Industrial Arts and Technology

DELMAR W. OLSON

Industrial Arts And Technology

DELMAR W. OLSON

Professor of Industrial Arts
Coordinator of Graduate Study for Industrial Arts
Kent State University, Kent, Ohio

PRENTICE-HALL, INC.
Englewood Cliffs, N. J.

To every industrial arts teacher
who sees industrial arts
as fundamental education
for every American boy and girl

PRENTICE-HALL INTERNATIONAL, INC., *London*
PRENTICE-HALL OF AUSTRALIA, PTY., LTD., *Sydney*
PRENTICE-HALL OF CANADA, LTD., *Toronto*
PRENTICE-HALL OF JAPAN, INC., *Tokyo*

Printed in the United States of America
45921-C

Library of Congress Catalog No.
63-11097

Current printing (last digit):
11 10 9 8 7 6 5 4 3 2

Frontispiece: Courtesy, Ford Motor Company

Industrial Arts And Technology

To My Colleagues:

A Foreword

Many of us at one time or another have wondered about the curriculum for industrial arts, because at the same time that we saw it in its common form of woodworking, mechanical drawing, and metalworking, we also saw that it could be crafts, power, graphic arts, transportation, auto mechanics, or other. We personally know teachers who support the narrower curriculum and others who insist on the expanded. Who is right?

Industrial arts has traditionally been a disciplinary subject in that it insisted on routing a youngster through a series of prescribed experiences leading to a mastery of a tool or a machine tool under the assumption that this mastery was the essence of its goodness. It seems to me that it is time for us to reconsider what the mastering of materials, energies, tools, machines, and products by man has done for him; to reflect on the control he has created for himself over his natural environment; and to look at the environment he is creating out of this mastery; and to study all of this mastery as the source of its subject matter. In my opinion all of this stands as a challenge: it is the challenge of technology and the great mission for industrial arts. With this kind of industrial arts man can learn about this materials mastery as he discovers and develops his own native aptitudes for having better ideas with materials. He can find value in his technology beyond that of tool skills and can gain even greater control of what happens to him in his time.

This proposal suggests a rather clear direction for a new industrial arts. My hope is that it will help you to envision a great new program, too, and that each of us will take it upon himself to study, experiment, and to share his findings. I can see the possibility of a magnificent new education for every American and a golden age for industrial arts in the years ahead.

DELMAR W. OLSON

Preface

The concept of industrial arts described in this book is a proposal that originated with an attempt to place today's industrial arts within the context of today's technology. The influence of such an environment projects change for the industrial arts. Necessarily imaginative and idealistic, the proposal creates a new ideal for industrial arts. In this idealism it seeks to discover meaning, purpose, and excellence in a technology that is commonly assumed to be materialistic. Idealism and materialism, essentially divergent philosophies, have seemed sufficiently reconcilable to me to be brought together.

The hypotheses on which the proposal is based are simple and logical. First, the purpose of the school in any society is to acquaint the young with the nature of their culture. Second, man by nature is facile in reasoning, problem-solving, creating, and constructing with the materials and energies provided by nature. Third, the ultimate goal and good in technology is the liberation of man from enslavement to materials, freeing him for higher purpose and achievement. Fourth, the technology originated through man's creativity; the continuing change in technology evidences a continuing creativity. Fifth, all men possess a measure of creativity, but not necessarily the same measure. The creative imagination is the highest level of the human intellect, the greatest of man's gifts, and is of greater significance than knowledge. Sixth, in the American pattern of civilization there is more than one road to wisdom and culture, and among them the study of the technology is fully as liberating as the liberal arts. And last, it is the responsibility of the school to acquaint its students with the nature of technological culture and to assist them in discovering and developing their talents therein. This should be the province of the industrial arts.

A proposal for a new industrial arts might possibly have entirely different bases than these. It might follow from a study of the

psychological nature and needs of man, or it might be drawn from a scientific-mathematical-engineering analysis of materials, processes, and machines. This study, however, is essentially socio-economic-cultural in origin and development, since the material culture, the technology, derives from men and materials.

Two sources should be read before studying this proposal. The first, an address given by Alfred North Whitehead in 1917, is Chapter 4 in his *The Aims of Education* (*89*, 52-68) and is entitled "Technical Education and its Relation to Science and Literature." This essay, teeming with significant concepts, permits the industrial arts teacher to idealize and then to realize his visions. Especially meaningful to us in industrial arts, Whitehead's idealism of 1917 now approaches common logic.

The second source is Chapter 8 in *Goals for Americans* (*63*, 193-204). Thomas J. Watson, Jr. describes national goals as he analyzes technological change. He stands in a key position for influencing such change, and seems to speak directly to the industrial arts teacher. These two sources, each in its own way, envision a technology released from restriction to materialism. They prepare the teacher for his search for a greater industrial arts.

