Industrial Arts Builds the Skills in People that America Needs

monograph 7

AMERICAN COUNCIL
ON INDUSTRIAL ARTS
TEACHER EDUCATION

Industrial Arts Builds the Skills in People that America Needs

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Preface

The American Council on Industrial Arts Teacher Education is now in its 29th year of existence. Throughout these past years, much has happened in the technological and industrial portion of society. ACIATE has been a part of these developments through its member involvement in the total process. Also, ACIATE members have added much to the education oriented technical and industrial literature.

This monograph, seventh in the series, becomes an important part of our literature. Dr. Donald R. Maley is to be commended for preparing this manuscript. The content helps to define the role industrial arts has in the industrial-technical world. People of the United States of America have, do, and will need a wide variety of skills. The part industrial art plays in this total process is tremendous. Dr. Maley does an outstanding job of writing and illustrating the contributions of the industrial arts discipline.

Monograph Seven should be placed into the hands of school administrators throughout the nation. It will tell the story of industrial arts in a way which can be understood by technical and non-technical oriented people alike. It will help the administrator understand what is happening in the industrial arts laboratory. There will be more appreciation for this many facited discipline. Also, this title is good reading for anyone working directly in the industrial arts discipline. It should be required reading by all persons responsible for administering and making decisions about industrial arts curriculum and facilities.

Thanks to Thomas J. Barber, chairperson of the ACIATE publication committee, for his dedicated effort in following this monograph through the process of publication and distribution. It is a task which takes considerable time and effort. The total membership of the Publication Committee deserve a round of applause. The total publication effort of ACIATE is much more than a "one person operation." It takes a group of people working as a team to create the scholarly products which have resulted over the years. This publication is no exception.

Inquiries regarding the monograph series should be directed to the chairperson of the ACIATE publication committee or to any current officer. Specific questions or suggestions relative to the content of this monograph should be forwarded to the author.

Ervin A. Dennis, President

President

Industrial Arts Builds the Skills in People that America Needs

The title of this writing may appear somewhat misleading or in a sense overly presumptive. That is, one might be led to believe from the title that Industrial Arts is alone in this process of building the skills in people that America needs. This is not the intent of this discussion since there must be many partners in building such skills. On the other hand, Industrial Arts need not make any apology for its role. The contributions of Industrial Arts professionals in this important task of building the skills that America needs is limited only to their perception of the nature of skills that America needs as we move forward into the period of "super industrialism". If the profession's perceptions of needed skills are blurred, narrow, confined, or restricted, then its role in the future might well be meager, unresponsive, and perhaps even eliminated.

Additionally, the extent to which Industrial Arts will be a partner in building the skills that America needs will also depend upon the dynamics with which the profession is willing to engage in the process. It is in this vital arena where the design and construct of learning experiences through Industrial Arts must interface with the requirements of human kind and the associated skills so vital for accomplishment and contribution.

It will be these two dimensions that will be dealt with in this writing, i.e., the nature of the skills that America needs, and the role that Industrial Arts can play in contributing to the development of such skills. This discussion will not deal with the technical — manipulative skills such as drawing, forming, and shaping which in themselves are significant in many respects.

The nature of the skills that are needed is directly related to the period of human history in which the individual functions. This point is easily demonstrated with a quick look at the nature of change in selected areas over the past twenty centuries. See Figure I.

The skills required in the agrarian society of the first centuries AD were largely those of a manual-manipulative context related to the need for food, clothing and shelter and a relatively low level of technological sophistication. The early crafts that remained unchanged over centuries were largely muscle powered and required a high form of skill that was controlled by the low level of technological development. This is exemplified by the work of the shipwright, the wheelwright, the shoe maker, the weaver, carpenter, and the farmer. In a sense, the tools and implements of work placed extraordinary requirement on muscular capability, physical coordination, and a dependency on extended periods of apprenticeship for effectiveness.

However crude the tools of this early period may have been by comparison with modern tools, the quality of work was the result of great individual skills, considerable resourcefulness, a sense of purpose and dedication, and a genuine pride of workmanship.

As history moved on into the Nineteenth and Twentieth Centuries the movement was from the isolated, independent craftsman and the home industries to the factory system. The skills of America in its goods producing efforts were radically changed with more and more specialization of technique and effort. The problem of powering the tools of manufacture changed from human or animal power to ingenious mechanical functions activated by water power. This gave way to the age of steam power and then on to the age of electrical power. Each of these ages brought new challenges to the skill requirements of the producers as well as the consumers of the period.

As one examines the skills that America needs there is a need to examine the nature of the society into which the products of the school enter. This should take us out into a much broader sphere of reference and not confined to the requirements of employers in business and industry.

Dr. Robert B. Howsam in a discussion entitled "Problems, Procedures and Priorities in Designing Education for the Future" listed a series of societal conditions which the present generations and those of the 1980 generations must face.

See the scientific and inventive method applied wholesale to human problems and to witness the phenomenal results so far achieved.

Face the prospect of a man-made world — an easy extension from the results so far achieved.

Grow up with television and other media which free it from the restraints of provincialism and open to it the world and all its diversity of culture and views.

Experience release from earth-boundness in the sense of physical space.

Confront the reality of possible total human destruction.

