN OUTLINE OF TEACHER BEHAVIORS COMPATIBLE WITH HUMANISTIC TECHNOLOGY

1. Planning

1.1 Formulating

1.1.1 Determining Educational Goals

1.1.1.1 Related to the teacher's view of reality;

1.1.1.1.1 The teacher will establish educational goals that aid students to apply industrial-technical knowledge to problems of man in the real world.

1.1.1.1.2 The teacher will establish educational goals that will aid students to analyze the relationship between the natural and the man-made world to demonstrate the impact of technology on the environment.

1.1.1.1.3 The teacher will establish educational goals that will enable students to synthesize their learning to the extent that they can adapt to and cope with technological change.

1.1.1.1.4 The teacher will establish educational goals that will enable students to establish a value-system that recognizes the finite resources of the natural world and man's obligations to his
fellow man in the use of those resources.

1.1.1.2 Related to the teacher's view of knowledge;

1.1.1.2.1 The teacher will establish educational goals that will provide the student with exposure to praxiological knowledge to complement knowledge in the other domains and permits application of such knowledge to problems in the classroom.

1.1.1.2.2 The teacher will establish educational goals that will enable students to analyze the technological domain of knowledge to determine the means for solving problems caused by man's misapplications of technological knowledge.

1.1.1.2.3 The teacher will establish educational goals that will enable students to apply knowledge gained to new situations requiring the synthesizing of knowledge to develop a solution.

1.1.1.2.4 The teacher will establish educational goals that will enable students to establish criteria for evaluating the worth of technological innovations through the processes of technological assessment.

1.1.1.3 Related to the teacher's view of values;

1.1.1.3.1 The teacher will establish educational goals that will enable the student to apply his value system to his use of technology or to his use of the products of technology.

1.1.1.3.2 The teacher will establish educational goals that will enable the student to analyze his values related to technology to determine whether they are conducive to man's survival on earth and to man's living in harmony with man.

1.1.1.3.3 The teacher will establish educational goals that will enable the student to compare his values related to technology with the values of other individuals and
to establish an homogeneous value-system.

1.1.1.3.4 The teacher will establish educational goals that will enable the student to examine the currently dominant value-systems of our society to determine whether technological control is possible with those systems.

1.2 Researching

1.2.2 Describing

1.2.2.1 Related to the teacher's view of reality;

1.2.2.1.1 The teacher attempts to describe the reality of the man-made world as it impacts upon the reality of the natural world.

1.2.2.1.2 The teacher attempts to describe the full impact of selected elements of the man-made world on mankind and on the environment.

1.2.2.1.3 The teacher attempts to describe the close relationship between man's technology and his cultural or intellectual condition.

1.2.2.1.4 The teacher attempts to describe the value of the man-made world and its impact upon man's values.

1.2.2.2 Related to the teacher's view of knowledge;

1.2.2.2.1 The teacher attempts to describe man's applications of technology to the solution of human problems.

1.2.2.2.2 The teacher attempts to describe techniques for analyzing man's use of technology.

1.2.2.2.3 The teacher attempts to describe processes for using technological knowledge to solve problems, and the nature of new problems that might result from the technology.
1.2.2.4 The teacher attempts to describe technological knowledge as equal in importance to the other domains of knowledge.

1.2.2.3 Related to the teacher's view of values;

1.2.2.3.1 The teacher attempts to describe the application of values to man's use of technology.

1.2.2.3.2 The teacher attempts to describe procedures for analyzing the values that regulate technological growth.

1.2.2.3.3 The teacher attempts to describe divergent values and procedures for resolving value differences into a value-system for the regulation of technological growth.

1.2.2.3.4 The teacher attempts to describe values in a manner that places a spectrum of values before the student rather than a hierarchy of values, and emphasizes the impact of values on technological growth.

1.3 Designing

1.3.2 Preparing student performance expectations

1.3.2.1 Related to the teacher's view of reality;

1.3.2.1.1 The teacher will expect the students to demonstrate the importance of technological knowledge as applied to problems of man.

1.3.2.1.2 The teacher will expect students to analyze the relationship between the natural and man-made world to determine appropriate directions for technological growth.

1.3.2.1.3 The teacher will expect students to be capable of proposing future technological realities for man.

1.3.2.1.4 The teacher will expect the student to be able to illustrate the effect of the
natural and man-made world on man's values.

1.3.2.2 Related to the teacher's view of knowledge;

1.3.2.2.1 The teacher will expect the student to be able to apply industrial-technical knowledge to specific problem situations in the laboratory.

1.3.2.2.2 The teacher will expect the student to be able to analyze industrial-technical knowledge to determine its benefits to man and its relationship to the other domains of knowledge.

1.3.2.2.3 The teacher will expect the student to be able to develop technological solutions to self-identified problems.

1.3.2.2.4 The teacher will expect the student to be able to judge the relative merit of selected technological solutions to the problems of man.

1.3.2.3 Related to the teacher's view of values;

1.3.2.3.1 The teacher will expect the student to demonstrate their acquisition of a value-system related to man's use of technology.

1.3.2.3.2 The teacher will expect the students to be able to analyze their value-systems to determine how well they fit into the society in which they live.

1.3.2.3.3 The teacher will expect the student to contribute to the development of an "ideal" value-system which would best serve the needs of man in a technological society.

1.3.2.3.4 The teacher will expect the student to be able to discuss a spectrum of possible values as opposed to an hierarchy of values.

1.4 Engineering

1.4.1 Detailing the instructional program
1.4.1.1 Related to the teacher's view of reality;

1.4.1.1.1 The teacher will devise and/or implement educational experiences that will enable students to seek extensional meanings for the industrial technology that exists in our society.

1.4.1.1.2 The teacher will devise and/or implement educational experiences that enable the student to engage in hypothesizing concerning the nature of industrial technology and the effects of industrial technology on man and the ecosystem.

1.4.1.1.3 The teacher will devise and/or implement educational experiences that expose the student to a sense of connectedness with the growth of industrial technology.

1.4.1.1.4 The teacher will devise and/or implement educational experiences that enable the student to explore his sense of power or powerlessness over the direction and pace of industrial-technical growth.

1.4.1.2 Related to the teacher's view of knowledge;

1.4.1.2.1 The teacher will devise and/or implement educational experiences that will permit students to apply basic technological knowledge and skills to problems in the laboratory.

1.4.1.2.2 The teacher will devise and/or implement educational experiences that enable the student to generate alternative actions within the realm of industrial technology.

1.4.1.2.3 The teacher will devise and/or implement educational experiences that aid the student to synthesize the activities of his industrial education experience to explain the social context of industrial technology and the power of the individual to alter that social context.
1.4.1.2.4 The teacher will devise and/or implement educational experiences that enable the student to predict outcomes of actions within the realm of industrial technology.

1.4.1.3 Related to the teacher's view of values;

1.4.1.3.1 The teacher will devise and/or implement educational experiences that will enable students to utilize rational processes to examine the value of industrial technology and its effects on man and the ecosystem.

1.4.1.3.2 The teacher will devise and/or implement educational experiences that will enable the students to engage in analytic procedures to determine the effect of elements of industrial technology on man's values.

1.4.1.3.3 The teacher will devise and/or implement educational experiences that will aid the student to reach a sense of self-fulfillment regarding his use of industrial technology, and his control over industrial technology.

1.4.1.3.4 The teacher will devise and/or implement educational experiences that will enable students to use inquiry techniques to determine the value of elements of industrial technology as they apply to man's existence on earth.

2. Organizing

2.1 Structuring

2.1.4 Setting learning conditions

2.1.4.1 Related to the teacher's view of reality;

2.1.4.1.1 The teacher will establish learning conditions that permit the student to apply his concept of technological reality to the solution of selected problems.
2.1.4.1.2 The teacher will establish learning conditions that permit the student to analyze technological methods that have been used to solve human problems.

2.1.4.1.3 The teacher will establish learning conditions that permit the students to combine knowledge from all four domains into solutions for human problems identified by the student.

2.1.4.1.4 The teacher will establish learning conditions that permit the student to evaluate the present state of our technology and to propose changes for future realities.

2.1.4.2 Related to the teacher's view of knowledge;

2.1.4.2.1 The teacher will establish learning conditions that permit students to apply technological knowledge to the solution of selected problems in the laboratory.

2.1.4.2.2 The teacher will establish learning conditions that permit students to analyze technological knowledge in order to make its structure easier to grasp.

2.1.4.2.3 The teacher will establish learning conditions that permit students to demonstrate their learning through activities designed to synthesize acquired knowledge through the development of concrete or abstract problem solutions.

2.1.4.2.4 The teacher will establish learning conditions that permit students to evaluate their knowledge concerning the technological society to determine their competence to control its direction and growth.

2.1.4.3 Related to the teacher's view of values;

2.1.4.3.1 The teacher will establish learning conditions that permit students to apply their values to the development
of technological scenarios for the future.

2.1.4.3.2 The teacher will establish learning conditions that permit students to analyze their future scenarios to determine possible problems for man and the environment.

2.1.4.3.3 The teacher will establish learning conditions that permit students to apply divergent values from other individuals to the solution of technological problems.

2.1.4.3.4 The teacher will establish learning conditions that permit students to engage in assessment activities to determine the effect of various technological practices on their own or their society's values.

2.2 Supplying

2.2.2 Procuring materials and arranging for team teaching

2.2.2.1 Related to the teacher's view of reality;

2.2.2.1.1 The teacher selects instructional materials that reflect the practices of man in the production of goods through the application of industrial-technical knowledge.

2.2.2.1.2 The teacher analyzes instructional needs as they relate to material shortages and attempts to avoid usage of those materials in short supply.

2.2.2.1.3 The teacher selects instructional materials that reflect the close relationship between the natural and the man-made world.

2.2.2.1.4 The teacher selects instructional materials on the basis of their accuracy in depicting elements of the man-made world as they affect man and the environment.
2.2.2.2 Related to the teacher's view of knowledge;

2.2.2.2.1 The teacher selects instructional materials that permit or illustrate a direct application of technical knowledge to practical problems.

2.2.2.2.2 The teacher analyzes his own knowledge base, and utilizes other teachers or human resources to fill in where gaps in his own knowledge are recognized.

2.2.2.2.3 The teacher utilizes multi-media and multi-material approaches to facilitate maximum student learning of the essential concepts of man's technology.

2.2.2.2.4 The teacher will determine the extent to which material waste from the instructional system is likely to pollute air, water, or the landscape and will take necessary steps with students to prevent such pollution.

2.2.2.3 Related to the teacher's view of values;

2.2.2.3.1 The teacher attempts to apply humanistic values to the selection and use of instructional materials.

2.2.2.3.2 The teacher analyzes instructional materials to determine the extent to which positive reinforcement of concepts regarding the humane use of controlled technology is presented.

2.2.2.3.3 The teacher utilizes team teaching to demonstrate other value orientations concerning the use of technology in man's society.

2.2.2.3.4 The teacher evaluates instructional materials to establish an instructional system that is most likely to assist students in establishing an humane value orientation and in achieving the other goals and purposes of the instructional program.
3. Controlling

3.1 Directing

3.1.1 Supervising learning experiences

3.1.1.1 Related to the teacher's view of reality;

3.1.1.1.1 The teacher will encourage students' activity that increases their awareness and appreciation of the character of the natural and man-made world.

3.1.1.1.2 The teacher will direct students toward activity that will encourage close examination of the elements and interactions of the natural and man-made worlds.

3.1.1.1.3 The teacher will encourage students to combine knowledge of the natural world with knowledge of man's practices to develop a model socio-technical system.

3.1.1.1.4 The teacher will encourage students to engage in valuing of man's technological achievements and of proposed technological innovations.

3.1.1.2 Related to the teacher's view of knowledge;

3.1.1.2.1 The teacher will encourage students to apply knowledge of man's practices to the solution of individual and social problems.

3.1.1.2.2 The teacher will act as a fellow seeker of knowledge as he encourages students to critically analyze man's technologies.

3.1.1.2.3 The teacher will serve as a resource person as students attempt to synthesize their learning of the natural and the man-made world through the development of technological scenarios for the future.

3.1.1.2.4 The teacher will assist students to establish the value of various elements of technical knowledge and to place such discrete elements into a logical
3.1.1.3 Related to the teacher's view of values;

3.1.1.3.1 The teacher will encourage students to express the values that direct their applications of technical knowledge or their use of the products of technology.

3.1.1.3.2 The teacher will encourage students to analyze the values which direct their use of technology or the products of technology to determine whether such values are congruent with their own image of an ideal value system.

3.1.1.3.3 The teacher will support students in their attempts to establish a valid value system out of the spectrum of values held by the class as a group concerning the use of technology and technological controls.

3.1.1.3.4 The teacher will encourage students to establish the relative merit of selected valued technologies as they relate to selected human values.

3.2 Monitoring

3.2.1 Measuring student performance

3.2.1.1 Related to the teacher's view of reality;

3.2.1.1.1 The teacher will examine the students on their ability to identify with the world as it now exists, and on their perception of their ability to change the world as individuals.

3.2.1.1.2 The teacher will examine the students on their ability to analyze selected elements of the man-made world to determine the function of such elements in supporting or retarding the evolution of man.

3.2.1.1.3 The teacher will examine the students on their ability to present natural and man-made conditions that constitute a viable environment for modern man.
3.2.1.1.4 The teacher will examine the students on their ability to judge the merit of man's current technology as it serves to meet human needs.

3.2.1.2 Related to the teacher's view of knowledge;

3.2.1.2.1 The teacher will examine the students on their ability to apply industrial-technical knowledge to the solution of selected problems in the laboratory.

3.2.1.2.2 The teacher will examine the students on their ability to analyze man's past and present technology to determine the effects of that technology on man and the ecosystem.

3.2.1.2.3 The teacher will examine the students on their ability to synthesize elements of man's technology with man's values to solve problems created by the misuse of technology.

3.2.1.2.4 The teacher will examine the students on their ability to determine the value of basic and specific industrial-technical knowledge and practices.

3.2.1.3 Related to the teacher's view of values;

3.2.1.3.1 The teacher will examine the student's value-system acquisition through the use of student developed scenarios in which the student's values are applied to the direction of technological growth and development.

3.2.1.3.2 The teacher will examine the students on their ability to critically analyze the scenarios of other students who have applied their own value systems to the direction of technology.

3.2.1.3.3 The teacher will examine the students on their ability to overcome institutional or individual inertia as they establish a spectrum of values for technological development and control.
3.2.1.3.4 The teacher will examine students on the ability to discuss the relative merit of various value-systems as to their power to control the direction and pace of industrial-technical growth.

3.3 Reporting

3.3.2 Appraising student achievement

3.3.2.1 Related to the teacher's view of reality;

3.3.2.1.1 The teacher will make an appraisal of the student's ability to identify with the natural and man-made world.

3.3.2.1.2 The teacher will make an appraisal of the student's ability to analyze his purpose and power of the technological world.

3.3.2.1.3 The teacher will make an appraisal of the student's ability to synthesize his experiences into a proposal for his own self-realization in interacting with the reality of the world and with other human beings.

3.3.2.1.4 The teacher will make an appraisal of the student's ability to evaluate man's technology and his own values to determine whether technology or personal values must change to maximize his possibilities for self-realization.

3.3.2.2 Related to the teacher's view of knowledge;

3.3.2.2.1 The teacher will make an appraisal of the student's ability to apply the knowledge that they have to problems rather than on their ability to know "everything" about the subject area.

3.3.2.2.2 The teacher will make an appraisal of the student's ability to analyze technology in terms of the results accrued from the technology rather than the intended purposes of the technology.

3.3.2.2.3 The teacher will make an appraisal of the student's ability to integrate
practical knowledge with knowledge in other domains in the solution of individual and group problems.

3.3.2.2.4 The teacher will make an appraisal of the student's ability to express the value of rational action for technological growth as opposed to uncontrolled technological growth or growth based on narrow intensional attitudes.

3.3.2.3 Related to the teacher's view of values;

3.3.2.3.1 The teacher will make an appraisal of the student's ability to establish personal values based on experiencing and interacting with the real world.

3.3.2.3.2 The teacher will make an appraisal of the student's ability to analyze the extent to which his technological and human valuing has been introjected from others and not acquired through the process of experiencing.

3.3.2.3.3 The teacher will make an appraisal of the student's ability to synthesize technological and human values gained through the process of experiencing with values that have been introjected upon him through social and environmental interaction to form a personal value-system for the use of technology.

3.3.2.3.4 The teacher will make an appraisal of the student's ability to explain that his values are in a constant state of change -- that technology, society, and aspects of the natural world impinge upon him and his value structure -- and that technical action should be examined for extensional results and not for any inherent or intrinsic "rightness" or "wrongness" of the act.

3.4 Correcting

3.4.5 Redirecting educational goals or activities
   (As indicated by pupil or program evaluations)
3.4.5.1 Related to the teacher's view of reality;

3.4.5.1.1 The teacher will redirect educational goals or activities when students are unable to apply their view of themselves to the reality of their technological society.

3.4.5.1.2 The teacher will redirect educational goals or activities when students are unable to analyze present technology to determine its human consequences.

3.4.5.1.3 The teacher will redirect educational goals or activities when students are unable to relate humanistic goals to the growth of technology.

3.4.5.1.4 The teacher will redirect educational goals or activities when students cannot find any merit in opposing views of technological reality and its effects on man.

3.4.5.2 Related to the teacher's view of knowledge;

3.4.5.2.1 The teacher will redirect educational goals or activities when students are unable to apply technological knowledge to problems in the laboratory.

3.4.5.2.2 The teacher will redirect educational goals or activities when students are unable to analyze possible applications of technical knowledge for their human consequences.

3.4.5.2.3 The teacher will redirect educational goals or activities when students are unable to synthesize their learning into new concrete or abstract technological structures.

3.4.5.2.4 The teacher will redirect educational goals or activities when students are unable to apply evaluation criteria to technological innovations or to engage in assessment activities to determine the worth of new technologies.
3.4.5.3 Related to the teacher's view of values;

3.4.5.3.1 The teacher will redirect educational goals or activities when students are unable to illustrate the influence of values on the application of technology to human problems.

3.4.5.3.2 The teacher will redirect educational goals or activities when students are unable to analyze their own values or the values of others as they relate to the use of technology.

3.4.5.3.3 The teacher will redirect educational goals or activities when students are unable to synthesize their technological knowledge with their value-systems.

3.4.5.3.4 The teacher will redirect educational goals or activities when students are unable to establish a personal value-system for their use of technology or to appreciate the close relationship between technological growth and cultural values.

The above operational definition was judged by the investigator to be adequate as a working model for evaluation purposes. The operational definition was outlined for the evaluation as shown in Appendix A. The evaluation team received a cover letter (Appendix B) and a telephone interview schedule card (Appendix C) with the operational definition. The assumption at the close of this chapter was that a teacher demonstrating all of the behaviors listed in the above operational definition would be described as possessing a philosophy of Humanistic Technology for industrial education. The essential concepts of the philosophical position concerning reality,
knowledge, and values as related to technical education were assumed, by the investigator, to be clearly defined.
CHAPTER IV

EVALUATION OF THE DEFINITION
EVALUATION OF THE DEFINITION

The investigator designed an evaluation instrument from the operational definition that was presented in Chapter III, see Appendix A. The instrument was submitted to the evaluation team to indicate judgments as to whether the various statements should be (1) included in the final definition, (2) changed to some degree, or (3) omitted from the final definition. The judges made check marks regarding their opinions of the discrete statements. There was also a blank page facing every page of statements in the evaluation instrument, where the judges were to write their suggestions and comments.

The evaluation team consisted of twelve educators who were selected by the investigator on the basis of their past writings, speeches or personal contacts with the investigator. On the strength of these professional contributions, the investigator determined that the persons selected had a philosophical point of view that was compatible with the philosophical position which was being defined by the investigator. In all but two cases, the judges were contacted by telephone to determine their willingness to participate in the study -- the two judges
who were not so contacted were invited to call the investigator collect for an explanation of the materials that they received, but both of these evaluators responded without finding the phone call necessary. See Appendix D for the complete list of judges.

