An Analysis and Evaluation of Industrial Arts Projects Used in Midwestern Ohio

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AN ANALYSIS AND EVALUATION
OF INDUSTRIAL ARTS PROJECTS
USED IN MIDWESTERN OHIO

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by
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Henry W. Krause
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CHAPTER I

INTRODUCTION

Philosophy and Aims of Secondary Education

Recent social and economic conflicts have caused educators to examine their philosophies in the light of the needs of present-day society. The cultural view of education has given way to a growing emphasis upon the importance of functional education. Bode¹ tries to account for this when he says that the "rugged individualism" based upon a policy of "laissez faire" has changed to a conception that industry must contribute to the continuous development of functional education.

The classical curriculum of yesterday does not serve the youth of today with respect to solving the problems of living in a modern democratic society. A re-interpretation of the aims of education must take cognizance of the needs of this society.

Modern educational theory and practice. Spencer²

² Spencer, Herbert, Education. New York: D. Appleton Century Co., 1883. p. 32
was one of the first modern writers to express aims in the form of activities derived through an analysis of human life. He stated the single broad general objective of education thus:

"To prepare us for complete living is the function which education has to discharge —-.. It behooves us to set before ourselves, and ever to keep clearly in view, complete living as the end to be achieved; so that in bringing up our children we may choose subjects and methods of instruction, with deliberate reference to this end."

The activities involved in complete living, according to Spencer, fall into five major categories. These may be stated as: (1) self preservation, (2) vocations, (3) rearing and disciplining children, (4) maintaining proper social and political relations, and (5) leisure and gratification of tastes and feelings.3

The commission on Reorganization of Education, appointed by the National Education Association in 1912, reported (1918) seven cardinal principles of secondary education as: (1) health, (2) command of the fundamental processes, (3) worthy home membership, (4) vocation, (5) civic education, (6) worthy use of leisure, and

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3 Ibid., p. 32
(7) ethical character.\textsuperscript{4} This statement of aims has had without doubt a very great influence on secondary education in the United States.

The study of evaluation by the Progressive Education Association in its Eight-Year Study (1934-1942) attempted to measure certain outcomes of secondary schools. These outcomes or objectives may be stated thus:\textsuperscript{5}

1. To develop study habits and skills.
2. To develop ability to collect data appropriate to a problem and to interpret them for their implications.
3. To develop skill in applying facts and principles of new situations.
4. To discover and develop pupil attitudes and tastes.
5. To develop social sensitivity.
6. To develop power in critical thinking.
7. To encourage and develop pupil initiative, originality, resourcefulness, self-reliance, and the like.


In Ohio High School Standards (1937) Reavis states the aims of the high school as follows: 6

"In regard to individuals, the school endeavors: (1) to help them discover and develop their individual interests; (2) to help them identify and think about their basic disturbances and conflicts; (3) to help them improve their techniques of research, thinking and experimentation; (4) to help them master those facts and develop those skills and understandings which are needed for effective living.

In regard to the Social or Cooperative relations of people the school will endeavor: (1) to help them understand the cooperative way of solving problems in the light of the American tradition; (2) to help them increasingly improve their techniques of cooperative inquiry, discussion and experimentation; (3) to help them recognize and develop a genuinely democratic leadership; (4) to help them develop an understanding of, a respect for and faith in good leadership, and a critically intelligent following of that leadership."

Williams 7 reported the efforts of the American Youth Commission to determine the needs of youth at the high-school level. One of the more outstanding results of this effort has been a statement of high-school objectives phrased from the point of view of youth actually in high schools. This is a national youth movement which is interested in youths of high-school level.


A recent trend is implied by the cooperative Study of Secondary School Standards when it says:8

"It is essential for each secondary school to have a carefully formulated educational philosophy. The school should be free to determine this philosophy for itself to the extent that it promotes the principles and spirit of American democracy. Each school should be able to justify any marked variation from generally accepted principles. The stated philosophy of education should be associated with and be made fundamental to the educational program of each school. This philosophy should be made specific in a statement of objectives. Without such a statement of objectives growing out of a sane educational philosophy, a school leads an aimless life."

The relationship of the aims of secondary education to the community is indicated under the guiding principles for evaluation of secondary schools. These guiding principles are stated as follows:9


9 Ibid., p. 9
and groups of peoples of the school community, particularly those of the children. But every school community inevitable is interrelated with other communities and is a part of larger communities, particularly the state and nation. The school should therefore adapt its general philosophy and specific purposes to its own community and to the larger communities of which it is a part."

Summary

From the foregoing citation it can be assumed that educators are continuously examining their philosophies in the light of demands of the new social and industrial order on man. Although the educators are not agreed on any one theory, aim, or philosophy of education, most seem to believe that education must be functional in the lives of youth. It must help them to solve the problems of our modern democratic society.

Place of Industrial Arts in the High School Program

It is recognized that education as a whole is closely associated with the national social and economic development. Fitting the individual into the social and economic framework consists mainly in training him to perform tasks which the community needs to have done. Industrial Arts is one of the areas designed specifically for meeting this need. It encompasses the following:
(1) Provides exploratory opportunities.
(2) Develops elementary skills in the use of common tools and machines.
(3) Creates active interest in industrial life.

Industrial arts has five distinct contributions to make to the stabilization of our social life.  

(1) Contribution may be in the form of vocational and educational guidance. Courses which include an exploratory aim and supporting subject matter assist boys through manipulative tryouts and related occupational studies, in sampling industrial and trade occupations and in testing their aptitudes, capacities, and interests.  (2) Social contribution, particular in required classes in junior high school, is that they act as a leveler between the youths of different economic and intellectual levels of society. Industrial arts education provides a meeting ground for them. It provides an opportunity for becoming acquainted with industrial life and its problems for those fortunate boys who continue into higher education and subsequent commercial and professional life.  (3) Another social contribution deals with free time. The latter has been a problem of increasing importance since 1925, and

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becomes a problem of major importance with the shorter work week emerging from the past war labor conditions and from national and state legislation. Outlets for hobbies, avenues for tinkering, and opportunities for creative, artistic expression constitute one group of social outcomes of industrial arts education. (4) An important social contribution lies in the fine opportunities for developing character that are waiting to be grasped by the wide-awake industrial teacher. (5) The fifth contribution to the social development of the nation lies in the opportunities that present themselves for learners to practice getting along together well. A spirit of cooperation in adult life is urgently needed as we are coming to realize that American society must become more and more cooperative if fascism or communism is not to take the place of democracy. Industrial arts, in its organization, methods, and content, abounds in opportunities for mutual helpfulness and cooperative effort.

The spread and internal development of education in a nation is a direct index of the economic status of that nation. The Committee on Education of the Chamber of Commerce of the United States has verified this

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relationship for America through an investigation, and its revealing report shows that the volume of economic activity in the several states of the Union rises or falls with the level of expenditures for education.

Industrial arts¹² assume new importance in current economic developments. Part of this increased importance is caused by the fact that the courses represent occupational life either for guidance, training, or interpretative purposes. These courses assume importance also because inherently they are of a nature which abounds in problem-solving situations. The adolescent boy is curious, because sometimes he likes to make and assemble or manipulative tools, especially when the situations are concerned with physical materials.

The boy sees the result of his planning and work in concrete form. Through examination and evaluation he knows whether or not his solution of the problem has been satisfactory. Only subjects in which there is physical evidence of problem solving have this added attraction and value.

