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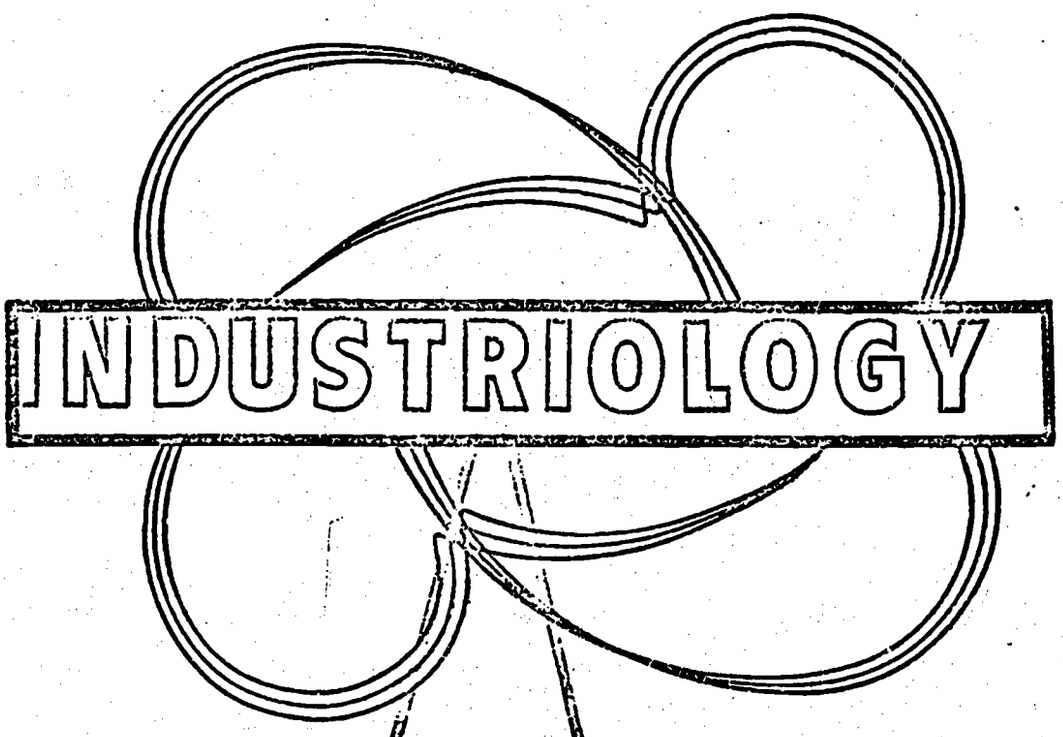
ABSTRACT

This overview of an industrial arts curriculum project, resulting from comprehensive studies of industry by the staff and graduate students of the College of Industry at Wisconsin State University through federally funded institutional grants and fellowship programs, focuses on "industriology"--the science of industry. Intended to update and improve industrial arts programs at the elementary and secondary levels, the comprehensive sequential program examines extractive, manufacturing, distribution, and service industries by delineating their activities in development and design, finance and office services, marketing, processing, industrial relations, and purchasing. General and specific behavioral objectives, a program rationale, a brief content outline, and descriptions of the instructional organization are presented. Instructional materials for these courses will consist of: (1) a study guide, (2) sheets for learning activities and teaching procedures, (3) student worksheets, and (4) resource lists and a bibliography. Integrated resource units will be developed and implemented for the elementary grades. Program activities will include occupational guidance, cooperative work experience, and modular units varying from 5 to 25 instructional hours in length. (AG)

the science of industry



Raw Materials
Manufacturing
Distribution
Service

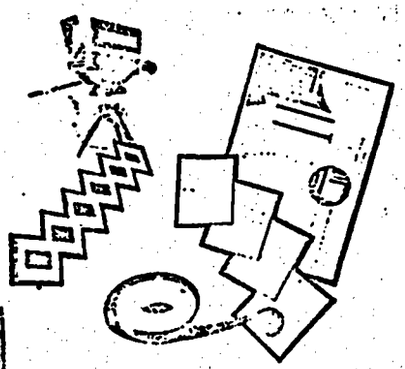
Development and Design
Purchasing
Manufacturing or Processing
Finance and Office Services
Industrial Relations
Marketing

WISCONSIN STATE UNIVERSITY- PLATTEVILLE

PHILOSOPHY

Industry today affects people in all walks of life. Therefore, a study and understanding of industry should be a part of the education of all boys and girls. INDUSTRIOLOGY is a program designed to be broad and comprehensive in the initial phases, providing a basic understanding of industry. Schools with only one lab should be able to present a comprehensive study of industry.

