

AN ABSTRACT OF THE THESIS OF

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M.S.

Industrial Education

-----for the-----in-----
(Name) (Degree) (Major)

May 8, 1938

Date Thesis presented-----

Metalcraft as an Educational Medium in the

Title-----
Industrial Arts Program

Abstract Approved:-----

Redacted for privacy

(Major Professor)

The purpose of this study was to determine, if possible, the place of metalcraft work in the industrial arts program for secondary education. Use of metalcraft activities as a means of realizing some of the broad general aims of education, particularly within the metals' area of industrial arts, has been advocated by many yet practiced by few. It was thought desirable, then, to investigate the possibilities of metalcraft work as a medium in industrial arts programs.

Three criteria were used in the study. First, a survey of the literature of the field was made for the purpose of recording all possible references to the use of metalcraft activities. Representative statements were then selected and used to form one chapter. Second, a questionnaire was prepared and sent to 279 industrial arts teachers, supervisors, department heads, teacher-educators, etc., who have demonstrated superior abilities in this field. The purpose of the questionnaire was to ask the opinions of these men, as formulated through their years of experience, regarding the value and advisability of including metalcraft work in the industrial arts program. Third, the same questionnaire was sent to 24 men who, because of their writings and professional standing, have acquired positions of prominence in the field.

The results of the study would indicate: (1) That metalcraft activities are highly desirable as a medium in industrial arts education; (2) that they would be of general interest to the students; (3) that only a limited amount of work is being done at the present time in this field; (4) and that there is a definite desire to develop the program farther. There is a pronounced demand for more training along this line, to be offered by teacher-education institutions.

Based on the enthusiastic response to the questionnaire (69 per cent of the larger group and 83½ per cent of the smaller group returned), a suggested course of study was developed for use at the tenth grade level.

METALCRAFT
AS AN EDUCATIONAL MEDIUM
IN THE INDUSTRIAL ARTS PROGRAM

by

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A THESIS

submitted to the
OREGON STATE COLLEGE

in partial fulfillment of
the requirements for the
degree of

MASTER OF SCIENCE

June 1938

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Redacted for privacy

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ACKNOWLEDGEMENT

Grateful acknowledgement is hereby given to Professor Geo. B. Cox whose inspiration and encouragement made this study possible; to Professor William H. Varnum, Professor Emil F. Kronquist, Mr. Leon H. Baxter, Dr. Burl N. Osburn, Dr. William L. Hunter, Professor R. L. Welch, and Professor R. W. Selvidge for their assistance beyond that asked for by the questionnaire; to the many specialists in industrial arts education who so enthusiastically helped in the study.

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METALCRAFT AS AN EDUCATIONAL MEDIUM IN THE INDUSTRIAL ARTS PROGRAM

CHAPTER I

INTRODUCTION

Statement Of The Problem

The place of industrial arts in the secondary school curriculum seems at the present time to be rather firmly established. Descending with its rich heritage from the older forms of activity known as "manual training," it has expanded and developed gradually until it now fills a definite place in secondary education. Even in the face of the greatest challenge ever presented to education in general, the recent depression, the industrial arts activities have maintained their status, and more than many other subject fields have advanced since the depression along the conservative-progressive front.

It is not assumed, however, by leaders in the field of industrial arts that perfection has been attained in the secondary industrial arts program. In fact, a great deal of attention is being focused at the moment on the industrial arts curriculum in secondary

education with a view to learning more accurately what to teach and how to teach it. And while tradition is bound to include much worth while work in setting up an industrial arts curriculum, the question is often raised as to whether the right activities have been included. Is it not possible that many worth while activities are being omitted while others of less worth are still included?

It is not the purpose of this study to determine what the industrial arts curriculum in secondary education shall be. Rather it is the hope of the writer to determine the place of metalcraft or "art metal" work in the industrial arts program of secondary education. It has been the contention of many writers in the field of industrial arts education that the industrial arts program should contain more art. It would seem, therefore, that one of the ways to emphasize art would be to offer activities rich in artistic opportunities. It is believed that courses or activities in the field of metalcraft or art metal would supply a portion of this need. It is our desire, therefore, to objectively determine the place (if there be any) of metalcraft or art metal work in the industrial arts program of secondary education. To this end this study is set up.

If it is found desirable to offer work of this nature in secondary schools, a suggested course of study will be constructed.

Procedure

The procedure used in this study may be divided into four distinct steps. While the first three are more or less related and may at times overlap, they nevertheless appear as separate phases of the problem.

First. A survey of the writings of the leaders in the field of industrial education was made and any opinions relative to the PROBLEM were recorded and tabulated. Certain representative statements were then used to indicate the ideas expressed by these leaders.

Second. A questionnaire was prepared and sent to 279 industrial arts teachers, supervisors, administrators, and teacher-educators located throughout the United States. The purpose of this questionnaire was to sample the opinions of these men with regard to the place of art metal in the secondary industrial arts program.

Third. To further objectify the study, the same questionnaire was sent to twenty-four outstanding leaders in the field of industrial education. These men

were selected because of their recent writings and because of the positions of prominence they hold in the field.

Fourth. Based on the findings of the first three steps, a suggested course of study was worked out using the textbooks and writings of outstanding men in the field of art metal, metalcraft, and silversmithing, and supplemented with the personal experience of the writer gained from seven years' teaching of this work in secondary schools.

Definition of Terms

Art metal work. The term "art metal work" as used in this treatise refers to the type of activity which, among other things, leads to the production of the type of article generally made by a silversmith. It is not to be confused with jewelry work or ornamental wrought iron work. By the use of the precious and semi-precious metals as the medium for execution, the product may vary from simple flat objects in copper or brass, such as letter openers and desk sets, to the more difficult raised objects in the precious metals. The nature of such work would include processes, operations, and embellishments common to the silversmithing trade.

Metal craft work. The term "metal craft work" is used synonymously with "art metal work."

Industrial arts. "Industrial arts" is a part of general education and is not to be confused with vocational-industrial or trade-training activities. Industrial arts is non-vocational in its major objectives. It is an instrument of general education in the industrial realm, just as science in the secondary schools is an instrument of training for appreciations and background values rather than for vocational application. The study of industrial arts combines the skills or "the arts" of industry, a knowledge of industrial materials and processes, and the application of aesthetic design to industrial products.

Limitations of the Study

The problem of objectively determining just what shall and what shall not be taught is at best a very difficult one. Who shall say what the curricula for a certain community shall include? There are so many factors which bear directly on the problem that it is impossible to answer without thorough consideration of those factors. In addition, it has always been conceded that the 'what' is taught is not so important as the

'how' it is taught. "A farmer boy sat on one end of a log, and Mark Hopkins sat on the other. Mark Hopkins sat as a pedagogue and taught like an elder brother. I care not what Mark Hopkins taught; If his Greek was small and his Latin was naught. But the farmer boy he thought, thought he; The kind of a man Mark Hopkins is, is the kind of a man I mean to be." The ability and personality of the instructor, his capacity for making his offerings vital and interesting, these have a pronounced bearing on the worth of what is taught.

Douglass and Boardman (16:323) point out that "The purpose of education is so to condition the future behavior of those being educated that they are willing and able to function in ways of greatest satisfaction to themselves and most conducive to the welfare and progress of others." On the same page they indicate the relationship of subject matter to education in general when they say, "Whatever subject matter will contribute most to the objectives of education should be included in the course of study. There is no other justification for subject matter." If we are to accept this as a criterion for evaluating the worth of the subjects or activities offered, who is to say which offerings actually do these things? In the absence of a more

objective means, the opinions of a large group of men would, all other things being equal, seem to be one of the most reliable methods of determining the probable value of a given subject. In addition, the opinions of men particularly trained in a special field and who have attained prominence through years of leadership in that field should be of some significance in the judging of the probable contribution of a given subject to the recognized educational objectives of the field concerned. It is recognized, however, that these opinions are, after all, only opinions and are, therefore, in that respect subjective.

CHAPTER II

THE FUNCTION OF INDUSTRIAL ARTS IN SECONDARY EDUCATION

Before proceeding to fit metalcraft activities into the general industrial arts program, it may be well to review the modern concepts of industrial arts as set forth by some of the leaders in the field.

The matter of terminology seems always to be turning up whenever an attempt is made to explain or elaborate upon any problem. At the risk of seeming petty, it is thought advisable to differentiate between what is now generally known in the field as industrial arts and that known as vocational education.