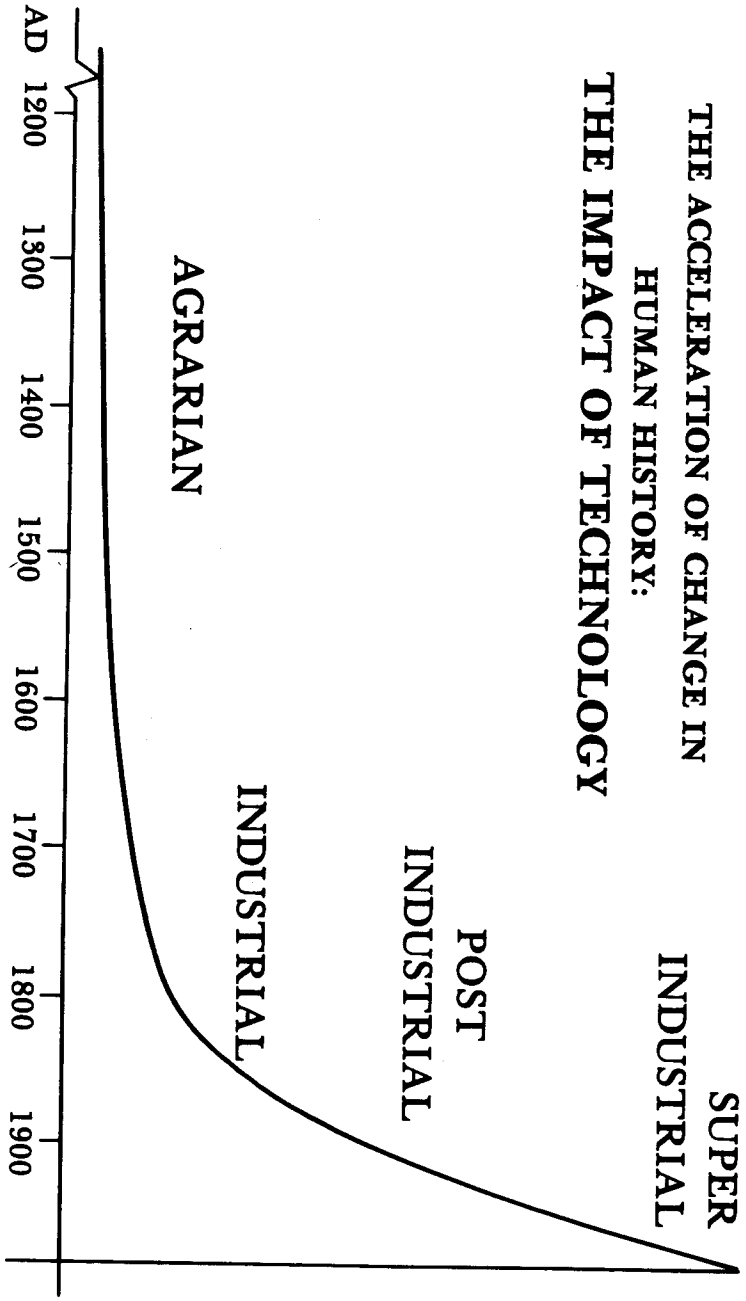
Live with the growing use of automation with all its attendant impact on living styles and value systems.

Make widespread use of experimentation with drugs, both new and old, in an atmosphere that permits consideration of two sides to the question of their use.

Experience "the pill" and its impact on the cultural imperatives concerning sex relationships.

Know the phenomenon of physical, as well as verbal, protest in widespread use. (6, p. 85)

One might add an additional dozen or more items such as a world-wide energy crisis, super-sonic commercial travel, severe water and power shortages, a largely urban society, space warfare, mining the ocean floor, pocket and family computers and the marvels of modern medicine.



The skills required to deal with such conditions as sketched out above are unlike those of previous generations. Furthermore, the consequences of a lack of skill in dealing with such factors or conditions are much more serious than was the case with past conditions and/or circumstances. Few areas of the human's existence have been exempted from the technological impact that has contributed to the nature of governmental processes, values, life styles, work effort, work rewards, health and longevity, leisure, and personal satisfactions.

The nature of skills that America needs is interlaced with the many and varied roles that the human plays as well as the life styles of people in general or individuals in particular. Let us examine some of the roles engaged in by persons living in this latter part of the Twentieth Century. There is —

— *the producer of goods and products role*
— *the service or service producing role*
— *the consumer role*
— *the leisure role*
— *the citizenship role*
— *the self-fulfillment role*
— *the educational role*

See Figure 2 for a graphic presentation of these roles.

Each of these roles require skills that deal with different dimensions of the individual's roles in the Twentieth Century as opposed to those of one or two hundred years ago. As a matter of fact, there are considerable differences in the nature of skills required today as opposed to the requirements some twenty-five years ago. This condition is a resultant of the accelerating changes generated by a dynamic technology, social awareness, the concern for human dignity, environmental concerns, communications, the current energy problems, and international forces.

Let us take a look at certain dimensions of change that have occured in the last thirty years with respect to industry in the production of goods and services. Traditionally the work force in America has been concentrated in the goods producing function, and incidentally, a great deal of the emphases in Industrial Arts have been centered in the goods producing sector of industrial interpretation. It is significant to note that at the present time the goods producing sector requires about one-third of the country's work force. It is expected that by 1985 the service producing workers will reach the figure of 71.5 million people. (14, p. 45)

Table I provides the data related to the changing work force for the goods producing industries as compared to the service producing industries.

It is quite apparent that the production skills for manufacturing, contract construction, masonry, and agriculture are considerably different than those required for modern production in transportation,