INSTRUCTIONAL MATERIALS



THE PROGRAM

. . . an industrial arts curriculum project aimed at up-dating and improving the industrial arts programs in elementary and secondary schools through a broad, comprehensive approach to a study of industry.

ACTIVITIES

Girls and boys studying industry
Mass production activities
Papermaking
Study of construction in industry
Extracting raw materials
Corporate study and structure
Occupational studies
Cooperative work experience

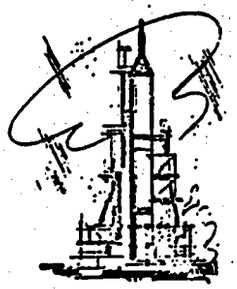
OBJECTIVES

1. Interpreting Industry - To develop an understanding of industry and its implications on modern society.
2. Problem-Solving Ability - To develop the ability to solve industrially related problems.
3. Creativity and Design - To develop the ability to create, design, and appreciate industrial products and methods.
4. Skills - To develop a degree of skill and safe practices in the use of tools, machines, materials, and processes of industry.
5. Communications - To develop the ability to communicate using the language of industry.
6. Practical Application - To develop the ability to apply other education in practical situations.

INDUSTRIOLOGY - THE SCIENCE OF INDUSTRY

RATIONALE FOR CHANGE

Industrial arts, as a discipline in the public schools today, has a new and vital role in the education of American youth. The tremendous advances of industry in what is commonly referred to as "technology" affects all youth. This is an industrial society in which we live and all students need experiences which will enable them to better understand this technological world-to adjust socially and occupationally.



The industrial society of today demands that all members possess an understanding of industry. Industrial arts has long held this to be one of the major objectives. However, traditionally and particularly in smaller schools, industrial arts has been geared primarily to skill development and to the completion of individual projects with considerable emphasis on the manufacturing industries.

Currently, industrial arts programs are too narrow in scope, not only in course offerings but also with regard to content within the courses. A national study by Schmitt and Pelley revealed that the concentration of subject content is centered in the three areas of woodworking, drafting, and metalworking.[1] They concluded that the "current industrial arts curriculum is too narrow in scope."[2]

Further examination of industrial arts programs around the country would reveal many small schools with rather limited industrial arts programs. One could very easily find a number of schools with the traditional woodwork shop, and consequently all that is taught is woodwork. This is tragic and does not truly reflect industrial arts. It is not tragic that

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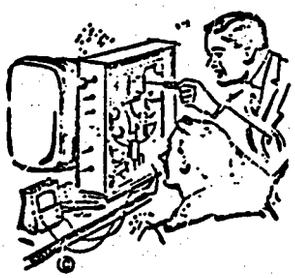
[1]Marshall Schmitt and Albert Pelley, Industrial Arts Education. (Washington: U.S. Government Printing Office, 1966), p. 29.

[2]Ibid., p. 30.

woodwork is being taught, but it is tragic that only woodwork is being taught. This could be said about any of the "traditional" areas of industrial arts.

Students participating in such limited industrial arts programs are disadvantaged and will tend to face this industrial world sadly unprepared. Actually, no student should be handicapped in this way. All schools, whether they have only one shop such as a wood shop, or have many types of shops, should be able to provide a broad, comprehensive study of industry.

It is the belief of many that the project per se has been over-emphasized as the end product of many industrial arts programs. Parents, and lay people as well, and even some industrial arts instructors consider the project as an expected end product of the course rather than insights gained by the student as to what industry is and how it functions.



This may lead one to believe that project making and skill development should be curtailed completely. This is not true; however, less emphasis should be placed on skill development and project making as an end product with more thought and energy given to planning industrial arts programs that provide students with a broader background of experiences and insights which will prepare them to more adequately deal with a constantly changing industrial society.

Certainly much of what has been done in industrial arts in the past has been good and needs to be retained. However, as was pointed out before, industrial arts is in need of some up-dating and becoming more comprehensive in scope if the present-day needs of youth are to be met. INDUSTRIOLOGY proposes to meet these needs as a broadening and an extension of existing industrial arts programs.

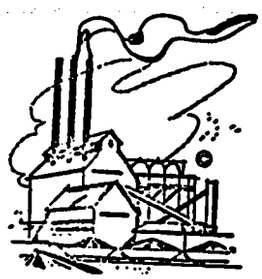
The INDUSTRIOLOGY Concept, as it is designed, is not intended to replace industrial arts as a curriculum but rather to supplement, revise, and modify present-day industrial arts programs.