In the recently published state course of study for industrial arts in Oregon secondary schools (9:7-8), we find the statement:

Industrial arts is non-vocational; it is a vital part of general education. At the same time it has a close kinship to trade education because it lays a most excellent background for those who, upon reaching the age of specialization, will continue with a vocational-industrial program.

That the concept of industrial arts as a functional unit of general education is widespread in the field is apparent in the article by James L. McRae (32:360).

To summarize, the junior high school industrial arts of the future must assist in accomplishing the functions of the junior high school; it must be a phase of general education and not vocational training. Its purposes are to make the student a more valuable member of society because he shall have developed certain interests, appreciations, attitudes, habits, knowledges, and skills.

As far back as 1928, we find leaders in the field protesting the confusion of vocational education with industrial arts. J. J. Hatch, (21:441-2) says:

Industrial arts teachers need feel under no compulsion to call their work vocational or try and teach vocational courses for which they are not prepared, for which they have no adequate equipment, and for which there is really no demand.....Education may be divided into two great divisions; education for culture, and education for vocation. The dominant idea in one is appreciation and in the other service.....Industrial arts has been, is, and should continue to be a very definite and important part of the general educational process. Its chief objective should be to develop appreciation--an appreciation of a hand and machine made world, an appreciation of the functions of tools and machines and the problems connected therewith, an appreciation of materials and mediums for definite purposes, an appreciation of systematized jobs finished in a businesslike way, appreciation of accuracy, of skill, of ability to think straight, of industry, and of dependability in the whole world of industrial activities.

Cox says (10:319-323):

The field here is that of general education, and the shop subjects should concern themselves with general industrial education in the same sense that science, mathematics, etc. are concerned with general scientific and mathematical

education, without restriction to specific trades or professions.

Bawden (6:161-2) also expresses the newer concept of industrial arts when he says:

Without eliminating manual abilities and skills, the objectives of industrial arts now place new emphasis on interest in avocational and leisure-time activities; knowledge of industrial products, processes, and occupational opportunities; creative expression and problem solving; exploration of individual inclinations, interests and abilities.

Payne (38:167) expresses much the same opinion in the following:

I. Practical Arts. - The purpose or general objective of the practical arts is the same as of general education. The practical arts are taught for their cultural values, for appreciative values, and for their consumer values.

It is seen, then, that leaders in the field of industrial arts education are pretty well agreed that the purpose of industrial arts in secondary education is to contribute to the broad aims of general education. Citation of specific aims and objectives or purposes of industrial arts as expressed by all the men prominent in the field would be in itself an exhaustive work. It would seem sufficient to say that the general thinking of these men indicates that the place of the practical arts in secondary education is to go hand in hand with the academic activities in achieving the broad general

aims of education. Vocational or trade training is considered to be a separate function and should be carried on under a distinctly separate set-up and for a distinctly different purpose.

CHAPTER III

A SURVEY OF THE WRITINGS OF LEADERS IN THE FIELD
OF INDUSTRIAL EDUCATION REGARDING
METALCRAFT ACTIVITIES IN SECONDARY EDUCATION

Wide reading in the literature of the field discloses a definite trend toward increased emphasis on the artistic and aesthetic values to be obtained from an industrial arts activity. And in the general field of metal work, exceptional emphasis is placed on the possibilities of art metal work. The Ohio Educational Association and the Ohio State Department of Education (45:84-7) recognize this when they state:

Next to wood, metal was one of the first materials to be used for industrial arts purposes and in a like manner has suffered from a narrow application. Offerings too frequently have consisted of experiences in the limited fields of sheet metal and machine shop. More serious perhaps than this narrowness of manipulative opportunities has been the positive neglect of the rich fund of informational material which rightly belongs with any study of metals.

Development is needed along several lines. First, there should be a great variety of experiences offered. Opportunities should be provided for such units as molding, forging, cold metal working, spinning, jewelry making, copper and silversmithing, as well as in sheet metal and machine shop. All of these activities are rich in manipulative processes and have wide informational possibilities.

Secondly, contact should be made with as great a number of materials as possible. It is not

sufficient to introduce the pupil to experiences with galvanized iron, tin plate, and steel. Provision must also be made for contacts with many other common metals such as the new alloy steels, copper, brass, aluminum, nickel silver, monel metal, lead, pewter, zinc, and silver. Each of these opens up a whole new field of experience, study, and appreciation. New processes are required, new tools utilized, and a new wealth of information is available.

Let the pupil learn of the production of each metal; let him understand where and under what conditions the ores are produced; how they are transported; and how smelted and refined. Refer him to such books as "Materials of Industry" by Mersereau and "Non-Technical Chats on Iron and Steel" by Spring. Both of these read more like stories than texts. Show the relation of chemistry to the smelting and working of metals, and the application of physical laws to the manipulation of tools and materials.

The opportunity should not be neglected to introduce the romantic stories of men who have long been famous in the working of metals. Such names as Benvenuto Cellini and Paul Revere stand out as great craftsmen, while such names as Senator Clark, Georg Jensen, Sir Henry Bessmer, Andrew Carnegie, and Henry Ford suggest current opportunities for study. Bring to him also those fascinating stories of the discovery of metals, their development, and contributions to our modern civilization.

Appreciation of beauty of line and proportion and the developing of a knowledge of design should be stressed. Antiquity and the work of Oriental craftsmen have provided numerous examples which may be seen in museums and the better stores, and manufacturers are constantly striving to provide worthy designs. Pupils may be made conscious of these examples through pictures, displays, trips, and motion pictures. Two books on this subject which every industrial arts teacher should have in his laboratory are "Pewter Design and Construction" and the new edition of "Industrial Arts Design" by

Varnum. Cooperation between the industrial and fine arts departments in a school would do much to improve pupils' efforts in adapting old or creating new designs and probably improve the status of both areas.

Any industrial arts course has fallen far short of its goal if it does not influence the pupil to carry his interests in metal work outside of the school. The subject is teeming with unlimited opportunities for individual investigations.....

A broad course in the study of metals means greater opportunities for exploration. Every added experience and every new metal also means a greater chance for the development of avocational interests, and the teacher should be ready to foster such interests as they appear. The study of how several metals are used from the standpoint of costs, characteristics, and applications constitutes a basis for teaching consumer knowledges and appreciations. An increase of aesthetic experiences and resulting appreciations is an outcome to be expected from a study of design as applied to the making of a copper vase, a wrought iron lamp, or a spun bowl. Adequate provision should be made for the acquisition of common technical knowledges and manipulative functions. This may be accomplished through the making of a rich and varied assortment of metal working problems and investigations in as many fields as can be presented. The teacher should be constantly alert to the reactions of pupils to the many types of metal work as possible ground for guidance and counseling, and should also be aware that in the occasional case this work may take on a vocational aspect, particularly for older or senior high school pupils.

William H. Varnum (48), presupposing and assuming that the worth of such a course will go unchallenged, continually makes reference to art metal courses in secondary schools in connection with the industrial

arts program.

Dudley Crafts Watson (51:5) says:

Intellectual education has run away with us. The balance necessary for a rounded-out culture can only be had when the practice of the arts as well as appreciation is a part of general community life. Machinery today has robbed us of the urge to be practical with our hands, but no machine has ever designed, and no design has been successful unless the material of its application was thoroughly understood by the designer.

We no longer have to produce as individuals with our hands the necessities and comforts of daily life, and this very leisure which science has given us promotes a passion for grace and satisfaction in all the things we possess. A product of manufacture must now be beautiful as well as useful. The design that goes into it must be created by one who understands the materials from which it is made. Who knows the limitations of wood, stone, metal, clay, or fabric unless he has worked in it?

The development of aesthetics was never more needed from the practical standpoint, but from the standpoint of individual happiness it is even more needed. With machinery doing the world's work there is time to spend in the daily life of all. Shall it be squandered, or will we really buy something with it? Pleasure can be bought on the outside but happiness comes from within. The flare to create beauty is rare in a mechanical age, but within all humans is a smouldering desire, the divine heritage. This is not recognized in the great system, the steamroller process, of present day education.

Augustus F. Rose (41:7) writing in the preface of his book, recognizes the value of art metal activities in secondary education as follows:

When this book was first published in 1906 it was an outgrowth of the author's experience in teaching metal crafts work in the Providence Technical High School. At the time it was a pioneer in its field the author being the first to introduce the subject into the public schools. Since the book was published twenty-four years ago, interest in the metal crafts has spread until now it is included in school work all over the country. Summer schools and camps have introduced it as a most valuable craft. Hospitals have included it in their occupational therapy work. Universities, colleges, private and public schools now offer the work as an elective, while art schools are training teachers for this unlimited field. Much new material has been added to the book consisting of drawings, designs and photographs of various objects executed by junior high, senior high, and art school pupils and also detailed descriptions of the processes necessary for the execution of many of the designs.

