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AUTHOR. Swanson, Robert S.
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ABSTRACT

Industrial arts must consider its place in an environment which has changed in the past decade. It should be concerned with changes brought about by accelerating technological advances, increasing social problems, and the reappraisal of many personal values. Three important areas of thrust for industrial arts are (1) the study of industry, (2) career education, and (3) technological responsibility. The first thrust recognizes that industrial arts can provide a context in which to understand modern society, since industry is the vehicle through which technology is made available to all and is a dominant contributor to a high material standard of living. Industrial arts can play a part in career education (thrust two) because it can deal with many careers rather directly since the source of industrial arts content is the industrial world. The technological responsibility (thrust three) of industrial arts can be seen as providing the major educational element to focus extensive and intensive attention on technological/social problems and their solutions. Although industrial arts is a relatively recent addition to the curriculum, it has moved to a point of being capable of making significant contributions essential to survival. (TA)

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INDUSTRIAL ARTS: A FOCUS ON SOCIETY'S NEED

Robert S. Swanson

We are just at the beginning of our nation's Bicentennial celebration. The theme of this convention is a bicentennial theme, exhorting us to look at where we've been and where we might go. Besides providing an opportunity to review 200 years of progress in this country and 100 years of progress in industrial arts, this anniversary year of our country provides an opportunity to reflect on the individuals who contributed to that progress. One of those individuals was Benjamin Franklin. To industrial arts educators, he should be a hero. At times it seems we've neglected the importance of inventions and inventors on the development of American culture. For example, the plow, the reaper, the cotton gin, the steamboat, and the telegraph. Later, the combustion engine, the airplane, computers, and rocketry. Some people cite the mass production of automobiles in 1914 by Henry Ford as the "real American Revolution."

One of the first American geniuses devoted to mechanical pursuits was Benjamin Franklin. He was an inventor, craftsman, and scientist. His printing business provided him with the financial opportunity to sharpen his skills as a writer, diplomat, and philosopher.

From his humble beginnings as a printer's apprentice, he went on to make world famous discoveries in electricity; he invented the lightning rod; developed his own printing press, made significant contributions relating to heat that led to the development of the Franklin stove (which is reappearing today), invented an electrostatic generator, and laid out practical plans for paving and lighting streets. He found time to organize the first fire stations and libraries as well as starting a hospital, an insurance company, and a college, now the University of Pennsylvania.

He was a man interested in technical as well as social progress. And he was one of our most prolific givers of good advice. Franklin suggested that if we do not know something, we should admit it. He usually learned something, he said, after he acknowledged his own ignorance. To paraphrase Franklin: Those who think they know everything and undertake to explain everything, often remain ignorant of the many things others could teach them.

This has come to be a prestigious convention; a high point in our annual professional activities. It is not a place where anyone will attempt to explain everything, but it is a place where many will teach something. Let me hope to be among them--the teachers of something.

Industrial arts must consider its place in an environment which has changed in the past decade. Undoubtedly, there are teachers, courses, and whole curricula which operate as though no change has taken place; and there are those who feel the changes are only temporary and that we are in the pro-

cess of returning to the good old days. Some yearn for a "return to basics" which is often another term for the same idea.

What factors in this environment are of concern to us in industrial arts? Certainly, there are many, but let me comment on three: Accelerating technological advance, Increasing social problems, and Reappraisal of many personal values. (Figure 1)

Accelerating technological advances are all around us. There are mechanical spare parts for the human body, homes using solar energy, biomedical monitoring systems, instant and frozen foods, synthetic fabrics, and teaching machines.

Technologically, we are looking ahead to developments that include ocean farming, most Americans carrying their own telephone, three dimensional television in our livingroom, a permanent base on the moon, and robots that perform household chores.

In the printing industry, type is now set through optical scanners, pages are edited at video display terminals, and laser beams are used to separate colored photographs. The industry is printing on new papers made from synthetic fibers. In a sense, printing has moved from a primary emphasis on the mechanical to an emphasis of chemistry, electronics, and physics.

Microminiaturization has revolutionized the field of electronics. With the help of integrated circuits, we now use hand-held calculators and miniature cameras. We have created smaller and more reliable radio and television sets. Microelectronics have found their way into today's automobile and will be used to monitor fuel and emissions.

Miniaturized electronic circuitry will help eliminate five miles of wiring in your automobile. It will also enable you to afford a less costly list of

dodads that include window wipers that react to the moisture in the air, automatic light dimmers, and seat and window controls.

New materials are being discovered, and we are learning to work with them. We find that they have greater chemical stability, better moldability, and are high in temperature resistance.