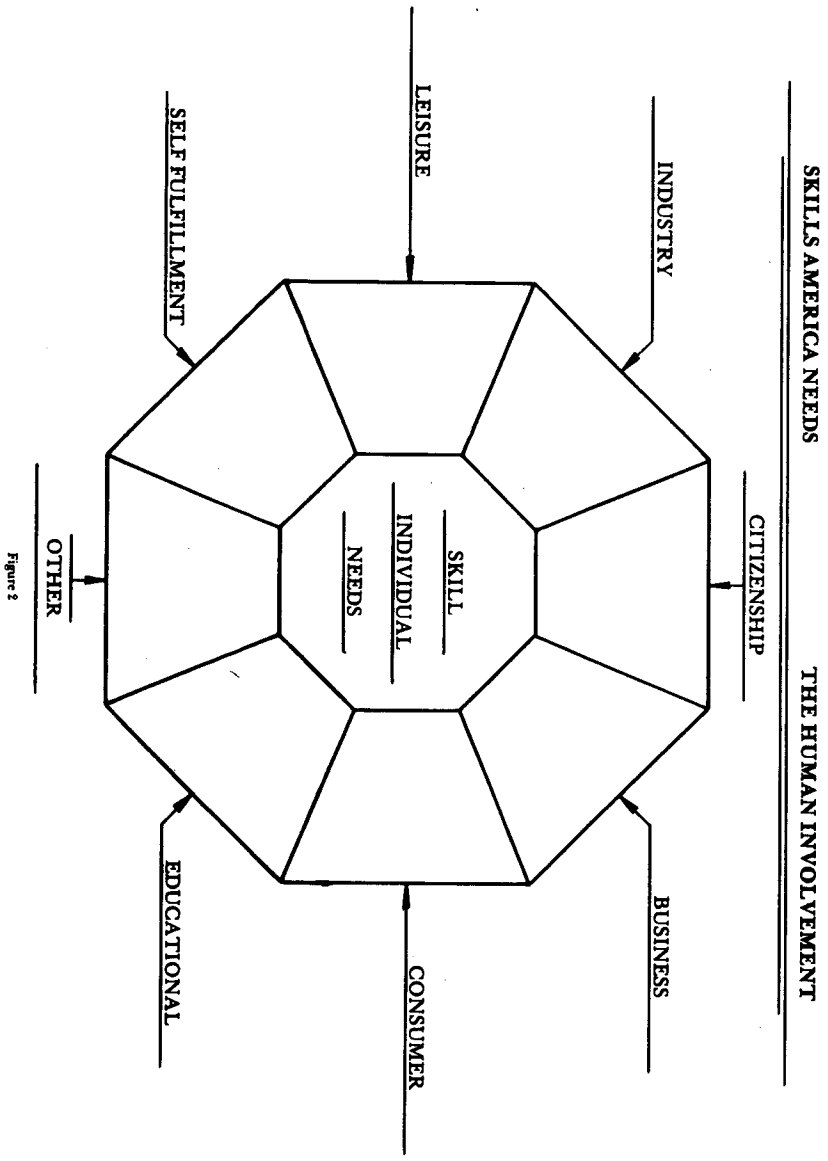


Figure 2

Needed Skills

THE PRODUCT PRODUCING ROLE

Skills In...

...Planning ...Decision Making

...Coping ...Articulating

...Organizing ...Leading ...Following

...Problem Solving

...Calculating ...Interpersonal Relationships

...Manual-Mental Functioning

...Technical Performance

...Learning

...Communicating

...Reading ...Writing

Needed Skills

THE LEISURE ROLE

Skills In...

...Decision Making

...Self Appraisal

...Value Clarification

...Organizing

...Programming One's Self

...Mental-Physical Coordination

...Interpersonal Relationships

...Communicating

—Reading —Writing

...Observing

Needed Skills

THE SERVICE PRODUCING ROLE

Skills In...

...Articulating ...Calculating

...Interpersonal Relationships

...Analytical Thinking ...Decision Making

...Planning ...Manual-Mental Functioning

...Technical Performance

...Business Practice

...Communicating

—Reading —Writing

...Coping

...Decision Making

Needed Skills

THE CITIZEN ROLE

Skills In...

...Learning

...Problem Solving

...Coping with Change

...Communications

—Reading and Writing

...Interpersonal Relationships

...Decision Making

...Leading

...Following

Articulating

Resourcefulness

...Critical Thinking

Needed Skills

THE CONSUMER ROLE

Skills In...

...Personal Management

...Product Selection

...Product Use

...Assembling Items

...Safe Use

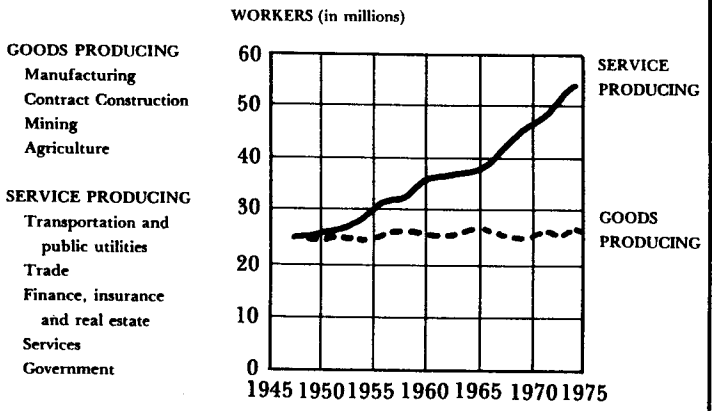
...Maintenance

...Value Clarification

...Communication

...Cost Analysis

INDUSTRIES PROVIDING SERVICES OFFER MORE JOBS THAN THOSE PROVIDING GOODS



WAGE & SALARY WORKERS, EXCEPT AGRICULTURE, WHICH INCLUDES SELF-EMPLOYED AND UNPAID FAMILY WORKERS.
SOURCE: Occupational Outlook Handbook, 1976-1977 — Pg. 14

Table 1

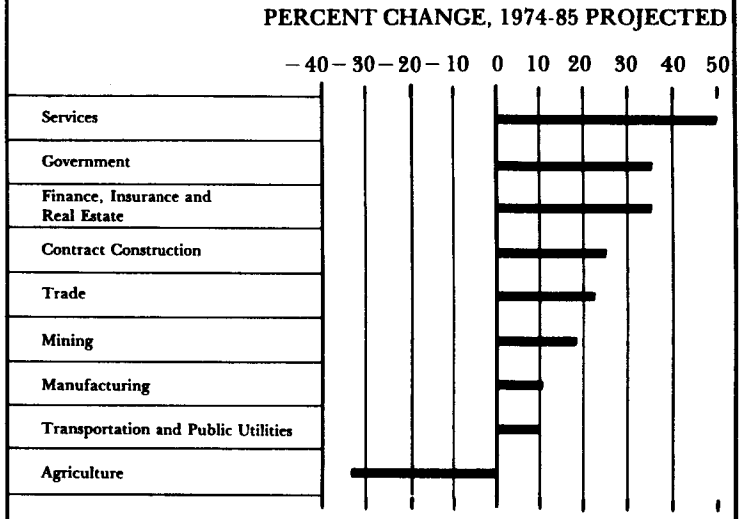
public utilities, trade, finance, insurance, real estate, services, and government.

Another way to look at this same phenomena is to examine the percent of employment change that is expected in a variety of different kinds of industry. This data is related to the anticipated percent of change (employment) for the period of 1975 to 1985 as shown in table 2. The percentage of increase in service employment is estimated to be approximately fifty, while the percentage of increase in manufacturing employment is estimated to be only ten percent. These data and projections also project lower percentages of increase for mining and construction when compared with the areas of service, government, finance, insurance, and real estate.