It is hoped that this volume will be especially helpful to manual arts teachers who have already started the work as well as those who are trying to introduce metal work into the regular school course.

And again, in the preface of the same book, the author (41:12) explains further the function of art metal work in the junior and senior high school.

Many experiments have been tried in the development of manual arts courses in the public schools and much time has been spent in discussing the types of work that should be included.

Wood and iron were the first materials used and are yet indispensable, but experience has led those who are developing this work to believe that there are other materials as well adapted to manual arts work in all its various forms. Clay, used not only for modeling but for ceramic work as well,

leather, textiles, brass, pewter and copper are materials that have been put to the test and found satisfactory in many ways.

Work in sheet copper has been introduced into the public schools with gratifying results. It has proved itself to be a valuable departure from other kinds of manual arts work and has now taken its place as a part of the regular school curriculum. No other craft calls for such skill in the handling of the materials used, nor so keen a sense of fine line and proportion in design.

There is something about this kind of school work that appeals to boys and girls and holds their interest. The nature of the material, hard enough to offer some resistance and yet pliable enough to allow its being wrought into many forms, the durability of the object and its attractiveness when completed, and the variety of colors that may be obtained, all tend to make the subject not only interesting but fascinating.

Arthur F. Payne (37:5), writing the preface to the revised edition of his book, substantiates Professor Rose's opinions.

One of the notable developments of the past decade in school shopwork is the increasing attention given to metalwork. With the organization of the junior high school, and the assumption of the responsibility of giving to our youth some adequate introduction to things mechanical and industrial as a part of the preparation for complete living in an industrial democracy, it is seen that the old conception of school handwork was too narrow.

Not only are woodwork and mechanical drawing too restricted as a basis for hand training, but widespread and increasing utilization of metal demand a place for it in the school program of manual arts. For this reason, in the junior high school especially, the various

types of metalwork, including bench metalwork, sheet metal, pipe-fitting, forging, machine-work, are finding a place along with the older forms of woodwork, drawing, printing, textiles, ceramics, to make a more balanced and rounded program.

In this development, art metalwork is receiving more and more attention as a highly significant means of supplementing these other lines of work. It is unsurpassed as a medium for teaching the arts of design and for developing the spirit of craftsmanship.

Art metalwork makes a special appeal because of the simple and inexpensive character of the equipment required. Furthermore, it is admirably adapted to the new point of view of handwork in education, by emphasizing the importance of a content of related knowledge in the field of chemistry, mineralogy, metallurgy, physics, and art.

Elmer A. Stephan (46:4-5), director of art education, Pittsburgh public schools, Pittsburgh, Pennsylvania, in a short article says:

I am convinced that the joy of creation and of building something everlasting with our hands is one of the most vital problems for the high school boy or girl to accomplish. The metal crafts serve to stimulate this desire for creation in a peculiar way. The material itself is resistant. It forces the boy or girl to become ingenious in solving a problem by skill of cutting, bending, soldering, or riveting. They learn the tricks of the trade but in doing so find opportunity for originality in applying these processes to their particular problem. To be a good craftsman one must develop persistence and inventiveness which become the points of fascination in the work.

Perhaps there is no craft which trains the eye and the hand in expert coordination as does the art of metal work. The hand will

accomplish what the eye, guided by a keen brain, directs. It is this perfect balance of the eye and hand cooperating to produce that makes the accomplished artist in any mediums; whether he be a sculptor in wood, stone, or bronze; whether he be a craftsman in copper, silver or fine platinum, or whether he be a mechanic in the work shop of one of the leading manufacturers.

But the metal crafts have a large contribution also to offer in developing an appreciation of the fine arts. The student constantly comes in contact with fine design, line form and proportion, as exemplified in historic ornament. The article made by the student is built upon this knowledge.....

The place of the metal crafts therefore is an important one in the curriculum of the high school. Every student should be able to do some form of handwork before he leaves the secondary school. What form could be more fascinating or more beneficial than this one of creating eternal beauty, moulded out of some of the most permanent materials in our possession. The value, as already stated, lies in the opportunity afforded to train the eye and the hand in coordination and the soul of the creator in an appreciation of the quality of his best efforts. Let us hope that in the near future metal crafts shall be offered in each high school, taking its place beside household economy and industrial training.

In the introduction to his recently compiled textbook, T. Franklin Evans, (17:13) lecturer in handcraft and art at Goldsmiths' College, University of London, and lecturer and tutor in metalwork for the board of education, further explains the values to be obtained from working with the art metals.

Hammered metalwork is the term herein used to denote constructive silversmithing and the extension of its hand processes to suitable nonferrous base metals. It embraces the hand tool operations involved in the construction of domestic ware in silver, gilding-metal, copper and brass.

To write of hand methods might appear in this mechanized civilization to be a retrograde step, especially as the working of metal is concerned, the processes of which have been transformed by the merciless ingenuity of the machine.

In bygone days a craftsman prospered by the skill of his hand, but now the current flows so swiftly that those who rely solely upon hand methods soon become engulfed in its vortex.

Work in a hand craft today is but the retracing of the stream of development. To linger awhile in its backwaters is to find a stimulus which should inspire and influence design in the modern rapids of mass production.

To design and make by hand something of simple beauty and usefulness, to make it well, sparing nothing in the making, is to recapture the spirit which animated those to whom we owe our heritage of fine craftsmanship.

Creative work in the hand crafts is still desirable and the acquiring of skill in a constructive craft is a wise employment of leisure. It encourages a balanced conception of design and its value in setting standards of taste is considerable.

It is insufficient to assess modern production with a revolution-counter and a stop-watch, or yet to assume that what is modern must of necessity be good. An urgent present day requirement is that design for the machine shall be such that will make mass production as inspired and genuine as hand work in the days of the craftsman of old. Experience in the hand

crafts and a realization of the requirements of simplicity in modern design is a useful equipment for this task.

In hammered metalwork the hand processes are still available, and for those who find pleasure in working with their hands it is confidently stated that no more fascinating craft exists. The joy of shaping and seeing a disc of metal 'grow' under the hammer, surprise at the unexpected beauty of an intermediate stage and the expression of the maker's personality in the finished work, may be the rewards of the modern hand-worker in metal as much today as they were to medieval workers.

In his book *Art Training for Life and Industry*, C. A. Bennett (3:21-3) records the following conversation with John Malton:

"Then, in order to have all the people appreciate painting you would have to make painting a required subject in the public schools."

"Exactly so," was the quick reply. "We have begun to do that already in many of our elementary schools. Only we have not done it with its purpose clearly enough in mind. We have taught the children to use transparent water colors and sometimes we have given them experience in tempera, and occasionally in oil colors, but too often the teachers have been so interested in finding a few children with special ability in art work that they have forgotten the great service they can render by giving to all the children the fundamental experiences which may serve as a basis for real art appreciation."

"This sounds very well," said I, "if the experience in painting would serve for all the other forms of art, but if the public schools are to give fundamental experiences in sculpture, and architecture, and needlecraft, and bookbinding, and art metal work, and all the rest of the manual arts, what would happen to the languages,

to mathematics and the sciences?"

I confess I was feigning a little, but I wanted to draw him out on this point.

"I don't think we need to worry about them; they are in no danger. The schools of a nation always reflect the life and ideals of that nation. As the people of this nation recognize the value of art in life and the importance of laying the foundations of appreciation of the various forms of art during the school period, they will demand that the technique of the more common forms of art expression be found in the schools. They will very generally require, as some are doing now, that certain typical forms of art be taught in the primary grades as an essential part of the activities, the means of expression of that period of child development. They will provide for a variety of more definitely technical applications of the arts in the junior high school period, and a more intensive study of a few of the arts in the senior high school. They will provide more museums and more opportunities for study after the school period, for the development of appreciation is an endless process unless we consider that it terminates with this life. And, because it is a continuous, a growing experience, and because it concerns the higher things in life--the finer emotions, it is a constant source of joy. And because each person's appreciation is the result of his own individual experiences, of his own trials and errors, observations and reflections, searchings and successes, it gives spice and flavor and keen satisfaction. True appreciation of art enriches life."