The twelve judges were sent a cover letter, Appendix B; two copies of the evaluation instrument; a telephone interview schedule, Appendix C; and a stamped return envelope for the marked copy of the evaluation form and the telephone interview schedule. Evaluation forms were received and telephone interviews completed with ten of the twelve judges. Two judges expressed their regrets, and indicated that they would be unable to participate -- reasons given were; definitional problems within the discrete statements, a lack of a clear personal adoption of an educational philosophy related to technology, and a feeling that the average industrial educator would not comprehend the philosophy as defined.

Of the ten judges who did complete the evaluation of the operational definition, there was unanimous agreement for the inclusion of eighteen of the original one hundred and twenty statements. A total of one hundred and six of the one hundred and twenty items were considered acceptable by at least seventy percent of the judges. The investigator tallied the decisions of the ten judges and determined the status of the items for the final
definition by a majority vote for the inclusion of an item, or by a tie or majority vote for the change of an item. Also, if any judge indicated that an item should be omitted, the item was included in the telephone interview and a change in the item was determined that would make it acceptable. In Appendix F, Tables 1 through 10 represent the decisions of the evaluation team for each of the items in the operational definition, and the decision of the investigator based on the tally of the evaluation team's suggestions.

Each of the ten judges was called at times indicated on the telephone interview schedule forms that they returned with their evaluations. On the average, the investigator found it necessary to make two calls before the telephone interviews could be completed — some judges indicated only one hour during the week when a call could be made, and the investigator tried to honor the scheduled times, but the judges were often not available due to unexpected demands on their time. However, all calls were completed, and transcripts of the telephone interviews are included in Appendix E.

The judges were in general agreement concerning the question of the need for a new philosophy of industrial or technical education that might be called a Humanistic Technology philosophy and which might be characterized by behavioral statements such as those which were presented
in the operational definition. The most common reservations expressed by the judges included a feeling that the operational definition was slanted toward the negative effects of man's technology, and the lack of a clear basis for dialogue concerning values, knowledge, humanistic goals, and reality.

There was general agreement on the desirability of implementing a teacher education curriculum that would develop a Humanistic Technology philosophy for technical teachers, but there was some concern expressed as to how such a curriculum would be designed. A variety of techniques were proposed for implementing the philosophy without devising an entirely new curriculum -- in-service workshops, professional forums, a change in emphasis for traditional programs, and a shift in emphasis to some of the innovative curriculums such as IACP, American Industry, The Maryland Plan, and a Man-Technology-Society type of program.

During the telephone interview, some of the judges illustrated their interpretation of the philosophic position defined with references to current or past experiences with socio-technical phenomena. Several judges presented examples of problems faced by individuals as they attempted to resolve issues that placed human life or human dignity at odds with economic gain or technology imperatives.
The judges who indicated that items should be omitted from the final definition were questioned during the telephone interviews to determine their reasons for their recommending to omit items. Vagueness or lack of clarity were the reasons suggested but none of the statements was found to be totally unacceptable to the judges who suggested that they should be omitted.

STATEMENTS WHICH BEST CHARACTERIZE HUMANISTIC TECHNOLOGY

The statements which follow are the ones which the evaluation team unanimously selected for inclusion in the definition -- as such they should represent the best attempt to concretize the Humanistic Technology philosophy.

<table>
<thead>
<tr>
<th>Item #</th>
<th>Statement</th>
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<tbody>
<tr>
<td>1.1.1.1.2</td>
<td>The teacher will establish educational goals that will aid students to analyze the relationship between the natural and the man-made world to demonstrate the impact of technology on the environment.</td>
</tr>
<tr>
<td>1.1.1.2.3</td>
<td>The teacher will establish educational goals that will enable students to apply knowledge gained to new situations requiring the synthesizing of knowledge to develop a solution.</td>
</tr>
<tr>
<td>1.3.2.1.2</td>
<td>The teacher will expect students to analyze the relationship between the natural and man-made world to determine appropriate directions for technological growth.</td>
</tr>
<tr>
<td>1.4.1.1.2</td>
<td>The teacher will devise and/or implement educational experiences that enable the student to engage in hypothesizing concerning the nature of industrial technology and the effects of industrial technology on man and the ecosystem.</td>
</tr>
</tbody>
</table>
1.4.1.2.4 The teacher will devise and/or implement educational experiences that enable the student to predict outcomes of actions within the realm of industrial technology.

1.4.1.3.1 The teacher will devise and/or implement educational experiences that will enable students to utilize rational processes to examine the value of industrial technology and its effects on man and the ecosystem.

1.4.1.3.3 The teacher will devise and/or implement educational experiences that will aid the student to reach a sense of self-fulfillment regarding his use of industrial technology and his control over industrial technology.

1.4.1.3.4 The teacher will devise and/or implement educational experiences that will enable students to use inquiry techniques to determine the value of elements of industrial technology as they apply to man's existence on earth.

2.1.4.2.3 The teacher will establish learning conditions that permit students to demonstrate their learning through activities designed to synthesize acquired knowledge through the development of concrete or abstract problem solutions.

2.1.4.2.4 The teacher will establish learning conditions that permit students to evaluate their knowledge concerning the technological society to determine their competence to control its direction and growth.

2.1.4.3.1 The teacher will establish learning conditions that permit students to apply their values to the development of technological scenarios for the future.

2.1.4.3.2 The teacher will establish learning conditions that permit students to analyze their future scenarios to determine possible problems for man and the environment.

2.2.2.3.2 The teacher analyzes instructional materials to determine the extent to which positive reinforcement of concepts regarding the humane use of controlled technology is presented.

3.1.1.1.1 The teacher will encourage student activity
that increases awareness and appreciation of the character of the natural and man-made world.

3.1.1.1.2 The teacher will direct students toward activity that will encourage close examination of the elements and interactions of the natural and man-made worlds.

3.1.1.2.3 The teacher will serve as a resource person as students attempt to synthesize their learning of the natural and the man-made world through the development of technological scenarios for the future.

3.2.1.2.2 The teacher will examine the students on their ability to analyze man's present technology to determine the effects of that technology on man and the ecosystem.

3.3.2.1.3 The teacher will make an appraisal of the student's ability to synthesize his experiences into a proposal for his own self-realization in interacting with the reality of the world and with other human beings.

STATEMENTS MARKED FOR CHANGE BY MAJORITY VOTE OR OMIT VOTE

Using the criteria established above, a total of thirty items, or twenty-five percent of the original number, were selected for changes in words, phrases, or general context. The remaining ninety items were, according to the same criteria, considered acceptable for the final definition. In using the established scheme for change or inclusion of the various discrete items, a total of 171 judgments were not honored called for inclusion by the 30 decisions to change items. On the average 5.7 judgments for inclusion were disregarded by each decision to change an item — the reason for this apparent disregard for the
majority opinion lies with the investigator's decision to change any item that received at least one suggestion to omit.

Listed below are the statements that were chosen to be changed, with summaries of the judges' comments and suggestions for change.

<table>
<thead>
<tr>
<th>Item #</th>
<th>Statement</th>
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<tbody>
<tr>
<td>1.1.1.1.1</td>
<td>The teacher will establish educational goals that aid students to apply industrial technical knowledge to problems of man in the real world.</td>
</tr>
</tbody>
</table>

Summary of changes suggested:

1) Change the phrase, problems of man in the real world to, "typical social and psychological problems of man."

2) Strike the word, industrial.

3) Insert "comprehend the need for" in the place of apply, and insert "solve" before problems.

4) Vague... What kinds of problems? Who decides what solutions are desirable?

5) Change the whole section from "goals" statements to "program strategies statements."

1.1.1.1.3 The teacher will establish educational goals that will enable students to synthesize their learning to the extent that they can adapt to and cope with technological change.

Summary of changes suggested:

1) More emphasis needs to be placed on the student's role in goal setting.

2) Needs to be revised from passive acceptance and coping to reflective thought which leads to creative direction and problem solving.
3) As well as "change the technology."

4) Turn the statement around -- change the technology to fit mankind.

5) Man should not always have to adapt to the technology.

6) Insert "and social" after technological.

1.1.1.2.1 The teacher will establish educational goals that will provide the student with exposure to praxiological knowledge to complement knowledge in the other domains and permits application of such knowledge to problems in the classroom.

Summary of changes suggested:
1) Involve the student in goal setting.

2) The statement seems redundant.

3) Change permits to "will permit."

4) Too much jargon.

1.1.1.2.2 The teacher will establish educational goals that will enable students to analyze the technological domain of knowledge to determine the means for solving problems caused by man's misapplications of technological knowledge.

Summary of changes suggested:
1) The statement should be broken into two statements.

2) The statement should include a future orientation.

3) It is too negative -- the emphasis is on misapplications.

4) Simplify the statement.

5) Technological knowledge alone can't do the job.

6) The teacher should be assisting the student to establish the goal.
1.1.1.3.1 The teacher will establish educational goals that will enable the student to apply his value systems to his use of technology or to his use of the products of technology.

Summary of changes suggested:

1) Whose value system? The teacher's? The student's?
2) Definition of value system needed.
3) Application should follow analysis.
4) Meaning of statement is unclear.
5) Change enable to "provide," insert "with opportunities" after student, change apply to "test," change to his to "in the" and change to his #2 to "test his."
6) Does his mean the student's value system?

1.1.1.3.3 The teacher will establish educational goals that will enable the student to compare his values related to technology with the values of other individuals and to establish a homogeneous value system.

Summary of changes suggested:

1) Change homogeneous to "comprehensive."
2) Change the statement to read: "The teacher will establish educational goals that will provide the student with an opportunity to compare his values about technology with the values of other individuals."
3) This seems to be a lack of holding to ideals... a throwback to the mediocre... should not try to homogenize values.
4) Strike the phrase, and to establish an homogeneous value system.
5) A homogeneous value system is not necessarily desirable if the values are not arrived at reflectively.
1.2.2.1.1 The teacher attempts to describe the reality of the man-made world as it impacts upon the reality of the natural world.

Summary of changes suggested:

1) The students should perform this function with teacher assistance.

2) Keep in mind that any view of reality is only a description.

3) Too vague... meaning unclear.

4) Change describe to "describe and criticize."

5) Change impacts upon to "relates to," change natural to "student's."

1.2.2.1.2 The teacher attempts to describe the full impact of selected elements of the man-made world on mankind and on the environment.

Summary of changes suggested:

1) Seems redundant.

2) Change describe to "tell about in written or spoken words, pictures or graphs."

3) Who selects the selected elements?

4) Involve the students in the selection of the elements and in the description of the impacts.

1.2.2.3.4 The teacher attempts to describe values in a manner that places a spectrum of values before the student rather than an hierarchy of values, and emphasizes the impact of values on technological growth.

Summary of changes suggested:

1) Need to involve students in the description.

2) Seems redundant.

3) People are not necessarily on the same wave length -- values are difficult to communicate.
4) Not sure what the statement does for the operational definition.

5) Last part O.K., not sure of methodology for the first part.

1.3.2.2.1 The teacher will expect the student to be able to apply industrial-technical knowledge to specific problem situations in the laboratory.

Summary of changes suggested:

1) Are the specific problems student selected?

2) Student involvement in the selection of problems is essential.

1.3.2.3.1 The teacher will expect the students to demonstrate their acquisition of a value-system related to man's use of technology.

Summary of changes suggested:

1) Primary or secondary value systems?

2) Care must be taken not to attempt to impose values on the students.

3) Not sure how this could be done... methodology should be included.

4) Strike their acquisition of and insert "his" also insert "as" before related.

1.4.1.1.3 The teacher will devise and/or implement educational experiences that expose the student to a sense of connectedness with the growth of industrial technology.

Summary of changes suggested:

1) The phrase, to a sense of is poor.

2) The statement seems repetitious.

3) Need to emphasize the positive and negative aspects of this.
4) Change **connectedness** to "power to control."

5) Connectedness?

2.1.4.1.3 The teacher will establish learning conditions that permit students to combine knowledge from all four domains into solutions for human problems identified by the student.

Summary of changes suggested:

1) Change all four domains into to "other disciplines for," change for to "of."

2) List the domains.

3) Identify the domains, but not with more jargon.

2.1.4.2.2 The teacher will establish learning conditions that permit students to analyze technological knowledge in order to make its structure easier to grasp.

Summary of changes suggested:

1) Change structure to "common denominators and interface with other disciplines."

2) Insert "and criticize" after analyze.

2.2.2.1.2 The teacher analyzes instructional needs as they relate to material shortages, and attempts to avoid usage of those materials in short supply.

Summary of changes suggested:

1) Need student involvement in this or else the student will gain little from the activity.

2) Depends on objectives... might require the intelligent use instead of non-use.

3) Without student involvement, the activity would be meaningless.

4) Change to "The teacher assists students to analyze..."
2.2.2.3.1 The teacher attempts to apply humanistic values to the selection and use of instructional materials.

Summary of changes suggested:

1) The statement is vague... misinterpretation could cause trouble.

2) You will need to define humanistic values.

3) Strike attempts to and change apply to "applies."

4) Meaning is unclear.

5) Not clear on what the values are... i.e. attempts to apply values of respect for human dignity, human survival, human well-being and advancement of the human spirit and intellect... if that is what is meant.

2.2.2.3.4 The teacher evaluates instructional materials to establish an instructional system that is most likely to assist students in establishing an humane value orientation and in achieving the other goals and purposes of the instructional program.

Summary of changes suggested:

1) Vague statement.

2) Seems somewhat circular.

3) Strike an and insert "a reflective and."

3.1.1.2.4 The teacher will assist students to establish the value of various elements of technical knowledge and to place such discrete elements into a logical taxonomy of knowledge.

Summary of changes suggested:

1) They are not discrete from my point of view.

2) Are you trying to make the whole the sum of its parts?
3) You might come out with logic and no relation to reality.
4) How do you mean value in the statement?
5) Could be two statements.

3.2.1.1.2 The teacher will examine the students on their ability to analyze selected elements of the man-made world to determine the function of such elements in supporting or retarding the evolution of man.

Summary of changes suggested:
1) What do you mean by the evolution of man... what constitutes support for that evolution?
2) These elements cannot be separated from other events... they don't operate separately.
3) Strike evolution insert "development."

3.3.2.1.1 The teacher will make an appraisal of the student's ability to identify with the natural and man-made world.

Summary of changes suggested:
1) What do you mean by identify?
2) Change the word identify.
3) Meaning unclear... vague statement.

3.3.2.1.4 The teacher will make an appraisal of the student's ability to evaluate man's technology and his own values to determine whether technology or personal values must change to maximize his possibilities for self-realization.

Summary of changes suggested:
1) Strike or insert "or both" before must.
2) Meaning unclear, sounds more like psychoanalysis than industrial arts.
3) Needs to be simplified.

4) Change realization to "actualization."

3.3.2.2.3 The teacher will make an appraisal of the student's ability to integrate practical knowledge with knowledge in other domains in the solution of individual and group problems.

Summary of changes suggested:

1) Strike domains insert "disciplines."

2) Define domains.

3) Sounds like psychology... a group encounter session.

3.3.2.3.2 The teacher will make an appraisal of the student's ability to analyze the extent to which his technological and human valuing has been introjected from others and not acquired through the process of experiencing.

Summary of changes suggested:

1) This seems to be a "T" group activity... not the job of the I.A. teacher, he is not qualified, and it has nothing to do with industrial arts.

2) Seems like "heavy" stuff, how would it be done?

3) Seems too complex.

3.3.2.3.4 The teacher will make an appraisal of the student's ability to explain that his values are in a constant state of change -- that technology, society, and aspects of the natural world impinge upon him and his value structure -- and that technical action should be examined for extensional results and not for any inherent or intrinsic "rightness" or "wrongness" of the act.

Summary of changes suggested:

1) This seems to be an imposed value.
2) You are putting words in the mouth of the learner... might be changed to "The teacher will make an appraisal of the student's ability to examine the constantly changing values that direct technical action and which determine the "rightness" or "wrongness" of technical action."

3.4.5.1.1 The teacher will redirect educational goals or activities when students are unable to apply their view of themselves to the reality of their technological society.

Summary of changes suggested:
1) Vague statement... needs to be clarified.
2) Meaning unclear.
3) Goals should not be equated with activities.
4) It seems that activities might be redirected but that the goals, if sound, would remain.
5) Strike the word goals.
6) Educational goals should be constants.

3.4.5.1.4 The teacher will redirect educational goals or activities when students cannot find any merit in opposing views of technological reality and its effects on man.

Summary of changes suggested:
1) What exactly do you mean by redirect?
2) Strike cannot find any merit and insert "refuses to examine."
3) Could waste a lot of time with absurd views.
4) Change the method but not the goal.

3.4.5.2.1 The teacher will redirect educational goals or activities when students are unable to apply technological knowledge to problems in the laboratory.
Summary of changes suggested:

1) Insert "philosophical" after technological.
2) Goals should not change.
3) How does the teacher redirect?

3.4.5.2.3 The teacher will redirect educational goals or activities when students are unable to synthesize their learning into new concrete or abstract technological structures.

Summary of changes suggested:

1) Change the word redirect.
2) Change structures to "innovative technological activities."
3) Strike the word goals.

3.4.5.3.1 The teacher will redirect educational goals or activities when students are unable to illustrate the influence of values on the application of technology to human problems.

Summary of changes suggested:

1) Strike the word influence insert "relationship," strike on and insert "to."
2) Strike the word goals.

3.4.5.3.2 The teacher will redirect educational goals or activities when students are unable to analyze their own values or the values of others as they relate to the use of technology.

Summary of changes suggested:

1) Strike the word goals.
2) Vague statement.
3) Clarify meaning of redirect.
The investigator's decisions to include items in the final definition resulted in a total of 176 discrete judgments for change being ignored. On the average, 1.9 judgments to change items were disregarded for each of the ninety decisions to include statements based on the majority vote. Therefore, on the average, there was approximately 80% agreement for inclusion of all those items which were so slated for the final definition. In Chapter V, the items of the final definition reflect the changes suggested by the evaluation team, and the decisions of the investigator with regard to the suggestions of the evaluation team and the tally of the total team decisions.

**STATEMENTS WITH MINOR CHANGES IN WORDING**

Some of the statements in the revised definition reflect changes that were suggested by the reading committee. These changes were made to clarify the meaning of the statements, but are not included in the comments section above.
CHAPTER V

THE REVISED OPERATIONAL DEFINITION
THE REVISED OPERATIONAL DEFINITION

The operational definition below utilizes the same numbering system established in Chapter III and used in the evaluation instrument sent to the evaluation team for their analysis and suggestions for improvements. The following revised definition incorporates a synthesis of those suggestions and reflects a majority opinion of the judges for inclusion of items from the original definition without change. Where sections of the original definition have been deleted, a line is struck through the deleted portion. Where words or phrases have been added to the original definition, the words or phrases appear in parentheses. A notation appears to the left of each of the discrete statements that refers the reader to the appropriate evaluation tally table and to the summary of comments that refers to that particular item.

AN OUTLINE OF TEACHER BEHAVIORS
COMPATIBLE WITH
HUMANISTIC TECHNOLOGY

(Revised)

1. Planning
   1.1 Formulating
1.1.1 Determining Educational Goals and Program Strategies

1.1.1.1 Related to the teacher's view of reality;

1.1.1.1.1 The teacher will establish educational goals that aid students to apply industrial-technical-knowledge-to-problems of man in the real-world. (will aid students to comprehend the need for technical knowledge to solve typical social and psychological problems of man).

1.1.1.1.2 The teacher will establish educational goals that will aid students to analyze the relationship between the natural and man-made world to demonstrate the impact of technology on the environment.

1.1.1.1.3 The teacher will (work cooperatively with students to) establish goals that will enable students to synthesize their learning to the extent that they can adapt to and cope with technological (and social) change (as well as engage in reflective thought leading to proposals for creative direction and problem solving to help the technology change to fit mankind).

1.1.1.1.4 The teacher will establish educational goals that will enable students to establish (study) a value-system that recognizes the finite resources of the natural world and man's obligations to his fellow man in the use of those resources.

1.1.1.2 Related to the teacher's view of knowledge;

1.1.1.2.1 The teacher will (work cooperatively with students to) establish educational goals that will provide the student with exposure to praxiological-knowledge to complement-knowledge-in-the-other domains and permits application-of-such (and program strategies that will expose the students to knowledge of technology to complement knowledge in other disciplines, and which permits the application
of that) knowledge to problems in the classroom.