The total proposal evolves through five stages. The first, Chapter I, provides the historical and evolutionary background of industrial arts and identifies forces which have tended to shape its curriculum. The second, Chapters II and III, studies the technology itself, identifying its elements and outlining results. A perspective of contemporary industry as an institution is also developed. Technology and industry are seen as the primary sources of subject matter for industrial arts. The third stage, Chapters IV, V, VI, and VII, derives and classifies subject matter originating in industry and makes an analysis of the functions of industrial arts. The fourth stage, Chapters VIII and IX, identifies the new industrial arts as a complete program and describes essential facilities. The last stage, Chapter X, reviews the entire proposal pointing out implications which may become principles or generalizations from within the over-all concept. These serve as guides to a clarification of the concept, to implementation of the program at any level, to a rethinking of teaching method, to measures for evaluation, and as issues for debate.

May I express my appreciation to my colleagues throughout the profession who through the years have assisted in their own unique

ways in the development of this proposal for a new industrial arts. I am even indebted to those who have said, "It is a good idea, but it won't work." The testing because of this resistance has caused me to broaden my thinking about industrial arts. I am sure that if it is a good idea, someone can make it work.

I wish also to express my gratitude to the many students who, captive as they may be in my classes, have been willing to reflect on the contents of the proposal and to take parts of it for study and experimentation in their own schools. Some of these stand out today as bright spots in the progress of the profession.

May this also acknowledge our men who have been moved to stimulate the profession with their vision and their hope, and who have persisted in their faith that there is much more good in industrial arts than we have sensed. I am reminded of a letter from George A. Bowman, President of Kent State University, in which he pointed out to me that the hand must reach farther than it can grasp. I wish I could acknowledge all of those who have shared in this proposal for a new industrial arts.

D.W.O.

Acknowledgements

The author is grateful to the following for the illustrative material reproduced in this text:

American Vocational Association, Inc.: the selection from "A Guide to Improving Instruction in Industrial Arts," used by permission of the American Vocational Association, Inc.

Appleton-Century-Crofts, Inc.: from *Technology and Social Change*, by Francis R. Allen, Hornell Hart, Delbert C. Miller, William F. Ogburn and Meyer F. Nimkoff. Copyright (c) 1957. Used by permission of Appleton-Century-Crofts, Inc.

Chas. A. Bennett Co., Inc.: the selection from the editorial by Charles Richards in Volume VI, No. 1, October, 1904, of the *Manual Training Magazine*, the selection from Charles A. Bennett's *The Manual Arts*, the selection from Bennett's *History of Manual and Industrial Education 1870 to 1917*, used by permission of Chas. A. Bennett Co., Inc.

Bonser, Frederick G. and Lois C. Mossman: from *Industrial Arts for The Elementary School*, used by permission.

The Bruce Publishing Company: from Bawden's *Leaders in Industrial Education*, 1950, by permission of the Bruce Publishing Company.

Columbia University Press: from *Modern Science and Modern Man* by James B. Conant, copyright 1955, used by permission of Columbia University Press, and David Snedden and W. E. Warner, *Reconstruction of Industrial Arts Courses*, 1927, used by permission of Bureau of Publications, Teachers College, Columbia University.

Crown Publishers, Inc.: the selection from *The Power Age* by Walter Polakov, used by permission of Crown Publishers, Inc.

Epsilon Pi Tau, Inc.: the selection from *Industrial Arts and The American Tradition* by Boyd H. Bode, used by permission of Epsilon Pi Tau, Inc.

Harcourt, Brace & World, Inc.: from *Technics and Civilization* by Lewis Mumford, copyright, 1934, by Harcourt, Brace & World, Inc., used by permission of the above.

Harper & Row, Publishers: the selection from *America's Next Twenty Years* by Peter F. Drucker, in *Harper's Magazine*, March, April, May, June, 1955, used by permission of Harper & Row, Publishers.

D. C. Heath and Company: the selection from *The Manual Training School*, 1887, by Calvin M. Woodward.

International Textbook Company: from *Industrial Arts and General Education* by Gordon O. Wilber, used by permission of International Textbook Company

Liveright Publishing Corporation: from *The Story of Mankind* by Hendrick W. Van Loon, by permission of LIVERIGHT, Publishers. N.Y.

The Macmillan Company: from *The Aims of Education* by Alfred N. Whitehead, by permission of The Macmillan Company.

McGraw-Hill Book Company, Inc.: from *Modern Technology and Civilization* by Charles R. Walker. Copyright 1962. McGraw-Hill Book Company, Inc. Used by permission.

National Industrial Conference Board: *Road Map* No. 1080, used by permission of National Industrial Conference Board.

Prentice-Hall, Inc.: the selection from T. J. Watson, Jr., in *Goals for Americans, The Report of the President's Commission on National Goals.* © 1960, by The American Assembly. Prentice-Hall. Inc., Publisher. Used by permission.

The Ronald Press Company: the selection from *History of American Technology* by John W. Oliver, Copyright 1956. Used by permission of The Ronald Press Company.

Scientific American: from *Automatic Control,* September, 1952, used by permission of Scientific American.

Simon and Schuster, Inc.: from *American Science and Invention,* Copyright 1954 by Mitchell Wilson, by permission of Simon and Schuster, Inc.