The term "industriology" is intended as a replacement for "industrial arts". It more aptly represents a study of industry as suggested for industrial arts programs. While INDUSTRIOLOGY is a relatively new term, it is not completely foreign to some leaders in our field. About the time that it was first used on the Platteville campus, Dr. Joseph Carrel of Purdue University also suggested such a term.[3]

STRUCTURE OF INDUSTRIOLOGY

INDUSTRIOLOGY can be briefly defined as "the science of industry". With this brief definition, it is apparent that the content for INDUSTRIOLOGY should reflect current industrial practice. In defining INDUSTRIOLOGY as the science of industry, it is necessary to clarify or define what is meant by the term industry.

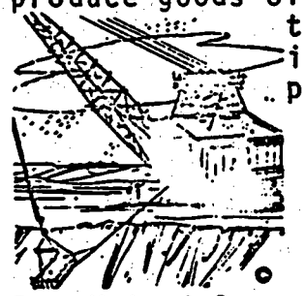
> The term industry as it is used in the INDUSTRIOLOGY Concept is defined as "an institution in our society with the basic purpose of producing, servicing, and/or distributing things of value for society."



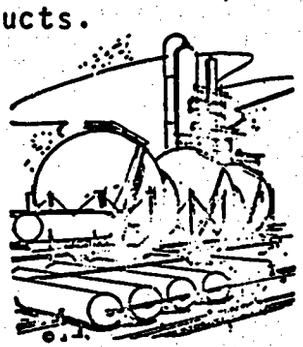
[3]Joseph J. Carrel, "Industriology the Study of Industry," American Vocational Journal. 40: 26 - 27 May 1965.

A two-pronged approach to the study of industry has been used for INDUSTRIOLOGY. The first prong is concerned with industry as an institution in our society.

More specifically it deals with the history, development, and implications of industry in our society as well as the industrial-economic system. Our industrial-economic system reveals that four general types of industries make up the total industrial complex. First, there are the primary raw materials or extractive industries which are concerned with obtaining and providing the raw materials with which we produce goods of various kinds. Secondly, there are the manufacturing industries which are involved in the production of finished products.

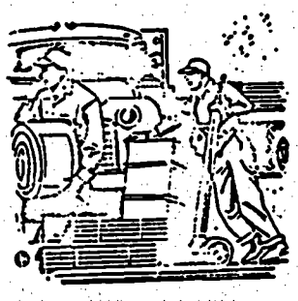


Raw Materials or Extractive Industries

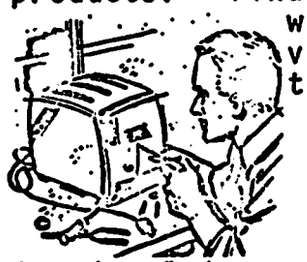


Manufacturing Industries

Distribution Industries



The third type, distribution industries, are concerned with the distribution of raw materials and finished products. Finally, there are the service industries which are concerned with providing a variety of services for society and the products it uses.

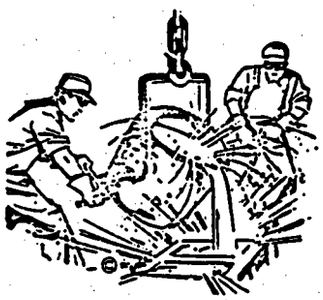


Service Industries

The other prong focuses on an examination of six basic activities typically found to be common to most industries. These six have been used for purposes of the WSU-P program and are:

Development and Design

Finance and Office Services



Manufacturing or Processing

Marketing

Industrial Relations

Purchasing

Most industries will involve all six of these activities in some form or other.

INDUSTRIOLOGY, then, is intended to be a broad, comprehensive study of industry to include the four types of industries, the six activities of industry, as well as the history, development, and implications of industry as an institution in our industrial society.

INSTRUCTIONAL OBJECTIVES OF INDUSTRIOLOGY

Objectives - outgrowths of philosophy - become specific goals to be attained. The following objectives and student outcomes reflect the INDUSTRIOLOGY Concept.

1. Interpreting Industry - To develop an understanding of industry and its implications for modern society.

2. Problem-Solving Ability - To develop the ability to solve industrially related problems.

3. Creativity and Design - To develop the ability to create, design, and appreciate industrial products and methods.

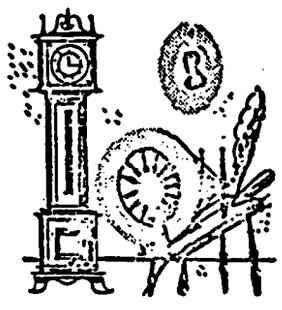
4. Skills - To develop a degree of skill and safe practices in the use of tools, machines, materials, and processes of industry.