¹² Ibid., pp. 12 + 13.
History of industrial arts. The early experiments in industrial arts finds such persons among the leaders as Rousseau, Pestalozzi, and Fellenberg. While industrial arts is a fairly recent addition to the school program, its beginnings can be traced back for many years. Rousseau in 1762 suggested that everyone should learn a trade, not to serve as a vocation but in order that they might better understand social relationships and develop a respect for those who work with their hands. A few years later, Pestalozzi advocated the education of the hands as well as the mind. One of his followers, Fellenberg, established a school at Hofwyl, Switzerland, in which he combined both industrial and cultural education.

According to Mayes the manual labor movement occurred in the United States between 1820 and 1840. This labor movement made contributions to the later development of industrial arts. Institutions of higher education,

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offered students the opportunity to work part-time in conjunction with their cultural education. This method was similar to our cooperative training programs of today. This movement disappeared by 1840 because it developed into a scheme to support the needy liberal-arts colleges rather than primarily a program of educational value.

The manual training movement resulted from the breakdown of the apprenticeship system.\(^{15}\) In 1880 the St. Louis Manual Training School was established by Dr. Calvin M. Woodward, and it was followed by the Chicago Manual Training School in 1883. The first such school to be supported by public taxation appeared in Baltimore, Maryland, in 1884. These pioneer schools led to the rapid development of manual training throughout the country during the 1890's.

The early schools were influenced largely by the Russian Sloyd systems\(^ {16}\) of training which supported the doctrine of formal discipline. This method required that

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\(^{15}\) Ibid., pp. 43-46.

the pupils perform certain unrelated exercises which
required the use of exact measurements, high skill in
use of tools, and a minute analysis of the operation
performed. Because the exercises had no real relation-
ship to a complete project, interest soon was lost.
The Sloyd system of Sweden seemed to offer a solution
to this difficulty. It began to be used in this country
around 1888. This plan still emphasized the tool opera-
tion, which, however, resulted in a completed model
rather than just the exercises. The teaching methods
under this system shifted from group demonstration to
individual instruction.

At the turn of the century as educators began to
question the formal discipline philosophy, manual training
began to lose favor. Manual training was replaced with
manual arts which placed more emphasis on good design
and general educational values rather than the development
of the mind. With the passage of the Smith-Hughes Act
in 1917 and the George-Deen Act in 1936 emphasis for a
time shifted to vocational training. Some schools saw no
need for the general type of training and eliminated the
courses from their curriculum. Largely through the efforts
of such men as Frederick Bonser of Teachers College,
Columbia University, and Franklin Bobbit of the University
of Chicago, industrial arts with its emphasis on general educational, exploratory, and consumer values emerged from this period.

The Value and Place of Projects
In High School Industrial Arts

Projects of various kinds offer a rich variety of experiences in the field of industrial arts. Few activities offer a greater opportunity for the individual to use his general knowledge, skill, and resourcefulness. The completed project will show the degree of success he has attained in using his related knowledge and the skill attained.

One value of projects is to develop skill in the use of hand and power tools. Another value is learning present plans. These plans will be found helpful in maintaining interest while developing techniques, skills, good work habits, attitudes, and appreciations. An important consideration in selection of the project is its value in the home. The project which has been so planned and designed and the workmanship so executed that it becomes a permanent part of the home furnishings is a continual source of pleasure.
Aims and objectives of industrial arts. While there is a continuing discussion of the aims and objectives in industrial arts, there seems to be general agreement, at least among the leaders in the field, that industrial arts should be offered for its exploratory and general education values rather than for development of vocational skills. The school should not be concerned with training for an occupation, but should rather be interested in providing opportunities for wise selection of a vocation and in offering a sound general education as a foundation for further study.

Probably the most widely accepted aims for industrial arts are those prepared by the Manual Arts Conference. These statements are supported by the Industrial Arts Association. The aims as developed by the Conference included:

1. To develop in each pupil an active interest in industry and in industrial life, including the method of production and distribution.

2. To develop in each pupil the ability to select wisely, care for, and use properly the things he buys or uses.

3. To develop in each pupil an appreciation of good workmanship and good design.

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17 Ibid., pp. 33-34.
4. To develop in each pupil an attitude of pride or interest in his ability to do useful things.

5. To develop in each pupil a feeling of self-reliance and confidence in his ability to deal with people and to care for himself in an unusual or unfamiliar situation.

6. To develop in each pupil the habit of an orderly method of procedure in the performance of any task.

7. To develop in each pupil the habit of self-discipline which requires one to do a thing when it should be done whether it is a pleasant task or not.

8. To develop in each pupil the habit of careful, thoughtful work without loitering or wasting time.

9. To develop in each pupil an attitude of readiness to assist others when they need help and to join in group undertakings.

10. To develop in each pupil a thoughtful attitude in the matter of making things easy and pleasant for others.

11. To develop in each pupil a knowledge and understanding of mechanical drawing, the interpretation of the conventions in drawings and working diagrams, and the ability to express ideas by means of a drawing.

12. To develop in each pupil elementary skills in the use of the more common tools and machines and handling materials, and an understanding of some of the more common construction problems.

It is very interesting to note that only the last two of these objectives deal with development of skills. This differs from the ideas of many people who associate industrial arts with the development of skills.
Ericson presented a somewhat different list as desired goals for industrial arts courses. His list included:

1. Self-discovery by the pupil of his own abilities and aptitudes, leading toward maturing life interests.

2. Satisfying experience in self-expression through creative effort leading to material accomplishments.

3. Understanding of industry and methods of production, and of the influence of industrial products and services upon the pattern of modern social and economic life.

4. Appreciation of good design and good workmanship in their application to construction and to manufactured products.

5. Judgment and resourcefulness in selection, purchase, use, and care of industrial products and service in the home and in occupational life.

6. Ability to use tools and materials leading to household maintenance, leisure time pursuits, and, in some degree, to basic occupational skills.

7. Ability to read and make sketches and drawings used for illustrative and construction purposes, including the ability to read graphic and technical illustrations in books and magazines.

8. Development of maturing work habits, feeling of responsibility, and ability to plan and execute work alone and in cooperation with others.

9. Basic experience in the use of tools, machines, and materials of value in carrying on future educational and professional work on scientific and technological levels.

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10. Development of safety habits and fundamental safety consciousness not only in the school but in the home and in future occupational life.

Summary

From the foregoing citation it can be assumed that there is a place for industrial arts in the secondary school. Further the values of industrial arts are related directly to the aims and objectives of modern education.

Need for Providing Good Projects

The increased enrollment in the courses of industrial arts in the secondary schools and colleges has required shop teachers to rely more and more on written material and plans for guidance. The expansion of the adult evening program has also created a need for instructional aids. Also, the growing popularity of the home workshop as a leisure time activity creates a need for fully developed plans for constructing articles which have a practical application in the home.

The Ohio Project Movement. For years, industrial arts instructors have followed different aims and objectives. Many industrial arts men have published papers concerning this subject, each expressing a different viewpoint. It is possible that the Ohio project movement resulted from these differences. This movement was started to determine what the other men in the field were doing and the type of projects they made to meet their
school requirements. In order to standardize these aims and objectives in Ohio the State Department of Education published "The Ohio High School Standards", booklet. In this booklet the committee on industrial arts listed the six following aims, objectives and guiding functions:

1. Orientation function.
2. Technical function.
3. Avocational function.
5. Social function.
6. Cultural function. 19

The first of these, the "orientation function", was intended to aid the pupil to become oriented to our industrial society and to explore the tools, materials, and methods of various occupations. The "technical function" dealt with specialization in the later years of the secondary school in one of the areas of industrial arts as possible try-out before final selection of an occupation. The "avocational function", concerned itself with development of interests to occupy leisure time. The "consumer function" strived to promote intelligent

selection and use of the products of our industry. The "social function" embodied the development of the ability to get along with people, particularly in a shop situation. The "cultural function" in which industrial arts courses strived for development of an appreciation of quality materials, workmanship, and desirable projects.