The Industrial Arts profession must not be insensitive to such trends in its program development as well as its projection of skills that America needs and the contribution that its programs can make towards the development of such skills.

One serious mistake that the Industrial Arts profession has tended to make is to think that its students will function largely at the lower levels of the production or service producing industries. This has been the case in the minds of many Industrial Arts professionals as

THROUGH THE MID-1980's EMPLOYMENT GROWTH WILL VARY WIDELY, BY INDUSTRY



Source: Occupational Outlook Handbook, 1976-1977 — Pg. 15

Table 2

well as with a great many vocational administrators and teachers. Any subject area that has served upwards of ninety-five percent of the male population in grades seven and eight (or in the middle school) surely must contain within its ranks the future unskilled, semi-skilled, skilled, middle management, top management and professional personnel of the society. Many Industrial Arts educators, counselors, administrators, and vocational educators have failed to take into account the changing occupational structure in this country. They have failed to relate the range of student differences and potential in the Industrial Arts classes with the realities of the world of work and the composition of the work force. The fact that the productivity in the United States as reflected by the gross national product continues to rise each year and the blue-collar workers actually decrease in their percentage of the work force should tell the professional something. Also, the fact that the professional, technical, managerial and administrative personnel in the work force continue to rise in numbers and percentage of the work force should have a significant bearing on the nature of the programs. The data for these comments are listed on Table 3 which contains the information regarding the white-collar workers, blue-collar workers, service workers, and farm workers for 1974 and the projected number for 1985.

EMPLOYMENT BY MAJOR OCCUPATIONAL GROUP, ACTUAL 1974, AND PROJECTED FOR 1985.
(numbers in thousands)

Occupational Group	1974		1985	
	Number	Percent	Number	Percent
Total	85,936	100.0	103,400	100.0
White-collar workers	41,739	48.6	53,200	51.5
Professional and technical workers	12,358	14.4	16,000	15.5
Managers and administrators	8,941	10.4	10.5	6.1
Salesworkers	5,417	6.3	6,300	
Clerical workers	15,043	17.5	20,100	19.5
Blue-collar workers	29,776	34.6	33,700	32.6
Craft and kindred workers	11,477	13.4	13,800	13.3
Operatives	13,919	16.2	15,200	14.7
Nonfarm laborers	4,380	5.1	4,800	4.6
Service workers	11,373	13.2	14,600	14.1
Private household workers	1,228	1.4	900	.9
Other service workers	10,145	11.8	13,700	13.2
Farmworkers	3,048	3.5	1,900	1.8

NOTE: Details may not add to totals because of rounding

SOURCE: Department of Labor Statistics

> ...the white-collar professions and occupations are the most rapidly expanding — from 48.6 percent of the total private-sector work force in 1974, to an estimated 51.5 percent in 1985,...Blue-collar workers, on the other hand, are expected to decline from 34.6 percent in 1974 to 32.6 percent in 1985...(9, p. 20)

The growth in research personnel, the scientific community, personnel in the distributive services, middle management, etc. literally refute the notion that the child who takes drawing in Industrial Arts will be a future draftsman, or the youngster who takes metalworking classes in Industrial Arts will be a future metalworker, or that the student who takes an Industrial Arts course in graphic communications will be a future printer.

The fact that the goods and product producing workforce will decrease in proportion to the total work force and that the service producing component of the work force will increase substantially in the next eight or ten year should also have an impact on Industrial Arts programs.

The skills that America needs are as one may well surmise related to the age-old difference of whether one is a producer of the skills in people or if one is the user of people's skills. This is the relationship between the school or educational function on the one hand and the business or industry requirements on the other. However, in more recent years it is quite obvious by citations elsewhere in this discussion that industry and business play an increasingly active role in the development of the skills required by them. This presentation will attempt to include statements of skill needed from both the producer and the consumer. The first of these will come from the consumer or industry side of the issue.

One perspective on the skills America needs came out of a question and answer session that was part of a White House meeting on "Human Resource Development in the World of Work". Ed Sutton of the New York Telephone Company (AT&T) described what AT&T is looking for in new employees.

> What we're looking for when people come to work at AT&T is the ability to do the job we bring them in to do...which really means their ability to move into the training and learn! It boils down to two basic skills — language skill and arithmetic. And, if people would come into the world of work with greater skills in these areas, the ability to move in our upgrade and transfer plan would be much easier. This sounds simple, but it's an incredible barrier today for people coming into the work. (15, p. 19)

The emphasis in Mr. Sutton's commentary was on — "the ability to move into the training program and learn." Essential to this emphasis, according to Sutton, were the skills in language and arithmetic.

George R. Terry, Distinguished Professor of Business at Ball State University, describes the skills needed to carry out the responsibilities of a supervisory position in industry.

> Today's and tomorrow's supervisor must master new knowledge and skills to carry out supervisory work. An ability to work with individuals and groups who want

— indeed, sometimes demand — to participate in decision-making, an ability to mediate conflicting demands, an ability to lead people with different values, and an ability to interface with other interest groups — environmentalists, minorities, government agencies — are all increasingly necessary abilities. (10, p. 41)

The commentary by Professor Terry is contemporary in its references to the world of work that most supervisors, executives, and administrators face. The skills cited were —

decision-making

mediating conflicting demands

leading people with different values

interfacing with other interest groups

Alfred S. Warren, Director of Personal Development at General Motors Corporation, makes the following comments regarding the things that society and General Motors wants from education.

GM wants the same things society wants from the education systems...people who can read, write and do math well, who have some coping skills and problem-solving skills, and an understanding of our economic system. This puts the emphasis back on the quality of education. This is what most Americans say they really expect from education. (13, p. 11)

Mr. Warren's statement emphasized the need for skills in reading, writing and mathematics. He also stressed two other skills —

1. *coping skills, and*
2. *problem-solving skills*

During the research on this topic, I called upon a former Industrial Arts teacher and a colleague, Mr. John F. Connors, who is the Director of Human Resources for the Martin Marietta Corporation. Mr. Connors made the following comment.