1.1.1.2.2 The teacher will (work cooperatively with students to) establish educational goals (and program strategies) that will enable students to analyze-the-technological-domain-of-knowledge-to-determine-the-means-for-solving-problems caused-by-man's-misapplications-of technological-knowledge (to derive knowledge from all disciplines for the solution of present and potential future problems related to man's use of technology).

Table 1 p. 274
Comments p. 132

1.1.1.2.3 The teacher will establish educational goals that will enable students to apply knowledge gained to new situations requiring the synthesizing of knowledge to develop a solution.

Table 1 p. 274

1.1.1.2.4 The teacher will establish educational goals that will enable students to establish criteria for evaluating the worth of technological innovations through the processes of technology assessment.

1.1.1.3 Related to the teacher's view of values;

1.1.1.3.1 The teacher will establish educational goals that will enable-the-student-to apply-his-value-system-to-his (provide the student with opportunities to test his beliefs about worthwhile action regarding the) use of technology or to his-use-of the products of technology.

Table 1 p. 274
Comments p. 133

1.1.1.3.2 The teacher will establish educational goals that will enable the student to analyze his values related to technology to determine whether they are conducive to man's survival on earth and to man's living in harmony with man.

Table 1 p. 274

1.1.1.3.3 The teacher will establish educational goals that will enable the student to compare his values related to technology with the values of other individuals and-to-establish-an-homogeneous-value-system.

Table 1 p. 274
Comments p. 133
1.1.1.3.4 The teacher will establish educational goals that will enable the student to examine the currently dominant value systems of our society to determine whether technological control is possible with those systems.

Table 1 p. 274

1.2 Researching

1.2.2 Describing

1.2.2.1 Related to the teacher's view of reality;

1.2.2.1.1 The teacher attempts (assists the student) to describe (and criticize) the reality of the man-made world as it impacts-upon (relates to the student's concept of) the reality of the natural world.

Table 2 p. 275
Comments p. 134

1.2.2.1.2 The teacher attempts-to-describe (assists the student to select and tell about) the full impact of elements of the man-made world on mankind and on the environment.

Table 2 p. 275
Comments p. 134

1.2.2.1.3 The teacher attempts to describe the close relationships between man's technology and his cultural or intellectual condition.

Table 2 p. 275

1.2.2.1.4 The teacher attempts to describe the value of the man-made world and its impact upon man's values.

Table 2 p. 275

1.2.2.2 Related to the teacher's view of knowledge;

1.2.2.2.1 The teacher attempts to describe man's applications of technology to the solution(s) of human problems.

Table 2 p. 275
Comments p. 142

1.2.2.2.2 The teacher attempts to describe techniques for analyzing man's use of technology.

Table 2 p. 275

1.2.2.2.3 The teacher attempts to describe processes for using technological knowledge to solve problems and the nature of new problems that might result from the technology.
1.2.2.3 Related to the teacher's view of values;

1.2.2.3.1 The teacher attempts to describe the application of values to man's use of technology.

1.2.2.3.2 The teacher attempts to describe procedures for analyzing the values that regulate technological growth.

1.2.2.3.3 The teacher attempts to describe divergent values and procedures for resolving value differences into a value-system for the regulation of technological growth.

1.2.2.3.4 The teacher attempts (assists the students) to describe values-in-a manner-that-places-a-spectrum-of values-before-the-student-rather-than a-hierarchy-of-values,-and-emphasizes the-impact-of-values-on-technological growth (the spectrum of values that impact on technological growth and avoids any attempt to place such values in an hierarchical order).

1.3 Designing

1.3.2 Preparing student performance expectations

1.3.2.1 Related to the teacher's view of reality;

1.3.2.1.1 The teacher will expect the students to demonstrate the importance of technological knowledge as applied to the problems of man.

1.3.2.1.2 The teacher will expect students to analyze the relationship between the natural and man-made world to determine appropriate directions for technological growth.

1.3.2.1.3 The teacher will expect students to be capable of proposing future technological realities for man.
1.3.2.1.4 The teacher will expect the student to be able to illustrate the effect of the natural and man-made world on man's values.

Table 3 p. 276

1.3.2.2 Related to the teacher's view of knowledge;

1.3.2.2.1 The teacher will expect the student to be able to apply industrial-technical knowledge to specific (student selected) problem situations in the laboratory.

Table 3 p. 276
Comments p. 135

1.3.2.2.2 The teacher will expect the student to be able to analyze industrial-technical knowledge to determine its benefits to man and its relationship to the other domains of knowledge.

Table 3 p. 276

1.3.2.2.3 The teacher will expect the student to be able to develop technological solutions to self-identified problems.

Table 3 p. 276

1.3.2.2.4 The teacher will expect the student to be able to judge the relative merit of selected technological solutions to the problems of man.

1.3.2.3 Related to the teacher's view of values;

1.3.2.3.1 The teacher will expect the student(s) to demonstrate their acquisition-of-a value-system (own personal primary value system as) related to man's use of technology.

Table 3 p. 276
Comments p. 135

1.3.2.3.2 The teacher will expect the students to be able to analyze their value systems to determine how well they fit into the society in which they live.

Table 3 p. 276

1.3.2.3.3 The teacher will expect the student to contribute to the development of an "ideal" value-system which would best serve the needs of man in a technological society.

Table 3 p. 276

1.3.2.3.4 The teacher will expect the student to be able to discuss a spectrum of possible values as opposed to an hierarchy of values.
1.4 Engineering

1.4.1 Detailing the instructional program

1.4.1.1 Related to the teacher's view of reality;

1.4.1.1.1 The teacher will devise and/or implement educational experiences that will enable students to seek *extensional-meanings* for (unintended outcomes of) the industrial technology that exists in our society.

Table 4 p. 277
Comments p. 142

1.4.1.1.2 The teacher will devise and/or implement educational experiences that enable the student to engage in hypothesizing *concerning* (about) the nature of industrial and the effects of industrial technology on man and the ecosystem.

Table 4 p. 277
Comments p. 142

1.4.1.1.3 The teacher will devise and/or implement educational experiences that expose the student to *a-sense-of-connectedness-with* (feelings of power and responsibility for) the growth of technology.

Table 4 p. 277
Comments p. 135

1.4.1.1.4 The teacher will devise and/or implement educational experiences that enable the student to explore his sense of power or powerlessness over the direction and pace of industrial-technical growth.

1.4.1.2 Related to the teacher's view of knowledge;

1.4.1.2.1 The teacher will devise and/or implement educational experiences that will permit students to apply basic technological knowledge and skills to problems in the laboratory.

Table 4 p. 277

1.4.1.2.2 The teacher will devise and/or implement educational experiences that enable the student to generate alternative actions within the realm of industrial technology.

Table 4 p. 277

1.4.1.2.3 The teacher will devise and/or implement educational experiences that aid the student to synthesize the activities of his industrial education experience to explain the social context of industrial
1.4.1.2.4 The teacher will devise and/or implement educational experiences that enable the student to predict (the) outcomes of actions within the realm of industrial technology.

1.4.1.3 Related to the teacher's view of values;

1.4.1.3.1 The teacher will devise and/or implement educational experiences that enable students to utilize rational processes to examine the value of industrial technology and its effects on man and the ecosystem.

1.4.1.3.2 The teacher will devise and/or implement educational experiences that will enable the students to engage in analytic procedures to determine the effect of elements of industrial technology on man's values.

1.4.1.3.3 The teacher will devise and/or implement educational experiences that will aid the student to reach a sense of self-fulfillment regarding his use of industrial technology and his control over industrial technology.

1.4.1.3.4 The teacher will devise and/or implement educational experiences that will enable students to use inquiry techniques to determine the value of elements of industrial technology as they apply to man's existence on earth.

2. Organizing

2.1 Structuring

2.1.4 Setting learning conditions

2.1.4.1 Related to the teacher's view of reality;

2.1.4.1.1 The teacher will establish learning conditions that permit the student to apply his concept of technological reality to the solution of selected
problems.

2.1.4.1.2 The teacher will establish learning conditions that permit the student to analyze technological methods that have been used to solve human problems.

2.1.4.1.3 The teacher will establish learning conditions that will permit students to combine knowledge from all-four domains (other disciplines) into solutions for human problems identified by the student.

2.1.4.1.4 The teacher will establish learning conditions that permit the student to evaluate the present state of our technology and to propose changes for future realities.

2.1.4.2 Related to the teacher's view of knowledge:

2.1.4.2.1 The teacher will establish learning conditions that permit students to apply technological knowledge to the solution of selected problems in the laboratory.

2.1.4.2.2 The teacher will establish learning conditions that permit students to analyze (and criticize) technological knowledge in order to make its structure (common denominators and interface with other disciplines) easier to grasp.

2.1.4.2.3 The teacher will establish learning conditions that permit students to demonstrate their learning through activities designed to synthesize acquired knowledge through the development of concrete or abstract problem solutions.

2.1.4.2.4 The teacher will establish learning conditions that permit students to evaluate their knowledge concerning the technological society to determine their competence to control its direction and growth.
2.1.4.3 Related to the teacher's view of values;

2.1.4.3.1 The teacher will establish learning conditions that permit students to apply their values to the development of technological scenarios for the future.

Table 5 p. 278

2.1.4.3.2 The teacher will establish learning conditions that permit students to analyze their future scenarios to determine possible problems for man and the environment.

Table 5 p. 278

2.1.4.3.3 The teacher will establish learning conditions that permit students to apply divergent values from other individuals to the solution of technological problems.

Table 5 p. 278

2.1.4.3.4 The teacher will establish learning conditions that permit students to engage in assessment activities to determine the effect of various technological practices on their own or their society's values.

Table 5 p. 278

2.2 Supplying

2.2.2 Procuring materials and arranging for team teaching (or guest speakers).

2.2.2.1 Related to the teacher's view of reality;

2.2.2.1.1 The teacher selects instructional materials that reflect the practices of man in the production of goods through the application of industrial-technical knowledge.

Table 6 p. 279

2.2.2.1.2 The teacher analyzes (works with students to analyze) instructional needs as they relate to material shortages and-attempts-to-avoid-usage-of (to cooperatively determine the need for intelligent use or avoided use) of those materials in short supply.

Table 6 p. 279

2.2.2.1.3 The teacher selects instructional materials that reflect the close relationship between the natural and
the man-made world.

2.2.2.1.4 The teacher selects instructional materials on the basis of their accuracy in depicting elements of the man-made world as they affect man and the environment.

Table 6 p. 279

2.2.2.2 Related to the teacher's view of knowledge;

2.2.2.2.1 The teacher selects instructional materials that permit or illustrate a direct application of technical knowledge to practical problems.

Table 6 p. 279

2.2.2.2.2 The teacher analyzes his own knowledge base and utilizes other (team) teachers or (other) human resources to fill in where gaps in his own knowledge are recognized.

Table 6 p. 279

2.2.2.2.3 The teacher utilizes multi-media and multi-material approaches to facilitate maximum student learning of the essential concepts of man's technology.

Table 6 p. 279

2.2.2.2.4 The teacher will determine the extent to which material waste from the instructional system is likely to pollute air, water, or the landscape and will take necessary steps with students to prevent such pollution.

Table 6 p. 279

2.2.2.3 Related to the teacher's view of values;

2.2.2.3.1 The teacher attempts to apply humanistic values (applies values of respect for human dignity, human survival, human well-being and advancement of the human spirit and intellect) to the selection and use of instructional materials.

Table 6 p. 279

2.2.2.3.2 The teacher analyzes instructional materials to determine the extent to which positive reinforcement of concepts regarding the humane use of controlled technology is presented.

Table 6 p. 279

2.2.2.3.3 The teacher utilizes team teaching to demonstrate other value orientations concerning the use of technology in man's society.
2.2.2.3.4 The teacher evaluates instructional materials to establish an instructional system that is most likely to assist students in establishing an (to develop a reflective and) humane value orientation and in achieving the other goals and purposes of the instructional program (concerning the use of technology).

Table 6 p. 279
Comments p. 137

3. Controlling

3.1 Directing

3.1.1 Supervising learning experiences

3.1.1.1 Related to the teacher's view of reality;

3.1.1.1.1 The teacher will encourage student activity that increases awareness and appreciation of the character of the natural and man-made world.

Table 7 p. 280
Comments p. 142

3.1.1.2 The teacher will direct students toward activity (activities) that will encourage close examination of the elements and interactions of the natural and man-made worlds.

Table 7 p. 280
Comments p. 142

3.1.1.3 The teacher will encourage students to combine knowledge of the natural world with knowledge of man's practices to develop a model socio-technical system (by combining knowledge of the natural world with knowledge of man's practices).

Table 7 p. 280
Comments p. 142

3.1.1.4 The teacher will encourage students to engage in valuing of man's technological achievements and of proposed technological innovations.

Table 7 p. 280

3.1.1.2 Related to the teacher's view of knowledge;

3.1.1.2.1 The teacher will encourage students to apply knowledge of man's practices to the solution of individual and social problems.

Table 7 p. 280

3.1.1.2.2 The teacher will act as a fellow seeker of knowledge as he encourages students to critically analyze man's technologies.
3.1.1 The teacher will serve as a resource person as students attempt to synthesize their learning of the natural and man-made world through the development of technological scenarios for the future.

Table 7 p. 280

3.1.1.2.3 The teacher will assist students to establish the value of various elements of technical knowledge and to place such discrete elements into a logical taxonomy of (determine the relationships between those elements and among various taxonomies of man's accumulated) knowledge.

Table 7 p. 280

3.1.1.2.4 Related to the teacher's view of values;

3.1.1.3 The teacher will encourage students to express the values that direct their applications of technical knowledge or their use of the products of technology.

Table 7 p. 280

3.1.1.3.1 The teacher will encourage students to analyze their values which direct their use of technology or the products of technology to determine whether such values are congruent with their own image of an ideal value system.

Table 7 p. 280

3.1.1.3.2 The teacher will support students in their attempts to establish a valid value system out of the spectrum of values held by the class as a group concerning the use of technology and technological controls.

Table 7 p. 280

3.1.1.3.3 The teacher will encourage students to establish the relative merit of selected valued technologies as they relate to selected human values.

Table 7 p. 280

3.1.1.3.4 Related to the teacher's view of reality;

3.2 Monitoring

3.2.1 Measuring student performance

3.2.1.1 The teacher will examine the students on their ability to identify with the world as it now exists and on their
perception of their ability to change the world as individuals.

3.2.1.1.2 The teacher will examine the students on their ability to analyze selected elements of the man-made world to determine the function of such elements in-supporting-or-retarding-the-evolution of-man (as they contribute to or retard man's development).

3.2.1.1.3 The teacher will examine the students on their ability to present natural and man-made conditions that constitute a viable environment for modern man.

3.2.1.1.4 The teacher will examine the students on their ability to judge the merit of man's current technology as it serves to meet human needs.

3.2.1.2 Related to the teacher's view of knowledge;

3.2.1.2.1 The teacher will examine the students on their ability to apply industrial-technical knowledge to the solution of selected problems in the laboratory.

3.2.1.2.2 The teacher will examine the students on their ability to analyze man's past and present technology to determine the effects of that technology on man and the ecosystem.

3.2.1.2.3 The teacher will examine the students on their ability to synthesize elements of man's technology with man's values to solve problems created by the misuse of technology.

3.2.1.2.4 The teacher will examine the students on their ability to determine the value of basic and specific industrial-technical knowledge and practices.

3.2.1.3 Related to the teacher's view of values;

3.2.1.3.1 The teacher will examine the student's value-system acquisition through the use of student developed scenarios in which student values are applied to the
Table 8 p. 281 direction of technological growth and development.

3.2.1.3.2 The teacher will examine the students on their ability to critically analyze the scenarios of other students who have applied their own value systems to the direction of technology.

Table 8 p. 281

3.2.1.3.3 The teacher will examine the students on their ability to overcome institutional or individual inertia as they establish a spectrum of values for technological development and control.

Table 8 p. 281

3.2.1.3.4 The teacher will examine students on their ability to discuss the relative merit of various value systems as to their power to control the direction and pace of industrial-technical growth.

3.3 Reporting

3.3.2 Appraising student achievement

3.3.2.1 Related to the teacher's view of reality;

3.3.2.1.1 The teacher will make an appraisal of the student's ability to identify-with (apply his concept of self to the reality of) the natural and the man-made world.

Table 9 p. 282 Comments p. 138

3.3.2.1.2 The teacher will make an appraisal of the student's ability to analyze his purpose and power in the technological world.

Table 9 p. 282

3.3.2.1.3 The teacher will make an appraisal of the student's ability to synthesize his experiences into a proposal for his own self-realization in interfacing with the reality of the world and with other human beings.

Table 9 p. 282

3.3.2.1.4 The teacher will make an appraisal of the student's ability to evaluate man's technology and his own values to determine whether technology or personal values must change to maximize his possibilities for self-realization.
Table 9 p. 282 (his personal values and man's technology to determine whether either or both must change for his self-actualization.

3.3.2.2 Related to the teacher's view of knowledge;

3.3.2.2.1 The teacher will make an appraisal of the students' ability to apply the knowledge that they have to problems rather than on their ability to "know everything" about the subject area.

3.3.2.2.2 The teacher will make an appraisal of the student's ability to analyze technology in terms of the results accrued from the technology rather than the intended purposes of the technology.

3.3.2.2.3 The teacher will make an appraisal of the student's ability to integrate practical knowledge with knowledge in-other-domains (from other disciplines) in the solution of individual and-group (or societal) problems.

3.3.2.2.4 The teacher will make an appraisal of the student's ability to express the value of rational action for technological growth as opposed to uncontrolled technological growth or growth based on narrow intensional-attitudes (assessment of outcomes).

3.3.2.3 Related to the teacher's view of values;

3.3.2.3.1 The teacher will make an appraisal of the student's ability to establish personal values based on experiencing and interacting with the real world.

3.3.2.3.2 The teacher will make an appraisal of the student's ability to analyze the extent to which his technological-and human valuing has-been-introjected-from others-and-not-acquired-through-the process-of-experiencing (of technology human welfare has been acquired through direct experience).
3.3.2.3.3 The teacher will make an appraisal of the student's ability to synthesize technological and human values gained through the process of experiencing with values that have been introjected upon him through social and environmental interaction to form a personal value system for the use of technology.

3.3.2.3.4 The teacher will make an appraisal of the student's ability to explain that his values are in a constant state of change that technology, society, and aspects of the natural impinge upon him, and his value structure, and that technical action should be examined for extensional results and not for any inherent or intrinsic "rightness" or "wrongness" of the act (examine the constantly changing values that direct technical action and which determine "rightness" or "wrongness" of technical action).

Table 9 p. 282

3.4 Correcting

3.4.5 Redirecting educational goals or activities. As indicated by pupil or program evaluations—(not discarding goals, but redirecting by level for acquisition).

3.4.5.1 Related to the teacher's view of reality;

3.4.5.1.1 The teacher will redirect educational goals or activities when students are unable to apply their view of themselves (concept of self) to the reality of their technological society.

Table 10 p. 283

Comments p. 140

3.4.5.1.2 The teacher will redirect educational goals or activities when students are unable to analyze present technology to determine its human (future) consequences.

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Comments p. 142

3.4.5.1.3 The teacher will redirect educational goals or activities when students are unable to relate humanistic goals to the growth of technology.
3.4.5.1.4 The teacher will redirect educational goals or activities when students cannot find any merit in (refuse to consider) opposing views of technological reality and its effects on man.

3.4.5.2 Related to the teacher's view of knowledge;

3.4.5.2.1 The teacher will redirect educational goals or activities when students are unable to apply technological knowledge (their philosophy of technology) to problems in the laboratory.

3.4.5.2.2 The teacher will redirect educational goals or activities when students are unable to analyze possible applications of technical knowledge for their human consequences.

3.4.5.2.3 The teacher will redirect educational goals or activities when students are unable to synthesize their learning through concrete or abstract (innovative) technological activities.

3.4.5.2.4 The teacher will redirect educational goals or activities when students are unable to apply evaluation criteria to technological innovations or to engage in assessment activities to determine the worth of new technologies.

3.4.5.3 Related to the teacher's view of values;

3.4.5.3.1 The teacher will redirect educational goals or activities when students are unable to illustrate the influence of values on the application of technology to human problems.

3.4.5.3.2 The teacher will redirect educational goals or activities when students are unable to analyze their own values or the values of others as they relate to the (the extent to which they dictate our) use of technology.
3.4.5.3.3 The teacher will redirect educational goals or activities when students are unable to synthesize their technological knowledge with their (personal) value system(s).