The Problem

The evidence presented herein indicates that there are a number of philosophies, aims, and objectives dealing with the teaching of Industrial Arts. Many of these are not in agreement. Nevertheless, there is general agreement of the value of projects in teaching Industrial Arts. This agreement, however, does not extend necessarily, to the choice of specific projects.

It is therefore, the purpose of this study to analyze and evaluate Industrial Arts projects used in midwestern Ohio. The major problem is divided into three minor problems as follows:

1. The collection of drawings of projects used in classes in Industrial Arts in midwestern Ohio.

2. The analysis and evaluation by experts of the drawings obtained in minor problem one.

3. The classification of these drawings into categories.
Limitation of the problem. The present problem is limited specifically to an analysis and evaluation of the projects in Industrial Arts used in midwestern Ohio. Since a search through the literature failed to disclose any previous evaluation of the similar projects, it was not possible to compare the present findings and conclusions with those of other investigators.
CHAPTER II

THE COLLECTION OF THE PROJECTS IN INDUSTRIAL ARTS

The Problem

The purpose of this phase of the investigation is to obtain from instructors of industrial arts in midwestern Ohio, those projects which in their opinions could be rated as valuable for use at the junior-or senior-high school level.

Methods Employed

In November 1948 a meeting of the Midwestern Industrial Arts Association was held at Bowling Green State University, Bowling Green, Ohio. At this meeting the participants decided to compile a list of projects which were found to be valuable for use in classes in industrial arts. The projects were to be delimited to those at the junior-and senior-high school level in any of the several areas of Industrial Arts.

The list of projects, to be published in booklet form, was to be a cooperative effort of the members of the Ohio Midwestern Industrial Arts Association. The members of the association consist of approximately 270
instructors in Industrial Arts in the 24 counties of midwestern Ohio, and are instructors of Industrial Arts in the secondary schools of this area. A committee, of which the author was a member, was then set up to organize the procedures necessary for carrying out the project.

It was decided that the Industrial Arts Department of Bowling Green State University should draw up a letter and send it to each of the instructors in the association. They were requested to send a sketch or job sheet of one or more of the projects they deemed to be of special value for teaching industrial arts at their level. The sketches or job sheets were to be sent to the Engineering Department of Bowling Green State University.

November 2, 1948

TO: The instructors of Industrial Arts of Midwestern Ohio.

THE JOB: At the last meeting of our Association it was decided that we collect drawings or job sheets of our favorite projects and put them into printed form and make copies available to instructors in this area.

YOUR PART: Will you send a sketch or job sheet of a good project? You may send as many as you wish, but send at least one - your pet project in any field at any grade level.
OUR PART: We will make a printed booklet of all the sheets submitted.

The Engineering Department students will redraw your drawings or sketches so all are of uniform size.

The Graphic Arts Department will photograph the drawings, print and bind the sheets.

Each contributor will be given credit for his contribution.

FELLOW INSTRUCTORS: Get behind this activity and send your sketches, job sheets or drawings.

Industrial Arts Department
Bowling Green State University
Bowling Green, Ohio

This is a big job and we wish to start the work immediately. Send them soon - send them to:

Engineering Drawing Department
Bowling Green State University
Bowling Green, Ohio

These instructors in Industrial Arts were not asked to sign their names to the project drawings. This was done so that they would feel confident that their individual project drawings would never be identified and perhaps criticized.

The drawings or job sheets were sent by these instructors to the Engineering Drawing Department, Bowling Green State University, Bowling Green, Ohio. The Engineering
Drawing Committee checked all drawings and job sheets and segregated the ones that were drawn clearly and could be used feasibly as plans, from the ones that were not drawn clearly. The drawings that were not clearly understandable to the members of the drawing department were sent back to the owners. These drawings could be revised and returned if the instructors so desired.

After all the drawings were received, segregated, and checked by the chairman of the Engineering department, they were apportioned among the engineering instructors. The engineering instructors presented the engineering students in their class with the original drawings for redrawing the plans to uniform size. After all drawings were redrawn to uniform size, they were again checked by the engineering committee and approved by the Chairman of the drawing department as being satisfactory for use in the next step of the study.

Summary

In this phase of the investigation letters were sent to approximately 270 members of the Ohio Midwestern Industrial Art Association requesting drawings of one or more of their best projects. About 400 drawings were
received. These drawings were checked by the Engineering Drawing Committee of Bowling Green State University and the usable drawings were all redrawn to uniform size.
CHAPTER III

ANALYSIS AND EVALUATION OF THE INDUSTRIAL ARTS PROJECTS

The purpose of this step of the investigation is to analyze and evaluate the projects for Industrial Arts which were collected according to the procedures described in the preceding chapter.

Selection of Industrial Arts Committee

The first step in this section of the investigation was to establish a procedure by which the projects (collected in Chapter II) could be evaluated. It was decided to use the judgments of a committee of experts for the evaluation. The use of group judgments for the purpose of evaluation is justified by Keeslar\(^1\) who states the following:

"... group judgments are both reliable and valid within the frame of reference set up for them providing (1) that the judges be well trained and experienced, i.e. experts in this field of specialization and (2) that the criteria in terms of which the judgments are to be made be clearly and concisely stated for that purpose."

The instructors of Industrial Arts at Bowling Green

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\(^1\) Keeslar, Oreon P., "Contributions of Instructional Films to the Teaching of High School Science." *Science Education.* XXX (March - April, 1946), 82-8, 132-6.
State University who participated in collecting and preparing the projects for drawing, then selected a committee of specialists in Industrial Arts to analyze and evaluate the projects described in Chapter II. The specialists so selected were members of the Ohio Midwestern Industrial Arts Association. They were chosen on these bases:

1. Instructors engaged actively in teaching Industrial Arts, at the secondary level, in midwestern Ohio.

2. Instructors having ten or more years of teaching experience in Industrial Arts.

3. Instructors that are now serving or have served on some important Ohio committee in the area of Industrial Arts.

4. Instructors who have worked actively on some phase of the midwestern Ohio project book.

Criteria For Evaluating Projects

The committee of specialists just described was asked to evaluate each of the project drawings with respect to these points:

1. Is the project of such a nature that students will develop skill in the use of hand and power tools?
2. Is the project designed for the secondary level, and is it likely to create interest in the desired learning activity?

3. Is the project selected of value in the home, or home workshop?

4. Will the project aid the pupil in becoming oriented to our industrial society and in exploring the tools, materials, and methods of various occupations?

Selecting The Projects

The industrial arts committee was presented with approximately 400 project drawings. The committee first classified the drawings according to the different areas of Industrial Arts. The projects in each of the areas were considered separately. If in the opinions of the judges the projects, as indicated in the drawings, contributed substantially to the objectives of Industrial Arts as identified in the criteria, the project was considered as desirable for use in teaching Industrial Arts at the level mentioned. If it was not considered as contributing substantially, the project was discarded. From the original project drawings 106 were considered as desirable for the use intended.
After the project drawings were classified and evaluated each of the ones that were selected as desirable by the committee of specialists was given a file number which was placed at the bottom of the drawing. The project drawings so numbered are included in the next chapter.

The projects judged to be desirable are compiled in the following list. They are classified according to "Area of Industrial Arts". The name of the project, the instructor who contributed the project, the school at which the instructor is employed and the file number of the project are included in this list.