It is apparent that leaders in the field of industrial education who have given time and thought to the problem and who should be well qualified to voice their opinions are in rather general agreement as to the worth of the metal crafts in secondary education. That there

is a definite place for them to be conceded by all; while some are even more enthusiastic. This seems in keeping with the general trend of increased emphasis on the appreciational and cultural values obtainable from industrial arts activities in secondary education. One is particularly impressed with this definite trend which appears to be national, if not international, in scope, and which is being recognized by writers in the field.

Wide reading in the literature of the field does not disclose any 'unfriendly' attitudes regarding the inclusion of metal craft in the industrial arts program for secondary education.

One very interesting situation which exists is the failure of actual practice to keep pace with the writing and thinking of the leaders in the field. Of course, a limited amount of lag is to be expected. It is felt, however, that this great lag is due, somewhat at least, to the failure of teacher-education institutions to provide adequate facilities and staff for offering training in metal craft or art metal work within the industrial education departments.

McHenry (31:177) found that out of 42 schools in twenty-two states only five offered courses in art metal work.

CHAPTER IV

A SURVEY OF THE OPINIONS OF INDUSTRIAL ARTS EDUCATORS

Procedure

It is believed that the opinions of men actively engaged in industrial arts education, and who have been specifically trained for their jobs in institutions of higher learning which maintain leading industrial education departments, would be a significant factor in determining the worth of various mediums for attaining certain goals or objectives in the field of industrial education. If an analogy may be permitted, the seeking of the opinions of a number of men on this matter might be likened to the seeking of the opinions of a number of doctors relative to the proper diet for certain people, or to the seeking of the opinions of a number of agricultural experts on the problem of selection of crops for production. The resulting aggregate of opinions formulated through experience and training should be a significant factor.

To conform to this hypothesis, a questionnaire was developed relative to the place of art metal or metalcraft work as a medium in the industrial arts program in secondary education and, accompanied by an

explanatory letter, was sent to 279 persons. A copy of the questionnaire and the letter is included in this report as appendix A.

The persons to whom the questionnaire was sent were selected from the active roster of Epsilon Pi Tau, a national honorary and professional fraternity in industrial education, every fourth name from the alphabetical index of members being used.

This is the only national organization of its kind and maintains chapters only at the institutions which have leading departments of industrial arts education, the membership being selected from the upper twenty-five per cent of the students pursuing industrial arts teacher-education programs at these institutions. It is presumed, therefore, that those affiliated with this organization represent the more progressive and outstanding men in the field of industrial arts education and should, therefore, be qualified to make intelligent and pertinent reports. Admitting that the foregoing may not hold true in all specific cases, it should, nevertheless, hold largely true for the group as a whole.

Of the 279 questionnaires distributed, 192, or 69 per cent, were filled out and returned. These came from

28 states. The distribution as to states is shown in Table I. It is pictured graphically in Chart I. The distribution as to present occupation is shown in Table II.

It is assumed that a proportionate representation was obtained with reference to: population distribution, the relative development of the industrial arts program in secondary education nationally, and the relative number of teachers, teacher-educators, superintendents, principals, state department representatives, etc. who are members of this organization.

Table I

Showing Geographical Residence of Persons
Participating in This Study

<u>State</u>	<u>Number of</u> <u>Participants</u>
Arizona	2
California	11
Colorado	3
Connecticut	2
Florida	1
Idaho	2
Illinois	27
Indiana	11
Iowa	10
Kansas	5
Kentucky	4
Maryland	3
Massachusetts	3
Michigan	4
Minnesota	4
Missouri	1
Nebraska	7
New Jersey	21
New York	14
North Carolina	1
Ohio	47
Oklahoma	2
Oregon	12
Pennsylvania	3
South Dakota	1
Vermont	1
Washington	3
Wisconsin	17
Total	212

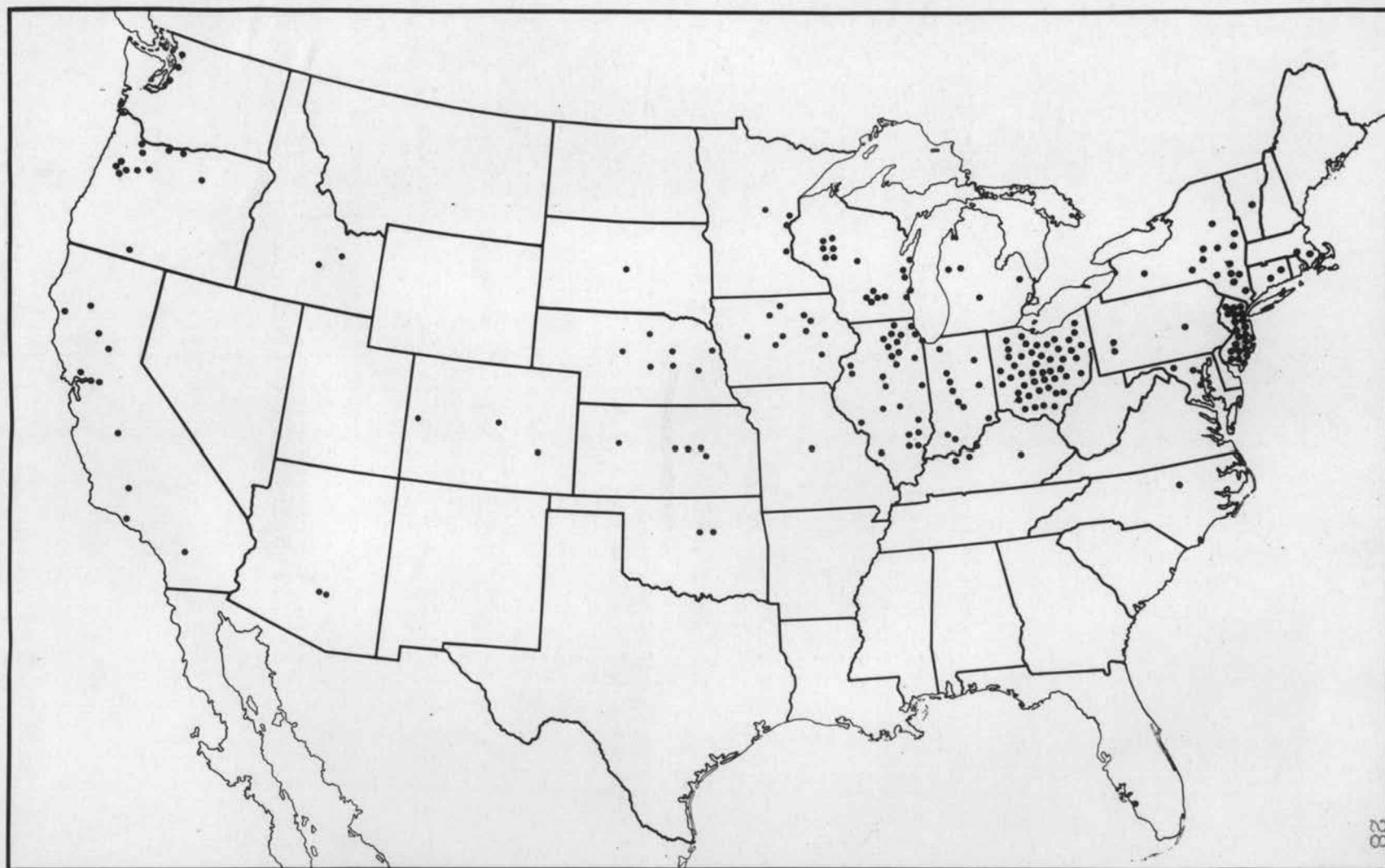


Chart I. Showing Geographical Distribution of Persons Participating in the Study

Table II

Showing Occupation of Persons Participating
in This Study

<u>Occupation</u>	<u>Number</u>
Teachers	108
Directors of Industrial Arts	5
Heads of Departments	5
Supervisors	8
Principals	1
Superintendents	3
State Departments	3
Teacher Educators	22
Students	17
Industrial Relations in Industry	1
Dean	1
Unclassified	<u>18</u>
Total	192

Analysis and Results of the Survey

An overview of the survey is shown graphically in Chart II. Table III shows a further analysis of the responses to the questions and gives percentages for each answer. The following paragraphs contain a discussion of each question and the purpose for including it in the questionnaire.

Question one has to do with the objectives of industrial arts and the possibility of art metal work contributing to them. From the stated objectives found throughout the literature of the field, ten were selected as being representative because of their recurrence in many places. To that list were added the four native impulses enumerated by Bonser (5:33).

Question two was formulated in an attempt to get a commitment regarding the probable relative worth, all other things being equal, of various industrial arts courses.

Since student interest is one of the most significant factors in educational work, the third question was designed to investigate the probable student interest in art metal work.