3.4.5.3.4 The teacher will redirect educational goals or activities when students are unable to establish a personal value system for their use of technology or to appreciate the close relationship between technological growth and cultural values.

The above definition, derived from assumptions that followed a review of selected literature related to issues of man and his use of technology, was amended by a panel of educators to adequately define a philosophical point of view that attempts to integrate the concerns of the humanist with the concerns of the technologist. The definition is presented by the investigator as a model which may be used by teachers of technology to pattern their behavior to the end of preparing students who might strive to use technology with wisdom and who might visualize technology as a process for meeting human needs.
CHAPTER VI

SUMMARY, CONCLUSIONS, AND
RECOMMENDATIONS
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

In recent years, there has been an increasing emphasis on some of the negative consequences of man's technology. The problems of environmental damage, a dehumanized society, and an erosion of individual rights and freedom have been documented by many authorities, and technology has almost invariably been characterized as the villain. Many of these authorities seem incapable of acknowledging any positive attributes for technology. Some authorities would suggest that technology is an entity capable of growth independent of man's direction, and, as such, it is viewed as a threat to man's survival. Other writers suggest that technology has always and will always be subject to the direction and control of man, but that technology has become more important than the human needs it was designed to serve -- thus the problem centers on man's values and not on his technology.

A basic fact, often ignored, is that both technology and values are used to build a society. Technology forms structures and artifacts, and the nature of those structures and artifacts affects the behavior of those
individuals who use them. Individuals adopt values, values shape society, and society, in turn, dictates the behavior of its members.

Technology now seems to exist as an interface between man's values and his society. Values affect the direction and pace of technological growth and technological growth, in turn, affects societal change. Societal change creates new demands for technological devices which result in further changes in man's values.

This cyclic process of change between man and his technology and between technology and society can be affected by individual or societal values, and frequently by a form of compromise value when individual values are at odds with societal values. The need for increased knowledge is magnified dramatically by advancing technology. As technology becomes increasingly complex, it becomes infinitely more difficult for non-technical individuals to make wise decisions due to lack of knowledge concerning the present scope or future impact of today's technology, while future innovative technologies are virtually incomprehensible. It would be dangerous to assume that the solution to the dilemma is simply to call for more and more technical education. Individuals will certainly need more technical knowledge, but they will also need to be aware of human objectives and goals for technical action, of constraints for technical action, of the consequences
of technical action, and of alternative courses for technical action.

There is every indication that technology is evolving at an accelerating pace, and public ignorance of advanced technology and the consequences of that technology is becoming more common. The potential danger of a technocratic elite has been pointed out by numerous factual and fictional reports. The technology of the novel 1984 has arrived early, and the void between individual values and the values of certain elements of government with regard to the use of that technology has led to a major upheaval in the politics of the United States. But the fact remains that our educational processes are not integrating technological knowledge with human values. There are few educational programs that encourage individual or group efforts to improve judgments related to the use of technology or the implementation of innovative technologies.

The investigator attempted to define a philosophical outlook for teachers of technology that would encourage students to comprehensively and objectively consider the impact of technology on man and the environment. The philosophical outlook defined includes an appreciation for the many positive results of technology in improving the human condition, but not to the exclusion of examination of the negative aspects of the effects of technology.
The review of the literature indicated a need for a new form of education that would prepare individuals to make technical decisions based on human considerations. It was apparent that, as the definition was being evaluated, some of the evaluators perceived the assumption of control as a disruption to the flow of technological progress. Clearly, there are alarmists who approach a Neo-Luddite hysteria in their attempts to place limits on some of man's obvious technical excesses, but social change based on human needs must not be labeled "Luddite" if such needs are satisfied by an increased emphasis on controlled technology development.

Modern scientific method and technology development for the sake of technology development promotes a form of values skepticism that seems contrary to man's whole pattern of cultural development and philosophical thought. Education, and particularly technical education, must become more values oriented unless man is to remake himself to live in a world without values -- in such a world man would be little more than a biological machine. As Jenkin Lloyd Jones (1973) points out;

Lines of behavior must be drawn, even if they involve close questions and possible error. Only a billionth of an inch separates a true strike from a true ball, but if someone doesn't try to call it there is no ball game...

Our galloping cleverness is wonderful. But it will take something else to save mankind.
The "something else" that is called for is an emphasis on values as we initiate action, respond to action, and survey the results of actions. Judgments must be made and the possibilities for erroneous judgment just be minimized through an educational process that permits considerable practice in the use of and the study of the nature of our values as they relate to our actions.

The pages above reflect the efforts of the investigator to establish a concretized definition for an educational philosophy that attempts to integrate man's concern for human values with his mounting potential for developing innovative technologies. The definition was validated or refined by a distinguished panel of educators and is presented as a suitable model for technical educator behavior that reflects a Humanistic Technology philosophy.

In Chapter I, several questions were advanced by the investigator which were to be answered by the study and reported herein. The questions are repeated below with the investigator's answers as derived from the literature review or the evaluation of the operational definition.

Question #1

To what extent does the literature related to man and technology issues support the thesis that man can and should control the direction and pace of technological growth?

The literature reviewed for this study overwhelmingly supported the thesis that man can and should control his
technology. The general direction of that control was aimed toward human ends. Technology control was advocated to protect the environment, to preserve societal institutions and to preserve individual rights. Recommendations for control extended from an increased emphasis on values education to stringent legislation that would protect man and the environment from technological incursions.

Question #2

To what extent does the literature related to man and technology issues deny the thesis that man can and should control the direction and pace of technological growth?

The question of control for technological development seems to affect some writers as a restriction of inquiry, and any attempt to legislate against technological development is viewed as a form of praxiological book burning. There seems to be limited support for the denial of controls over man's technology. Some writers have suggested that had the technology of space exploration been restricted on the basis of limited foreseeable benefits to mankind, a great many unanticipated benefits which have developed would have been needlessly protracted or eliminated from possible development. Some of these writers suggest that any attempt to legislate against technological inquiry will result in a displacement of the inquiry to another area or to an underground development of technology that would completely deny the ability of society to
control technology.

Question #3

To what extent do traditional philosophies of industrial arts reflect a philosophy of Humanistic Technology?

If the commonly accepted definitions of industrial arts are examined, it is apparent that some emphasis on questions of human needs and social effects was intended to be included in the industrial arts curriculum. Bonser and Mossman (1925) provided a definition that is most commonly accepted by industrial arts educators;

The industrial arts are those occupations by which changes are made in the forms of materials to increase their values for human usage. As a subject for educational purposes, industrial arts is a study of the changes made by man in the forms of materials to increase their values, and the problems of life related to these changes (p. 5).

The final phrase of the above definition suggests an affinity for the Humanistic Technology philosophy.

In a later statement, Bonser (1932) asserted;

As a secondary school subject, industrial arts must meet just as fully the test of rich thought content and humanistic values as any other appropriate school subject (p. 73).

Bonser (1932) expanded on the above with suggestions that human and social consequences of industry must be a part of the industrial arts curriculum unless it is to be "devoid of educational values (p. 74)."

In spite of the general acceptance of Bonser's definition, traditional industrial arts curricula have
seldom placed emphasis on humanistic values or the human and social consequences of industrial technology. Most traditional programs would be labeled, according to Bonser's definition, "devoid of educational values." The answer to question number three seems to be that traditional philosophies of industrial arts do reflect a Humanistic Technology point of view, but actual practices in traditional industrial arts curricula show little adherence to the philosophy to which they ostensibly subscribe.

Question #4

To what extent do philosophies of innovative programs in industrial arts reflect a philosophy of Humanistic Technology?

Several innovative industrial education programs were suggested by the evaluation team members to be compatible with the Humanistic Technology point of view. Specific references were made to the Industrial Arts Curriculum Project, to the American Industry Project, to the Maryland Plan, and to DeVore's Man and Technology proposals.

It is apparent that the philosophy underlying the IACP material includes consideration for the effects of technology on humans and society. In the Rationale for the IACP effort, Towers, et al (1966) suggest that praxiology (technology) has to do with "all the practices which ultimately affect individual and social human behavior (p. 39)." Industrial arts is defined as dealing
with a study of industrial praxiology (technology) for the purpose of understanding how industrial practices affect materials and humans in industry (Towers, et al, pp. 43-44). The definition of industrial arts is more restrictive since it does not extend to study the effects of industry on persons outside of industry. This restriction was not made with the intent of ignoring the broader societal implications. Rather, it was made with the hope that social studies would assume that obligation.

The American Industry Project as discussed by Pace, et al (1965) includes as a major concept "public interest," but it is only one of some fourteen concepts that are included in the curriculum -- there is no apparent emphasis on the human values that affect or are affected by technology.

The Maryland Plan has placed considerable emphasis on student initiative in developing goals and selecting activities for the pursuit of industrial knowledge, but curricular emphasis has been on several clusters of practices in technology (Maley, 1962). In practice, this program seems to follow patterns that frequently touch on human values and the effects of technology on man and the environment.

For many years, Paul W. DeVore has advocated the development of industrial arts curricula that examine the man-society-technology equation. DeVore has called for an
increased emphasis on the study of technology and its consequences for man and society. His efforts have resulted in a significant group of doctoral recipients who view industrial arts as serving a more important social purpose than has been evident in traditional programs of industrial arts. DeVore (1970) suggests that;

The challenge of today and tomorrow is to enhance our ability to measure and to predict future technological developments and their probable results or consequences. The questions must be future-oriented, as technology has always been (p. 118).

Several of the philosophies of innovative programs for industrial arts seem to reflect the Humanistic Technology philosophy, and the activities that students engage in allow considerably more exposure to values questions than is found in traditional programs of industrial arts.

**Question #5**

To what extent does a selected group of professional educators agree on the basic issue of the need for establishing a philosophy of Humanistic Technology for industrial arts education?

The answer to the above question was sought in the telephone interviews that followed the evaluation of the operational definition by the panel of judges (see Appendix D). The responses of the judges suggest unanimous agreement of the need for a Humanistic Technology philosophy, see Appendix E for complete transcripts of the interviews. There were some reservations expressed
concerning implementation, and some judges questioned a possible bias toward the negative effects of technology, but on the basic issue of a need for a new philosophy emphasizing human values as they relate to and are affected by technology, there was definite agreement.

Question #6

Can an operational definition of an educational philosophy be developed that may emphasize ties between technology and culture and which may characterize an educator for future industrial arts curricula?

The operational definition presented in Chapter V is presented as an answer to the first part of the above question, and the interviews with the panel of judges suggest that the operational definition presents a desirable characterization of an educator using future industrial arts curricula.

Question #7

Can a selected group of professional educators who advocate greater understanding of the relationship between technology and man agree on a set of behavioral descriptors that comprise an operational definition of an educational philosophy labeled Humanistic Technology?

As outlined in Chapter IV, a substantial majority of agreement was expressed for 75 percent of the descriptors used in the operational definition suggesting an affirmative answer to the above question.
Question #8

What recommendations might be made by a group of professional educators who support a philosophy of Humanistic Technology for curriculum changes in industrial arts?

A summary of the recommendations presented by the panel of judges is outlined below (see Appendix E for complete transcripts of the responses of the evaluation team).

We must balance the curriculum to cover both sides of issues related to industry and society.

In our technology education programs, we have not gone far enough in studies of the effects of the technology that we have chosen to pursue.

We should use the term socio-technical to illustrate the relationships between society and technology.

All teachers need a basic education in the activities of man.

We must pursue the future with a rethinking of whom we are—conservation and a change in lifestyle may be required.

There is a real need for an objective analysis of technology so that all sides of issues will be examined.

In the implementation of this philosophy, a big job will be to figure out real, purposeful activities for the students.

In total, the humanistic aspects of technology are, at this point in time, more important than the technology itself. We must constantly be looking at technology to solve the problems that it has created for man.

There is a need for examining what exists today to see how these objects or systems have
given us the values that we hold today.

An examination of value systems related to technology is a good thing and should be incorporated into the course of study, but one of the cautions would be to avoid the imposition of any given value system.

Implementation of the philosophy might be better accomplished through in-service workshops and weekend conferences rather than through a course or a series of courses.

Education must break down the feeling that man is separate from the world. People must be taught to feel some kind of oneness between themselves and their fellow man. People need to develop higher levels of feeling and cognition to see the entire world as interrelated rather than looking at things discretely and taking things out of context.

The foundation for a humanistic technology philosophy derives from the fact that technology develops in order to meet human needs and wants. Technology is a problem solving activity, and problem solving often begets new problems.

Implementation would require a strong admixture of the social sciences and humanities with the technical training. But these should not be the traditional kinds of courses. The new courses would relate to the interaction of technology and society.

Industrial educators must be made sensitive to such concepts as "dehumanization," "finite resources -- infinite demands," and "exponential growth."

It is difficult to work with teachers "in the trenches," we must revamp the undergraduate program to produce teachers who can function within the context of the humanistic technology philosophy.

We definitely need more technical education and on a higher technical plane. Students should be exploring computers, lasers and other innovative technologies, but they must also
examine the human and social consequences of the new technology.

We must design our curriculum with a futures orientation -- we cannot escape the fact that our students will live for some sixty years after they pass through our programs. The futures movement has a firm rationale behind its conception and all teacher educators should become involved with it.

There is a need for man to arrange his industry so that it has benefit for man rather than letting us shape our lives and our actions to some inanimate industry.

The definition is general enough to apply to every curriculum area in the public school system, and that is what would need to be done to really do the job of closing the humanist-technologist gap.

Some of the complex language needs to be simplified if the philosophy is ever going to reach the people who are really going to make the difference.

The philosophy will never "get off the ground" unless some very effective teacher education is implemented -- in-service, pre-service, wherever you are trying to influence teachers.

When considering the concept of humanistic technology and its possible impact we must be very sure that we are not developing an "albatross" that will stand in the way of progress.

From the review of the literature and from comments of the evaluation team, the investigator has been led to the conclusion that a need exists for a philosophy of Humanistic Technology for education in today's society. The schools of the present must prepare students for the society that will exist in the future. Most educators are
aware of the lag that exists between the real needs of the society and the kind of preparation students receive in the school. In the past, educative efforts of the adult portion of a culture have been directed toward providing its younger members with the knowledge and skills essential to maintaining livelihood in the culture and, at the same time, have attempted to protect and preserve the status quo. The desire to preserve the status quo is a prime reason for the lag that persists in educational institutions today.

It seems evident that in our present society, which is the very antithesis of inertia, we must exert every effort to break down the barriers to change that exist and to provide young people with knowledge and attitudes that will enable them to cope with constant and rapid change. The curriculum that will exist in such schools must contain a central theme that will reflect the nature of the society while providing an atmosphere conducive to acceptance of change. The investigator feels that the theme required would emphasize Humanistic Technology.

The greatest gap between the society of today and the student who leaves the traditional twelve-year school program lies in the area of technological understanding. The reasons for this gap extend back to the European origins of our schools and to a system of struggle between the liberal and practical factions of academia. For years
the college faculties of liberal arts have looked at the scientific and engineering faculties with disdain. In secondary schools, the industrial arts and vocational education teachers are considered to be in a lower echelon of the total school program — suited to teaching underachievers, delinquents, and the lower I.Q. population.

What most of these groups, on both sides, fail to perceive is that there is an inseparable tie between technology and culture. Culture, as we know it, would not exist without present technology, and technology, if not controlled by humanistic ideals, could lead to an abolition or subjugation of many, dearly held, humanistic standards.

The curriculum of the schools of the future should be designed to reveal the close tie between technological expansion and cultural revolution. Cultural works were made available to ever increasing numbers of human beings by the development of movable type in the 15th century which led to a rapid dissemination of printed materials. In the same way, the development of radio and television transmission, in spite of programs that may be judged as inane, have permitted millions to hear and see the works of the great writers, composers and artists of the past and present. The same liberal arts professor who disdains commercial television programming for its lack of educational value will often insist that students watch some
"special" programs that are of great benefit in understanding our cultural heritage.

In the days of our primitive ancestors, the young man who failed to learn the techniques of survival -- hunting, firemaking, and cultivating crops -- simply did not survive. In more recent years, a young man needed to learn certain computational and language skills to obtain employment that became his life's work and thus his means of survival. In the future, and to a large extent in the present, the skill most needed for survival is the skill of quick adaptation to technological change. The nature of technological growth is such that future breakthroughs will be astounding and virtually devastating to any who fail to keep up with the steady progress of technological innovation.

The need for an emphasis on humanistic technology in the schools of the future is important from the standpoint of societal needs as well as those of the individual as outlined above. A curriculum that centers on Humanistic Technology should provide a balance that will close the gap between the technologist and the humanist.

The application of this theme to traditional subject areas or to an integration of subject matter would serve equally well. Students should be encouraged to seek out many ties between man's techniques for survival and exploration and his techniques of social construction and
aesthetic expression. The relationship between fine and commercial art, studio photography and snapshot photography, creative writing and newspaper journalism, theater and television, poetry and commercial jingles, monumental architecture and urban housing could all be explored for better appreciation of the social, aesthetic and technical aspects of the pairs.

A foundation of humanistic technology would prepare students for a society of the future where "work" may not be vital to survival. In a society where the production of needed goods can be accomplished by a mere eight to fifteen percent of the total population, as predicted by some authorities, men must be prepared to use technology and the leisure time provided by technology for the advancement of man through techniques of human development, environmental enhancement, and aesthetic expression.

From a merging of humanism and technology a population of unified men might be capable of great contributions to humanity. If the two aspects of our culture remain separated, humanists and technologists will, in all probability, continue to engage in a conflict of interests to the detriment of both sides.

The philosophical position that has been defined in the preceding chapters is a position that views man as a creature in a constant state of change. The position views man as valuing survival, inquiry, industry, pleasure and
social grouping. It is a point of view that recognizes
man's technology as a form of problem solving that assists
man to attain valued ends, and which acknowledges the
fact that the means of technology may become ends in them­
selves or may seriously alter the values that brought the
technology into reality.

The point of view suggests that man's great potential
for initiating change that creates conflicts between or
among values must be subjected to self-control. Such
self-control is necessary to prevent the inadvertent loss
of humane values necessary to man's survival as a thinking,
reasoning, creative entity.

The Humanistic Technology philosophy suggests that
reality has natural and man-made dimensions. The natural
dimension of reality includes all the substances and
systems of the universe including man and other living
creatures. The man-made dimension of reality includes all
the abstractions and synthetic combinations of natural
reality that man has devised through centuries of efforts
to attain valued ends. The most important tenet of the
Humanistic Technology concept of reality is that man exists
as a part of, and not apart from, the natural world. As a
part of natural reality, any action of man affects nature --
man's techniques of survival, inquiry, industry, pursuit
of pleasure, and social organization have a direct impact
on the substance and systems of the natural world. The
values orientation of the Humanistic Technology philosophy places concern for the survival of man as a species moving toward an unknown Omega of higher development as the primary guidepost for human action. The mantle of that primary value includes the values of preservation of human life, human dignity and human welfare along with promotion of the human intellect and physical condition through processes of inquiry, industry and creative thought.

As is true with most philosophies, the propositions of the Humanistic Technology philosophy are not verifiable except by empirical means. The proof of the validity of the propositions might result from a continuation of the present trend to implement technology without regard for the long term effects of that technology on human beings. If the point of view suggested by the Humanistic Technology philosophy were to become universally accepted, the soundness of its propositions might never be verified, however, the probability of truth could be ascertained by analysis of man's past applications of technology and of the human behaviors that change or are changed by technology.

The literature reviewed by the investigator included numerous references to such analyses of man's technology and human behavior. The investigator believes that the probability of truth for the propositions of the Humanistic Technology philosophy is high enough to warrant its adoption, and the interviews with the panel of judges for
the operational definition suggest that they, too, favor the adoption of the Humanistic Technology point of view. As Erich Fromm (1968) suggests:

We are in the very midst of the crisis of modern man. We do not have too much time left. If we do not begin now, it will probably be too late. But there is hope -- because there is a real possibility that man can reassert himself, and that he can make the technological society human (p. 165).