In line with developing materials, our university has introduced course work in industrial ceramics. It certainly is not a new material, but it is becoming more important all the time. For example, parts made from ceramics can be used in gas turbines. Ceramic parts substituted for metal parts operate at higher temperatures, thus enabling us to gain greater efficiency in fuel combustion.

Wood preservatives have opened up new developments in the home building industry. Homes can now be constructed with wood foundations. They are cheaper, they take one-sixth the time to construct, and they can be put up in any weather.

Numerically controlled machines are moving parts down assembly lines, picking them up, placing them on circuit boards, and soldering terminals. General Motors is using numerically controlled machines to assemble automobile engines.

Biological and medical breakthroughs that have been forecast will test our religious and moral values severely. We are told there will be laboratory creation of new types of life forms, hibernation of people, chemical control of the aging process, and new behavior manipulation techniques.

These are just a few of the projected developments, a mere sprinkling of the forecasts. In light of them, widely accepted values must be weighed and reexamined daily.

We are now in a period of transition. We are puzzled by the meaning of or disagree on the value of such concepts as privacy, freedom, patriotism, hard work, loyalty, and family.

For months our society witnessed a national drama, a national struggle, if you will, revolving around a court case in Morristown, New Jersey. Medical technological progress of recent years was questioned there--held up before the nation for examination. The court had been asked to decide whether a 21-year old woman should be permitted to live or die--whether she could be removed from the life support systems that maintain her. Is it morally right or wrong to maintain life indefinitely through artificial means? The incident is a sign of the times. Just one more piece in our changing mosaic.

The events of our time have forced us to search out the answers through a somewhat painful self-examination process. Vietnam, for instance, forced us to ask ourselves whether we are infallible as a nation. Even more painful, whether we are a violent nation. Are we rich industrially, but impoverished when it comes to important social concerns? Are we ready to agree that progress, for its own sake or for economic gain, may no longer be totally acceptable? There are many who are questioning the profit motive. Can business actions which impinge on the public interest be justified, they ask.

Recently, one of the world's great historians, Arnold Toynbee, died. He gained his eminent reputation by describing the rise and fall of civilizations. His idea was that civilizations arise, develop, and then decay--usually because they make wrong responses to challenges facing them. Upheaval follows and then the patterns begin again. Rome rose, then subsequently fell. Not too long ago, Spain was the richest and most powerful nation on earth. After that, France and England. Historically, we know that Syria, Egypt, and Greece were once the brightest stars in the world's lineup of countries.

A British writer and prominent social thinker has helped put the events of our time in perspective. C. P. Snow said: "During all human history until this century, the rate of social change has been very slow. So slow, that it could pass unnoticed in one person's lifetime. That is no longer so. The rate of change has increased so much that our imagination can't keep up."

In the book, Redesigning the Future, we are warned that because of an increased rate of technological change, social environmental crises are generated and come to a head more rapidly today than in any previous time. Therefore, quicker responses are required.

The busing crisis in Boston reminds us that this country has been arguing school integration, busing, and related questions for more than 20 years. The decision goes all the way back to 1954 in Brown vs. the Board of Education. Certainly, the Supreme Court at that time expected that this country would begin solving the question of integrated schools immediately following the decision. Failure to respond quickly to such social issues or the lack of any kind of response at all causes disruptive protests, discontent, alienation, or civil disobedience. Repressive measures are often society's response to civil disruptions. Repression stimulates additional protests and disruptions. We now have created a cycle: protest, repression, protest. The cycle either intensifies or leads to indifference. Both outcomes are damaging.

As educators, we must make certain that our traditional programs, attitudes, and approaches come to grips with the challenges a technological age produces. Our subject matter is closely tied to industry. We are all aware of the elements of direct cost related to technological change. Design, engineering, labor, raw materials, plant, equipment, packaging, marketing, and distribution are the direct costs. One of our challenges is to make certain

our students are equally aware of the indirect costs--waste dumped into rivers, smoke pollution, dislocation of workers, radioactivity--in other words, the negative effects of technology.

We must know and understand the total cost of progress--and in some ways, we are learning. In 1971, Congress decided it did not want to finance the development of a supersonic transport. That decision, some maintain, cost this nation financially, and caused it to lose air leadership. Some congressmen decided, however, intercontinental transportation at speeds of 1,800 miles per hour was not worth the serious risk of noise pollution caused by sonic booms. Others were deeply concerned that emissions from the aircraft weakened the earth's ozone shield. It seemed possible that high speeds at out-of-sight altitudes could drastically upset the whole planet's ecological balance and force each of us to pay the cost of a fast trip from New York to London whether we were aboard the SST or not. And from the news reports of recent weeks, we still may.