...don't overlook the importance of articulation. A real familiarity with meanings of words, with the principles of effective writing and effective speaking, with the importance of combining speaking skills with "presence" is likewise important. Acquisition of those skills, however, is a factor not only of the school's willingness to teach them but also of the student's willingness to develop them.

The emphasis by John Connors was on speaking skills, effective writing, and the important quality of "presence".

Learning or *learning to learn* is one of the most important skills that America needs in 1978 and the decades that follow. It is the individual's central power system that will enable him or her to generate the potential in each. The development of learning skills has been a vicarious and incidental process amidst the total school's efforts to warehouse specified content in neat categorical packages within the minds of the students. This need for learning to learn is accentuated by the uncompromising demands of a society that is undergoing a rate of change that is beyond most of our ability to comprehend. Furthermore, learning is a tool skill vital to one's effectiveness as well as one's occupational or professional advancement and security. This is attested to by the fact that many of our industries have become learning institutions as well as product or service producing institutions.

McDonald's Hamburg University is spending nearly $10 million on training. (16, p. 26)

General Motors spends well over 100 million each year strictly on the training aspects of personnel development. Nearly all of this is for formal internal training and doesn't take into account all of the casual on-the-job training that takes place. (13, p. 9)

The (Conference) Board surveyed 610 firms (each with 500 or more employees) and learned that they spent more than $2 billion during 1974-1975 — a time of severe recession — on employee education and training. (9, p. 20)

This is not to imply that the development of learning skills is a job solely for Industrial Arts. It is a task for all educational components in every institution dedicated to learning. Industrial Arts has unique opportunities for making a contribution in this area through directed efforts at first-hand observation, increased involvements in the learning processes, greater use of the immediate and expanded community, the interfacing of learning skills, and the exploitation of the processes of observation, analysis, synthesis, generalization, and projection.

Some Industrial Arts programs have moved a long way in helping with the process of learning to learn. Some have remained stationary, and some have literally retreated in the face of a societal requirement unprecedented in human history.

Another point of view regarding the "skills in people that America needs" is that of the professional educator. The literature in education has endless listings of goals which may or may not identify "skills" needed by the individual in order to accomplish such goals. The following discussion will provide some insight into the "skill" needs of people as listed by professional educators. Most of the comments related to the needs of people in the future and interestingly enough have a close relationship to the skills identified by the people from industry and business.

Dr. Ralph Tyler has identified a number of skills individuals will need for proper functioning in the future.

...The goals of education appropriate for a future that will include many surprises will include strong emphasis upon problem-solving, upon learning how to meet new situations, upon the skills of observation, analysis, and communication, and upon the development of attitudes appropriate to change. (12, p. 36)

The specific skills identified by Dr. Tyler were problem-solving, learning to meet new situations (coping), analysis, and communication. Later on in this same discussion Tyler makes the following comment.

...Hence, an important aim today is to teach students to learn and to develop in them a strong interest in continued study together with the motivation and skills required to keep on with their learning after graduation. (12, p. 39)

Dr. Robert E. Nelson, in the Novemeber, 1977 issue of *The*

American Vocational Journal, identified twelve survival skills topics in an article titled: "Survival Skills: Mastering the Human Aspects of Work". Dr. Nelson prefaces the listing with the following comment:

> Student should understand the concepts relating to general skills and attitudes such as problem-solving, communications, and coping with change. But the curriculum content in most vocational programs does not reflect this concern. Because these survival skills are general in nature, not unique to any specific vocational area, they are not likely to be systematically taught in any vocational subject area. (8, p. 64)

The twelve topics listed under the heading of "survival skills" include:

1. *Working in an Organization*
2. *Understanding Self and Others*
3. *Motivation for Work*
4. *Interpersonal Relations*
5. *On-the-Job Communications*
6. *Using Creativity on the Job*
7. *Authority and Responsibility*
8. *Problem Solving*
9. *Coping with Organizational Conflict*
10. *Coping with Organizational Change*
11. *Leadership*
12. *Adapting and Planning for the Future*

(8, pp. 65, 66)

The listing by Nelson extends across areas of understanding as well as skills. The specific skills in the topics include interpersonal relationships, communications, creativity, problem-solving, coping, leading, adapting, and planning.

A statement from the Educational Policies Commission identifies thinking as a central purpose of the school.

> The purpose which runs through and strengthens all other educational purposes — the common thread of education — is the development of the ability to think. That is the central purpose to which the school must be oriented... (3, p. 217)

Glen Hass has identified a number of skills that curriculum developers for the future should be aware of in their work.

> The curriculum planners will learn that the school which faces toward the future world must teach innovation, problem-solving, a love of learning: its students must acquire the tools of analysis, expression and understanding... (4, p. 249)

Jerome Bruner in a discussion of "The Nature of Knowledge" couples the skill of problem-solving with the process of inquiry.

> It is evident, then, that if children are to learn the working techniques of discovery, they must be afforded the opportunities of problem solving. The more they practice problem solving, the more likely they are to generalize what they learn into a style of inquiry that serves for any kind of task they may encourter. (2, p. 167)

Alvin Toffler identified a number of skills needed by individuals in

the future in the following statement taken from *Learning for Tomorrow: The Role of the Future in Education.*

> ...The ultimate purpose of futurism in education is not to create elegantly complex, well-ordered, accurate images of the future, but to help learners cope with real life, crises, opportunities and perils. It is to strengthen the individual's practical ability to anticipate and adapt to change... (11, p. 73)

The specific skills identified by Toffler above include coping, anticipating, and adapting to change.

An article in *The Journal of Epsilon Pi Tau* by this writer contained a listing of six specific skills gleaned from the literature on the future needs of people. These six skills are as follows:

1. *The ability to cope with new and difficult situations.*
2. *The ability to anticipate and adjust to change.*
3. *The ability to do critical thinking.*
4. *The ability to inquire and make effective analyses of information.*
5. *The ability to solve problems.*
6. *The ability to learn how to learn.*

(7, p. 22)

It is apparent that the skills identified by the persons from industry and business contained many of those listed by professional educators. The following is a listing of the skills by the two groups as referenced in the previous discussion.