RECOMMENDATIONS

On the basis of (1) the literature reviewed, (2) the evaluation of the operational definition derived therefrom, and (3) the interviews with the evaluation team, the investigator strongly recommends the implementation of programs to encourage the development of a Humanistic Technology philosophy for technical educators. The programs that might encourage such a philosophical point of view must necessarily involve an integration of axiological and praxiological disciplines, and would include exploration of methods for translating the philosophy to students of technology at every level of inquiry. A continued emphasis on the integration of concerns must be ensured for students who elect to pursue a concentrated study of either axiological or praxiological disciplines. The complex nature of advanced technology requires at least a conceptual working acquaintance between the humanists and the technologists of our society.
It is recommended that the refined operational definition in Chapter V of this study be further verified by educators at various levels, and that the discrete statements of the operational definition be utilized to develop educational programs that would produce technical teachers who display those behaviors.

The following uses could be made of the results of this study;

1) The operational definition could be used as a self-survey of personal behaviors by any teacher who feels that the philosophy defined is worthy of adoption.

2) The operational definition could be used to check the competencies of teachers of technology who are completing their training.

3) The operational definition could be used in a survey of teacher behavior to determine the extent to which such behaviors are characteristic of teachers in traditional and innovative industrial arts curriculums.

The following recommendations are made for further study of this or similar problems;

1) The operational definition could be expanded to include the affective and psychomotor domains of learning.
2) The operational definition could be refined to eliminate complex statements, redundant phrases, and simplify the numbering to make it more useful as a self-evaluative instrument.

3) Similar investigations could be developed with emphasis on disciplines other than technology.

4) The operational definition could be subjected to further evaluation with an instrument that would weight responses for further analysis.

5) A more comprehensive narrative statement of the philosophy could be developed that would include discussion of similarities to and departures from other philosophies of education.

In 1974 the National Science Foundation (NSF) and the National Endowment for The Humanities (NEH) jointly endowed The Ethical and Human Value Implications of Science and Technology (EHVIST) Program. The purpose of EHVIST was to support research, education, and public understanding of:

1) The impact of innovative scientific and technological developments on the values of society.

2) The impact of societal values on the development of science and technology.

3) The value questions which arise within science and technology, including ethical questions that must be answered by professionals in the sciences and technologies.
The Humanistic Technology philosophy that has been defined above includes a number of behavioral descriptors that relate directly to the above EHVIST concerns. It is possible that such statements could be developed into proposals for research projects that could be fundable by EHVIST.

For the fiscal year 1976 EHVIST has established program priorities that would favor research that takes the form of in-depth case studies of specific historical or contemporary situations in which values conflict with or impact upon technology or science. There is an apparent recognition on the part of NSF and NEH of a need for the development of public awareness of the close ties between human values and technological development. EHVIST is also considering the funding of experimental workshops and national conferences which focus on values questions related to scientific and technological development. Although EHVIST is not accepting proposals for curriculum projects at this time, it is expected that current activities will lead to the development of materials that are essential to course and curriculum development and it is probable that such projects will become fundable in the future.

The investigator strongly recommends the development of materials that would lead to teacher behaviors that parallel those outlined in the operational definition for
Humanistic Technology. Outlines for courses and curricula can be developed through in-service workshops or graduate seminars, and proposals can develop from such outlines.

The gap between the two cultures will not close unless educators admit that it exists and then seek the means to close it with an adjusted philosophical outlook.
LIST OF REFERENCES
LIST OF REFERENCES


Lauda, Donald P. (Ed.) *Technology, Values and Education.* Terre Haute, Ind.: School of Technology, Indiana State University, Publisher, 1971.


Scobey, Mary M. *Teaching Children About Technology.* Bloomington: McKnight and McKnight Publications, 1968.


APPENDICES
APPENDIX A

THE EVALUATION INSTRUMENT

HUMANISTIC TECHNOLOGY
AN OPERATIONAL DEFINITION
EVALUATION FORM
Teacher Functions

1. Planning

1.1 Formulating

1.1.1 Determining Educational Goals.

1.1.1.1 Related to the teacher's view of reality:

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<th>1.1.1.1.1 The teacher will establish educational goals that aid students to apply industrial-technical knowledge to problems of man in the real world.</th>
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1.1.1.2 Related to the teacher's view of knowledge:

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<table>
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<tr>
<th>Include</th>
<th>1.1.1.2.4 The teacher will establish educational goals that will enable students to establish criteria for evaluating the worth of technological innovations through the processes of technological assessment.</th>
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</table>
1.1.1.3 Related to the teacher’s view of values:

Include
1.1.1.3.1 The teacher will establish educational goals that will enable the student to apply his value system to his use of technology or to his use of the products of technology.

Omit
Change
Include
1.1.1.3.2 The teacher will establish educational goals that will enable the student to analyse his values related to technology to determine whether they are conducive to man's survival on earth and to man's living in harmony with man.

Omit
Change
Include
1.1.1.3.3 The teacher will establish educational goals that will enable the student to compare his values related to technology with the values of other individuals and to establish an homogeneous value-system.

Omit
Change
Include
1.1.1.3.4 The teacher will establish educational goals that will enable the student to examine the currently dominant value-systems of our society to determine whether technological control is possible with those systems.

1.2 Researching

1.2.2 Describing.

1.2.2.1 Related to the teacher’s view of reality:

Include
1.2.2.1.1 The teacher attempts to describe the reality of the man-made world as it impacts upon the reality of the natural world.

Omit
Change
Include
1.2.2.1.2 The teacher attempts to describe the full impact of selected elements of the man-made world on mankind and on the environment.

Omit
Change
Include
1.2.2.1.3 The teacher attempts to describe the close relationship between man's technology and his cultural or intellectual condition.

Omit
Change
Include
1.2.2.1.4 The teacher attempts to describe the value of the man-made world and its impact upon man's values.

Omit
Change

1.2.2.2 Related to the teacher’s view of knowledge:

Include
1.2.2.2.1 The teacher attempts to describe man's applications of technology to the solution of human problems.

Omit
Change
1.2.2.2 The teacher attempts to describe techniques for analyzing man's use of technology.

1.2.2.3 The teacher attempts to describe processes for using technological knowledge to solve problems, and the nature of new problems that might result from the technology.

1.2.2.4 The teacher attempts to describe technological knowledge as equal in importance to the other domains of knowledge.

1.2.2.5 Related to the teacher's view of values;

1.2.2.5.1 The teacher attempts to describe the application of values to man's use of technology.

1.2.2.5.2 The teacher attempts to describe procedures for analyzing the values that regulate technological growth.

1.2.2.5.3 The teacher attempts to describe divergent values and procedures for resolving value differences into a value-system for the regulation of technological growth.

1.2.2.5.4 The teacher attempts to describe values in a manner that places a spectrum of values before the student rather than a hierarchy of values, and emphasizes the impact of values on technological growth.

1.3 Designing

1.3.2 Preparing student performance expectations.

1.3.2.1 Related to the teacher's view of reality;

1.3.2.1.1 The teacher will expect the students to demonstrate the importance of technological knowledge as applied to problems of man.

1.3.2.1.2 The teacher will expect students to analyze the relationship between the natural and man-made world to determine appropriate directions for technological growth.

1.3.2.1.3 The teacher will expect students to be capable of proposing future technological realities for man.
Include 1.3.2.1.4 The teacher will expect the student to be able to illustrate the effect of the natural and man-made world on man's values.

Omit

Change

1.3.2.2 Related to the teacher's view of knowledge:

Include 1.3.2.2.1 The teacher will expect the student to be able to apply industrial-technical knowledge to specific problem situations in the laboratory.

Omit

Change

Include 1.3.2.2.2 The teacher will expect the student to be able to analyze industrial-technical knowledge to determine its benefits to man and its relationship to the other domains of knowledge.

Omit

Change

Include 1.3.2.2.3 The teacher will expect the student to be able to develop technological solutions to self-identified problems.

Omit

Change

Include 1.3.2.2.4 The teacher will expect the student to be able to judge the relative merit of selected technological solutions to the problems of man.

Omit

Change

1.3.2.3 Related to the teacher's view of values:

Include 1.3.2.3.1 The teacher will expect the student to demonstrate their acquisition of a value-system related to man's use of technology.

Omit

Change

Include 1.3.2.3.2 The teacher will expect the student to be able to analyze their value systems to determine how well they fit into the society in which they live.

Omit

Change

Include 1.3.2.3.3 The teacher will expect the student to contribute to the development of an "ideal" value system which would best serve the needs of man in a technological society.

Omit

Change

Include 1.3.2.3.4 The teacher will expect the student to be able to discuss a spectrum of possible values as opposed to an hierarchy of values.

Omit

Change

1.4 Engineering

1.4.1 Detailing the instructional program.

1.4.1.1 Related to the teacher's view of reality:
1.4.1.1 The teacher will devise and/or implement educational experiences that will enable students to seek extensive meanings for the industrial technology that exists in our society.

1.4.1.2 The teacher will devise and/or implement educational experiences that enable the student to engage in hypothesizing concerning the nature of industrial technology and the effects of industrial technology on man and the eco-system.

1.4.1.3 The teacher will devise and/or implement educational experiences that expose the student to a sense of connectedness with the growth of industrial technology.

1.4.1.4 The teacher will devise and/or implement educational experiences that enable the student to explore his sense of power or powerlessness over the direction and pace of industrial-technical growth.

1.4.1.2 Related to the teacher's view of knowledge:

1.4.1.2.1 The teacher will devise and/or implement educational experiences that will permit students to apply basic technological knowledge and skills to problems in the laboratory.

1.4.1.2.2 The teacher will devise and/or implement educational experiences that enable the student to generate alternative actions within the realm of industrial technology.

1.4.1.2.3 The teacher will devise and/or implement educational experiences that aid the student to synthesize the activities of his industrial education experience to explain the social context of industrial technology and the power of the individual to alter that social context.

1.4.1.2.4 The teacher will devise and/or implement educational experiences that enable the student to predict outcomes of actions within the realm of industrial technology.

1.4.1.3 Related to the teacher's view of values:

1.4.1.3.1 The teacher will devise and/or implement educational experiences that will enable students to utilize rational processes to examine the value of industrial technology and its effects on man and the eco-system.

1.4.1.3.2 The teacher will devise and/or implement educational experiences that will enable the student to engage in analytic procedures to determine the effect of elements of industrial technology on man's values.
1.4.1.3.3 The teacher will devise and/or implement educational experiences that will aid the student to reach a sense of self-fulfillment regarding his use of industrial technology, and his control over industrial technology.

1.4.1.3.4 The teacher will devise and/or implement educational experiences that will enable students to use inquiry techniques to determine the value of elements of industrial technology as they apply to man's existence on earth.

2. Organizing

2.1 Structuring

2.1.4 Setting learning conditions.

2.1.4.1 Related to the teacher's view of reality:

2.1.4.1.1 The teacher will establish learning conditions that permit the student to apply his concept of technological reality to the solution of selected problems.

2.1.4.1.2 The teacher will establish learning conditions that permit the student to analyze technological methods that have been used to solve human problems.

2.1.4.1.3 The teacher will establish learning conditions that permit the student to combine knowledge from all four domains into solutions for human problems identified by the student.

2.1.4.1.4 The teacher will establish learning conditions that permit the student to evaluate the present state of our technology and to propose changes for future realities.

2.1.4.2 Related to the teacher's view of knowledge:

2.1.4.2.1 The teacher will establish learning conditions that permit students to apply technological knowledge to the solution of selected problems in the laboratory.

2.1.4.2.2 The teacher will establish learning conditions that permit students to analyze technological knowledge in order to make its structure easier to grasp.

2.1.4.2.3 The teacher will establish learning conditions that permit students to demonstrate their learning through activities designed to synthesize acquired knowledge through the development of concrete or abstract problem solutions.
2.1.4.4 The teacher will establish learning conditions that permit students to evaluate their knowledge concerning the technological society to determine their competence to control its direction and growth.

2.1.4.3 Related to the teacher's view of values:

Include 2.1.4.3.1 The teacher will establish learning conditions that permit students to apply their values to the development of technological scenarios for the future.

Omit

Change

Include 2.1.4.3.2 The teacher will establish learning conditions that permit students to analyze their future scenarios to determine possible problems for man and the environment.

Omit

Change

Include 2.1.4.3.3 The teacher will establish learning conditions that permit students to apply divergent values from other individuals to the solution of technological problems.

Omit

Change

Include 2.1.4.3.4 The teacher will establish learning conditions that permit students to engage in assessment activities to determine the effect of various technological practices on their own or their society's values.

Omit

Change

2.2.2 Procuring materials and arranging for team teaching.

2.2.2.1 Related to the teacher's view of reality:

Include 2.2.2.1.1 The teacher selects instructional materials that reflect the practices of man in the production of goods through the application of industrial-technical knowledge.

Omit

Change

Include 2.2.2.1.2 The teacher analyzes instructional needs as they relate to material shortages and attempts to avoid usage of those materials in short supply.

Omit

Change

Include 2.2.2.1.3 The teacher selects instructional materials that reflect the close relationship between the natural and the man-made world.

Omit

Change

Include 2.2.2.1.4 The teacher selects instructional materials on the basis of their accuracy in depicting elements of the man-made world as they affect man and the environment.

Omit

Change

2.2.2.2 Related to the teacher's view of knowledge:
2.2.2.1 The teacher selects instructional materials that permit or illustrate a direct application of technical knowledge to practical problems.

2.2.2.2 The teacher analyzes his own knowledge base, and utilizes other teachers or human resources to fill in where gaps in his own knowledge are recognized.

2.2.2.3 The teacher utilizes multi-media and multi-material approaches to facilitate maximum student learning of the essential concepts of man's technology.

2.2.2.4 The teacher will determine the extent to which material waste from the instructional system is likely to pollute air, water, or the landscape and will take necessary steps with students to prevent such pollution.

2.2.2.3 Related to the teacher's view of values:

2.2.2.3.1 The teacher attempts to apply humanistic values to the selection and use of instructional materials.

2.2.2.3.2 The teacher analyzes instructional materials to determine the extent to which positive reinforcement of concepts regarding the humane use of controlled technology is presented.

2.2.2.3.3 The teacher utilizes team teaching to demonstrate other value orientations concerning the use of technology in man's society.

2.2.2.3.4 The teacher evaluates instructional materials to establish an instructional system that is most likely to assist students in establishing an humane value orientation and in achieving the other goals and purposes of the instructional program.

3. Controlling

3.1 Directing

3.1.1 Supervising learning experiences.

3.1.1.1 Related to the teacher's view of reality:

3.1.1.1.1 The teacher will encourage student activity that increases awareness and appreciation of the character of the natural and man-made world.
3.1.1.2 The teacher will direct students toward activity that will encourage close examination of the elements and interactions of the natural and man-made worlds.

3.1.1.3 The teacher will encourage students to combine knowledge of the natural world with knowledge of man's practices to develop a model socio-technical system.

3.1.1.4 The teacher will encourage students to engage in valuing of man's technological achievements and of proposed technological innovations.

3.1.1.2 Related to the teacher's view of knowledge:

3.1.1.2.1 The teacher will encourage students to apply knowledge of man's practices to the solution of individual and social problems.

3.1.1.2.2 The teacher will act as a fellow seeker of knowledge as he encourages students to critically analyze man's technologies.

3.1.1.2.3 The teacher will serve as a resource person as students attempt to synthesize their learning of the natural and the man-made world through the development of technological scenarios for the future.

3.1.1.2.4 The teacher will assist students to establish the value of various elements of technical knowledge and to place such discrete elements into a logical taxonomy of knowledge.

3.1.1.3 Related to the teacher's view of values:

3.1.1.3.1 The teacher will encourage students to express the values that direct their applications of technical knowledge or their use of the products of technology.

3.1.1.3.2 The teacher will encourage students to analyze the values which direct their use of technology or the products of technology to determine whether such values are congruent with their own image of an ideal value system.

3.1.1.3.3 The teacher will support students in their attempts to establish a valid value system out of the spectrum of values held by the class as a group concerning the use of technology and technological controls.
Include 3.1.3.4 The teacher will encourage students to establish the
relative merit of selected valued technologies as they
relate to selected human values.

3.2 Monitoring

3.2.1 Measuring student performance.

3.2.1.1 Related to the teacher's view of reality:

Include 3.2.1.1.1 The teacher will examine the students on their ability
to identify with the world as it now exists, and on
their perception of their ability to change the world
as individuals.

Change

Include 3.2.1.1.2 The teacher will examine the students on their ability
to analyse selected elements of the man-made world to deter­
mine the function of such elements in supporting or retard­
ing the evolution of man.

Change

Include 3.2.1.1.3 The teacher will examine the students on their ability
to present natural and man-made conditions that con­
stitute a viable environment for modern man.

Change

Include 3.2.1.1.4 The teacher will examine the students on their ability
to judge the merit of man's current technology as it
serves to meet human needs.

Change

3.2.1.2 Related to the teacher's view of knowledge:

Include 3.2.1.2.1 The teacher will examine the students on their ability to
apply industrial-technical knowledge to the solution of
selected problems in the laboratory.

Change

Include 3.2.1.2.2 The teacher will examine the students on their ability
to analyze man's past and present technology to deter­
mine the effects of that technology on man and the
eco-system.

Change

Include 3.2.1.2.3 The teacher will examine the students on their ability
to synthesize elements of man's technology with man's
values to solve problems created by the misuse of tech­
nology.

Change

Include 3.2.1.2.4 The teacher will examine the students on their ability
to determine the value of basic and specific industrial
technical knowledge and practices.

Change

3.2.1.3 Related to the teacher's view of values:
3.2.1.3.1 The teacher will examine the student's value-system acquisition through the use of student developed scenarios in which the student's values are applied to the direction of technological growth and development.

3.2.1.3.2 The teacher will examine the students on their ability to critically analyze the scenarios of other students who have applied their own value systems to the direction of technology.

3.2.1.3.3 The teacher will examine the students on their ability to overcome institutional or individual inertia as they establish a spectrum of values for technological development and control.

3.2.1.3.4 The teacher will examine students on their ability to discuss the relative merit of various value-systems as to their power to control the direction and pace of industrial-technical growth.

3.3 Reporting

3.3.2 Appraising student achievement.

3.3.2.1 Related to the teacher's view of reality:

3.3.2.1.1 The teacher will make an appraisal of the student's ability to identify with the natural and man-made world.

3.3.2.1.2 The teacher will make an appraisal of the student's ability to analyze his purpose and power in the technological world.

3.3.2.1.3 The teacher will make an appraisal of the student's ability to synthesize his experiences into a proposal for his own self-realization in interacting with the reality of the world and with other human beings.

3.3.2.1.4 The teacher will make an appraisal of the student's ability to evaluate man's technology and his own values to determine whether technology or personal values must change to maximize his possibilities for self-realization.

3.3.2.2 Related to the teacher's view of knowledge:

3.3.2.2.1 The teacher will make an appraisal of the students' ability to apply the knowledge that they have to problems rather than on their ability to know "everything" about the subject area.
3.3.2.2 The teacher will make an appraisal of the student's ability to analyze technology in terms of the results accrued from the technology rather than the intended purposes of the technology.

3.3.2.3 The teacher will make an appraisal of the student's ability to integrate practical knowledge with knowledge in other domains in the solution of individual and group problems.

3.3.2.4 The teacher will make an appraisal of the student's ability to express the value of rational action for technological growth as opposed to uncontrolled technological growth or growth based on narrow intensional attitudes.

3.3.2.3 Related to the teacher's view of values:

3.3.2.3.1 The teacher will make an appraisal of the student's ability to establish personal values based on experiencing and interacting with the real world.

3.3.2.3.2 The teacher will make an appraisal of the student's ability to analyze the extent to which his technological and human valuing has been introjected from others and not acquired through the process of experiencing.

3.3.2.3.3 The teacher will make an appraisal of the student's ability to synthesize technological and human values gained through the process of experiencing with values that have been introjected upon him through social and environmental interaction to form a personal value-system for the use of technology.

3.3.2.3.4 The teacher will make an appraisal of the student's ability to explain that his values are in a constant state of change—that technology, society, and aspects of the natural world impinge upon him and his value structure—and that technical action should be examined for extensional results and not for any inherent or intrinsic "rightness" or "wrongness" of the act.

3.4 Correcting

3.4.5 Redirecting educational goals or activities. (As indicated by pupil or program evaluations)

3.4.5.1 Related to the teacher's view of reality:

3.4.5.1.1 The teacher will redirect educational goals or activities when students are unable to apply their view of themselves to the reality of their technological society.