There is another environment in which we find ourselves--the educational environment. There have always been changes in the total educational scene, but the Sixties was the decade of curriculum reform (Figure 2). It started officially in physics, precipitated by Sputnik. A group of physicists at MIT, lead by Zacharias, developed a curriculum based on understanding concepts of physics through appropriate experiments. It came to be called PSSC physics (Physical Science Study Committee). Practically all other fields followed suit during the next ten years.

Industrial arts, too, was active. Over twenty curriculum projects, large and small, came forth. Major funded projects were Stout's American Industry and Ohio State's Industrial Arts Curriculum Project. Others were the Alberta

Plan, the Maryland Plan, the Main State Plan, the Georgia Plan, and the Richmond Plan. There were the Cluster Concept, the Correlated Curriculum Project, Functions of Industry, Industriology, and the Orchestrated Systems.

A great deal of thinking, debating, and coursework were done. The field searched itself for new ideas and many came forth.

While we don't hear as much about such projects today, each has contributed to leaving an imprint. Several influences came from this work to affect today's industrial arts curricula.

1. Most of the projects presented a need and basis for a broader, integrated view of things, rather than a series of unrelated pieces. For some, the broad subject is industry. For others, it is technology. For a few, it is the world of work. But all proposed a broad view.

2. In keeping with this idea, most dealt with concepts and their understanding. There was a desire to develop structures to organize and give meaning to facts.

3. Most tried to come up with some new and exciting activities, often involving groups of students, rather than individuals.

4. Most proposed a problem solving approach.

The national movement most recently on the scene is career education. This became prominent in the 1970's when Sidney Marland became Commissioner of Education. Economic factors, such as a slowdown in the job market, and social factors, such as a desire to see more responsible citizens who knew how to work and wanted to, make this a popular thrust.

Career education has the possibility of making a great impact on all of education but especially on industrial arts. To many in our field, this is "our kind" of education. Regardless of philosophy, the possibility of increased

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support for our work has made this an attractive approach. Several results can be observed already:

1. Some have made a major shift to rather direct vocational preparation in industrial arts.

2. Some have conceived career education very broadly and viewed industrial arts as a place to develop broad career competencies.

3. The dichotomy between general education and occupational education has largely disappeared.

The environment in which we find ourselves today is dynamic and compelling. We cannot ignore it.

All conditions and developments have made the message very clear to us-- industrial arts can and must focus on society's needs and problems. We cannot isolate ourselves from the broader goals of society (Figure 3). This is both a responsibility and an opportunity. It can open doors to the significance of our field. If we don't accept this challenge, we will become very unimportant on the scene. If we do accept it, we'll make a major contribution. Industrial arts teachers can personally influence individual students and through them, society. Industrial arts as a field can make an impact on society in general.

As a profession we have sought to provide meaning and direction to our work by stating objectives and goals. We are all familiar with the several national publications that provided objectives for our profession. Many state and local curriculum guides have extended the national statements by listing more specific goals and individual courses of study have detailed expected outcomes with varying degrees of specificity.

A study of the goals and objectives proposed over the years illustrates what we have considered important and what we feel will give our field status

and support. Many of the goal statements have retained their basic essence over the years, but have been modified to fit changing needs and conditions.

Today I would like to use the concept of "thrust," rather than goals or objectives. With the theme I have chosen, "Industrial Arts Must Focus on Societal Problems," it seems to me more productive to think in terms of thrusts rather than objectives or goals. Thrusts imply focused action. They are directional rather than specific and detailed.

Let me propose the following thrusts for industrial arts. Two of them have long been incorporated in our field, though they have been reinterpreted and modified with changing conditions. The third has not received much emphasis, but is extremely important and timely and I believe it will add significance to our work.

Thrust One--The Study of Industry. Industrial Arts can provide a context in which to understand modern society (Figure 4).

Most of our professional publications for the past 30 years have placed emphasis on teaching students about industry. Three objectives, each drawn from one state and two national bulletins, sound very similar. They tell us:

1. To work with the elements of industry to gain understanding of how they function in producing goods and services (5, p.3).
2. To develop an insight and understanding of industry and its place in our culture (4, p.9).
3. To develop in each student an insight and understanding of industry and its place in our society (2, p.4).

So much of our life is influenced by the fact that our goods and services are provided through the institution of industry. Industry is the vehicle through which our technology is made available to all and is a dominant con-

tributor to a high material standard of living. We have come to accept this. We accept, even anticipate, that new car models will come forth annually, that new clothing styles will be created periodically, that new foods will be available, that new television series will start each fall. We need to understand how all this comes to be.