In an attempt to get to the real issue or purpose of this survey, the fourth question was used.

Since, while there might be a place for this work, it would not necessarily follow that it is essential to a well-rounded program, question five was formulated to get some opinion as to the need for such a course in a well-rounded industrial arts program.

The ideal situation would provide for the best means and methods of instruction regardless of cost. The matter of cost is, however, a very important one in many communities. And while many educators recognize, for example, the value of printing instruction, budgets often do not, because of the cost of equipment, permit its inclusion. So whether we like it or not, monetary considerations have an influence on what we include in the curricular work of the schools. The sixth question is designed to consider the justification with relation to cost of equipment.

It was thought desirable to inquire how extensively art metal work is being offered in secondary education at the present time. Question seven deals with this but the results are not as accurate as might be desired because no provision was made for quantitative recording.

Question eight was asked for a dual purpose. The first was to find out how many of the persons can-

vassed have had training in art metal work. The other was for use in connection with question nine, the two asking the closely related questions, "have you had any?" and "would you like more?"

The final question was asked so that there might be some sort of guide to aid in knowing for what grade level to prepare a course of study, in case it should become apparent that metalcraft would be desirable in the industrial arts program in secondary education.

Chart II

Overview of Survey of Industrial Arts Educators

1 Do you believe that a course or an activity period in the field of Art Metal work could and would contribute materially to the following specific aims and objectives of industrial arts?			
Appreciation for good workmanship	Yes- 190	No- 1	
Appreciation for good materials	Yes- 182	No- 6	
Appreciation for good design	Yes- 190	No- 1	
Consumer appreciation and knowledge	Yes- 177	No- 13	
A cooperative attitude	Yes- 131	No- 35	
Effective use & care of tools & machines	Yes- 169	No- 19	
Develop certain skills	Yes- 190	No- 1	
Reveal & develop creative abilities	Yes- 185	No- 2	
Desirable personal traits & habits	Yes- 162	No- 16	
Provide a measure of occupational information	Yes- 155	No- 16	
Develop & satisfy the four native impulses listed by Bonser			
Manipulative	Yes- 184	No- 2	
Investigative	Yes- 165	No- 15	
Art	Yes- 186	No- 1	
Social	Yes- 143	No- 31	
2 How would you rank Art Metal work as to probability of success in achieving the objectives of industrial arts, as compared with the following traditionally established industrial arts courses?			
	Better (total - 382)	Equal (total - 722)	Less (total - 386)
Woodwork	13	102	71
Drafting	58	75	55
General Metal	26	100	60
Sheet Metal	69	98	19
Machine Shop	58	80	48
Auto Mechanics	62	81	41
Printing	39	91	48
Electricity	47	94	44
3 Do you believe that Art Metal work would be of general interest to secondary school students?			
	Yes- 175	No- 15	
4 Do you believe there is a place for Art Metal work in the industrial arts program in the field of secondary educ?			
	Yes- 187	No- 2	
5 Do you believe that Art Metal work is necessary to a complete & well rounded industrial arts program?			
	Yes- 127	No- 57	
6 Realizing that the cost of equipment necessary for a high degree of accomplishment in Art Metal work is, by comparison, only a fraction of that required for most industrial arts subjects, do you believe this work would be justified as to cost?			
	Yes- 168	No- 16	
7 Is Art Metal work included in the industrial arts program of the school with which you are connected? (If not engaged in secondary education work omit this question.)			
	Yes- 98	No- 57	
8 Have you had any courses in Art Metal work?			
	Yes- 125	No- 63	
9 Do you feel that more emphasis should be placed on this phase of metal work in teacher education institutions, so as to make available adequate training to teachers & prospective teachers?			
	Yes- 167	No- 17	
10 At what level in the secondary school would you offer this activity?			
Grade-7	39	Grade-9	100
Grade-8	61	Grade-10	126
		Grade-11	125
		Grade-12	118

Number of questionnaires sent out ----- 279
 Number of questionnaires returned ----- 192
 Percentage of return ----- 69%

Table III

Showing Responses to Questionnaire and Giving
Percentages for Each Answer

1. Do you believe that a course or an activity in the field of art metal work could and would contribute materially to the following specific aims and objectives of industrial arts?

	Yes		No		Total
	No.	%	No.	%	Answers
Develop appreciation for good workmanship	190	99½	1	½	191
Develop appreciation for good materials	182	97	6	3	188
Develop appreciation for good design	190	99½	1	½	191
Develop consumer appreciation and knowledge	171	93	13	7	184
Develop a cooperative attitude	131	79	35	21	166
Teach the effective use and care of tools and machines	169	90	19	10	188
Develop certain skills	190	99½	1	½	191
Reveal and develop creative abilities	185	99	2	1	187
Develop desirable personal traits and habits	162	91	16	9	178
Provide a measure of occupational information	155	91	16	9	171
Develop and satisfy the four native impulses listed by Bonser:					
Manipulative	184	99	2	1	186
Investigative	165	92	15	8	180
Art	186	99½	1	½	187
Social	143	82	31	18	174

Table III - Continued

2. How would you rank Art Metal work as to probability of success in achieving the objectives of industrial arts, as compared with the following traditionally established industrial arts courses.

	Better		Equal		Less		Total
	No.	%	No.	%	No.	%	Answers
Woodwork	13	7	103	55	71	38	187
Drafting	58	31	75	40	55	29	188
General Metal	26	14	100	54	60	32	186
Sheet Metal	69	37	98	52½	19	10½	186
Machine Shop	58	31	80	43	48	26	186
Auto Mechanics	62	34	81	44	41	22	184
Printing	39	22	91	51	48	27	178
Electricity	47	25	94	51	44	24	185

	Yes		No		Total
	No.	%	No.	%	Answers
3. Do you believe that Art Metal work would be of general <u>interest</u> to secondary school students?	175	92	15	8	180
4. Do you believe there is a place for Art Metal work in the industrial arts program in the field of secondary education?	187	99	2	1	189
5. Do you believe that Art Metal work is necessary to a complete and well-rounded industrial arts program?	127	69	57	31	184
6. Realizing that the cost of equipment necessary for a high degree of accomplishment in Art Metal work is, by comparison, only a fraction of that required for most industrial arts subjects, do you believe this work would be justified on the basis of cost?	168	91½	16	8½	184

Table III - Continued

	Yes		No		Total	
	No.	%	No.	%	Answers	
7. Is Art Metal work included in the industrial arts program of the school with which you are connected? (If not engaged in secondary education work omit this question.)	98	65	57	35	155	
8. Have you ever had any courses in Art Metal work?	125	66½	63	33½	188	
9. Do you feel that more emphasis should be placed on this phase of metal work in teacher education institutions, so as to make available adequate training to teachers and prospective teachers?	167	91	17	9	184	
10. At what level in the secondary school would you offer this activity?						
Grade 7	<u>39</u>		Grade 9	<u>100</u>	Grade 11	<u>125</u>
Grade 8	<u>61</u>		Grade 10	<u>126</u>	Grade 12	<u>118</u>

CHAPTER V

A SURVEY OF THE OPINIONS OF LEADERS IN INDUSTRIAL EDUCATION

To further objectify the study, which at best is rather subjective, it was thought advisable to make a survey of the opinions of active leaders in the field of industrial education regarding the place of metalcraft as a medium for attaining certain goals or objectives in the field of industrial arts in secondary education. This, analogically, is in line with consulting not only a large group of doctors, as was the purpose of Chapter IV of the study, but also a group of specialists.

Accordingly there was selected a group of twenty-four men particularly outstanding in the field of industrial arts education as judged by their recent contributions, their positions, and their professional standing in the field. These men received the same questionnaire used in making the general survey and, in addition, a separate letter of explanation. A copy of the letter and the questionnaire is included in this report as Appendix B.

Of the twenty-four questionnaires distributed, 20 were filled out and returned. The distribution as to

present occupation is shown in Table IV.

An overview of the survey is shown graphically in Chart III. Table V shows a further analysis of the responses to the questions and gives the percentages for each answer.

Table IV

Showing Occupations of Outstanding Leaders
Participating in This Study

<u>Occupation</u>	<u>Number</u>
Teachers	3
Directors of Industrial Arts	2
Head of Department	1
Supervisors	1
State department	3
Teacher educators	9
Editor	<u>1</u>
Total	20

Chart III

Overview of Survey of Leaders in Industrial Education

- 1 Do you believe that a course or an activity period in the field of Art Metal work could and would contribute materially to the following specific aims and objectives of industrial arts?