3.4.5.1.2 The teacher will redirect educational goals or activities when students are unable to analyze present technology to determine its human consequences.
3.4.5.1 The teacher will redirect educational goals or activities when students are unable to relate humanistic goals to the growth of technology.

3.4.5.2 Related to the teacher's view of knowledge:

3.4.5.2.1 The teacher will redirect educational goals or activities when students are unable to apply technological knowledge to problems in the laboratory.

3.4.5.2.2 The teacher will redirect educational goals or activities when students are unable to analyze possible applications of technical knowledge for their human consequences.

3.4.5.2.3 The teacher will redirect educational goals or activities when students are unable to synthesize their learning into new concrete or abstract technological structures.

3.4.5.2.4 The teacher will redirect educational goals or activities when students are unable to apply evaluation criteria to technological innovations or to engage in assessment activities to determine the worth of new technologies.

3.4.5.3 Related to the teacher's view of values:

3.4.5.3.1 The teacher will redirect educational goals or activities when students are unable to illustrate the influence of values on the application of technology to human problems.

3.4.5.3.2 The teacher will redirect educational goals or activities when students are unable to analyze their own values or the values of others as they relate to the use of technology.

3.4.5.3.3 The teacher will redirect educational goals or activities when students are unable to synthesize their technological knowledge with their value system.

3.4.5.3.4 The teacher will redirect educational goals or activities when students are unable to establish a personal value-system for their use of technology or to appreciate the close relationship between technological growth and cultural values.
APPENDIX B

COVER LETTER
Dear Colleague,

Man's technology has been metaphorically described as a two edged sword. Every positive effect of technology is said to be attended by negative effects. The negative impacts of technology upon man and his society have led many individuals to fear technology--to feel powerless to control technology, and some have withdrawn from high technology societies to form new low technology communes.

The gap between the humanist and the technologist has created severe problems in establishing control over technological development. A philosophical position that unites the concerns of the humanist and the technologist seems to be needed to close the philosophical gap between the two cultures. Our technical education system could serve to establish such a closure of the man-nature-technology circle.

Enclosed you will find two copies of an operational definition of an educational philosophy that might be appropriate for technical educators of today and of the future. The philosophy has been labeled a Humanistic Technology philosophy to indicate its purpose in unifying the concern of man's values with his technological action.

Please examine the behavioral statements that make up the operational definition and make any corrections, additions, changes, or deletions that you feel would be appropriate. Send the corrected copy with the attached telephone interview schedule to the undersigned in the enclosed self-addressed and stamped envelope. You will be called at the time indicated on your response. Your suggestions and opinions will be included in the final draft form of a study undertaken by the undersigned in partial fulfillment of requirements for the PhD at The Ohio State University.

Thank you for your cooperation,

T. Norman Tomazic, Assistant Prof.
Dept. of Industrial Education and Technology
Western Kentucky University
Bowling Green, KY 42101

Enclosures
APPENDIX C

TELEPHONE INTERVIEW SCHEDULE FORM
TELEPHONE INTERVIEW RESPONSE FORM

Please schedule the telephone interview with me during one of the hours marked in the below schedule.

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The number where I may be reached during the above marked times is:

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I understand that the telephone interview will be taped and that a transcript of the tape will be sent to me for correction or editing before it is included in your study.

______________________________________
Signature of Interviewee
APPENDIX D

THE EVALUATION TEAM
THE EVALUATION TEAM

Listed below are the twelve educators who were sent the evaluation instrument. The names marked with an asterisk are those who decided not to participate after they received the materials and had an opportunity to reflect on their agreement to serve on the panel of judges.

1) Dr. Paul W. DeVore, Professor
Technology Education
College of Human Resources
West Virginia University
Morgantown, W. V. 26506

2) Dr. Clyde M. Hackler, Chairman
Department of Technology
Western Washington State College
Bellingham, Washington 98225

3) Dr. Marshall Hahn, Professor
Dept. of Vocational Education
New York University--Washington Square
New York, New York 10003

4) * Dr. Olaf Helmer, Professor
School of Business Administration
University of Southern California
Los Angeles, California 90007

5) Dr. Melvin Kranzberg
Society for the History of Technology
Georgia Institute of Technology
Atlanta, Georgia 30332

6) Dr. Donald P. Lauda, Coordinator
Technology Education
College of Human Resources and Education
West Virginia University
Morgantown, W. V. 26506

220
7) Dr. Michael S. Littleford, Asst. Prof.
Foundations of Education
School of Education - Haley Center
Auburn University
Auburn, Alabama 36803

8) Dr. Donald Maley, Chairman
Industrial Education Department
College of Education
University of Maryland
College Park, Maryland 20742

9) Dr. Lloyd P. Nelson, Dean
College of Fine and Applied Arts
Ball State University
Muncie, Indiana 47306

10) * Dr. Fred Olsen
Department of Technology
Western Washington State College
Bellingham, Washington 98225

11) Dr. Robert Swanson, Chancellor
University of Wisconsin -- Stout
Menomonie, Wisconsin 54751

12) Dr. Ethan A. T. Svendsen, Chairman
Department of Industrial Arts Education
Indiana State University
Terre Haute, Indiana 47809
APPENDIX E

TRANSCRIPTS OF TELEPHONE INTERVIEWS

WITH THE EVALUATION TEAM
Transcript of Telephone Interview

Dr. Paul W. DeVore
West Virginia University

9:00 p.m., June 5, 1975

Subject:

Humanistic Technology
Operational Definition Evaluation
Question #1

To what extent is there a need for a new philosophy of industrial or technical education that might be titled a Humanistic Technology philosophy?

Answer:

I'm sort of an angry man at this point in the education effort. We really need to review our goals and philosophies.

I just finished reviewing the new issues of Technology Review and Scientific American. Two days ago I returned from Washington, D.C. and a meeting of the World Future Society. I don't like to be an alarmist or a doomsayer, but as I read and listen to people such as cab drivers in Washington -- we drove by schools that were being destroyed by children -- and we talked about parents and social structures and economics. It is evident that we have major problems. A lot of these problems, most of them, relate to the lack of correlation between the behavior of the technical system and our social system.

Levels of behavior and levels of expectations are so different within our society. Recently I made a speech to a group at a Phi Delta Kappa Bicentennial Meeting in Charleston, West Virginia. In preparing for the presentation I identified for myself the issue to be that of the spirit of man. Somehow we seem to have lost our sense of direction. For some reason or other we haven't internalized the very specific and critical values related to the questions of: "Who am I?" "Why am I here?" "How do I relate to others?" "Where are we going as a society?"

Rather we have focused our educational efforts on short term goals, like job preparation. And so long as industrial educators, technical educators, vocational educators and industrial arts educators think that their primary job is getting people ready for jobs; so long as they have this goal and its attendant philosophy as the basic underlying goal and philosophy, and so long as these educators perceive the students in their classes only as future workers and contributors to building a greater Gross National Product then I think we have some very serious problems. The mandate is clear to me, our philosophy must be changed. It has to be human -- placed in a human context, else, "What the hell are we existing for?" This is a human world and unless we enhance your life and my life with whatever the tools are, the technologies, the
social techniques, the United Nations, the local government, the town council and the way we relate to our neighbor's view, then we are not going to have a humanistic world or a humanistic technology.

Recently I became involved with the idea of "thinking small". This has to do with what is called intermediate technology. This approach to technology has to do with designing technology that is valid in a finite world, a technology that is not capital intensive nor energy intensive. It is part way between a primitive existence and an existence discussed in Technology Review as the total elimination of workers from manufacturer. With micro-miniaturization and the low cost of the computers today such a future is possible. It is cheaper to buy a computer than it is to use a man. The question is one of training vs. education. It is a question of an educational program shaping people for some kind of world that a typical educator or industrial arts teacher believes exists out there.

I like to place the question in a personal context. "How do we prepare my young son and my daughter to participate fully in life -- in a democracy -- in a high technology society?" This is the basic question and we should get on with the business of pursuing it. Unfortunately we have too many teachers who believe the business that we should get on with is their main interest, not the interest of the child. Some time ago, an "industrial arts teacher" wrote me a letter. He said he taught woodworking and that if I had a job teaching woodworking he would like to join our faculty. He reminded me that he was the best woodworking teacher in the United States and if we didn't have a job teaching woodworking, don't contact him. It's this sort of thinking that is at the core of the problem. He wasn't interested in teacher education at all. His values, his orientation, was to wood, to a material, and not to people. This is not the kind of teacher educator that we need. This, I believe, begins to answer your question about a humanistic technology.

Question #2

What reservations do you have concerning the Humanistic Technology philosophy as it has been defined?

Answer:

My only reservations, and they are minor, are in the use of some of the terms. We need to eliminate or
alter or place in other contexts the terms "industrial" and "technical". Let's look at item 3.1.1.1.3. This item concerns socio-technical systems. This perspective of technology must be emphasized more if we are to direct our educational programs toward a humanistic technology.

Rather than industrial-technical, socio-technical is closer to a term that describes the intent. Socio-technical is a term that has more impact on the true meaning of humanistic than does industrial-technical.

That would be a quick comment and I think one that I can hold to for some time. From the beginning to the end of your questionnaire, I was interested in statements which implied a redirecting of educational goals.

Question #3

Would it be desirable to implement a teacher education curriculum that would develop a Humanistic Technology philosophy for technical teachers?

Answer:

By all means. But not for technical teachers only, for all teachers. This is essential, I believe, particularly for people in the humanities and the social sciences. There is a good book review on Zen and the Art of Motorcycle Maintenance in the last issue of Technology Review. The reviewer is an English teacher at MIT. She admitted that when she went to MIT she was quite biased against engineers because she knew that they didn't know anything about arts and letters and plays and so on. But she "came a cropper" on that assumption because she found they were as astute as she was on many of the readings and writings of poets and plays and music events. She discovered that what she had to do if she was going to live in that environment was to become acquainted with the computer and with technology and the sciences, areas in which she didn't have an adequate background. My answer is that all teachers need a basic education in the activities of man. The impact, the power of technology, the potential of it should be known not only by technical teachers but by all teachers. Technical teachers, certainly, but also all others.
Question #4

Are there any other comments that you would like to make concerning the philosophical position defined?

Answer:

I would like to see humanistic technology described by means other than simple statements. I'm a great one for narrative. Have you done a narrative on this?

Investigator:

Yes, there is a narrative explanation of the philosophy in the body of the dissertation. I had that same comment from Dr. Littleford who is at Auburn University -- she didn't care for the discrete statements for the definition and would have preferred a narrative form.

DeVore:

There are some things missing for me. I would like to see a narrative. I would start along this line, but maybe that's where you came from; maybe you have already been there and what I'm saying is really old hat. I would start with a philosophical statement. Your definition is a statement, but its a different way of structuring a philosophical statement. From the narrative philosophical statement or within the narrative you should discuss what you believe man to be and what you believe to be the purpose of life. You should attempt to answer the old, old questions of: "Who am I?", "Why am I here?", "Where are we going?", "Who is man?", "Why is he here?", and "Where is he going?". And then, from these answers I've always like to ferret out assumptions about man, society and education. From the assumptions we can derive implications about education, educational goals and the content and structure of education. From the educational goals objectives can be derived and the process continued until you arrive at activities and strategies to attain the goals. To restate my position, it seems to me that you need to determine your assumptions about man, about society, about education, about life and living. From these assumptions, which should match your statements if that was done, you should be able to derive implications which should match the statements in your questionnaire. In other words, if you had completed the above, you should be able to give
this to somebody else. You would say, "Here is my philosophy." "This is my educational philosophy." "These are the assumptions that I derived from my philosophy and these are the implications." This, with those implications, somebody else ought to be able to match your implications with the statements in your questionnaire. The individual assisting you could say, "O.K. this implication meets statement 1.1.1.2.4, and etc. Maybe you have already done this.

Investigator:

That was really the way that I developed the operational statements. It was from a somewhat narrative form to a series of assumptions and then to the discrete statements. In the concluding chapters I hope to synthesize some of the viewpoints that I gained from the evaluation team. And I've had some very helpful statements from you and the other evaluators. It helped me, really, to clarify my own point of view. The reactions frequently were expressions of what I wanted to say with some of the statements but didn't.

DeVore:

Your tactic is important in this area. I think more of our people than ever before are coming around to this point of view. They are questioning why we are in the public schools. The humanistic point of view is developing. I just visited teachers in Baltimore, Buffalo, and Williamsport, Pennsylvania in conjunction with the development of a middle school program for a publication series. The more you talk with teachers, the more the humanistic technology viewpoint comes out. They share this philosophical point of view. It may be a long time in coming, but I believe it has always been a latent viewpoint. It has always been there. However, our field, industrial arts, keeps getting on "bandwagons". During the early 60's it was the occupational effort, then the "world of work" effort with a lot of so-called economic and econometric solutions, matching people to jobs, and so forth. We seem prone to forget the social context of what should be our direction. It's just possible that a re-evaluation of our goals may bring about the discovery that our present technology is inappropriate for a humane society. One example would be our design of inappropriate transportation systems. The phrase inappropriate technology, there is appropriate technology, has a lot of meaning. The term appropriate technology has meaning if you are talking about
a humanistic technology. A humanistic technology is an appropriate technology. It would be the type of technology that would enhance all people and not only the G.N.P. For instance, in technology everything that is designed that produces a high noise level is inhumane. Present technology is energy intensive and capital intensive. It is also highly destructive of the environment and denies man of one of his prime modes of expression, his work. For example, the President's nuclear power plan requires a tremendous investment of capital. It may be an investment of capital that is beyond the actual return in human terms. Conservation, a change of life style, a rethinking of who we are is the way we must pursue the future. But, I have digressed. I wish you success on your project.
Transcript of Telephone Interview

Dr. Clyde M. Hackler
Chairman
Department of Technology
Western Washington State College

11:00 a.m., May 19, 1975

Subject:

Humanistic Technology
Operational Definition Evaluation
Question #1

To what extent is there a need for a new philosophy of industrial or technical education that might be titled a Humanistic Technology philosophy?

Answer:

I think certainly there is a need for developing some kind of direction in the study of technology. There needs to be some system - some analytical approach to the study of technology. Examining what exists today to see how these objects or systems have given us the values that we hold today -- that could be a very important implication -- which came first? -- the chicken or the egg? -- that could be a very important issue in the study of values and technology.

Question #2

What reservations do you have concerning the Humanistic Technology philosophy as it has been defined?

Answer:

The reservations that I have relate to the bias that I feel seems to be built into the definition. I received the impression that there was a bias throughout the definitional form and that's something that bothered me. There should be a consideration of the positive aspects of technology as it affects humans. Basically my reservations are;

1) There seems to be a great deal of overlap or repetitiveness in the statements.

and 2) There seems to be a bias toward the negative effects of technology.

Because certainly there are some very positive implications. I think that we are more human today than we ever were, and I think we could be even more. And I think we can realize our human potential with the help of technology.
Question #3

Would it be desirable to implement a teacher education curriculum that would develop a Humanistic Technology philosophy for technical teachers?

Answer:

Yes, it would be desirable, but at this point in time I'm not sure how it could be done. With the state-of-the-art, I'm not at all sure that we could do it right now. But I think certainly it's something to be worked toward.

Question #4

Are there any other comments that you would like to make concerning the philosophical position defined?

Answer:

No comments at the moment.
Transcript of Telephone Interview

Dr. Marshall Hahn
New York University, Washington Square

8:00 a.m., June 17, 1975

Subject:

Humanistic Technology
Operational Definition Evaluation
Question #1

To what extent is there a need for a new philosophy of industrial or technical education that might be titled a Humanistic Technology philosophy?

Answer:

If we are looking for new goals and new methods of studying industrial arts -- I think there is a strong need for this approach. That doesn't necessarily mean that we would get rid of all the past thinking related to technical education -- but I think that the humanistic statements certainly wouldn't hurt anything and I think that we do need redirection -- so I am in favor of the philosophy. How would you like me to indicate my emphasis? Is there a scale that you are using?

Investigator:

No -- I have no scale for your responses, I am looking for your general response only.

Hahn:

O.K. I would say that there should be a strong emphasis. Now I'm not certain -- I haven't studied it thoroughly -- as to how this might affect teaching in general -- because whenever you have an action, as my engineering friends always tell me, you have an opposite reaction. So if we go forward with the humanistic emphasis, what will we be leaving out? I'm not certain that we could only go toward humanistic values because I think that is part of our trouble -- with our discipline of children we have allowed them to think that their direction -- and that what they want and desire is the only important thing. And therefore a humanistic emphasis from that aspect also has some negative connotations. But I do think that if I were to rate this with a scale of one through five with five being the highest rating, I would rate it as a four or maybe a four point three or a four point five. Certainly not a full five because that would indicate that it would be the only direction -- and then we would have some implications from it that we haven't considered. I think this is an important point to consider -- "What are the implications of going in that direction?" I certainly think that we should take a look at humanistic technology and see if it is superior to what
we have had for the past thirty to seventy years. We have looked only at the industrial side and said that we were working for industry, when, in fact, we are not working for industry -- we shouldn't be -- we should balance both sides of the issues between industry and society.

Question #2

What reservations do you have concerning the Humanistic Technology philosophy as it has been defined?

Answer:

I do have some reservations in that we have to study what the effects are going to be. And, if we plan for and consider these effects, then, I believe we can improve education -- but if we just go from the far left to the far right, we won't solve what we are trying to solve. We've got to choose a middle ground -- to think about -- to study -- and to meditate on what we are actually trying to have take place. I can't emphasize enough that in the study of technology we haven't gone nearly far enough in studies of the effects of what we decide to pursue. Whether it be the use of plastics or the use of energy or the non-use of plastics or the non-use of energy, we must examine the action for its human effects. The humanistic values would not necessarily have to be negative to technology and technology development. I think that if you examine it philosophically you would have to say that we have gone to the far left in the past thirty to seventy years and we have looked at only one side -- we haven't told both sides of the story. I have never seen any textbook or any piece of literature that we use to describe industry -- some of the negative aspects of industry. There is no mention of the point that in today's multi-national corporations bribery is a normal business practice. Even in small construction businesses, cheating on the code to save time or nails is fairly common. Over the years the contractors save a few hundred dollars -- it becomes standard procedure, but we don't examine these practices or criticize them. To me this is not doing the full job -- we have got to give both sides -- and if we don't give both sides, students will come to believe that there is only one side. It is analogous to our television productions -- if violence is the only thing you see, you tend to believe that violence is natural. It doesn't have to be that way. It shouldn't be that way! Therefore, humanistic technology could be interpreted as anti-technological advancement, but it isn't
necessarily so. The same is true of energy — it doesn't mean that to cut down the use of fossil fuels and to adopt the use of alternative energy sources that we go backward in our standard of living — one doesn't necessarily follow the other. Therefore I can't say that a negative reaction to technology is logical — it becomes logical if you only look at half the story — I can't do that.

Question #3

Would it be desirable to implement a teacher education curriculum that would develop a Humanistic Technology philosophy for technical teachers?

Answer:

Only to the point that the curriculum would tell both sides of the story. You have got to look at humanistic technology, but, on the other hand, you also have to look at the economic issues. I don't know if the two are compatible or should be used together, but I'm saying that industries won't exist unless there is some profit and industries should not exist unless they are for the benefit of mankind. Any industry -- thalidomide comes to mind -- any industry that is functioning when it knows of consequences of its actions that are anti-societal -- in whatever country that you look at -- then the people in charge of those industries should have enough concern for humanity to disband. Unless you bring this out in the classroom and you take the attitude that both sides of the story are important, then you have a continuation of the status quo. You as a teacher have to demonstrate by your actions that you have thought things through and are willing to do something about it. A humanistic technology philosophy has to be lived!

Question #4

Are there any other comments that you would like to make concerning the philosophical position defined?

Answer:

Well -- I was very happy to see it come through. I don't know that anyone else, so far as I've observed, in our profession has approached it quite like you have.
I was very happy to see it come through. I hope that we can continue to go in that direction and that we will be able to achieve some round table discussions on this type of thing at future conventions. Because it is part of education and it has been overlooked for the past thirty years by the industrial arts teaching profession as well as by most of the other subject matter teaching groups. I think that we in industrial education have long overlooked humanistic values in our technology courses. I think we have held to the "party line" too long. I was just wondering, do you have any high school people on your evaluation team?