Industry and Business Personnel — Needed Skills Identified

Skills in —
- learning
- reading
- language use
- mathematics
- decision making
- mediating conflicts
- leading people
- interacting with others
- coping
- problem solving
- articulation
- effective speaking
- establishing presence

Professional Educators — Needed Skills Identified

Skills in —
- problem solving
- leading
- coping with change

analysis
communication
interpersonal actions
creating
coping with conflict
adapting to change
planning
thinking
innovating
expression
inquiry
anticipating

Dr. Robert J. Havighurst writing in *The Seventy-Fourth Yearbook of the National Society for the Study of Education* has presented another facet of the discussion of "skills that America needs". One of the very important products of a society is its youth. Dr. Havighurst has listed a series of skills or capabilities needed by youth in order that they achieve a sense of identity as well as self-esteem.

> The central objective of society for its youth is that they should achieve a sense of identity and self-esteem. In order to do this, they need skills and knowledge and experiences which fall into two broad classes — those involving self-development and those involving other people...
>
> *Objectives of Self Development*
>
> 1. Cognitive and noncognitive skills necessary for economic independence and for occupational competence. We refer here not only to verbal and mathematical skills, but also to a variety of social skills and of manual and technical skills to fit the wide range of contemporary occupations.
>
> 2. Capability (or skills) for effective management of one's own affairs. Self-direction and self-management are essential in a complex world.
>
> 3. Capability (or skills) to engage in intense concentrated involvement in an activity...
>
> 4. Capabilities (or skills) as a consumer, not only of goods, but more significantly of the cultural riches of civilization.
>
> *Objectives of Social Relations*
>
> A range of types of involvements with other people is needed for the social maturation of youth.
>
> 5. Experiences with persons differing in social class, subculture, and in age...
>
> 6. Experience of having others dependent on one's actions...
>
> 7. Experience of interdependent activities directed toward collective goals. A healthy society requires cooperation and coordination of the activities of many people. The young person needs experience in the roles of leader and of follower. (5, pp. 87, 88).

Industrial Arts and Its Role in Building the Skills in People That America Needs. The first part of this discussion dealt with the identification of skills America needs as preceived by a variety of persons and groups. The range of skills extend from the three R's to coping and to mediating, from observing to analyzing and to articulating. The skills are not all at the same level of human performance and, of course, some are basic to others. In an effort to deal with the variety of skills in a programmatical way, a hierarchy of skills by levels was established. The first level was identified as "basic" to all others. The second level was identified as "functional", and the third level was what might be termed "application". See Figure 3.

Level I — "Basic" includes such skills as:

Reading
Writing — Communications (speaking, sign, drawing, etc.)
Calculating
Observing
Physical Movement (coordination, dexterity, etc.)

Level II — "Functional" includes such skills as:

Relating	Coping
Decisioning	Solving
Analyzing	Learning
Thinking	

Level III — "Application" includes such skills as:

Structuring	Following
Generalizing	Articulating
Cooperating	Organizing
Mediating	Using
Interacting (Social)	Planning
Managing	Constructing
Leading	Maintaining
Servicing	Consuming
Evaluating	Manipulating

Industrial Arts has a vital role to play in the development of these needed skills at all three levels. That is to say, Industrial Arts has an important role to play in the development of the reading, communicating, calculating, observing, and the physical movement capability.

These "basic" human functions can and must be structured into the student activities so that reading (for example) provides the means by which the student is able to assemble a unit, write a report, secure materials, etc. The student reads to get something that he or she needs or wants. The work that has been done by Herb Siegel in New York City, George Haney at the Earle B. Wood Junior High School (Md.) and Paul Skellchock at Thomas W. Pyle Junior High School