5. Communications - To develop the ability to communicate using the language of industry.

6. Practical Application - To develop the ability to apply other education in practical and industrially related situations.

As a result of the student becoming involved through the various activities of INDUSTRIOLOGY, the following student outcomes should be expected as a result of attainment of the listed objectives.

1. Interpreting Industry
   The student will:
   a. Have a basic understanding of the internal organization of industry.
   b. Understand the basic industries of this country relative to history, processes, products, and importance to society.



c. Be acquainted with common terminology associated with industrial processes to be able to carry on an intelligent discussion about industry.

d. Realize some of the problems faced by industry.

e. Be familiar with the state and federal legislation affecting employer and employee relationships.

f. Associate industrial methods and activities with the experiences in the laboratory.

g. Be aware of the industries in his community and surrounding area.

h. Have some understanding of the differences between the various workers in industry as to pay, training, and working conditions.

i. Be able to better select his vocation by having an understanding of occupational opportunities and requirements.

2. Problem-Solving Ability

The student will:

a. Develop rational problem - solving ability through the use of industrially related products and processes.

b. Develop a deductive-inductive process of reasoning by which he will define his problems, formulate possible solutions, analyze these solutions, and determine his results.

c. Use the tools, products, and processes of industry - as sketches, models, working drawings, charts, and/or other methods - to achieve the desired solutions to his problems.

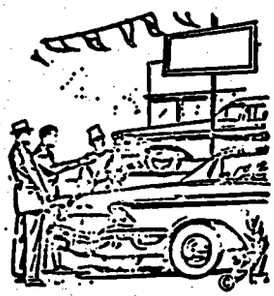
3. Creativity and Design

The student will:

a. Recognize and appreciate good workmanship in most industrial products.

b. Purchase industrial products wisely.

c. Be able to sense the esthetic qualities of products.



d. Understand the design process and be able to develop basic forms.

4. Skills

The student will:

a. Have sufficient skill to be able to use many of the machines and tools of industry.

b. Understand the importance of safe practices and be able to operate machines & tools in a manner that is safe for himself and others.

c. Be able to understand and appreciate the skills that are required in certain occupations and operations.

d. Realize that most things which are done well require some degree of skill and that this skill is developed through correct practice.

5. Communications

The student will:

a. Be capable of recognizing and comprehending various communication media used by or related to industry.

b. Be able to express himself clearly on industrial matters.

c. Be able to understand articles concerning industry appearing in magazines, books, and other sources.

d. Be capable of relating his research findings and the discoveries of industry to other people.

e. Be more capable of employment in work requiring a knowledge of the language of industry.

6. Practical Application

The student will:

a. Recognize the relationship of his other studies to everyday problems of life in an industrial society.

b. Be able to apply his other education to INDUSTRIOLOGY activities.

c. Realize the value of ALL education for participation in an industrial world.

d. Be able to utilize his basic education to meet his every day needs as concerned with industrially related activities.

TEACHING CONTENT FOR INDUSTRIOLOGY

The general content for INDUSTRIOLOGY has developed as a result of comprehensive studies of various industries by the staff of the College of Industry, Wisconsin State University - Platteville and graduate students through federally funded institutional grants and Fellowship programs.

Following is a descriptive outline of teaching content for INDUSTRIOLOGY and indicates in a more specific sense the structure of INDUSTRIOLOGY - the teaching content related to the two-pronged approach.

I. Introduction to Industry

- A. Industry defined including types of industries
- B. History and Development
- C. Functions and Implications
- D. Internal Organization
  1. Development and design
  2. Finance and office services
  3. Manufacturing or processing
  4. Marketing
  5. Industrial relations
  6. Purchasing

II. Raw Materials Industries

- A. Non-mineral
  1. Forestry
  2. Rubber
  3. Fishing
  4. Agriculture
- B. Mineral
  1. Metallic
  2. Non-metallic

III. Manufacturing Industries

- A. Metal
- B. Fabric

C. Food Processing
D. Chemical
E. Petroleum
F. Printing and Publishing
G. Leather, Leather products and Rubber
H. Brick, Cement and Glass
I. Lumber and Paper
J. Contract Construction