WOODWORK

<table>
<thead>
<tr>
<th>DRAWINGS - PICTURES</th>
<th>INSTRUCTORS - SCHOOL</th>
<th>FILE NO.</th>
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<tbody>
<tr>
<td>Picture</td>
<td>Swanton</td>
<td></td>
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<tr>
<td>Pencil Holder</td>
<td>M. Stocks, Waite</td>
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<tr>
<td>Book Ends</td>
<td>C. Hoekenga, McKinley</td>
<td>2</td>
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<tr>
<td>Book Ends</td>
<td>E. J. Moe, Toledo</td>
<td>3</td>
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<tr>
<td>Tie Rack</td>
<td>E. C. Bartlett, Donnell Jr.</td>
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<tr>
<td>Necktie Rack</td>
<td>E. C. Bartlett, Donnell Jr.</td>
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<tr>
<td>Wall Shelves</td>
<td>R. Bowers, Swanton</td>
<td>6</td>
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<tr>
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<td>E. C. Bartlett, Donnell Jr.</td>
<td>7</td>
</tr>
<tr>
<td>Bird Houses</td>
<td>E. J. Moe, Toledo</td>
<td>8</td>
</tr>
<tr>
<td>Item</td>
<td>Maker/Location</td>
<td>Page</td>
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<tr>
<td>Cutting Board</td>
<td>E. J. Moe, Toledo</td>
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<td>L. Koehler, Bryan</td>
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<td>6 Shelf Corner</td>
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<td>R. Collins, Melmore</td>
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<td>W. Sells, Toledo</td>
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<td>R. B. Gates, Maumee</td>
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<td>Gavel &amp; Nut Bowl</td>
<td>D. Eaton, Swanton</td>
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<td>F. H. Edgar, Wauseon</td>
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<td>F. Huffman, Fremont Ross</td>
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<td>C. Yoder, Bellevue</td>
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<td>C. Stephenson, Columbian</td>
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<td>D. E. Smith, Postoria</td>
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<td>S. E. Tennant, Zanesfield</td>
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<td>W. Loyd, Sylvania</td>
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<td>R. W. Constien, B.E.S.U.</td>
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End Table
R. Pritts, Toledo

End Table
T. Powell, Liberty Twp.

Coffee Table
D. Eaton, Swanton

Coffee Table
J. P. Moore, Celina

Coffee Table
R. Cole, Tiffin Jr.

Coffee Table
R. J. Karrmen, Robinson Jr.

Coffee Table
B. R. Constien, Findlay

Table
G. D. Helm, B.G.S.U.

Occasional Table
A. M. Youngquist, Toledo

Child's Hutch Cupboard
C. J. Donaldson, Rossford

Tool Chest
E. E. Herr, B.G.S.U.

Vanity Set
A. M. Youngquist, Toledo

Constitution Mirror
E. G. Powell, B.G.S.U.

Child's Rocker
E. C. Powell, B.G.S.U.

Chair
R. L. Chaney, Montpelier

Flower Stand
D. J. Hornish,

Gate Leg Table
V. Mooney, Libbey

Modern Desk
A. Youngquist, Toledo

Desk Table
J. Fast, Libbey

Corner Cupboard
E. C. Powell, B.G.S.U.

Storage Cabinet
J. A. Shaw, B.G.S.U.
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<td>R. Hackett, B.G.S.U.</td>
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<td>Plumb Bob</td>
<td>R. S. Swigart, Bowling Green</td>
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<td>Salt &amp; Peppers</td>
<td>D. Beatty, B.G.S.U.</td>
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<td>Hobby Knife Set</td>
<td>J. Lott, B.G.S.U.</td>
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<tr>
<td>Chuck Wrench &amp; Planer Jack</td>
<td>Schumacher, Findlay</td>
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<td>Drill Stand</td>
<td>C. J. Donaldson, Rossford</td>
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<td>Art Metal Hammers</td>
<td>H. D. Miner, B.G.S.U.</td>
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<td>Hammer Heads</td>
<td>D. Clingaman, Defiance</td>
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<td>Hammer</td>
<td>R. E. McDorman, Spencerville</td>
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<td>Hammer &amp; Punch</td>
<td>F. Hofacker, B.G.S.U.</td>
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<td>Screw Driver</td>
<td>H. F. Edgar, Wauseon</td>
<td>71</td>
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<tr>
<td>Pipe Vise</td>
<td>Jones, Fostoria</td>
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<td>Offset Screwdriver</td>
<td>J. Kehle, B.G.S.U.</td>
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<td>Tap Rod</td>
<td>A. D. Spayth, Bluffton</td>
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<tr>
<td>Surface Gauge</td>
<td>Schumacher, Findlay 77a-77b-77c</td>
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<td>Drill Press Vise</td>
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### SHEET METAL

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<td>Mail Box</td>
<td>B. Fleitz, B.G.S.U.</td>
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<td>Cookie Cutter</td>
<td>R. Torgerson, B.G.S.U.</td>
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### ART METAL

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<td>T. A. Powell, Liberty, Twp.</td>
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<td>Candy Dish</td>
<td>E. E. Herr, B.G.S.U.</td>
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<td>G.W. Moore, B.G.S.U.</td>
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<td>Tray</td>
<td>H. D. Miner, B.G.S.U.</td>
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<td>Small Tray</td>
<td>G. J. Davis, B.G.S.U.</td>
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<td>Bowl &amp; Rack</td>
<td>V. H. Walrath, Crestline</td>
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### FORGE & FOUNDRY

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<td>Hamburg Grill</td>
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<td>Hanging Basket</td>
<td>D. Hornish, O.M.U.</td>
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<td>Fire Place Fixtures</td>
<td>Youngquist, Toledo</td>
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<tr>
<td>Name Plate</td>
<td>H. D. Miner, B.G.S.U.</td>
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The drawing of the projects prepared in Chapter II were submitted to a committee of specialists in Industrial Arts. Members of the committee using a set of criteria, selected those projects which they considered desirable for use in Industrial Arts at the secondary level. One hundred and six were so selected. The projects so selected are listed in Chapter IV.
CHAPTER IV

SELECTED PROJECT DRAWINGS

The purpose of this chapter is to present the project drawings which were selected as valuable for use in Industrial Arts at the junior-or-senior-high-school secondary level.

Procedure

The projects as organized in Chapter III are listed in this chapter under these headings:

1. Woodwork
2. Machine Shop
3. Sheet Metal
4. Art Metal
5. Forge & Foundry
6. Electricity
7. Plastics
26 GAUGE METAL (GALV)

EQUAL REDUCTION BOTH SIDES

END OF SLOTS PLUGGED WITH SAME KIND OF STOCK

1/4 DOUBLE METAL FOLD
PRESSED IN SAWED GROOVE

STOCKS GLUED

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Title: BOOK END

Submitted by
Name: C. HOEKENGA
High School: MCKINLEY

Drawn by
George K. Wagner
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

title
TIE RACK

Submitted by
Name ECBARTLET
High School FINDLAY Jr.

Drawn by Madesign
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Drawn by James C. Trace

TITLE
WALL SHELVES

Submitted by
Name R. Bowers
High School Swanton, O.
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Drawn by Theodore St. Jenkins

TITLE
WALL SHELF

Submitted by
Name: E.C. Bartlett
High School: Donnell Jr.
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Drawn by

TITLE
BIRD HOUSES

Submitted by
Name E.J. Moe
High School Toledo

Drawn by C. Ward

8
FOR 7 & 8 GRADES

CURVES MAY BE PART CIRCLES OR IRREGULAR

DRAWN BY:...............