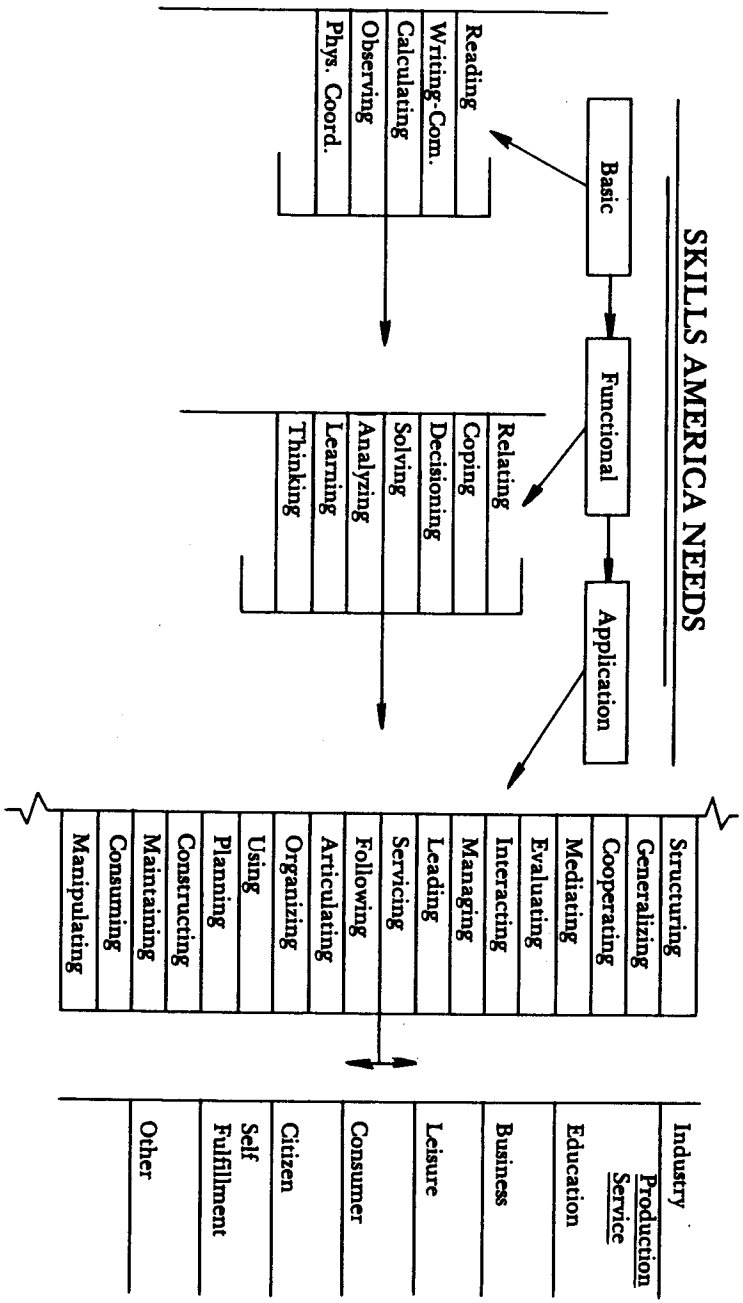


Figure 3

(Md.) are ample evidence that Industrial Arts can play a significant role in the development of the student's reading capability. The important ingredient that Industrial Arts brings to the student's development in reading, writing, calculating, observing, and physical activity is that it is in keeping with the student's purposes and not as an exercise or teacher assignment. Some fundamental principles or guidelines for the development of the "basic" skills are as follows:

1. The student engages in the (basic) activity because he/she wants or needs something.

2. The student gets something pertinent to his/her interest, project, or role.

3. The student is rewarded for his/her work with the "basic" skills and the results achieved.

4. The materials and activities associated with the "basic" skill involvement are at the level of the student's capability to perform.

5. The student's "need to know" is one of the most compelling factors in the development of the "basic" skills.

6. The student's "basic" skill activities center about his/her interests, activities, needs, and accomplishments.

Another important ingredient in the Industrial Arts contribution to the development of the "basic" skills is that the particular function (reading, writing, etc.) is carried out in conjunction with some physical object, project, process, or role involvement. Many times the "basic" function becomes a subtle but vital incursion in the learning experience. However, it should at all times be a part of the educational design and not just an incidental happening on the road to making a project. Such skill development is much too vital in the development of the citizen of today or tomorrow to leave it to chance.

The second level "functional" skills serve important human requirements that interface between the "basic" skills and the "application" skills. These "functional" skills are actually the prime movers among human functioning in which reading, writing, calculating, observing and physical activity provide the resources as well as the means for the "functional" skills to make possible the third level "application" (performance) skills. These "functional" skills are in a sense the "organizers" of the human's accumulated resources that come by way of the "basic" skills. The level of functioning of these second level skills is related to the integration of one's total experience.

The importance of these "functional" skills is evidenced by the frequency with which they are identified as "needed" skills by employers, educators, and those concerned with the human's ability to function in the present and future. It is obvious that most, if not all, of these "functional" skills would to some degree be involved in the pursuit of any one of the third level "application" skills. Figure 4 illustrates the interface of the skills needed with the Industrial Arts activities and program elements.

It also is important to understand that the second level "functional" skills are developed and/or sharpened by the individuals active encounter with the performance of the third level "application" tasks. It is this central idea that provides Industrial Arts with its important role in the development of the "functional" skills.

It is possible to develop strong, exciting, and effective Industrial Arts programs that involve the "application" skills of cooperating, interacting, managing, leading, organizing, planning, and structuring. At the same time that these "application" skills are being used, the individual will be experiencing development in the "functional" skills of relating, coping, decision making, solving, analyzing, learning, and thinking. Of course, all of this is based upon the assumption that it is a program in which the students are heavily involved in the pursuit of the "application" skills and are *not* following a fixed (cook book) routine established by the teacher or some other resource.

Industrial Arts can and will develop the skills that America needs to the extent that its programs are directed towards life-like experiences and — to the extent that the problems, conditions, and processes of the real world are integrated into the program.

The problems of communication, management, finance, production, safety, and quality control in an Industrial Arts laboratory can generate out of realistic situations centered around the functioning of student operated and controlled manufacturing enterprise. Or, the problems of research and development grow out of the natural curiosity of the learner or the specific needs of the industrial or manufacturing unit being carried out in the laboratory.

This concept of situational learning or of a problematic learning opportunity is consistent with what John Dewey was advocating years ago.

> ...Thinking, the best kind of thinking, Dewey concluded, included an overt act. The act of thought began with a problem or a problematic situation and ended with an action that converted it into a clear situation, one in which the interrupted action could proceed on its prosperous way. (1, p. 146)

Decision making for the Industrial Arts student generates out of his/her functioning as a project director in the process of leading, planning, organizing, managing or mediating.

Likewise, coping skills are used and developed by the safety director in a student operated manufacturing enterprise when he or she gets involved with planning, articulating, maintaining, interacting, and cooperating as needed to carry out the responsibilities of that role.

Analyzing skills are used and developed by the production manager of a student directed and operated line production as he/she deals with the problems of leading, evaluating, organizing, constructing, cooperating, and mediating. The capability of Industrial Arts to deal in a realistic manner with the skills that America needs has grown out of the imagination and ingenuity of the profession to introduce