Investigator:

No. The team is made up of university level people.

Hahn:

That's what I was thinking -- you see when you get down to the firing line -- they might accuse us of being "up in our ivory towers" and part of the reason that they would feel that way is that they have feelings of insecurity and they might feel that they aren't quite doing as well as they should -- but they really don't know how to move in another direction. I hold to a very continual and rapid barrage of this kind of activity in my classes -- sometimes, perhaps, too much so. But, as I told a class just last night -- unless both sides are presented -- and unless you try to get students to read between the lines, the teachers themselves will not be thinking -- they will not be doing their homework. And they need to keep on top of things in order to have their students achieve the objectives that they should hold for the curriculum. Young teacher trainees ask, "Why do students act the way they do?" But they themselves don't study what is happening in society. I told my class last night that I expected that along with an energy crisis that will continue for many years from aspects of monetary and other standards and fuel shortages -- that we will have some very serious societal disruptions. The troops will be called in and we will say, "Why?" "Why did all this happen?" And, of course, the reason it will have happened is that today we are not reading the handwriting on the wall -- we are not reading the events of today. I told my class that when the riots come to this city -- within five years of my projection -- I don't want to be here.
Investigator:

I like the way Dr. DeVore phrased it several years ago — he suggested that we in industrial education have become technology "pushers" when we should be technology "pullers". I think he was suggesting that instead of pushing the technology that we now have, we ought to be directing it, leading it, and showing other possible ways for using technology.

Hahn:

Yes -- I agree with that. When I think back to some of the classes that I have visited, I don't recall much of that kind of teacher behavior. I would venture to say that in some classrooms I could sit for the whole year and important questions would never be raised, not once. On the other hand I can think of some classrooms where the teacher has begun to make some small, perhaps insignificant, but at least some attempt to cover questions in that direction -- but such teachers are few in number. And as for actions, I can see very few activities along those lines being developed.

Investigator:

I was interested in your presentation on alternative energy sources at the AIAA conference in Cincinnati. The activity of your students -- exploring possible solutions to our energy problems -- seems to be a step in the right direction.

Hahn:

I hope that a groundswell will develop sometime soon -- a groundswell that will begin to turn the profession. The whole thing, for me, evolved from my activity with the Committee to Study the Future. During the three-year period that I was associated with that committee, constantly studying the future, I thought, "Where do you go from here?" After you have studied the future and you know what might happen, what do you do? And unless you do something, what good does all the studying do? So I realized somebody has to do something and I felt that I had better start. That is why I got my students involved with investigations and the development of alternate energy devices.
Transcript of Telephone Interview

Dr. Melvin Kranzberg
Georgia Institute of Technology
Atlanta, Georgia 30332

10:30 a.m., June 11, 1975

Subject:

Humanistic Technology
Operational Definition Evaluation
Question #1

To what extent is there a need for a new philosophy of industrial or technical education that might be titled a Humanistic Technology philosophy?

Answer:

Yes, there is a need, but this humanistic technology philosophy is not new. It is already underway; industrial arts educators like Ray, Lux, DeVore and others have been working toward that direction, even though they may not have called it "humanistic technology philosophy". They look at industrial arts as teaching more than skills -- as part of a larger process in a technical world -- in a world full of interactions between technology and society.

The foundation for a humanistic technology philosophy derives from the fact that technology develops in order to meet human needs and wants. Technology is a problem solving activity, and problem solving often begets new problems.

Question #2

What reservations do you have concerning the Humanistic Technology philosophy as it has been defined?

Answer:

My definition would be in line with what Lux and Ray did in that textbook that they developed a few years ago. That is a good introduction to a definition. After all, one cannot define in a few words a phrase which obviously refers to many complex parameters. About all one could say is that a Humanistic Technology philosophy is one which considers the technological enterprise in terms of the human and social context in which it is carried on, and in terms of its efficacy in responding to social needs and human wants.

Question #3

Would it be desirable to implement a teacher education curriculum that would develop a Humanistic Technology philosophy for technical teachers?
Answer:

Yes -- if that's what you are trying to do -- my answer would be yes. But how you go about it is another matter. It would require a strong admixture of the social sciences and humanities with the technical training. But these should not be the traditional kinds of courses. Instead these should relate to the interactions of technology and society.

Question #4

Are there any other comments that you would like to make concerning the philosophical position defined?

Answer:

I have some general remarks that I wanted to make -- especially in reference to your introductory letter where you state, "The gap between the humanist and the technologist has created severe problems in establishing control over technological development." I'm not sure that that is what has created severe problems in establishing control over technological development. Instead, I would say it's not the gap between the humanist and the technologist, but the diffuse mechanisms of control over technology. The humanist has very little to say in controlling technology; the businessman and the technologist have control, but they exercise it through a number of diffuse mechanisms. That creates some severe problems. Because each corporation, each government agency, or the military pursues its own goal -- its narrow little path of development -- and while their actions may seem rational to them, when you put all these together you sometimes come out with a semi-disaster.

The humanist has not been involved very much, except to sit on the sidelines and deplore. So I'm not sure that the gap between the humanist and the technologist has created problems in establishing technological controls. It's the fact that there are no central coordinating mechanisms. Everybody pursues his own self-interests -- which seems rational to them -- but when you put all these individual and narrow "rationalities" together, it turns out to be irrational in terms of society as a whole.

I know that it has become commonplace to say that it's the gap between the humanist and the technologist that has created the trouble, but I disagree. There is a
gap between the technologist and the humanist, but I don't think that's what has created the problem -- it's the fact that we have such diffuse mechanisms of control: Everybody does "his own thing", and each of them is rational within its own frame of reference; but when you put them all together, they come in conflict with one another and with the values of society as a whole. I don't know if this is really part of your project, but I did want to make that comment.

Another comment I'd like to make is that I'm always thrown off by jargon in any specialized field. So I'm a little bit "put off" by the educationist jargon, and I would like it to be a little more comprehensible to someone who is not in the field. But, of course, we all make these complaints about other people's jargon, while continuing to use the jargon of our own field (only then it's called "technical vocabulary").
Transcript of Telephone Interview

Dr. Donald P. Lauda
West Virginia University
Morgantown, W. V. 26506

1:30 p.m., June 10, 1975

Subject:

Humanistic Technology
Operational Definition Evaluation
Question #1

To what extent is there a need for a new philosophy of industrial or technical education that might be titled a Humanistic Technology philosophy?

Answer:

In my opinion there is a definite need for a new philosophy of industrial education that might be called Humanistic Technology. This has not been approached by our profession to any great extent in spite of social indicators which justify it. We have been quick to study the tangibles of our society but even there we have avoided the new technological developments. However, an even greater problem that we perpetuate, is the disregard for the study of the consequences of technological growth.

Our basic problem lies with the teacher education institutions. They do not allow students to study the gestalt of technology, that is the socio-cultural elements are almost totally avoided. If students are going to live in a technological society, which is almost totally unavoidable on earth, they cannot function adequately if they merely understand how things work mechanically and electronically. It is imperative that they understand how the technology affects their lives and their institutions. Furthermore, they must realize that they can control the direction and pace of change.

Personally, I like the title "Humanistic Technology". It has a certain connotation to me. It is an extension of the term "humanities". Persons in the humanities have traditionally addressed themselves to the question: "What is the good life?" Of course they have made the same error (only in reverse). They tend to restrict their inquiry to the consequences of cultural advancement without talking about the advancement of science and technical development. I do not see how anyone can really understand their culture unless they study both sides of the coin.

Question #2

What reservations do you have concerning the Humanistic Technology philosophy as it has been defined?
I have no reservations at all, as a matter of fact, I feel very comfortable with it. The operational definition addresses itself to a study of technology which brings the humanist and the technologist together. Once you begin to unite people who are concerned about a humane way of life, and that group includes people from all walks of life, we might solve some of the pressing problems of the world.

My only concern about the definition is that most people in our discipline do not heed the social indicators which have prompted your study. Somehow industrial educators seem to be immune to such concepts as "dehumanization", "finite resources -- infinite demands", "exponential growth", etc. Yet we claim to be interpreting our industrial world and preparing people for their future.

Question #3

Would it be desirable to implement a teacher education curriculum that would develop a Humanistic Technology philosophy for technical teachers?

Answer:

Assuming that you are using the term "technical teachers" in a generic sense, I feel that such implementation is not only desirable but imperative. Without such a change it seems that our discipline is doomed. All of the governmental agencies are moving to unify efforts. For example, the National Science Foundation and the National Endowment for the Humanities are more than willing to fund projects jointly in order to get a humanistic perspective in technical developments. The Technology Assessment Office also works within this context. Industry, also, is taking a look at social problems. It might be that this is being forced upon them by legislation and pressure groups, but nonetheless they are getting involved. They are releasing people on sabbaticals to work on social problems, cleaning up the environment, taking great strides in making the workplace more humane, etc.

If our profession does not follow suit, that is, if we stay in our craft orientation, we cannot survive as a viable academic unit. If the teacher education institutions do not begin to prepare teachers who can cope with
such a philosophy I do not know how we can expect students to be ready for their future. It is difficult to work with teachers "in the trenches", so we must revamp the undergraduate level and produce teachers who can function within the context of your definition. At the same time we must not neglect to work with current teachers. This means in-service education must be directed at relevance. We must, in many cases, totally revamp our curriculum since current models are not contributing to a solution to societal problems. It might be that we are contributing to the split between the humanist and the technologist. If our discipline does not take advantage of its position in the technologies we are missing one of the greatest challenges ever presented to academia.

Question #4

What other comments would you like to make concerning the philosophical position defined?

Answer:

It is my sincere hope that your study can help to close the gap between those who subscribe solely to studying materials/processes and those who study social conditions. Through your study, certain areas of study should be identifiable which will assist our profession in designing undergraduate and graduate curricula.

In such a discussion, one runs the risk of being labeled a sociologist as well as one who neglects studying the technical elements of our society. I would like to make clear that that is quite the contrary. The whole point of my remarks to you is that we need a balance between the two areas. We definitely need to have students studying on a higher technical plane. For example, they should be involved with computers, lasers, technology assessment, forecasting, etc. This can be done via simulations, gaming, models; therefore eliminating the problem of high costs. Even elementary students can work with these complex elements.

As students move through the study of technology (which is a life-long process) they need to constantly question personal and societal values. The institution of education does not have the right to impose values but nonetheless they have the responsibility to allow students to define and refine the values that they hold or will hold in the future. To do this they need experience in
questioning, assessing and making rational decisions.

Our greatest challenge is to update the teacher educators in our discipline. Few programs in the country prepare teacher educators who can handle the concepts listed in your study. Teacher educators must be prepared who can work with undergraduate students from freshmen on. Reaching current teachers is another story. Full-time teachers are at a distinct disadvantage since they must rely on short exposure to new ideas (evening classes). When introduced to a whole new philosophy (humanistic technology) it is threatening and difficult to cope with. Teacher education institutions therefore need to alter their delivery mode. This might be accomplished by altering summer sessions into interdisciplinary programs, working with viable in-service education, resurrecting long-term workshops such as EPDA, etc.

Teachers, being teachers, are very busy people and rely on the teacher education institutions (in most cases) to generate new ideas, instructional materials, etc. Therefore if we expect a new philosophy to be accepted by teachers we must provide these teachers with "survival items".

As a futurist I would like to add one more comment. We must design our efforts in curriculum with a future orientation. In our profession we tend to work with out-dated models, and in out-dated modes and procedures. Rarely do we allow our students to experience a true picture of the present, let alone the future. However, we cannot escape the fact that our students must rely on what we give them throughout their next sixty years. The last World Future Society Congress (June, 1975) reinforced many of these ideas for me. At this conference, educators were addressing themselves to the future with activities that students can utilize. Exhibitors displayed futures materials for studying the future. Both of these elements, that is the demonstrations of activities and the display of materials, have doubled in size since the last Congress in 1971. The futures movement has a firm rationale behind its conception and all teacher educators should become involved with it.

Well, these are just a few items that seem crucial to me. And who knows, maybe, just maybe, if we at least begin raising questions, our students may have a chance for a humanistic future.
Transcript of Telephone Interview

Dr. Michael S. Littleford
Auburn University

9:00 a.m., June 2, 1975

Subject:

Humanistic Technology
Operational Definition Evaluation
Question #1

To what extent is there a need for a new philosophy of industrial or technical education that might be titled a Humanistic Technology philosophy?

Answer:

To a great extent. I think that we need a totally new way of looking at it.

Question #2

What reservations do you have concerning the Humanistic Technology philosophy as it has been defined?

Answer:

Here? I think that I don't have any really major ones, I think that, given my predilections, I would probably prefer not to have the discrete behavioral objectives or at least have them preceded by some kind of statement of a general model, and I know that you have one -- some kind of philosophical statement about assumptions that you are making about the world and the relationship of technology to man and so forth so that people will know where you are coming from.

Question #3

Would it be desirable to implement a teacher education curriculum that would develop a Humanistic Technology philosophy for technical teachers?

Answer:

By all means.

Question #4

Are there any other comments that you would like to make concerning the philosophical position defined?
Answer:

I think there is a whole lot of material that is very pertinent to what you are doing. I mentioned Kohlberg, I think he is extremely important -- also the earlier writings of John Dewey in vocational education. And then there are more recent things on general systems theory and the theory of natural systems -- people like Arthur Koestler and others who really kind of stress that in the sciences and in a lot of thought in general there is a view emerging that is very compatible with a humane technology.

The idea is getting to be to really break down the feeling that man is separate from the world. And that there is something called subjective and objective which are separate and distinct realms. And I think that in order to get people into a frame of mind so they will relate to this, they are going to have to feel some kind of oneness between themselves and nature and between themselves and their fellow man. And developmental theory -- developmental psychology in terms of theory -- and so forth makes reference to the possibility of people who progress to higher levels of development, who have kind of gone beyond the conventional in development. And being and developing at this level of feeling and cognition is a kind of oneness, and a sense of seeing the entire world as interrelated rather than looking at things discretely, taking things out of context, and applying simple A causes B in the laboratory.

So I think the whole philosophy of science supports what you are trying to do. And there is a mass of literature on it.
Transcript of Telephone Interview

Dr. Donald Maley
Chairman
Industrial Education Department
University of Maryland

2:00 p.m., July 1, 1975

Subject:

' Humanistic Technology
Operational Definition Evaluation
Question #1

To what extent is there a need for a new philosophy of industrial or technical education that might be titled a Humanistic Technology philosophy?

Answer:

First of all, I understand what you are getting at and I applaud that idea. But when you talk about Humanistic Technology philosophy -- I'm not sure that that title is going to get you anywhere -- I'm not sure what you might call it though -- I don't have any concrete alternative to offer. There is no question about it in my mind -- let me give you a classic example -- there was a girl here in the office yesterday whose husband is being kept alive by an artificial valve in his heart plus a pacemaker that is set at a standard pace -- and she said, "Thank God for the space effort -- my husband is alive today and is able to work and carry on as he wants to." Well -- we have had all of these "damn fools" who have complained about technology and what it is doing to us. They have complained about the space program -- saying that we have sent people out there just to bring back so many pounds of rock -- and these people complaining are the so-called humanists of our society. They are ignorant of the positive gains that have resulted from that space program. I would recommend to you -- in the last issue of American Motorist an article by John McKenna -- an outstanding chemist and a Professor of Chemistry at the University of Texas -- he has made himself quite a reputation among our group in forums of AIAA, and he is world famous. If you were to read his analysis of the environmental problem -- it's not the same as these guys who are out there "strumming guitars" in the "Mall" these days. First of all though, I am thoroughly convinced that we need to understand how to use our technology better -- there is no question about that.

There is no question that we have abused technology in some cases -- in many cases. My father went into the coal mine at the age of fourteen and he was in there for ten or twelve hours a day before he could come out -- and technology "freed" him. And I think it was the humanism that relates to the application of technology that helped my father out of there. But, on the other hand, we refuse to build nuclear reactors because some "so-called" humanists have given the program a black mark. There was an article in the Reader's Digest about three issues ago on the subject of the safety of nuclear reactors -- they
are safer than living in Washington, D. C. If you read my speech that is in the proceedings of the Louisville, AIAA convention, you will find -- somewhere in there -- that I talk about "looking at the other side of the coin". That is to say that what we must do as human beings is to guard against abuses in our use of technology. So I believe that both sides of the coin are important -- and I found a great deal of that in what you are trying to do -- it seems to agree with some of my own ideas, so I am with you on it.

Question #2

What reservations do you have concerning the Humanistic Technology philosophy as it has been defined?

Answer:

The concern that I have about a lot of the statements is that you do use rather complex language from time to time. And I don't know who is going to read it beyond me and the distinguished panel that you have been able to put together -- I don't know how I fit in to that outfit, but I thought it was a very outstanding panel. I think it should be put in terms that the people who will use it can understand. You can have a damn good idea and blow it if you fail to communicate. The greatest philosophers can put their ideas in simple terms. Aside from philosophy, some years ago there was an outstanding physicist who did some TV commercials for the Ford Motor Company. In the commercials, he was talking about new suspension systems and other innovative developments that the average layman didn't know a damn thing about -- but he would use such things as matchsticks, paper clips, safety pins, and rubber bands to demonstrate what was happening inside these complex mechanisms that industry engineers were puttering around with. So what I'm saying is, there ought to be a concerted effort, on the part of all of us, to use as simple a language as possible. It isn't the people who are well versed in language who are really going to make the difference in many areas -- it will be the guy who doesn't understand the complex language who goes into the voting booth to make the decisions that affect humans and our use of technology -- he is the one that must be the target of our communications.

Another concern that I had was with statements that seemed to suggest that the teacher will do all the goal setting. If the teacher does all the goal setting, then
the students will be "locked in" partners without any say. There has to be the business of goals -- there is no question about that -- but I think that the teacher as an administrator or as a manager helps in the establishment of goals that move the educational system in the direction it should be moving -- and that is what makes him a professional -- as opposed to someone who only takes orders from someone else. In effect, a part of his competency would be to enable the students to assist him in developing the desirable set of goals that he would need to function. I think that such goal setting is entirely possible. But in the area of value questions, we must be careful not to let students make errors of judgment that might be the result of their developmental stage. One has to recognize that young people in the public schools have a great desire for immediate change, but given six or seven years of development or maturation or just living, their ideas may be quite different. What I'm saying is that I'm not sure that all the desires of students to overcome what appears to be institutional or other forms of inertia -- are "real" in terms of life values.

Question #3

Would it be desirable to implement a teacher education curriculum that would develop a Humanistic Technology philosophy for technical teachers?

Answer:

Let me tell you this -- before this point of view ever "hits the streets" you will need that. That issue -- teacher education -- cannot be after the fact -- it has to be before the fact. Some years ago I worked with the cluster concept in vocational education -- and we were almost forced into running the pilot programs before we did our teacher education -- and I was about ready to throw that whole project down the drain. I wouldn't agree to that -- that is, if we are going to run pilot programs we had better damn well have the people to run the programs. There is no question about it -- if you want this thing to "get off the ground", it's got to have some very effective teacher education to go with it -- or else forget about it. I'm talking about in-service, pre-service, wherever you are trying to influence teachers.
Investigator:

Some evaluators seemed to believe that in-service education might be the way to go.

Maley:

Yes and no -- in-service -- under the right leadership -- and I'm talking about the guy in charge -- that is the local supervisor who is going to spend time with it -- not just to make arrangements to have some guy come in and run the workshop while he goes off somewhere or whatever else he might do. I've seen workshops work and I've seen workshops that didn't, and it all depends upon the support back home -- on the encouragement back home and the logistical backup that you have.

On the other hand -- you take the young college kid, in pre-service, who has not been too brainwashed by previous industrial arts experiences -- he is a pretty wide eyed kid -- with lots of ideas -- he is an idealist in many ways. Because he is at that age level you see? And he is willing to go out and make moves, but he needs support too.

Question #4

What other comments would you like to make concerning the philosophical position defined?