APX. $\frac{3}{16}R$ APX. $\frac{1}{8}R$ APX. $\frac{2}{16}R$ APX. $\frac{1}{8}R$ APX. $\frac{3}{16}R$ 1" SQUARES

CUT LINES CORNER LAP

Bowling Green State University
Bowling Green, Ohio

6 SHELF CORNER
WHAT-NOT RACK

Submitted by
Name: P.E. Hosack
High School: Toledo
ASH TRAY

Submitted by
Name Van Meter
High School Shawnee
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO
Drawn by Walter L. Hendricks

TITLE
WAGON

Submitted by
Name Cleo Yoder
High School Bellevue, Ohio
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Drawn by James C. Trace

TITLE
PIN-UP LAMP

Submitted by
Name R. Collins
High School Melmore, O.
STOCK OBTAINED BY GLUING 1/2 DARK\LIGHT STOCK TOGETHER GIVING 11/2 HEIGHT TO BOX

NOTE: DARK\LIGHT STOCK CAN BE ALTERNATED VARIOUS WAYS

HANDLE
1 1/2 X 3/4 X 1/2 DARK STOCK

LID TO BE RABBETED ALL AROUND 1/2 DEEP TO FIT INSIDE BOX

BASE DARK STOCK

LIGHT STOCK

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO
TRINKET BOX
Submitted by
Name C. Hoekenga
High School McKinley

C. Hoelenga
High School McKinley
Note - Fasten with
1. "6-3/8 Flat head screw
2. "6-5/8 Flat head screw

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Drawn by

Title: JEWEL BOX or CIGARETTE BOX
Submitted by
Name: C. Mesnard
High School: Toledo, Ohio
GAME PUZZLE

Submitted by
Name  H. F. EDGAR
High School  WAUSEON

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Drawn by  [Undersigned]

BASE 4\times5\times13
BLOCKS

\frac{1}{2}\times 4 \times 4
\frac{1}{2}\times 3 \frac{1}{2} \times 3 \frac{1}{2}
\frac{1}{2}\times 3 \times 3
\frac{1}{2}\times 2 \frac{1}{2} \times 2 \frac{1}{2}
1 \times 2 \times 2
1 \times 1 \frac{1}{2} \times 1 \frac{1}{2}
\frac{1}{2} \times 1 \times 1
Material - \( \frac{5}{16} \) cedar lining. Interior may be rayon or felt flocked if desired.

Design legs as desired.

**BOTTOM**

**LID**

BOWLING GREEN STATE UNIVERSITY  
BOWLING GREEN, OHIO  
Drawn by Forrest Starrett

**TITLE**  
JEWEL BOX

Submitted by  
Name F. H. Edgar  
High School WAUSEON
Table is designed to accommodate 6 classes. Has one drawer for Board, 'T' Square, Scale, Triangles, etc., and 6 compartments for Students Plates and Supplies. Compartment doors may be equipped with Master Keyed Locks if desired. Table made of Birch with Birch Plywood used for all visible panels.

Panels:
- Back and side panels made from $\frac{3}{8}$ plywood (Birch).

Joints:
- Mortice and tenon joints used in construction. Top fastened with metal corner brackets.

Drawer:
- From $\frac{1}{2}$ stock, size $3'x22'x28'$

Footrest:
- $\frac{1}{4}$ Pipe, iron rod thru pipe. Rod is threaded on end for cap nuts, $\frac{1}{4}$-20NC-2

Compartment Doors:
- Doors made of $\frac{1}{2}$ stock. Doors maybe set flush with legs if desired.
TABLE LAMP

Drawn by R. L. Breka

Submitted by R. L. Breka
School Bowling Green
TITLE: BUILT - TURNING

Submitted by

Name: A.B. Crop
High School: Rossford

BILL OF MATERIAL

<table>
<thead>
<tr>
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<td>CEDAR</td>
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<td>3</td>
<td>3' x 3' x 17&quot;</td>
<td>MAPLE</td>
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<td>4</td>
<td>3' x 3' x 14&quot;</td>
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<td>5</td>
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<td>GUM</td>
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<td>CEDAR</td>
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<td>7</td>
<td>3' x 3' x 8&quot;</td>
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<td>3' x 3' x 8&quot;</td>
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<td>9</td>
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<td>10</td>
<td>3' x 3' x 4&quot;</td>
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<tr>
<td>12</td>
<td>3' x 3' x 6&quot;</td>
<td>WALNUT</td>
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</table>

\( \frac{3}{4} \) CENTER SLOT

\( \frac{3}{4} \) SLOT FOR LAMP CORD

\( \frac{1}{2} \) SQUARES
General Details

Shack cut to size shown in half breadth plan.

Stand up as in showing plan using waterproof glue.

Details cut from using template shown in shear plan on corresponding stations.

Build cut down to 3/4 thickness.

Middle trunk sheeted to plate which in turn is screwed to hull.

Load boat and after making pattern from shear plan.

Rigged by two battens, then batten on both sides.

Deck fastened on 1/2 inch sheeted on.

Tiller bar, mast step, and hatch put in place.

Must be fastened to "Jib" 1/8 inch, then to deck 1/8 inch.

Boom fastened to "Jib" 1/8 inch and to 3/8 inch of either end on

Compass fastened to mast with strong fit if boom tied to it.

Brass staple placed in mast if boom for fastening ends.

Must be held at points by mast or side edge with Leaders for rigging.

With brass fastened 3/8 inch of deck to 3/8 inch of either end

Railings to be both 1/4 inch have been inserted in for adjusting.

Deck fastened by panel ends.

Spring from boom to deck if boom has been done.

Panel to suit individual given two sets of upper wheels including mast if known.

All fittings to be at brass or copper.

Bowling Green State College
Model Sail Boat
Designed & Drawn by
Danny L. Traud
December 28, 1932.
Size may be varied in proportion to dimensions given.
NOTE: ALL JOINTS EXCEPT MORTISE & TENON FASTENED WITH SCREWS

BILL OF MATERIAL

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<td>4</td>
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<td>SUPPORT</td>
<td>2 x 2 x 12</td>
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<td>SCREWS 1/4 FL. HD.</td>
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BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

TITLE
END TABLE

Submitted by
Name S. E. TENANT
High School ZANESFIELD

Drawn by B. Booker
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

SMOKING CABINETS

Submitted by: W. Lloyd
SYLVANIA-BURNHAM HS
Submitted by: R.W. Constein
B.G.S.U.
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<tr>
<td>END 3/4 PARTITION</td>
<td>5/8 x 8 1/2 x 24 1/2</td>
<td>2</td>
</tr>
<tr>
<td>BOTTOM SHELF</td>
<td>3/4 x 9 1/2 x 29 1/2</td>
<td>1</td>
</tr>
<tr>
<td>OPEN SHELF</td>
<td>3/4 x 8 1/2 x 20</td>
<td>2</td>
</tr>
<tr>
<td>TOP</td>
<td>3/4 x 9 x 9</td>
<td>1</td>
</tr>
<tr>
<td>CLOSED SHELF</td>
<td>5/8 x 8 1/4 x 8 5/8</td>
<td>1</td>
</tr>
</tbody>
</table>

SECTION A-A

PARTITION MORTICED 1/4" INTO BACK 3/4 SHELF

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

TITLE
MODERNISTIC END TABLE

Submitted by
Name RALPH PRITTS
High School TOLEDO

Drawn by William W. Davis
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Title: MODERN END TABLE
Submitted by Tom Powell

Drawn by Charles Price
High School Liberty, Twp.
BOWLING GREEN STATE UNIVERSITY

BOWLING GREEN, OHIO

COFFEE TABLE

Submitted by

D. Eaton

High School SWANTON

Drawn by HARRY DAVIS

<table>
<thead>
<tr>
<th>NO.</th>
<th>MATERIAL</th>
<th>SIZE</th>
<th>REQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GLASS</td>
<td>4½ x 30</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>WALNUT 1</td>
<td>2½ x 31½</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>WALNUT 2</td>
<td>2½ x 17</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>WALNUT 3</td>
<td>1½ x 18</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>WALNUT 4</td>
<td>3 x 27</td>
<td>1</td>
</tr>
</tbody>
</table>
- 2R - 7/8 x 18 x 30 SHEET GLASS

ASSEMBLE WITH SCREWS
USE SUITABLE WOOD

USE FELT OVER ENDS TO PROTECT GLASS

88° CUT OFF FOR TENSION ON GLASS

TITLE
COFFEE TABLE

Submitted by RALPH COLE
Name TIFFIN JR.
High School TIFFIN, OHIO

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Drawn by Jerome Matson
Molding is $\frac{1}{2} \times 1\frac{1}{4}$ raised enough to protect glass.