IV. Distribution Industries

A. Land Systems
   1. Railroad
   2. Pipeline
   3. Highway
B. Water Transportation
C. Air Transportation

V. Service Industries

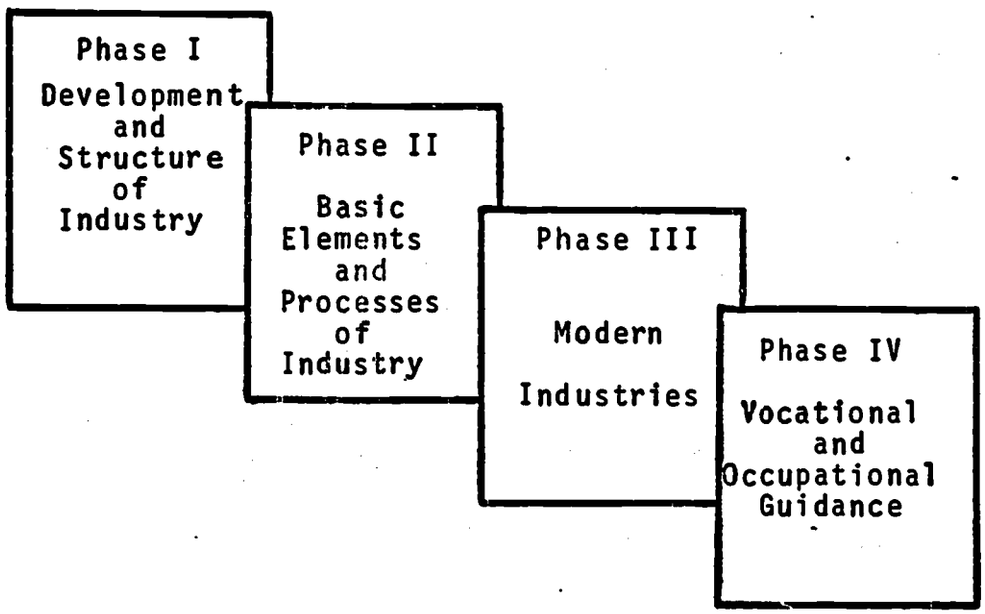
A. Laundry and Dry Cleaning
B. Appliance and Electric Motor Repair
C. Physical Plant Maintenance
D. Tool and Die Repair
E. Automotive Service
F. Farm Equipment Service
G. Small Engine Repair
H. Radio and TV Repair
I. Rental Service Agencies
J. Others - building construction and repairs, electrical wiring, plumbing installation

INSTRUCTIONAL ORGANIZATION OF INDUSTRIOLOGY

The teaching content for INDUSTRIOLOGY as described in the preceding paragraphs is centered around industrial subject matter. The content of this material has been organized into four major divisions which are designated as phases. These four phases are suggested as a basis for a complete INDUSTRIOLOGY program. Briefly these phases are identified as follows:

Phase I - Development and Structure of Industry
Phase II - Basic Elements and Processes of Industry
Phase III - Modern Industries
Phase IV - Vocational and Occupational Guidance

Ideally, the content, as it is being developed for the INDUSTRIOLOGY Concept, is best utilized beginning with the first phase and progressively completing each of the four phases in sequence.

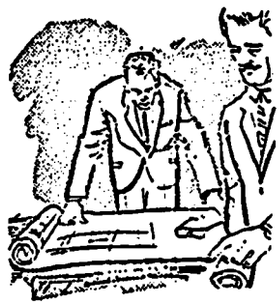


Phase I entitled The Development and Structure of Industry is intended to provide a general overview of industry for all students--girls as well as boys--in grades 7, 8, or 9. Content in this phase would involve a general study of all types of industries as well as the activities found within most industries.

While it is desirable that Phase I precede or be a prerequisite for the other phases, it is conceivable that the phases could be taught in any order as desired by the instructor.

The overall objectives for Phase I are:

1. To develop in each student an understanding of what industry is.



2. To develop in each student a general understanding of the development of industry and the affects and implications on modern society.

3. To develop in each student a generalknowledge of the various types of industries in the world today.

4. To develop in each student an awareness of and a general understanding of the typical activities conducted in most industries.

5. To develop in each student a basic degree of skill in the use of industrial type tools and machines.

The recommended amount of time in which the content of Phase I could be completed is one school year assuming the class met for five 50 to 60 minute periods per week for 36 weeks. It is conceivable that more or less time could be utilized, depending upon the school's schedule and/or the desires of the instructor.

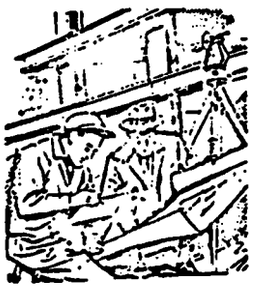
Some examples of activities in which the students would be involved in Phase I are: testing of materials, making paper, mass production, and others.