Appreciation for good workmanship	Yes-	20	No-	
Appreciation for good materials	Yes-	20	No-	
Appreciation for good design	Yes-	20	No-	
Consumer appreciation and knowledge	Yes-	19	No-	1
A cooperative attitude	Yes-	10	No-	6
Effective use & care of tools & machines	Yes-	18	No-	
Develop certain skills	Yes-	20	No-	
Reveal & develop creative abilities	Yes-	20	No-	
Desirable personal traits & habits	Yes-	15	No-	2
Provide a measure of occupational information	Yes-	18	No-	2
Develop & satisfy the four native impulses listed by Bonser	Manipulative Investigative Art Social	Yes- Yes- Yes- Yes-	No- No- No- No-	 1 2
		19 16 19 14		

- 2 How would you rank Art Metal work as to probability of success in achieving the objectives of industrial arts, as compared with the following traditionally established industrial arts courses?

	Better	Equal	Less
Woodwork	2	16	1
Drafting	5	14	
General Metal	3	13	3
Sheet Metal	7	11	1
Machine Shop	5	13	1
Auto Mechanics	7	11	1
Printing	4	14	1
Electricity	3	15	1

- 3 Do you believe that Art Metal work would be of general interest to secondary school students? Yes- 20 No-
- 4 Do you believe there is a place for Art Metal work in the industrial arts program in the field of secondary educ? Yes- 20 No-
- 5 Do you believe that Art Metal work is necessary to a complete & well rounded industrial arts program? Yes- 16 No- 3
- 6 Realizing that the cost of equipment necessary for a high degree of accomplishment in Art Metal work is, by comparison, only a fraction of that required for most industrial arts subjects, do you believe this work would be justified as to cost? Yes- 20 No-
- 7 Is Art Metal work included in the industrial arts program of the school with which you are connected? (If not engaged in secondary education work omit this question.) Yes- 9 No- 1
- 8 Have you had any courses in Art Metal work? Yes- 15 No- 3
- 9 Do you feel that more emphasis should be placed on this phase of metal work in teacher education institutions, so as to make available adequate training to teachers & prospective teachers? Yes- 18 No-

- 10 At what level in the secondary school would you offer this activity?

Grade-7-	3	Grade-9-	11	Grade-11-	11
Grade-8-	9	Grade-10-	12	Grade-12-	11

Number of questionnaires sent out ----- 24
 Number of questionnaires returned ----- 20
 Percentage of return ----- 83 1/2 %

Table V

Showing Responses to Questionnaire and Giving
Percentages for Each Answer

1. Do you believe that a course or an activity in the field of art metal work could and would contribute materially to the following specific aims and objectives of industrial arts?

	Yes		No		Total
	No.	%	No.	%	Answers
Develop appreciation for good workmanship	20	100			20
Develop appreciation for good materials	20	100			20
Develop appreciation for good design	20	100			20
Develop consumer appreciation and knowledge	19	95	1	5	20
Develop a cooperative attitude	10	62½	6	37½	16
Teach the effective use and care of tools and machines	18	100			18
Develop certain skills	20	100			20
Reveal and develop creative abilities	20	100			20
Develop desirable personal traits and habits	15	88½	2	11½	17
Provide a measure of occupational information	18	90	2	10	20
Develop and satisfy the four native impulses listed by Bonser:					
Manipulative	19	100			19
Investigative	16	94	1	6	17
Art	19	100			19
Social	14	87½	2	12½	16

Table V - Continued

2. How would you rank Art Metal work as to probability of success in achieving the objectives of industrial arts, as compared with the following traditionally established industrial arts courses.

	Better		Equal		Less		Total
	No.	%	No.	%	No.	%	Answers
Woodwork	2	10 $\frac{1}{2}$	16	84 $\frac{1}{2}$	1	3	19
Drafting	5	26 $\frac{1}{2}$	14	73 $\frac{1}{2}$			19
General Metal	3	15 $\frac{1}{2}$	13	69	3	15 $\frac{1}{2}$	19
Sheet Metal	7	37	11	58	1	5	19
Machine Shop	5	26 $\frac{1}{2}$	13	68 $\frac{1}{2}$	1	5	19
Auto Mechanics	7	37	11	58	1	5	19
Printing	4	21	14	74	1	5	19
Electricity	3	15 $\frac{1}{2}$	15	79 $\frac{1}{2}$	1	5	19

	Yes		No		Total
	No.	%	No.	%	Answers
3. Do you believe that Art Metal work would be of general <u>interest</u> to secondary school students?	20	100			20
4. Do you believe there is a place for Art Metal work in the industrial arts program in the field of secondary education?	20	100			20
5. Do you believe that Art Metal work is necessary to a complete and well-rounded industrial arts program?	16	84 $\frac{1}{2}$	3	15 $\frac{1}{2}$	19
6. Realizing that the cost of equipment necessary for a high degree of accomplishment in Art Metal work is, by comparison, only a fraction of that required for most industrial arts subjects, do you believe this work would be justified on the basis of cost?	20	100			20

Table V - Continued

	Yes		No		Total	
	No.	%	No.	%	Answers	
7. Is Art Metal work included in the industrial arts program of the school with which you are connected? (If not engaged in secondary education work omit this question.)	9	90	1	10	10	
8. Have you ever had any courses in Art Metal work?	15	83½	3	16½	18	
9. Do you feel that more emphasis should be placed on this phase of metal work in teacher education institutions, so as to make available adequate training to teachers and prospective teachers?	18	100			18	
10. At what level in the secondary school would you offer this activity?						
Grade 7	<u>3</u>		Grade 9	<u>11</u>	Grade 11	<u>11</u>
Grade 8	<u>9</u>		Grade 10	<u>12</u>	Grade 12	<u>11</u>

CHAPTER VI

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

Summary

There seems to be sufficient evidence to indicate that a course or activity in the field of metal craft or art metal work would contribute materially to at least a great many specific aims and objectives of industrial arts. It appears evident also that art metal work would compare favorably with at least eight of the traditionally established industrial arts activities.

The experiences of the persons participating in the study indicate that students are interested in working with the art metals.

There is general agreement that there is a definite place for this work in the industrial arts program. Also, approximately two thirds of the participants in the study believe this work to be necessary to a well-rounded industrial arts program.

At the present time, the industrial arts program of the secondary schools includes some work in art metal. There is a definite desire for further development. Comments and annotations accompanying the returned

questionnaires indicate that this phase of the program is developed much more in the Eastern states than in any other portion of the United States.

There is a definite request for more emphasis on metalcraft or art-metal activities in higher education, as a part of the industrial arts teacher-education program.

The literature in the field of industrial arts is replete with articles urging the development of art-metal activities.

In no case was any evidence found which questioned the advisability of developing art metal in the industrial arts program of secondary education.

Recommendations

It would seem advisable for teacher-education institutions to develop courses in art-metal work in the industrial arts department. At no other institutions can instruction and information of this nature be made generally available to teachers. The responsibility for making this training available rests, therefore, with higher education, more particularly with the industrial arts departments of higher education.

While it is recognized that certain craft activities are best developed within the art departments, it must also be granted that certain other courses can be developed to better advantage within the industrial arts department. It is not the purpose of this study to presume to engage in a discussion of the virtues of departments. Each, in addition to having possibilities in common with other departments, has a function and an opportunity peculiar to itself. But when we consider the facilities available and the organization existing in the secondary school systems, certain limitations become apparent. We find certain departments infinitely more suitable for offering certain activities. Accordingly we find the industrial arts departments better suited to offering metalcraft or art-metal work. The equipment in a general metal shop, for example, lends itself very readily to this type of work. Conversely, art departments have little or no equipment or facilities for developing and expanding metalcraft work to include spinning, casting, ornamentation of materials of a heavier nature, etc.

The industrial arts program of the past has been chiefly concerned with developing skills and manual abilities. The program of the future will be primarily

concerned with developing appreciations, aesthetic applications, creative abilities, etc. To do this a stronger program of training in design, drawing, and art must be developed. And one of the ways to actuate such a program is through the inclusion of such courses as art-metal work.

It is generally conceded that art-metal activities should be carried on in the industrial arts departments in secondary schools. It would seem logical to expect that the same situation exists in higher education.

Dr. William L. Hunter, head of the department of industrial arts at Iowa State College, says, in a letter accompanying the returned questionnaire: "I am thoroughly in agreement with you concerning the advisability of a course in Art Metal work. We are, at the present time, developing such a course and I believe that it is of great value." Leon H. Baxter, one of America's best qualified men in the field of industrial arts teaching, writes, "I am very much interested in your questionnaire and assure you of my whole-hearted support in giving to the field of Art Metal Craft its proper place in Industrial Arts." Professor R. W. Selvidge said, "I regard Art Metal Work as one of the most desirable types of work 'in a well-rounded industrial arts program'."