A word here on methodology may be appropriate. There is often a tendency to feel that if we deal with certain kinds of content, our teaching will end up as lectures on the subject with students just writing papers and reciting as they often do in many academic classes.

We often find resistance to moving to certain kinds of content because it is felt to be "social science." The method of industrial arts--to involve students actively in projects which develop understanding by illustrating principles and concepts with real life activities--is still a sound and exciting approach and should not be abandoned. The choice is not to either "convert to social science" or "remain with the traditional content of industrial arts." Rather, it is a challenge to develop real, life-like, and interesting student activities which develop understanding of important concepts.

Work done under a special project, coordinated with The Wisconsin Guide to Local Curriculum Improvement in Industrial Education (5), for example, provides outlines and activities to aid in this kind of teaching. Examples of units prepared include: Introduction to Production Technology, The Development of Industry, An Overview of Marketing and Distribution, Maintenance and Services, What is Communications, How Industry Uses Management, and Power and Energy.

Early approaches to industrial arts emphasized activity by the student and

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used trade-type activities in wood and metal as a means of interpreting industry. The idea was to involve students in "real industrial" activities at a time when "industry" was skilled tradesmen at work.

The curriculum projects of the Sixties broadened the approach to content for interpreting industry. The mass approach with each student performing a specialized task gave a view of industrial practice. Other approaches included many more of the activities of the manufacturing industry: setting up and financing a company, doing market surveys, designing products, setting them up for manufacture, operating and controlling a production line, performing quality control, selling products, and distributing profits.

Other approaches emphasized research and development, materials testing, and product design. The service industries have received less consistent attention from a broad overview standpoint.

Our field has made considerable strides in giving students a comprehensive view of industry as a provider of goods and services in our society.

Thrust Two--Career Education. Industrial Arts can make a major contribution to Career Education (Figure 5).

For years, we argued the vocational/general education approach in industrial arts. Many definitions of industrial arts carried the caution that "industrial arts is not vocational education."

The career education movement provided a new basis for justifying the exploration and development of various skills and knowledge that are related to the world of work. Career education gives a broader definition, puts into context some objectives we've claimed for some time.

Again, quoting from one state and two national bulletins, our curriculum writers have said that industrial arts exists to enable students to:

1. Discover and develop talents, aptitudes, interests, and potentialities of individuals for the technical pursuits and applied sciences (4, p.10).
2. Explore occupational areas as a basis for selecting a career and understanding the pursuits of others (5, p.2).
3. Discover and develop student talents in industrial-technical fields (2, p.4).

Industrial arts can deal with many careers rather directly because the source of our content is the industrial world. But there is another aspect, at least as important. The teaching methods we can and should use call for the development of many of the habits, attitudes, and work modes that are involved with all occupations, not just industrial pursuits. Industrial arts can thus develop "career habits" regardless of the career a person chooses. This may be the most valuable career education we can provide for many.

We hear so much that young people are undecided about what they want to do. As a teacher, you can significantly aid students to make some tentative choices at least. Making a choice gives direction, even if the choice is later modified. The personal attention you give to an individual can be a significant force in his or her life.

This is an area where the efforts of teachers can have a direct influence on students. Teachers should not underestimate the impact they can have on individual students. Henry Adams said, "A teacher affects eternity. He can never tell where his influence stops." On the other hand, the best possible curriculum, the best facilities, the latest teaching techniques, or the latest information in the field all suffer in the hands of a dull, disinterested,

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unimaginative teacher. One becomes aware of the power of the individual teacher in recalling Anne Mansfield Sullivan and her work with Helen Keller. Helen Keller was blind, deaf, and mute, as you may recall. Anne Sullivan demonstrated the power of teaching by turning darkness into light and silence into sound. Through her efforts, Helen Keller became a national figure, recognized by world leaders, universities, and governments thousands of miles away from the small Alabama town where she was born.

Glenn T. Seaborg, former chairman of the Atomic Energy Commission, showed absolutely no scientific proficiency or particular interest until he encountered Dwight Logan Reid, one of his high school teachers. Until meeting Reid, Seaborg was a typical student. He played football, mowed lawns, and had his own paper route. Reid, an enthusiastic science teacher, inspired Seaborg with an interest in chemistry and physics. From the small mining town in Michigan where he was born, Seaborg went on to supervise the \$3 billion organization that administered national laboratories, manufactured fissionable materials, developed reactors, and produced atomic power. In addition, he became a chief advisor to President Kennedy on atomic affairs.

It is often said that broad societal changes come as a result of the composite impact of individual-upon-individual, teacher-upon-student. Yours is an immense power.