Phase II, entitled Basic Elements and Processes of Industry, is intended to be centered around the basic elements or processes of industry for students in grades 9, 10, or 11. This phase would be composed of short modules of instructional content varying in length from 5 to 25 instructional hours on such topics as time and motion study, industrial advertising, quality control, and product development and design. These modules are intended to be separate teaching units but with the option of tying them together for a particular teaching situation. A teacher, therefore, would select those modules best suited for his particular situation to "build" a specific course.

Briefly listed below are general objectives for this phase.

1. To develop in each student a basic understanding of specific activities conducted within industries.

2. To develop in each student an understanding of the place and importance of specific activities of industries.



3. To enable each student to engage in activities associated with various aspects of industry.

4. To develop in each student the ability to cope with and solve problems of an industrial nature.

5. To develop in each student an understanding of industrial communications as associated with specific activities in industry.

Examples of modules for Phase II are: Single Family Dwelling, Product Development, Time and Motion Study, and Industrial Advertising.

Phase III, Mode.n Industries, is intended to be a course or series of courses for grades 10, 11 or 12 and concerned with studying specific industries structured somewhat traditionally according to specific materials used. Seven types of courses might be possible, namely: (1) metalworking industries, (2) woodworking industries, (3) fuels and power industries, (4) electricity-electronics industries, (5) graphics industries, (6) ceramics and related industries (moldable materials industries), and (7) textile and leather industries. Which of these courses or how many would be offered in a particular school would be dependent on available facilities, school philosophy, and student needs. These industries would be studied from a comprehensive point of view, beginning with the raw materials involved and continuing through manufacturing, distribution, and service, with a tendency towards accentuating vocational preparation of the student.

The following general objectives are listed for Phase III.

1. To develop in each student an understanding of the materials and processes of modern industries.

2. To develop in each student some specific industrial skills as related to modern industries.

3. To develop in each student a comprehensive understanding of modern industries from raw materials used through manufacturing or processing, distribution, and service.

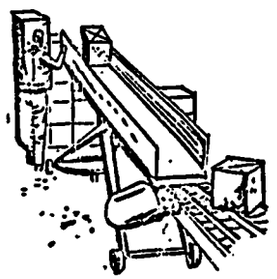
4. To provide experiences which will enable each student to make practical application of his total education.

Phase IV, Vocational and Occupational Guidance, is tentatively planned to be concerned with vocational and occupational guidance for students in grades 11 and 12.

It is designed to enable students to study industry strictly from a vocational or occupational point of view with the intent to better enable them to enter the world of work, whatever their choice might be.

The general objectives for Phase IV are:

1. To develop in each student an understanding of the procedure for selecting and securing an occupation.



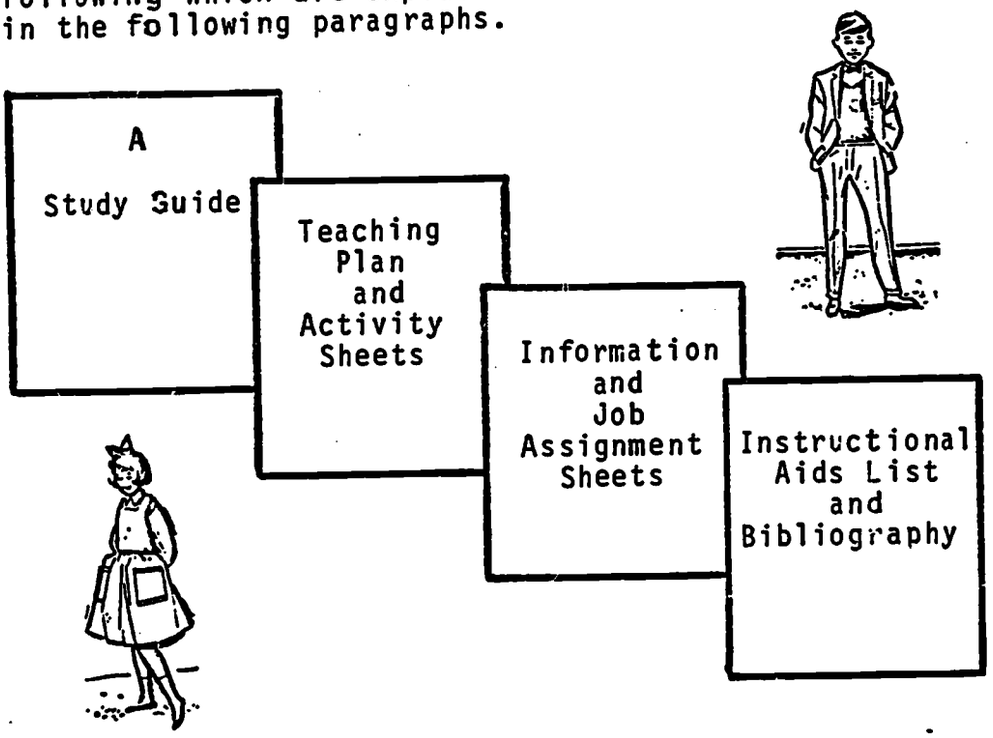
2. To provide each student with experiences that will illustrate the physical aspects of occupations.