Professor Emil F. Kronquist, of the Milwaukee Vocational School and author of a book "Metal Craft and Jewelry," wrote, "There is no question in my mind that art metal work would contribute materially to the specific aims and objectives of industrial arts, but where would we get the teachers? Surely not with the training now given in our teachers' colleges." That the implications of this situation are apparent to some educators is indicated by Professor Glen D. Brown, University of Maryland, in his letter enclosed with the returned questionnaire. "We are pleased to know that serious consideration is being accorded to the place of Art Metal Work in the Industrial Arts program in secondary education as we have been emphasizing this shop activity for some five years." And Professor William H. Varnum, also in answering the questionnaire, says, "I may say that I believe industrial education will either survive or fall in direct ratio to the amount of creative work introduced."

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APPENDIX A

Letter and Questionnaire
to
Industrial Arts Educators

April 1, 1938

Dear Sir:

Knowing that you as a member of Epsilon Pi Tau are as interested in research work as I, I am taking advantage of the new membership roster of Epsilon Pi Tau and turning to you for aid.

During the past few years there seems to have been quite a general revival of interest in ART METAL or METALCRAFT work. This interest manifested by supervisors, teachers, administrators, and leaders in the field of industrial education would indicate a more than passing consideration for the worth of ART METAL activities.

Study of and work with the precious and semi precious metals has been an important phase in the development of our culture and civilization, yet in the past we have largely disregarded this work in our industrial arts program in secondary education. It has been thought advisable, therefore, to determine objectively the place of ART METAL or METALCRAFT activities in the junior and senior high school industrial arts program, as exemplified by the thinking of a large number of teachers, supervisors, administrators, and teacher educators.

I believe this study to be of sufficient importance to merit the time and effort necessary for you to record your opinions on the following questionnaire, even though it comes at the time of the year that finds you perhaps busier than any other. And speaking of being busy; I'm sure if you realize the short time remaining for me to complete this study you will jot down your opinions and return them in the enclosed envelope today.

An extra copy of the questionnaire is inclosed for your files, and I shall be glad to inform you of the results of the survey as soon as it is completed.

Thank you very much for your cooperation and prompt response.

Very truly yours,

Marion T. Weatherford



THE PLACE OF ART METAL WORK IN THE
INDUSTRIAL ARTS PROGRAM IN SECONDARY EDUCATION

Note: By "Art Metal work, or Metalcraft work" we mean the type of activity which, among other things, leads to the production of the type of project exemplified by the pictures photostated around the borders of these pages.

1. Do you believe that a course or an activity period in the field of Art Metal work could and would contribute materially to the following specific aims and objectives of industrial arts?

	Yes	No
Develop appreciation for good workmanship	:	:
Develop appreciation for good materials	:	:
Develop appreciation for good design	:	:
Develop consumer appreciation and knowledge	:	:
Develop a cooperative attitude	:	:
Teach the effective use and care of tools and machines	:	:
Develop certain skills	:	:
Reveal and develop creative abilities	:	:
Develop desirable personal traits and habits	:	:
Provide a measure of occupational information	:	:
Develop and satisfy the four native impulses listed by Bonser:		
Manipulative	:	:
Investigative	:	:
Art	:	:
Social	:	:

2. How would you rank Art Metal work as to probability of success in achieving the objectives of industrial arts, as compared with the following traditionally established industrial arts courses.



	Better	Equal	Less
Woodwork	:	:	:
Drafting	:	:	:
General Metal	:	:	:
Sheet Metal	:	:	:
Machine Shop	:	:	:
Auto Mechanics	:	:	:
Printing	:	:	:
Electricity	:	:	:

- Yes No ⁵⁵
3. Do you believe that Art Metal work would be of general interest to secondary school students? _____ : _____
 4. Do you believe there is a place for Art Metal work in the industrial arts program in the field of secondary education? _____ : _____
 5. Do you believe that Art Metal work is necessary to a complete and well rounded industrial arts program? _____ : _____
 6. Realizing that the cost of equipment necessary for a high degree of accomplishment in Art Metal work is, by comparison, only a fraction of that required for most industrial arts subjects, do you believe this work would be justified on the basis of cost? _____ : _____
 7. Is Art Metal work included in the industrial arts program of the school with which you are connected? (If not engaged in secondary education work omit this question.) _____ : _____
 8. Have you ever had any courses in Art Metal work? _____ : _____
 9. Do you feel that more emphasis should be placed on this phase of metal work in teacher education institutions, so as to make available adequate training to teachers and prospective teachers? _____ : _____
 10. At what level in the secondary school would you offer this activity? _____ : _____
- Grade 7 _____ Grade 9 _____ Grade 11 _____
 Grade 8 _____ Grade 10 _____ Grade 12 _____

I shall be pleased to have you comment freely if you care to do so, and you may or may not sign, as you choose.

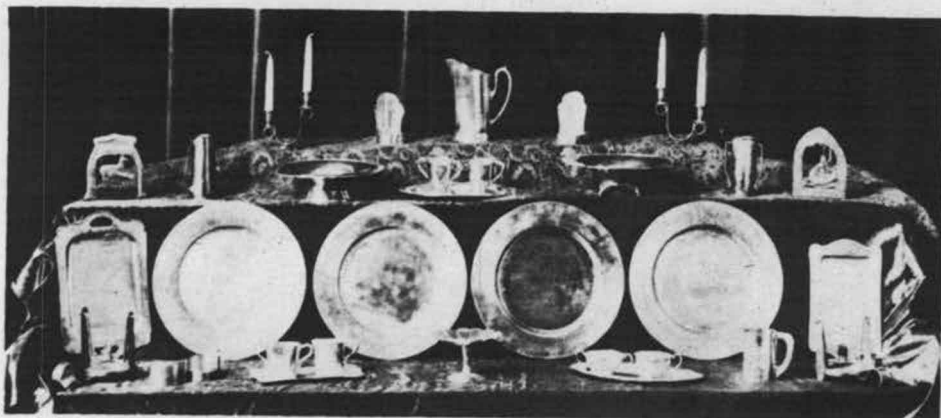
Please return at once to:

Marion T. Weatherford
 Industrial Education Department
 Oregon State College
 Corvallis, Oregon

Name of person participating in this study _____

Address _____

Position _____



APPENDIX B

Letter and Questionnaire
to
Leaders in Industrial Education

April 1, 1938

Dear Sir:

Inclosed is a letter and questionnaire that is being sent to three hundred industrial arts teachers selected at random over the United States. The purpose of the study is explained in those items.

However, I have prepared a special list of twenty-four leaders in the field of industrial arts and am doubly anxious to have their reaction to the questionnaire. Your recent writings and the very active leadership you give to the field makes your opinion of special value in this study. I shall certainly be indebted to you for assisting in what seems to me a very worth while study.

Yours very truly,

Marion T. Weatherford.

- - - -

April 1, 1938

Dear Sir:

During the past few years there seems to have been quite a general revival of interest in ART METAL or METALCRAFT work. This interest manifested by supervisors, teachers, administrators, and leaders in the field of industrial education would indicate a more than passing consideration for the worth of ART METAL activities.

Study of and work with the precious and semi precious metals has been an important phase in the development of our culture and civilization, yet in the past we have largely disregarded this work in our industrial arts program in secondary education. It has been thought advisable, therefore, to determine objectively the place of ART METAL or METALCRAFT activities in the junior and senior high school industrial arts program, as exemplified by the thinking of a large number of teachers, supervisors, administrators, and teacher educators.

I believe this study to be of sufficient importance to merit the time and effort necessary for you to record your opinions on the following questionnaire, even though it comes at the time of the year that finds you perhaps busier than any other. And speaking of being busy; I'm sure if you realize the short time remaining for me to complete this study you will jot down your opinions and return them in the inclosed envelope today.

An extra copy of the questionnaire is inclosed for your files, and I shall be glad to inform you of the results of the survey as soon as it is completed.

Thank you very much for your cooperation and prompt response.