Thrust Three--Technological Responsibility. Industrial Arts can be the major educational element to focus extensive and intensive attention on technological/social problems and their solutions.(Figure 6).

The first two thrusts have a considerable history in industrial arts and have developed from simple to more complex ideas as our society has become more

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complex. I believe that a third thrust for our field is now appropriate and concern for it constitutes a next step in the development of industrial arts.

This country prides itself on its progressive development of technology and its ability to put that technology to work in improving our standard of living.

There is, on the other hand, a deepening pessimism concerning the social role of technology. The number of students seeking engineering degrees declined during the late 1960s. Reform politicians accuse governments of neglect of the poor while spending heavily on technology. Weapons of war and the defenses against them--always heavily technological--taint technology itself as murderous.

Transportation, power, extraction, and production technologies are viewed by the public as principal polluters. The great American dream of two cars in each garage has become the great American catastrophe of noxious fumes, landscapes clogged with billboards along acres of concrete freeways.

Factories and power plants produce clouds of dirt which have reduced the overall sunlight by as much as 15% and raise the spectre of atmospheric inversions which could suffocate the earth in a poisonous choking blanket. This then produces the "greenhouse effect" in which the sun's radiation is locked in, the heat cannot return to the atmosphere, the earth's temperature rises, and the glaciers melt into torrential floods.

Computers are seen as dehumanizing monsters as they threaten individual privacy in large data banks and foster large-scale unemployment through industrial automation.

On the other hand, life as we know it today would not exist without the many technological devices and systems we have. It is important that we as a

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society understand this and make wise and prudent use of our efforts. Industrial arts is one subject area, perhaps the only one, where these concepts can be studied in depth and in a practical way. We have all the resources at our disposal to engage in such a study. It is important that we focus our efforts to that end.

I am not proposing a new curriculum for industrial arts that would throw out what is currently being done. Experience with problems created by technology and attacks on those problems can be incorporated into existing classes.

A problem in the search for alternate forms of power can call for design and construction of devices for converting wind into electricity. The devices can be simple and tested by subjecting them to the blast of an electric fan or extremely sophisticated and tested over time in natural winds.

Experiments with electric vehicles, either full-sized or scale versions, can test efficiency against pollution. More sophisticated studies must investigate the pollution created by the generation of the electricity for the storage battery, of course. Experiments with mass transit may provide other solutions.

Devices for recycling materials can be built and tested with experiments in the use of materials recycled.

Experiments with solar heating and heat pumps call upon the skills and knowledges taught in many of our courses. The emphasis on efficiency, conservation, and new source of energy are simply ways of looking at the use of these competencies.

We have developed an idea in Wisconsin that we hope industrial arts people in our home state will find exciting and valuable. We call it "Technology for Society."

It involves industrial arts in Wisconsin adopting a "Theme of the Year" each year and then developing junior and senior high school students' learning projects and competition around that theme. The theme chosen will deal with an important current technological problem which has considerable societal impact. For 1976-77, we have chosen "Sources of Energy." In future years we may consider such themes as: Alternate Forms of Transportation, Design for Adaptability vs. Design for Obsolescence, Improving the Environment, or Housing to Improve Living.

Certainly, it is unlikely that junior or senior high school students will solve problems that have baffled industry and business, but the attention paid to such problems by thousands of students and their teachers can encourage, enhance, and even force attention by others. At least a realistic view of the needs can result.

The activity can be incorporated in existing classes; it could be a club activity; it could be an individual student's outside extracurricular project; it could be a whole new course. The possibilities are endless and can be adapted to individual situations.

The point is that by participating in this program, Wisconsin's students will not be idle on the sidelines while important decisions relating to technology and their future are made. We want students to be aware of the impact before decisions are made. Given some experience with this, it perhaps can become a model for a national program. We all have a stake in the solutions of public problems. As major problems rise to the top of the public agenda, we need to understand their implications and perhaps have a chance to respond. Our problems are worldwide and interrelated. The solutions touch upon everyone of us.

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Further, I believe the efforts of thousands of students and their teachers studying significant problems and putting their ideas on display will place the value of our field before the public.

Conclusion

Our is a changing society. Many problems face us today in number and intensity previously unmatched. We have claimed that education is a major answer of our country in making democracy work. Industrial arts is a relatively recent addition to the curriculum, but we have moved through a maturing process to a point where I believe we can make the significant contributions essential to survival. It's up to you. Let's get at it.

END

Dr. Robert S. Swanson is the Chancellor at the University of Wisconsin-Stout, Menomonie, Wisconsin.

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