3. To develop in each student an understanding of the responsibilities which go with holding a job.

4. To develop in each student an awareness of the variety of occupations available in the world of work.

INSTRUCTIONAL MATERIALS ORGANIZATION AND UTILIZATION

Instructional materials are developed for each of the four phases. These materials consist of the following which are explained in detail in the following paragraphs.



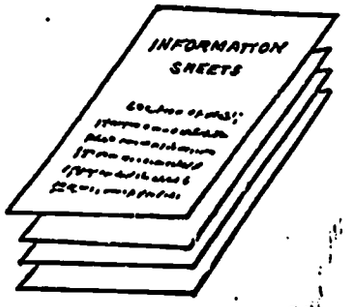
It must be recognized that these materials are suggested only as guides for the teacher to follow in an attempt to more adequately inform, orient, and prepare youth for living in an increasingly complex industrial society.

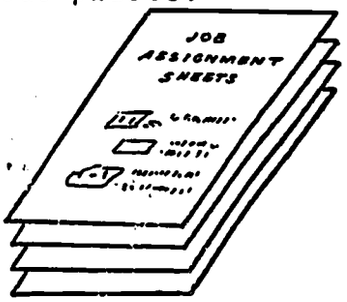
1. A Study Guide - specifically designed for student use, it serves as a basis upon which the content of each related phase is integrated. The material in this booklet is designed to stimulate students to investigate, read, solve problems, and participate in manipulative activities concerned with INDUSTRIOLOGY. The Study Guide also provides the teacher with the content to be covered.

2. The Teaching Plan and Activity Plans - contain step-by-step teaching procedures for the instructor to assist him in conducting the activities and preparing for fruitful student learning situations and activity plans for the teacher.

Each activity plan sheet accompanying the teaching plan was developed as further suggestions for conducting some of the activities referred to in the teaching plan.

3. Information and Job Assignment Sheets - contains instructions for student activities - those which are felt necessary to adequately cover the content and activities as suggested in each of the teaching plans for the various phases.





The information sheets differ from the job assignment sheets in that information sheets provide information for the student whereas the job assignment sheets describe a step by step procedure for the student to follow in conducting a particular activity.

4. Instructional Aids List and Bibliography - contains a listing of instructional materials which support the various phases of the INDUSTRIOLOGY Concept.

The listings of instructional materials in each of the Instructional Aids List and Bibliography booklets for the various phase content have been grouped into four sections: (1) Index to Numbered Instructional Media (IM) Sources,(2) Titles of Information, Job, and Activity Plan Sheets, (3) Instructional media other than books - such as films, film strips and slide series, video tapes, and free and inexpensive printed matter from industries, and (4) a bibliography of books which serve as excellent references for both the student and teacher.

Specific instructions for using the instructional materials are contained in the introduction of each of the booklets.

The instructional materials in INDUSTRIOLOGY were developed through research and trial testing in industrial arts programs of several public high schools. This was accomplished through the efforts of graduate fellowship students, staff members in the College of Industry, and an advisory group representing industry.

Those utilizing these materials must recognize that such materials are in initial stages of development and testing. It should also be recognized that the instructional materials for INDUSTRIOLOGY are suggested only as guides for instruction, although they could be followed exclusively as outlined. Further review, revision, and evaluation will be necessary to provide appropriate materials and content for teachers utilizing the INDUSTRIOLOGY materials. As constant changes take place in industry, so must these changes be reflected in any INDUSTRIOLOGY program.

VISUAL MATERIALS AVAILABLE AT WSU-P

Excellent film slide series with illustrated scripts and several video tapes (1") have been developed to support and enrich the INDUSTRIOLOGY content. These may be loaned at a nominal cost upon request or purchased by the instructor. Requests for these materials should be sent to the Industriology Project, College of Industry, WSU-Platteville, Platteville, Wisconsin 53818.