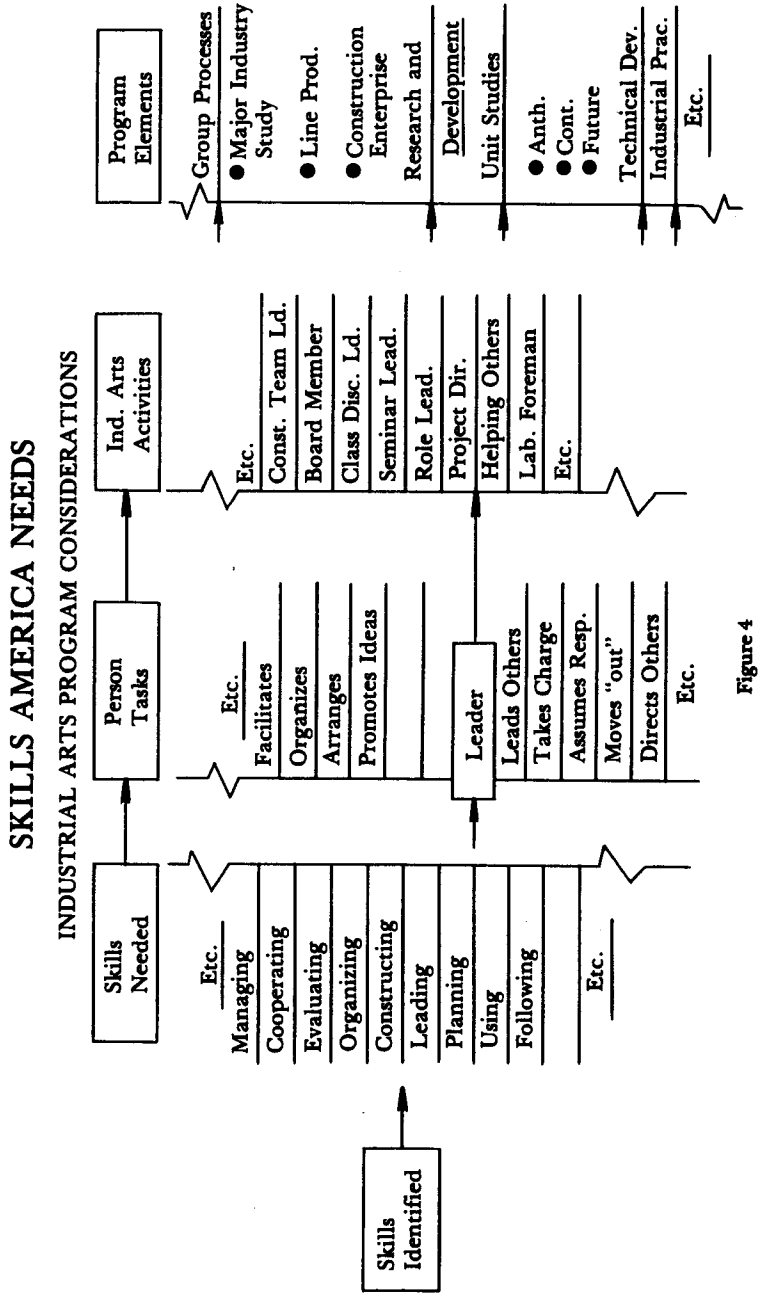


Figure 4

the reality of the industrial-technological society into the laboratory while at the same time exploiting the finest theories of learning in pursuing the educational function.

The *group process* experiences in Industrial Arts take on such forms as:

Major Industry studies (group project)

Line Production

Construction Enterprise

Each of these group process forms of educational organization provide excellent opportunities for all levels of skill development.

The opportunities for social involvement and the development of the social skills of leading, cooperating, mediating, managing, following, and interacting are tied in with all of the "functional" skills of relating, coping, decision making, solving, analyzing, learning, and thinking.

The constructional activities associated with the group process approaches to the study of industry and technology have rich potential for developing the "application" skills of structuring, servicing, organizing, using, planning, constructing, maintaining, consuming and manipulating. These application skills likewise require the performance and development of all of the "functional" and "basic" skills as identified in this discussion.

The organization of the personnel component and the constructional aspects are patterned after the industrial and business models associated with the experience.

The *research and development* program models in Industrial Arts provide realistic and meaningful opportunities to develop such "functional skills" as coping, solving, analyzing, learning, thinking, and relating.

The constructional and physical components of the research and development programs provide excellent opportunities for the development of the functional skills as well as such application skills as structuring, generalizing, evaluating, organizing, using, planning, constructing, maintaining, consuming, and manipulating.

The seminar component of the R & D programs provide excellent opportunities for the social skills development in the areas of cooperating, mediating, evaluating, interacting, leading, following, articulating, organizing, and planning.

Unit studies represent another form of Industrial Arts instructional organization that have rich potential for meaningful and relevant studies directed towards the skills that America needs.

Unit studies may take on the following forms:

Anthropological Unit Studies

Contemporary Unit Studies

Futuristic Unit Studies

Industrial Process Unit Studies

Each of these unit study forms provide excellent opportunities for developing the "basic", "functional", and "application" skills by virtue of the nature of the activities carried on at each of the phases in the unit development. The major phases of the unit instructional development are:

1. *Decision making regarding the major unit to be pursued.*
2. *Individual selection of his/her unit sub-topic.*
3. *Research and investigation into the sub-topic.*
4. *Planning the sub-topic development.*
5. *Constructing a project appropriate for the sub-topic.*
6. *Writing a report on the sub-topic.*
7. *Participation in class seminars.*

The pursuit of such unit studies provides the student with opportunities to develop all of the skills in the "basic" and functional" levels as well as most of those in the "application" level.

The *technical development* component of the Industrial Arts program is meant to apply to those opportunities the student has to explore in a greater depth his/her interest in metals, electronics, graphics, non-metallics, woods, or industrial chemicals.

Here again, the opportunities to develop the needed skills are in abundance dependent upon the extent to which the student is in charge of his/her learning and development process.

Guidelines for Industrial Arts in Providing the Skills that America Needs. One might comment that Industrial Arts is taking on a large commitment if it purports to be an effective contributor in the three levels of skills identified. The response to such a reaction is — "doing the job alone — No!", but as an effective contributive "Yes". It is the hope of this writer that all areas of the school will see the challenge and their responsibility in the developing of the skills America needs.

Some *guidelines* that may be useful to the profession as it pursues this important role of *contributing* to the development of the skills that America needs are as follows:

1. *The teachers, administrators and patrons of the school must be sensitive to the skills that America needs.*

2. *The teachers and administrators must encourage the development of such skills in all students in all levels.*

3. *The teachers and administrators must see such skill development as an important part of the program in Industrial Arts.*

4. *The Industrial Arts programs must bring the real world into the school and make the educational experiences as life-like as possible.*

5. *The Industrial Arts student's experience with such skill development as coping, relating, decisioning, solving, reading, writing, and thinking along with all of the others must be in the context of reality,*

meaningfulness, and relevance — not a series of highly structured exercises in each.

6. The program will require a great deal of initiative, involvement, and decision-making on the part of the student.

7. The teacher's role will be that of a manager of real-life experiences and one who facilitates, evaluates, encourages, consults, and stimulates.

8. The programs will extend out into the total school as well as the immediate and expanded community served by the school.

The challenge to the profession is obvious, and the contribution that Industrial Arts can make are significant. The skills in people that America needs are likewise obvious. Let us take up the challenge and be a prominent partner in America's most important business.

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