Answer:

I have one comment about the whole concept and its impact -- it seems to me that, in very simple language we have got to be sure that we are not developing some damn "albatross" that is going to stand in the way of progress. That is -- I've known of some courses in higher education that deal with technology that, I must say, are really some of the great obstacles to the progress of mankind through technology. I think that what we have got to do is look at some of the problems that man has and realize that the only solution to some of these problems is going to be through technology. A classic example is -- as we double our population, the water needs of our people are going to magnify and not just by double the former need. So where do we get the needed water? In some areas we are going to have to depend on new technology to get it for us -- desalinization of the oceans.
When we talk about our energy problems, technology will have to provide our solutions — there is no question about that — that is the only route we have. So I would hope that whatever you do and whatever society does in regard to assuming a posture with respect to technology, that it would not stand in the way of providing man with those things that he needs so badly — and thinking that he can get it by strumming guitars — that just isn't going to happen.

Around here, normally — if we have a dry summer, you run out of water — the water table drops due to the great use of water and the lack of rain. We have "solutions" to that problem here that I call the extra-legal ones — they sound something like this — "Don't wash your car!" "Don't water your lawn!" "Don't fill your swimming pool!" and all kinds of such statements. Now those are damned stupid solutions to a technological problem — they may be alright today, but next year you have the same old water problem.

So I would hope that as you move ahead on this definition and any impetus that you can develop in this direction, that it would deal with the facts in the case and try to look as positively as possible toward what we can do with technology. Beyond that — the only other solution we have is prayer — and I'm not saying that is a bad solution. But as Charles Kettering said, "Technology has freed more people than all the edicts, fiats, and emancipation proclamations put together." There is no question about that in my mind — I went to work in a foundry when I got out of high school — and when I went in there in the morning, I wasn't sure how I would come out at night — the improved technology has vastly changed working conditions for mankind.
Transcript of Telephone Interview

Dr. Lloyd P. Nelson, Dean
College of Fine and Applied Arts
Ball State University
Muncie, Indiana 47306

4:30 p.m., May 29, 1975

Subject:

Humanistic Technology
Operational Definition Evaluation
Question #1

To what extent is there a need for a new philosophy of industrial or technical education that might be titled a Humanistic Technology philosophy?

Answer:

To what extent? I would say that we are really "ripe" for a change now; to incorporate a humanistic point of view into technology. And I say that because of our recent focus upon the abuse of our environment and what it does to mankind. I think that right now there's a consciousness for it, and this is one of the reasons why I think it would be well for us to incorporate that into a curriculum for industrial arts.

Question #2

What reservations do you have concerning the Humanistic Technology philosophy as it has been defined?

Answer:

In this definition -- I guess one of the things that I'm a little cautious about here has to do with the imposition of ideals or of value systems. I think an examination of value systems as related to technology is a good thing and should be incorporated into the course of study, but one of the cautions would be the avoidance of an imposition of any given value system.

Question #3

Would it be desirable to implement a teacher education curriculum that would develop a Humanistic Technology philosophy for technical teachers?

Answer:

I'm sure that's where it would need to start. I would say yes to that. I think that one of the techniques of teacher involvement and teacher preparation in this would not be the typical course at first or even a series of courses in it. I would say, for example, some in-service types of workshops or weekend conferences might
serve to initiate the idea. I think the professional associations might very well involve themselves in introducing this as a topic -- we haven't to any great extent in professional meetings. This would introduce it. Then I kind of feel that the universities ought to pick it up and incorporate it into existing course structures and do it that way -- essentially the way that many of our changes have evolved in the field over the years.

Question #4

Are there any other comments that you would like to make concerning the philosophical position defined?

Answer:

None that I can think of just offhand.
Transcript of Telephone Interview

Dr. Robert Swanson
Chancellor
University of Wisconsin -- Stout
Menomonie, Wisconsin 54751

9:00 a.m., May 12, 1975

Subject:

Humanistic Technology
Operational Definition Evaluation
Question #1

To what extent is there a need for a new philosophy of industrial or technical education that might be titled a Humanistic Technology philosophy?

Answer:

Yes, I think that we have a kind of general problem in this that has concerned educators for some time, and that is -- how much education shall deal with the, shall we say, more factual versus things that are in the area of philosophy and objectives and things like that. Now I'm sure that probably every subject that is taught implicitly has got some of this kind of thing built into it. For example, as we study History I'm sure it is with a somewhat biased view toward the American Democratic position and so forth. So, I doubt that that whole concept is a particularly new idea. We have tended in things like technology probably to avoid affective kinds of things and deal more with the kind of fact.

In the process of dealing with the facts of course we've probably also implied a philosophy -- and the philosophy is that big is better and bigger is better yet. And that we have the right and responsibility to develop all the technology that we can and that implies that it is good. So I think that it might be more honest to come straight on with the thing and discuss the issues directly. So I would say yes -- that my feeling is that there is a need for dealing with the philosophical aspects of technology and I think your term Humanistic Technology is certainly very satisfactory to me.

Question #2

What reservations do you have concerning the Humanistic Technology philosophy as it has been defined?

Answer:

I don't have particular reservations about it -- I think with all of these kinds of things we must beware of personal biases. We had a board of visitors meeting here -- we have a group called our board of business and industrial advisors -- they come to our campus twice a year, and at our meeting last Monday -- a week ago today -- we asked them to discuss new developments in their technologies and
what they thought the implications were for a college like Stout in these areas. And what kept coming through all the time was -- "teach people the American free enterprise system" -- now there has been a tendency I think in some of these promotions of free enterprise as they have been looked at in the past have really given us a lot of the problems that we have today. And that this unbridled growth has given us all the problems of ecology and so forth. So many college professors and especially college professor types I think have tended to want to try to "blow the whistle" on this kind of thing -- and often come out as anti-growth, anti-technology, anti a lot of things that we have been doing.

Now I don't think that your statement of philosophy and definition as you have it here says that that's what would be done. I do like the places where you are saying that the student is to develop his own definitions and his own responses and his own opinions rather than being sort of proselyted by the teacher along the way. But I see that as a real need to have a rather objective analysis of the whole thing so that all sides of the issue will be looked at -- both long and short term. And I can see some people becoming unduely enthusiastic one way or another and in fact promoting a point of view -- for example, one of our board of visitors members is from Northern States Power Company and they are in the process of trying to get permission to build a new atomic power plant that is only about twenty miles from Menomonie -- now it would be built out in an area that has been largely rural farm land and so forth -- now a number of groups have surfaced, and at their public meetings have pointed out the dangers of nuclear power plants, and among these have been some college professors who have, of course, cited factual information of why such things as nuclear power plants are bad. There has -- it has come to the sort of thing though that Northern State Power is on the one side saying, "We need the energy -- this is a free enterprise system and it can't exist without energy," and then people on the other side saying that this is a bad sort of thing, that there are so many dangers with this, and that we should not do this kind of thing. Now, I think that kind of debate is very good and in the end citizens are going to have to decide some way or another, but I guess the problem is giving an objective viewpoint of the whole thing. When each of us is probably biased on the issue from our point of departure -- now that doesn't make the problem here any different than it is in, let's say, political science -- where we have always in our teaching been aware of the fact that you could be guilty of trying to sway a person one way or another -- whereas in
technology everybody has a tendency to agree, up to this point, that more technology was better and it's only in recent years that we have begun to question that tendency. So I would hate to see us become reactionary in the process of this, but undoubtedly something is needed.

Question #3

Would it be desirable to implement a teacher education curriculum that would develop a Humanistic Technology philosophy for technical teachers?

Answer:

Yes, I think that that would certainly be very important in this whole thing and they would have to be then taught in a way that they could represent objective analyses. I think in a number of our technical courses at Stout we have been trying to do this -- probably not in as carefully planned sense as the other part of the curriculum. We, for instance, have -- are beginning -- a program in solid waste disposal -- part of this is an analysis of the various materials in terms of how recyclable they are -- what is the real cost of things -- including the depletion of natural resources and things like this. Now, the big problem that one always has with this is teachers who are out in the field who do not have this kind of knowledge or who may read a few articles and become swayed one way or another. But I think that it has got to become a significant part of our curriculum and I think our whole American Industry approach has this as a basic element in all of it -- the real cost of things being implemented. So I would say as a simple answer, yes, it would be a very desirable thing to implement.

Question #4

Are there any other comments that you would like to make concerning the philosophical position defined?

Answer:

I think the position is good -- I think that all of us probably feel that it can't become the only thing that one will do in industrial education. And I think that one of the problems that any new curriculum has had as it came along, and our American Industry would be an illustration
of that, is that some people view that that will be all that there is to the field and that the only thing that we do is to discuss, shall we say, the humanistic aspects of technology without a considerable and extensive discussion of the technology too -- I think that we would tend to be "shorting" the student. And thus we get into this whole realm of jurisdictional disputes as to whose job the teaching of these aspects of technology is -- is this a part of social science? Is this a part of industrial arts? Is it some kind of an interdisciplinary study? Now, even though in theory we can say that that shouldn't make any difference, and the school, to become very good, eventually has to figure out some sort of an interdisciplinary, integrated approach -- it gives you a practical problem in implementation.

Maybe you are not terribly concerned, in your study, with the implementation aspects of it, but we have found with some things that we have tried to do that, of course, it's at the implementation stage that you find out what the real philosophical definition is. And, furthermore, I guess the whole method or approach is one where you have a lot of activity on the part of students to get experience with it. I can give you an illustration of an industrial arts teacher here in Menomonie that did something -- he had his students go out with cameras and find examples of pollution in the community and they made up a slide series on this thing. They found that, for instance, the city sewage disposal system was, about two-thirds of the time, dumping raw sewage into the river. They went to the few local industries that we had and looked at this kind of thing. Now this was a very active kind of thing -- it wasn't making projects -- though they did come back and discuss somewhat how you could correct these things. But I would think in the implementation a big job is figuring out real, purposeful activities that students could do that would get them "into the ballgame". And so often in the teaching of technology, of course, we come back to the early technological problems, projects that are to me made, rather than activities that are of this kind -- so I see that as a problem in the implementation of Humanistic Technology, and just how to solve that one, of course, will be up to the curriculum developers.

I think that you certainly in your studies have undoubtedly looked at the various movements in industrial arts as to what has caused us to move in one direction or another -- as far as the individual teacher is concerned, his philosophy, I have found, often becomes one of what he can figure out as things to present the student and then things that he can have them do. I can remember
thirty years ago when I was studying industrial arts curriculum as an undergraduate -- we'd come up with a lot of, I'd say, "lofty" things in that sense of the word. And I'd say a lot of what you are talking about here is a "lofty" thing -- which is not negative at all. We ought to have lofty things in education. And suddenly we'd develop the unit and if it was "lofty" the person would give a lecture on it or you might almost say a "sermon" on it, but then he'd quickly get to about three-fourths or nine-tenths of the period where the kids again would be driving nails and planing boards -- and I guess that that's one of the big problems of how to have real activities that deal with the most important issues. I think that all of us would agree that technology has created so many problems for us that if we just keep on developing the technologies we may keep on creating the problems. So implementation is a tremendous thing. And I'm sure that as you finish this study you are going to be very interested, in your own teaching, in implementing these kinds of things as well.

The teacher who had his students take slides of pollution in the Menomonie area presented this program to our Rotary meeting and made a lot of people mad -- people who were responsible for some of the problems. They were very polite to him and all, but they were kind of angry about it. But he did present this in such a fine manner that it was hard to get mad at him personally -- people were getting mad at the idea. And I think he learned some things about presentations too -- that you could do things in a way that will lead to improvement or you can do things in a way that just leads to people digging in more solidly and saying, "Well, I'm justified in doing this."

We had graduation Saturday and the father of one of the graduates, who was himself a graduate of Stout about thirty years ago, is the personnel manager of the Reserve Mining Company up in Beaver Bay, Minnesota, and, of course, the Reserve Mining Company is in constant litigation about the taconite tailings that they have been dropping into Lake Superior. Now as I was talking to him just very briefly, one could see many of the practical problems that he was facing, because the whole community that he is in -- the entire economy -- was built up on low grade ore -- the taconite -- and if they have to dispose of these tailings in some other way, it increases the cost so tremendously that, under current markets anyway, the taconite ore then is no longer competitive -- now, of course, that is as long as there is higher grade iron ore. That's why they hadn't developed taconite
earlier. But if you get to the point where you say, "Well there isn't going to be any higher grade ore," then the cost clearly assumes an entirely different importance along the way. So he gave me his viewpoint which, of course, is his life blood and his community's life blood -- that if we implement this kind of thing they could be put out of business and then what do you do with these people? Well that's a practical problem that all of us face, but when you get to a point where it is serious enough, that is, life or death, then whether somebody is going to have a job or not is not nearly as important. We have not realized that we are at that point in many cases when we probably are. I guess it's a little bit like in the early days of teaching wood-working in Wisconsin -- we had a state law that you had to have so many hours of discussion on conservation in the course because this was in the days when they slash cut all the timber and then for years there wasn't anything around here except brush, and so forth. Well, there was a state law that said you had to teach conservation. And I suppose that was a kind of minor sort of thing that you are talking about here -- one aspect of, "What are we doing to the environment of our human beings by this rather loose use of the technology that we have?" I suppose that, in total, the humanistic aspects of technology are, at this point in time anyway, more important than the technology itself -- and that we must be constantly looking at the technology to solve the problems that it has created among other kinds of problems.

That same board of visitors group -- one of the fellows from Chrysler Motors in Detroit is on the board -- pointed out that a new technological development there is the minicomputer that they have on their engines that can keep varying the elements of the engine; air, gasoline, spark, and so forth, and keep doing this constantly to get maximum efficiency out of the engine. He was pointing out that prior to the days of the computer, of course, you had to set any engine for an average situation -- that you were more heavily controlled, let's say, on an automobile by how easy it was to start rather than by how efficient it was after it was running hot. And his point was that the technological development, of the computer now has made it possible for us to monitor that engine from second to second and to modify the engine. Now here we have a case where technology then could actually resolve, or at least reduce, one of the problems. He was saying that the catalytic converters, for instance, while they solve one problem, have created another in a sense. And the only real way to solve the problem was to get as complete a combustion as possible, and so their approach
was not to trap out these items, but actually to burn them up as efficiently as possible. Now I think that that kind of activity tends to be very interesting and attractive to technologically oriented people and so it could be both on this humanistic and the technological side. Of course, then, when you get to the point that you decide having automobiles is an impossible situation from a humanistic standpoint -- then it's like a methods change to get a gross improvement -- then you have to change the whole scheme of things instead of just sharpening up what you have. And, I suppose that that's a principle of psychology and technology and probably every other field as well. I think that what you are doing here is probably one of the major shortcomings that we have had in industrial arts and that it may well be our next move in the future. And I would think that you are on the forefront of a very important area here.
Transcript of Telephone Interview

Dr. Ethan A. T. Svendsen
Chairman
Industrial Arts Education Department
School of Technology
Indiana State University
Terre Haute, Indiana 47809

10:00 a.m., July 3, 1975

Subject:

Humanistic Technology
Operational Definition Evaluation
Question #1

To what extent is there a need for a new philosophy of industrial or technical education that might be titled a Humanistic Technology philosophy?

Answer:

There is no question about the need -- in fact, it is not just in our field that we need it. I would say that the whole emphasis of education, the whole emphasis of society in its public opinion forums and in all the rest of it we need some kind of change in direction now. But in regard to the specific business of technology -- someplace in the school system there has got to be somebody who takes up this cause -- and there is the fact that you are making this effort -- I'm supportive of this. There are lots of barriers in the way.

There is a need for a critical attitude on the part of students. Such an attitude would be a tremendous contribution toward what the Humanistic Technology philosophy is working toward. That is, it asks for, not indoctrination, but a critical attitude fortified with enough information or at least enough interest in the whole area that valid opinions could be held by lay persons concerning technology. I am reminded of C. P. Snow and his *Two Cultures* and I do have on my shelf and have read parts of Lewis Mumford's *Pentagon of Power*, and particularly the last of the two volume work -- so I am in total agreement with the men who are pointing out that technology is, somehow, getting out of hand.

The forces that control technology are too limited. In fact if I go further than that I realize my whole philosophy is an idealistic one and one that I confine somewhat to writing and private conversation. The idealistic philosophy that the main purpose of industrial arts is to understand and be critical of -- we used industry in an older context -- but now of technology. I'm sure that you have probably looked at *Thought and Action* -- the message that is supposed to come through is the same as that John Dewey expressed way back in 1915 -- and it's the same thing that you are saying now -- but John Dewey was way ahead of his time. That is -- there is a need for man to arrange his industry so that it has benefit for man rather than letting us shape our lives and our actions to suit some inanimate industry -- something like that would be a rough paraphrase of Dewey. So I'm for it. And I think there is a need -- no question
Question #2

What reservations do you have concerning the Humanistic Technology philosophy as it has been defined?

Answer:

I thought about that question, and all I can think of as far as reservations go is the great difficulty that would be faced in implementing. And also the fact that -- and I don't think that you really envision this -- no single curriculum area will be able to do the job. And the kind of definition that you have set up is really kind of general enough to apply to every curriculum area in the public school system.

But, even in talking in broad terms -- I don't really think that the need is evident enough to the forces that control education in this country. The need is not evident enough so that the "time for this idea has come yet" -- to paraphrase someone else.

But, taken as an idea -- as a concept -- I don't have reservations as to what it ought to do as you expressed in your behavioral definition -- if I had, I would have made those comments when I read the various statements.

Question #3

Would it be desirable to implement a teacher education curriculum that would develop a Humanistic Technology philosophy for technical teachers?

Answer:

Maybe -- but as I said a moment ago, it might be an idea ahead of its time still. But I have a feeling that the emphasis that you are talking about here is going to have its influence -- not as a wholesale revolution of teacher education -- but in an increased emphasis, and that increase in emphasis -- on the part of teacher educators as they work with teachers in preparation -- that increase in emphasis is the best that we can do now, and certainly it will be an improvement. I have a lot of
arguments here — you know when you talk with people — to your own colleagues — on the issue of technology and to what extent technology should be allowed to "run free". I have very few sympathetic supporters in "coffee cup" arguments for the point of view which I would express as, "Technology must not do something just because it has the capability of doing it." DeVore, I know, one time said that, "What technology can do it will inevitably do." That, I think, is disastrous. So I think increasing the emphasis in our teacher education courses as they now exist is a way — and to do that, of course, your teacher educators are going to have to be convinced themselves — and some of them have yet to learn about it. There are not many who really have the limited knowledge that I have, and that sounds boastful — but I don't mean it that way — but I think that there are not many that really have the knowledge or who have paid much attention to the issue. They just don't know very much about it. I must say that they should increase the emphasis — anything that we could do would be desirable and I would support it. The one hope, on the national level, would be the AIAA — I don't think we would find support in the AVA for the idea. But when you go out in the public schools -- the reality of the job -- the nature of the situation that teachers find themselves in -- maybe this is a pessimistic view, but it seems so hopeless to introduce very much of that and make it stick. Particularly with our present organization of industrial arts education -- I think we would have our best chance with the Ohio State IACP program -- that is, to introject it at strategic points and to build this kind of emphasis.

Question #4

Are there any other comments that you would like to make concerning the philosophical position defined?

Answer:

I don't have any except to say that we have always had with us -- and here I am in a position of instructing you, and I'm sure that you have spent many hours researching this thing in the literature -- but you start with the Luddites way back who were really afraid of what that machinery was going to do to us -- and I think in retrospect -- justifiably so. I think John Dewey himself expressed that over and over again in connection with just the early twentieth century industry -- education must avoid the narrowness of concern with specific aspects
of industry — and that is what is our fear now. And what you are doing is modernizing it and using new terms, but it makes it much more important because our industry has become so much more of a controlling factor than it was in the early part of the century when automobiles were not even invented and certainly not TV and all the other elements that enter into modern technological influence. I cannot believe that man's welfare is always best served by technology. Even when technology or proponents of technology are most generous in what they say our future technology promises us, it seems that there must be some curtailment — and I know that is pessimism in a sense, but technology is just not God's gift to mankind -- I don't think -- not in every aspect of technology.

Your definition seems to be saying, "Let's avoid the excessive abuses -- the excesses of technological influence." I cited in my note to you that the one significant instance of federal legislation with regard to this was the SST ruling. The stopping of the development of that technology -- there might be others but that one is the most famous -- that is not Luddite -- it is simply a rational view -- looking at our possibilities and at the consequences of these possible actions -- that is just good "common sense". I'm somewhat concerned that industry has not been responsive enough to potential problems areas and the long range welfare of our society and the whole democratic way of life, in fact, and I am supportive of any movement that would improve that situation.
APPENDIX F

EVALUATION TALLY
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