INDUSTRIOLOGY FOR THE ELEMENTARY SCHOOL

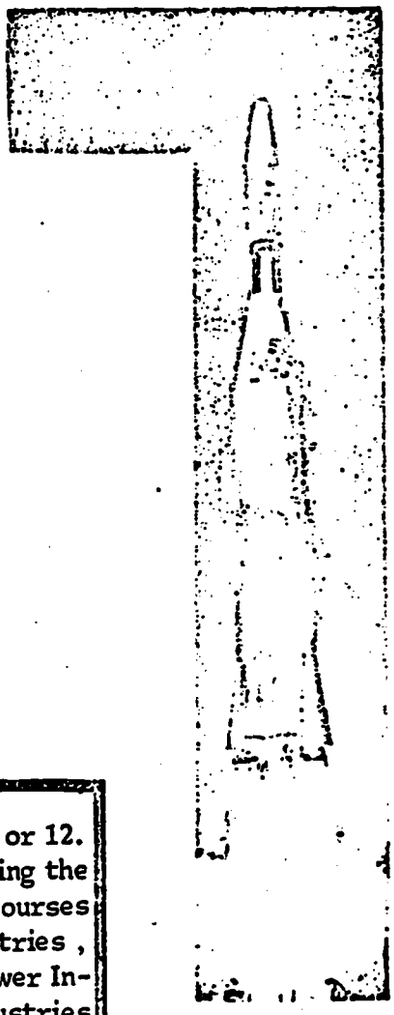
In developing the INDUSTRIOLOGY Concept efforts were first concentrated upon upgrading and improving existing industrial arts programs at the junior and senior high school levels. Expansion of the Concept includes a concerted effort to develop and implement INDUSTRIOLOGY into the elementary grades.

The directing of learning activities involving tools, machines, materials, and processes of industry in the elementary school curriculum is nothing new. Elementary industrial arts programs K-6 have been an integral part of outstanding elementary school curricula for many years, thus enriching the other traditional subject areas with excellent results.

INDUSTRIOLOGY, like industrial arts, may be considered to be a method of instruction, having some content in its own right. The activities function as an integrated part of the academic subject matter related to the work which children are doing in their studies of traditional subject matter. However, INDUSTRIOLOGY in the elementary grades differs from industrial arts in that the activities focus on a broader study of industry. There is more emphasis on group project activities and less on individual project work. Mass production activities are utilized involving a more comprehensive concept of industry.

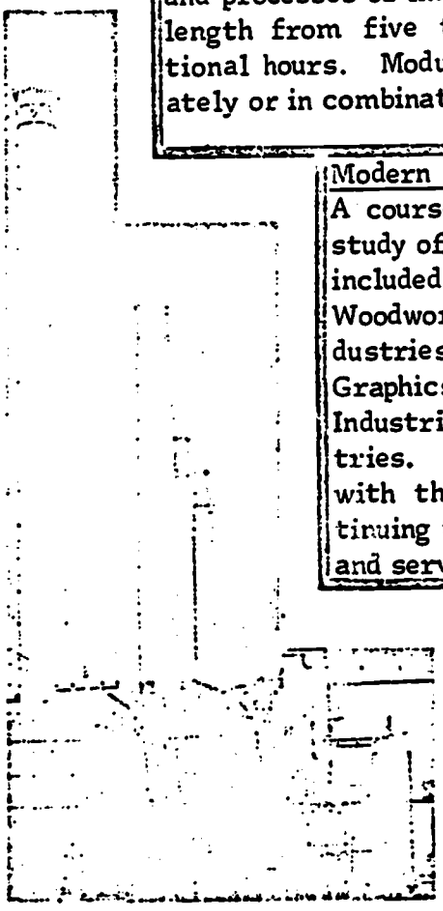
The INDUSTRIOLOGY Project will focus on the development of resource units correlated with a comprehensive study of industry. These resource units will involve activities designed to aid in and enrich the teaching of the usual elementary subjects.

INSTRUCTIONAL ORGANIZATION



Development and Structure of Industry - Grades 7, 8, or 9. A course intended to provide a general overview of industry for all students, girls as well as boys. A general look at the four types of industries and the six activities of industry.

Basic Elements and Processes of Industry - Grades 9, 10, or 11. A course composed of short modules focusing on specific elements and processes of industry. Modules vary in length from five to twenty-five instructional hours. Modules to be taught separately or in combinations.



Modern Industries - Grades 10, 11, or 12. A course or series of courses enabling the study of the particular industries. Courses included are: Metalworking Industries, Woodworking Industries. Fuels and Power Industries, Electricity-Electronics Industries, Graphics Industries, Ceramics and Related Industries, and Textile and Leather Industries. A comprehensive study beginning with the raw materials involved and continuing through manufacturing, distribution and service.

Vocational and Occupational Guidance - Grades 11 or 12. A course designed to enable students to study industry strictly from a vocational or occupational point of view with the intent to better enable them to enter the world of work, whatever their choices might be.

Industriology Project
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