Use $4 \times 14 \times 29$ plate glass.

45° Chamfer $\frac{1}{2} \times \frac{1}{2}$

Braces $1\frac{1}{2} \times 1\frac{1}{2}$ at 45°

Detail A

Radius 1" inside 2" outside
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Title: TABLE DETAILS
Submitted by: G.D. HELM
School: BGSU

Drawn by: Manfred W. Gabbee
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Drawn by [Signature]

TITLE Submitted by
OCCASIONAL TABLE Name A. Youngquist
High School TOLEDO
BOYLING GREEN STATE UNIVERSITY

TITLE

BOYLING GREEN, OHIO

CHILD'S HUTCH CUPBOARD

Submitted by

Name C. J. H. DONALDSON

High School Rossford

Drawn by J. M. M. McLaugh

SCALE: \( \frac{1}{8} \) INCH
### Bill of Materials

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 bottom sides</td>
<td></td>
<td>6 x 2 6 / 4</td>
</tr>
<tr>
<td>4 top sides</td>
<td></td>
<td>4 1 / 2 x 16 1 / 4</td>
</tr>
<tr>
<td>1 top shelf</td>
<td></td>
<td>6 x 20 1 / 4</td>
</tr>
<tr>
<td>1 middle shelf</td>
<td></td>
<td>8 x 20 1 / 4</td>
</tr>
<tr>
<td>2 bottom shelf</td>
<td></td>
<td>7 x 22 1 / 4</td>
</tr>
<tr>
<td>4 bottom shelves</td>
<td></td>
<td>6 x 20 1 / 4</td>
</tr>
<tr>
<td>1 drawer front</td>
<td></td>
<td>4 x 17 1 / 4</td>
</tr>
<tr>
<td>1 drawer back &amp; sides</td>
<td></td>
<td>4 x 40 1 / 4</td>
</tr>
<tr>
<td>1 door frames</td>
<td></td>
<td>1 1 / 2 x 6 1 / 2</td>
</tr>
<tr>
<td>1 strip between doors</td>
<td></td>
<td>1 x 16 1 / 4</td>
</tr>
<tr>
<td>2 strips above &amp; below drawer</td>
<td></td>
<td>3 x 18 1 / 2</td>
</tr>
<tr>
<td>2 front side strips</td>
<td></td>
<td>2 x 23 3 / 4</td>
</tr>
<tr>
<td>1 decorative strip along bottom</td>
<td></td>
<td>4 x 21 1 / 4</td>
</tr>
<tr>
<td>door panels, back of cabinet, &amp; drawer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bottom - tempered masonite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 butterfly hinges - black hammered finish</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 1 / 8 wooden drawer pulls</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Child's Hutch Cupboard**

This project is very suitable for second-year students in cabinetmaking.

Suggested materials: clear white pine, maple, walnut, cherry, birch, & mahogany.

The white pine may either be enameled any color or stained with maple stain and finished with spar varnish. The regular cabinet woods will look very good if finished in their natural color, either with oil, shellac, or varnish.

---

**BOWLING GREEN STATE UNIVERSITY**

**TITLE**

BOWLING GREEN, OHIO CHILD'S HUTCH CUPBOARD

**Drawn by** Lowell S. McElrath

**Submitted by**

Name C. J. H. Donaldson

High School

---

46
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Title: Machinists Tool Chest

Drawn by Byron Gable

Submitted by
Name Evan E. Herr
School Bowling Green State University
ASSEMBLE WITH SCREWS

USE 3/4 WALNUT FOR ALL PARTS
FOR CONTRAST USE BIRCH OR MAPLE

VANITY BENCH

VANITY TABLE

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Drawn by Jerome F. Rosenthal

Submitted by YOUNGQUIST
Name
High School Toledo, Ohio

TITLE
VANITY SET
CONSTITUTION MIRROR

Drawn from original in the
John Alden House, Duxbury Mass.
CHILD'S ROCKER
Adapted from an original made in Berea, Kentucky.
Drawn, traced and built in Bowling Green State University, 1939.

Rear section of seat (\(\frac{3}{4}\)" thick)

Section through side of the seat

Slip joint

Back 9\(\frac{1}{4}\)" overall

Front 11\(\frac{1}{2}\)" overall
Flowe Pot Stand

Scale = 3/4" = 1"

Designed and Traced by: D.J. Hornish
Approved by: 
July 20, 1941

Fit legs to curve of column and secure with 1/8 dowels and glue.
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Drawn by Fred Richotte

TITLE
GATE LEG TABLE

Submitted by
Name V. Mooney
High School Libbey
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

抽屉位置

NAME: J. FAST
High School: LIBBEY, TOLEDO

55
Title: Desk Table
Submitted by: J. Fast
Name: J. Fast
High School: Libbe, Toledo

Drawn by: Eugene Thompson

Bowling Green State University
Bowling Green, Ohio
CORNER CUPBOARD
Designed & built by
E. C. Powell
Drawn by LaMar Knecht
January 1938
Bowling Green State University
Bowling Green, Ohio

Detail drawing of Mold "D"

Detail drawing of Mold "A"

Detail drawing of Drawer
Title: Crocodile Wrench

Submitted by: G. J. Davis

Name: G. J. Davis

School: B. G. S. U

Bowling Green State University
Bowling Green, Ohio

Drawn by Sidney E. Davis
HANDLE
CRS. 1 Reg'd.

LOWER ARM
D. ROD 1 Reg'd.

PLUG
CRS. 1 Reg'd.

ARM HELD
CRS. 1 Reg'd.

HACK SAW

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Drawn by Franklin Rogers

Submitted by
Name R. Hacket

School BGS.
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Drawn by Harold L. Bruncliffe

TITLE
HOBBY KNIFE
SET

Submitted by
Name JIM LOTT
School B.G.S.U.

Base of blades 23/64
STAMP NO.'S WITH DIE

ROUND TO DESIRED RADIO

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Drawn by Henry Bucher

TWIST DRILL STAND

Submitted by
Name
High School Rossford
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

HAMMER HEADS

Submitted by
Name DAVE CLINGAMEN
High School DEFIANCE

Drawn by William Weigl
1/8 C'BORE 1/8 DEEP - FOR FORMING RIVET HD.

1/8 DRILL

1/8 C'BORE 3/8 DEEP

HEAD 1/2 DRILL ROD - 3" LONG

HANDLE 1/8 ROD - 12" LONG
ABOUT \( \frac{1}{2} \) TO BE CUT OFF AFTER KNURLING

MEDIUM KNURL - DO NOT TURN SECTION TO BE KNURLED

PRICK PUNCH
T.S. 1 REG'D
HEAT TO CHERRY RED TO HARDEN. TEMPER AT 425° FOR 10 MIN

MACHINISTS HAMMER

MACHINIST'S HAMMER
PRICK PUNCH
To Suit

1. PLEXGLAS - 1 REQ.
   DEEP & GROOVES

2. T. S. - 1 REQ.
   HARDEN & TEMPER BLADE

Submitted by
Name H. F. EDGAR
High School WAUSEON
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

PIECE VISE

Drawn by Arnold Schaw

Submitted by
Name Jones
High School Fostoria
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

DRAWN BY

TITLE
PIPE VISE

Submitted by
Name
Jones
High School
Fostoria
DRILL AND TAP FOR NO. 5 ALLEN SET SCREW

MOVEABLE JAW
C.T.