The Twentieth Century Fund: from *America's Needs and Resources* by J. Frederick Dewhurst and Associates, used by permission of The Twentieth Century Fund.

The University of Chicago Press: from *School and Society* by John Dewey, Copyright 1916 by the University of Chicago, used by permission of The University of Chicago Press.

C. A. Watts & Co. Ltd.: from *Man Makes Himself* by V. Gordon Childe, used by permission of C. A. Watts & Co. Ltd.

Wilkie Brothers Foundation: from *Civilization Through Tools,* used by permission of Wilkie Brothers Foundation.

Table of Contents

I

The Industrial Arts Curriculum In Transition

> ***. . . there are, however, three main roads along which we can proceed with good hope of advancing towards the best balance of intellect and character: these are the way of literary culture, the way of scientific culture, the way of technical culture. No one of these methods can be exclusively followed without grave loss of intellectual activity and of character. . . .***
>
> —Alfred North Whitehead, *The Aims of Education.* (New York: The Macmillan Company, 1929).

Industrial arts education had its beginning with the acceptance of the concept of *work as education.* But pinpointing in the history of education when this acceptance occurred is difficult. Work was considered moral, righteous, and spiritually uplifting long before it was considered to be educative. The experiments and theories of Johann Heinrich Pestalozzi and Philip Emanuel von Fellenberg in Switzerland during the latter part of the eighteenth and the early part of the nineteenth centuries are considered pioneer developments in the implementation of the concept of work as education. Pestalozzi has been called the father of manual training

as well as the father of modern elementary education, so great was his influence on later trends in education.

During the first part of the nineteenth century a technical instruction system was developed in Russia for the training of engineers and technicians. It was revolutionary in that it employed a *class* type of training in contrast to the *apprentice* method. This was officially launched in 1830 with the establishment of the School of Trades and Industries in Moscow. At the same time a system of educational handwork was being developed in the Scandinavian countries, to be known as Scandinavian *sloyd*. By the middle of the nineteenth century sloyd schools were common in Norway and Sweden. In Finland, an improved type of sloyd under the leadership of a teacher, Uno Cygnaeus, was introduced during the second half of the century and was recognized by law as a part of the public elementary school program in 1866. Sloyd was introduced into the common school because of its acceptance as education for all children. Instruction concentrated upon the making of articles useful in the home, generally of wood—although other materials were added in some schools.

At this point in history these concepts of educative handwork found their way across the Atlantic to the United States. Historians claim that the Russian plan was introduced in 1870 and the sloyd plan in 1888; but for purposes of studying their contributions to the development of industrial arts, we can assume that they arrived simultaneously. These systems, influenced by an expanding American industrialization, developed into a type of educative shopwork which was shortly to be known as *manual training*.

MANUAL TRAINING

The great American champion of manual training was Calvin M. Woodward, dean of the polytechnic faculty at Washington University, St. Louis, Missouri. Because of his leadership and the support of other prominent educators, manual training came to be the first form of organized, shop-type education in American public schools. Industrial drawing instruction was introduced at the Massachusetts Institute of Technology in 1870 by John D. Runkle, president of the institution, and Woodward also began his first experiments with manual training at the college level. In 1880, Woodward opened the country's first manual training high school, known as The Manual

Training School of Washington University. In 1886 he described his manual training:

> The object of the introduction of manual training is not to make mechanics. I have said that many times, and I find continued need of repeating the statement. We teach banking, not because we expect our pupils to become bankers; and we teach drawing, not because we expect to train architects or artists or engineers; and we teach the use of tools, the properties of materials, and the methods of the arts, not because we expect our boys to become artisans. We teach them the United States Constitution and some of the Acts of Congress not because we expect them all to become congressmen. But we do expect that our boys will at least have something to do with bankers, and architects, and artists, and engineers, and artisans; and we expect all to become good citizens. Our great object is educational: other objects are secondary. That industrial results will surely follow, I have not the least doubt; but they will take care of themselves. Just as a love for the beautiful follows a love for the true, and as the high arts cannot thrive except on the firm foundation of the low ones, so a higher and finer development of all industrial standards is sure to follow a rational study of the underlying principles and methods. Every object of attention put into the schoolroom should be put there for two reasons—one educational, the other economic. Training, culture, skill come first; knowledge about persons, things, places, customs, tools, methods comes second. It is only by securing both objects that the pupil gains the great prize, which is power to deal successfully with the men, things, and activities which surround him (99, p. 229).[1]

American educators experimented with the Russian system, the sloyd methods, and manual training, devising numerous variations and combinations of these. For years Woodward's manual training provided the basic pattern for high school shopwork in programs of general education. Manual trainers themselves, however, began to point out weaknesses in it. Among the criticisms were that manual training was too formal, too rigid, and not truly liberal because it confined the pupil to exercises in narrow fields and ignored relationships with the sciences. One stricture is particularly significant for this study. Some educators expressed concern over the lack of attention paid to aesthetic design in exercises, projects, and models. This criticism was echoed by reformers who were championing the arts and crafts movement. The latter was a crusade dedicated to

[1] For full citation of this and other references that follow, see the Bibliography at the end of the book.