HEAD BRACE
M.S.
1-REQ.

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Drawn by Jones
High School Fostoria
**HANDLE**

\[
\frac{3}{4} \text{ Alum. Rod} \\
1 \text{ Req'd}
\]

**TIP**

\[
\frac{3}{8} \text{ Alum. Rod} \\
1 \text{ Req'd}
\]

**Note.**

Threads throughout are \( \frac{5}{16} \)-18NC-2

**ROD**

\[
\frac{3}{8} \text{ Alum. Rod} \\
3 \text{ Req'd}
\]
BOWLING GREEN STATE UNIVERSITY  
BOWLING GREEN, OHIO  
Submitted by  
Name Schumacher  
High School Findley

<table>
<thead>
<tr>
<th>NO</th>
<th>NAME</th>
<th>MATL</th>
<th>NO REQ</th>
<th>NO</th>
<th>NAME</th>
<th>MATL</th>
<th>NO REQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BASE</td>
<td>C.R.S.</td>
<td>1</td>
<td>4</td>
<td>SLEEVE</td>
<td>C.R.S.</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>ADJ. SCREW</td>
<td>C.R.S.</td>
<td>1</td>
<td>5</td>
<td>SCRIBER</td>
<td>C.R.S.</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>CLAMP</td>
<td>H.R.S.</td>
<td>1</td>
<td>6</td>
<td>ELEV. ROD</td>
<td>C.R.S.</td>
<td>1</td>
</tr>
</tbody>
</table>

BOWLING GREEN STATE UNIVERSITY  
BOWLING GREEN, OHIO  
TITLE SURFACE GAUGE  
Assembly Detail  
Submitted by  
Name Schumacher  
High School Findley

77a
ADJ. SCREW F-134H-2
C.R.S. 2"-1" 1 REQ.

VERT. ADJ. NUT F-134H-7
H.R.S. 2"-1" 1 REQ.

BASE F-134H-1
C.R.S. 3"-2" 1 REQ.

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Submitted by
Name Schumacker
High School Findley
BOWLING GREEN STATE UNIVERSITY

BOWLING GREEN, OHIO

TITLE

SURFACE GAUGE

Assembly & Detail

Submitted by

Name Schumacker

High School Findley

Drawn by Tony Davis

77c
MAIL BOX

PAPER CATCH 5/8" wire 1
BODY 26 ga. iron 1
LATCH 18 ga. iron 1
HINGE 10
RIVETS 10
Name of Part Met. ms.

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO
Submitted by Name B. FLEITZ
Drawn by ROBERT STONE
School B.G.S.U.
MAIL BOX

SIDES
26ga. In. 1 Req'd

BACK
26ga. In. 1 Req'd

LID
26ga. In. 1 Req'd

PAPER HOLDER
25' of 1/4 wire 1 Req'd

HANDLE
7/16 In. 1 Req'd

HINGE
18ga. st. 1 Req'd

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Drawn by Bob Stone

Submitted by
Name B. Fleitz
B.G.S.U.
BODY
SH. METAL  HALF SIZE

HANDLE
SH. METAL
HALF SIZE

COOKIE CUTTER

Submitted by
Name R. TORGERSON
School B.G.S.U.
LARGE FARM FUNNEL

USE 26 GAGE GALV. IRON
SOLDER ALL JOINTS

Submitted by
Name          T.A. Powell
High School  Liberty Twp.
NOTE: SHAPE & DEPTH OF DESIGN AROUND EDGE MAY BE VARIED

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO
Submitted by
Name H.D. MINER
School B.G.S.U.

Drawn by Bert Barker

TITLE
TRAY
16 GA. AL
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

DRAWN BY Y. OZ

12 OZ. COPPER

TITLE

SMALL TRAY

Submitted by
Name G. J. DAVIS

School B.G.S.U.

Drawn by Charles K. Rosa
SCROLL - \( \frac{3}{8}'' \times \frac{3}{8}'' \) MILD STEEL - HAMMERED OR PAINTED
BOWL - COPPER - HAND RAISED - DRILL 3 - \( \frac{1}{8}'' \) HOLES EQUISPACE
BASE - WOOD - TURNED AS SHOWN
RING - \( \frac{3}{8}'' \) D. COPPER TUBING \( \frac{1}{8}'' \) WIDE - 1 REQ'D
HANGER - #26 OR LIGHTER \( \times \frac{3}{8}'' \) BRASS STRIPS TWISTED 3 REQ'D

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO
TITLE: BOWL & RACK
Submitted by Name V. H. WALRATH
Drawn by Robert O. Dykstra
High School CRESTLINE
1. Lay off 2½ and 2 3/4 from the ends. Mark with center punch.
2. Heat and draw 2½ end to 7/16 round. Offset on one side.
3. Bend to right angle at offset.
4. Reverse and forge opposite end in the same way.

5. To make eye--heat end, cool off square portion up to corner and turn eye over horn of anvil.
6. To make hook--heat end, cool corner to round and bend to dimensions given.
7. Heat middle of hook to even red, cool 1 1/4.
8. Heat middle of hook to even red, cool 1 1/4 of each end give one complete turn.
9. Straighten, if bent, with lead mallet and wooden block.
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Drawn by Frank A. Alger

Submit by
Name H.F. Edgar
High School Wauseon

HAMBURG GRILL
WELDING PROJECT

1/8 BAND IRON OR #9 WIRE

#9 WIRE

1/8 C.R.S.

1/4 C.R.S.

3/8 C.R.S.
STOCK
ROUND OR SQUARE
BRASS OR MILD STEEL
COPPER COATED

9" IN LENGTH

26 IN LENGTH

SPOT WELD, WELD
OR BRONZE JOINTS

2 3/4 IN LENGTH

15 1/2 IN LENGTH

---+-IH---......+-+-_....,,,.._ __ -'--

BRASS OR COPPER RING

#20 BRASS SINGLE JACK CHAIN OR
#00 BRASS SAFETY CHAIN

BRASS OR COPPER

2 1/8 D

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO
HANGING BASKET

Submitted by
Name DONN HORNISH
School O.N.U.

Drawn by Phil Crichton
WOOD GRATE & STAND

SCALE 3'1"

LENGTH OF RAIL MAY BE VARIED

FOOT RAIL
SCALE 1/4"

END DETAIL OF FOOT RAIL

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

TITLE
FIREPLACE FIXTURES

Submitted by
Name YOUNGQUIST
High School TOLEDO
NOTE:
Metal for casting is optional

$\frac{3}{16} \times 45^\circ$
Chamfer

No. 3 Wax Fillet
BOOK END
CAST ALUMINUM

YOUR INITIALS OR MONOGRAM

Submitted by H.O. Miner
Name B.G.S.U.
School

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Drawn by Jerome F. Hauser

TITLE
BOOK END
BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO
Drawn by Carol D. Hagerty

TITLE
NAME PLAQUE

Submitted by
Name HARVEY D. MINER
School B.G.S.U.

OPTIONAL BRACKET

NO. 4 FILLET

LENGTH DETERMINED BY
LENGTH OF NAME

YOUR NAME

OPTIONAL SIZE - PATTERN LETTERS

$\frac{3}{8}$ CHAMFER AROUND BORDER TOP

$\frac{1}{16}$
MATERIAL: 
CAST BRONZE

BOWLING GREEN STATE UNIVERSITY 
BOWLING GREEN, OHIO 

Drawn by

Submitted by

NAME: H.O. Miner
School B.G.S.U.

TITLE
JEWELER'S ANVIL
A MULTIPLE VOLTAGE TRANSFORMER

Core Date for 60-Cycle, Low-Voltage Transformers

<table>
<thead>
<tr>
<th>Watts Output</th>
<th>Dimensions of Cores in Inches</th>
<th>Weight of Cores Approx. Lb.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>10</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>20</td>
<td>3/4</td>
<td>3/4</td>
</tr>
<tr>
<td>50</td>
<td>1 1/8</td>
<td>7/8</td>
</tr>
<tr>
<td>100</td>
<td>1 1/2</td>
<td>1 2 3/4</td>
</tr>
</tbody>
</table>

Coil Date for Step-Down Transformers to Use on 60-Cycles, 115 Volts

<table>
<thead>
<tr>
<th>Watts Output</th>
<th>Volts Output</th>
<th>Amps. Output</th>
<th>Number of Pri. Turns</th>
<th>Wire Size B. &amp; S. Gauge</th>
<th>Length of Coils Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>6</td>
<td>1.6</td>
<td>2875</td>
<td>30</td>
<td>1 1/4</td>
</tr>
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<td>20</td>
<td>6</td>
<td>3.3</td>
<td>1500</td>
<td>30</td>
<td>1 1/2</td>
</tr>
<tr>
<td>20</td>
<td>10</td>
<td>2.0</td>
<td>1500</td>
<td>30</td>
<td>1 1/2</td>
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<tr>
<td>50</td>
<td>6</td>
<td>8.3</td>
<td>700</td>
<td>37</td>
<td>2 2</td>
</tr>
<tr>
<td>50</td>
<td>14</td>
<td>3.5</td>
<td>700</td>
<td>86</td>
<td>2 2</td>
</tr>
<tr>
<td>100</td>
<td>8</td>
<td>12.0</td>
<td>300</td>
<td>22</td>
<td>2 1/2</td>
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<tr>
<td>100</td>
<td>14</td>
<td>7.0</td>
<td>300</td>
<td>38</td>
<td>2 1/2</td>
</tr>
</tbody>
</table>

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

Submitted by Hyberger

Drawn by Glenn Honner
**MATERIALS**

- **COPPER ROD**
  - \( \frac{1}{2} \times 5 \frac{1}{2} \)

- **C.R.S.**
  - \( \frac{1}{8} \times \frac{1}{8} \)

- **C.R.S.**
  - \( \frac{1}{8} \times \frac{1}{8} \)

- **CONDUIT**
  - \( \frac{1}{8} \times 4 \frac{1}{2} \)

- **CONDUIT**
  - \( \frac{1}{2} \times 7 \frac{1}{2} \)

- **PLASTIC**
  - \( 2 \frac{1}{2} \times 2 \frac{1}{2} \times 6 \)

- **WOOD**
  - \( 9 \times 6 \times 32 \)

- **MACHINE SCREWS**
  - \( 10 \times \frac{1}{4} \times 6 \)

- **HEATER CORD**

- **ASBESTOS**

---

**NICHROME WIRE**

<table>
<thead>
<tr>
<th>DIA.</th>
<th>WATT WIRE</th>
<th>Z (ohms)</th>
<th>LENGTH (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>27</td>
<td>4.22</td>
<td>3.22</td>
</tr>
<tr>
<td>175</td>
<td>27</td>
<td>4.14</td>
<td>3.22</td>
</tr>
<tr>
<td>200</td>
<td>26</td>
<td>4.05</td>
<td>2.57</td>
</tr>
</tbody>
</table>

**TITLE**

**SOLDERING IRON**

**Submitted by**

**GLEN MOORE**

**School**

**B.G.S.U.**

**Drawn by**

**S. McCleary**

---

**BOWLING GREEN STATE UNIVERSITY**

**BOWLING GREEN, OHIO**
Length of stock for Lyre = 11"
CLEAR PLEXIGLAS
NOTE: FOR SALT USE #50 DRILL, FOR PEPPER #55

MATERIAL:
WATER CLEAR PLEXIGLAS

Bowling Green State University
Bowling Green, Ohio

Submitted by
Name R. Boroff
High School Bettsville, O.
PLASTIC LAMP

GROOVE 1/8 FOR LIGHT CORD

SHOULDER NUT

NO 5-40 N.C. 2 x 1/4
ROUND HD. MACH. SC.

GLUED

BOWLING GREEN STATE UNIVERSITY
BOWLING GREEN, OHIO

TITLE

PLASTIC LAMP

Submitted by
Name E. Weekly
High School Bowling Green

Drawn by Bob Long
PLASTIC DESK LAMP

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Conclusions

In this chapter 106 project drawings were presented. The number of drawings classified under each heading was as follows:

1. Woodwork  
2. Machine Shop  
3. Sheet Metal  
4. Art Metal  
5. Forge & Foundry  
6. Electricity  
7. Plastics
CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The Problem

The purpose of this investigation was to prepare a list of the projects for Industrial Arts which are considered valuable for use at the secondary-school level.

Techniques Employed

Letters were sent to approximately 270 instructors in Industrial Arts in twenty-four counties in midwestern Ohio, requesting drawings of their favorite project or projects. These drawings were redrawn for uniformity by the Engineering Drawing Department of Bowling Green State University. A committee of specialists in Industrial Arts rated the projects with respect to their value for use at the secondary-school level. The Printing Department of Bowling Green State University printed them, and bound them into project books.

Conclusions

In so far as the results of the investigation may be valid, the following conclusions seem justified:
1. An examination of the project drawings reveals that of the projects adjudged of value for the secondary-school level, the greatest number represented the area of Woodworking. From a total of the 106 selected as valuable for use at the secondary-school level, fifty-eight project drawings were selected in woodworking. (See pages 36 to 94.)

2. It was found that the area of Machine Shop was second, with a total of twenty-two of the selected 106 project drawings. (See pages 95 to 117)

3. Forge and Foundry which is closely related to Machine Shop was third with nine projects selected in that area from the 106 project drawings. (See pages 128 to 138.)

4. Art Metal and Plastics, the most modern of the Industrial Arts subjects, were fourth and fifth with six and five projects respectively. (See pages 123-127 and 142 to 146.)

5. Sheet Metal and Electricity with three each were in last place in the selection of project drawings. (See pages 119 to 122 and 138 to 140.)

6. It was noted that the variety as well as the number of projects in Sheet Metal, Electricity and Plastics was small.
7. It was noted also that there seemed to be no standardized form, on the part of the Industrial Arts Instructors, with respect to drawings of the projects.

Recommendation

Recognizing the value and importance of good projects for junior and senior high school students, the following is recommended:

1. That more emphasis be placed upon the selection of projects of value for use in Sheet Metal, Art Metal, Forge & Foundry, Electricity, and Plastics.

2. That a greater variety of projects be provided in Sheet Metal, Art Metal, and Plastics.

3. That more emphasis be placed on the standardizing of project drawings, for use in making good projects.

Recommendations for Further Study

In the course of this investigation several related problems have presented themselves as being suitable for further investigation. The problems that seem most pertinent to this study are:

1. Investigations to determine whether projects used in Industrial Arts are in accord with the activities found in our modern industrial world.
2. Investigations to ascertain the reasons for the variations in interest in the different subject-matter areas of industrial arts.

3. Investigations to determine the quality and completeness of education in Industrial Arts, and to compare such training with specialized industrial training.
BIBLIOGRAPHY

A. BOOKS


B. PERIODICAL REFERENCES


C. BULLETINS