Very truly yours,

Marion T. Weatherford



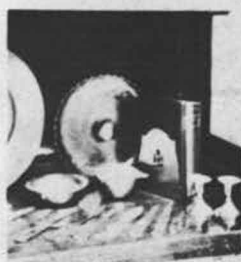
THE PLACE OF ART METAL WORK IN THE
INDUSTRIAL ARTS PROGRAM IN SECONDARY EDUCATION

Note: By "Art Metal work, or Metalcraft work" we mean the type of activity which, among other things, leads to the production of the type of project exemplified by the pictures photostated around the borders of these pages.

1. Do you believe that a course or an activity period in the field of Art Metal work could and would contribute materially to the following specific aims and objectives of industrial arts?

	Yes	:	No
Develop appreciation for good workmanship		:	
Develop appreciation for good materials		:	
Develop appreciation for good design		:	
Develop consumer appreciation and knowledge		:	
Develop a cooperative attitude		:	
Teach the effective use and care of tools and machines		:	
Develop certain skills		:	
Reveal and develop creative abilities		:	
Develop desirable personal traits and habits		:	
Provide a measure of occupational information		:	
Develop and satisfy the four native impulses listed by Bonser:		:	
Manipulative		:	
Investigative		:	
Art		:	
Social		:	

2. How would you rank Art Metal work as to probability of success in achieving the objectives of industrial arts, as compared with the following traditionally established industrial arts courses.



	Better	Equal	Less
Woodwork	:	:	
Drafting	:	:	
General Metal	:	:	
Sheet Metal	:	:	
Machine Shop	:	:	
Auto Mechanics	:	:	
Printing	:	:	
Electricity	:	:	

- Yes No ⁶⁰
3. Do you believe that Art Metal work would be of general interest to secondary school students? _____ : _____
 4. Do you believe there is a place for Art Metal work in the industrial arts program in the field of secondary education? _____ : _____
 5. Do you believe that Art Metal work is necessary to a complete and well rounded industrial arts program? _____ : _____
 6. Realizing that the cost of equipment necessary for a high degree of accomplishment in Art Metal work is, by comparison, only a fraction of that required for most industrial arts subjects, do you believe this work would be justified on the basis of cost? _____ : _____
 7. Is Art Metal work included in the industrial arts program of the school with which you are connected? (If not engaged in secondary education work omit this question.) _____ : _____
 8. Have you ever had any courses in Art Metal work? _____ : _____
 9. Do you feel that more emphasis should be placed on this phase of metal work in teacher education institutions, so as to make available adequate training to teachers and prospective teachers? _____ : _____
 10. At what level in the secondary school would you offer this activity? _____ : _____
- Grade 7 _____ Grade 9 _____ Grade 11 _____
 Grade 8 _____ Grade 10 _____ Grade 12 _____

I shall be pleased to have you comment freely if you care to do so, and you may or may not sign, as you choose.

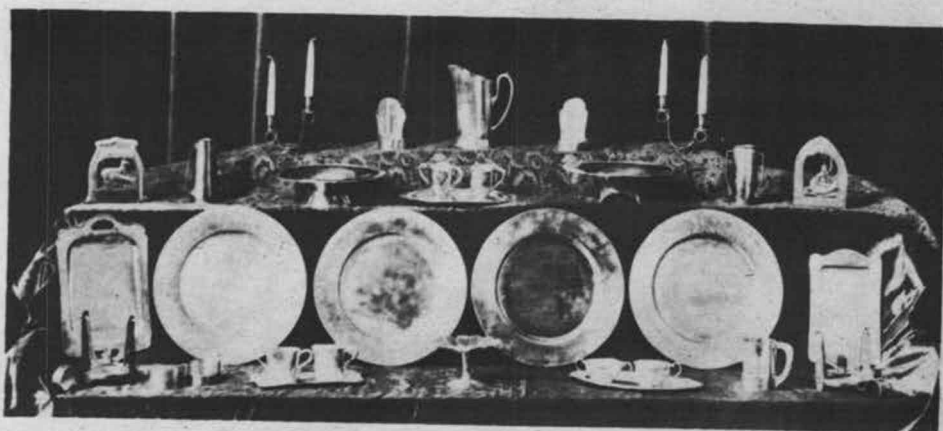
Please return at once to:

Marion T. Weatherford
 Industrial Education Department
 Oregon State College
 Corvallis, Oregon

Name of person participating in this study _____

Address _____

Position _____



APPENDIX C

Suggested Course of Study

APPENDIX C

SUGGESTED COURSE OF STUDY

INTRODUCTION

The foregoing parts of this treatise have demonstrated the desirability of including more of the cultural and appreciational aspects of industrial arts when the curriculum for industrial arts in secondary education is being formulated or rebuilt. It is safe to say that industrial arts work is regarded as a functioning part of the general education program. As such, there should be a more concerted effort to develop the lasting rather than the latest values.

Objective tests, careful analysis of present-day life, and a careful review of the lasting and fundamental aspects of life as recorded by history, indicate what those lasting values are. Subsequently, the aims and objectives of secondary education have been and are now being revised to produce these values through contact with its program. More emphasis is being placed on appreciations, development of an affirmative mind, and so on. Industrial arts activities are rich in offerings that produce these desirable habits, attitudes, knowledge, appreciations, responsibilities, etc.

The problem at the moment is focused on that phase of industrial arts education that asks, "Are we including the right offerings to secure the best results in terms of the desired outcomes? Are the right offerings available in all school systems? With a limited program is it possible to reach the interests of all the students? Is it necessary to include a wider variety of offerings to provide a well-rounded industrial arts curriculum?"

In line with the general movement to analyze critically the curricula of the public school systems, industrial arts educators are also taking stock of their own curricula. Wide reading in the literature of the field, supplemented by the study included herein, indicates that we have not, as yet, arrived. There are many weaknesses in our present program. As indicated in another chapter, actual practice has not kept pace with research. While it is admitted that in all probability there will always be some lag, it is nevertheless believed that efficiency dictates that the margin should be reduced appreciably.

But, in matters of this kind, men move slowly. This, perhaps, is as it should be. There are, however, many teachers anxious to revise their programs, to bring them up-to-date, and to align them more closely with the

newer concepts of industrial arts education. Even so, they find their paths blocked because of lack of knowledge. They do not know where to secure information that will give them the help they need.

It has been shown by the previous chapters in this thesis that in metal work generally, one of the richest fields for developing desirable outcomes lies in activities centered around the metalcrafts or art-metal work. It is the purpose of this suggested course of study to provide a measure of information that will aid the teacher or the prospective teacher in carrying on this type of work. It is true that there are a number of textbooks dealing with art metal, metalcraft and silversmithing. The purpose of this course of study is not to duplicate those works. It is meant rather to supplement them by suggesting a procedure that might be followed in offering a course in art-metal work. Nor is it expected that all suggestions contained herein will be followed verbatim. Any teacher who copies another's work is simply refusing to use his own creative abilities, and thereby defeats his own purposes. Also, the situation existing in one community is never duplicated by an identical situation in another community. Individual differences existing in communities, school programs,

teacher experiences and abilities all make it quite necessary that each instructor work out the details of his own course of study for his own particular situation.

Student abilities are, however, very much alike. What the boys in the tenth grade in one region are capable of accomplishing would probably hold true in another region. At least it would be a good criterion. Consideration of the accomplishments of the famous craftsman Paul Revere, and of other broadly educative related information topics, will indicate the same possibilities in all communities. This suggested course of study, therefore, is organized to be of service as a guide to the teacher, with or without experience, who is anxious to set up a course or activity in art-metal work.

The operations and processes suggested are within the ability of the students for whom they are intended. The progression of suggested projects makes a very satisfactory sequence to follow for the time allotted to the course. This course of study has been developed, tested, and tried by the writer for a period of seven years and is sincerely believed to be a safe and satisfactory one. It is not set forth as an object of perfection. It is submitted in the hope that it may assist

others to achieve better results and satisfactions in conducting a course in metalcraft or activities in art-metal work.

It is apparent that the time and effort necessary to develop instruction sheets and operation sheets telling how to do the various operations involved in art-metal work represents in itself a major problem. Also, there are several textbooks organized to give this instruction and information. Therefore, the writer has not presumed to include specific information on how to accomplish these operations. Instead, a special bibliography is offered which lists the specific source and page on which information and instruction may be found regarding the "how" of operations.

For Whom Intended

This course of study is suggested for use in the tenth grade, with students who have had no previous experience in art-metal work. For that matter, no previous experience with industrial arts work is presupposed. This does not preclude the student who has had previous experience in other courses. In fact, it is highly desirable and advantageous to the student to have had previous experience. It is suggested, however, that

instruction proceed on the supposition of no previous experience.

For How Long a Time Shall the Course Run

This course of study is designed to fit the class that meets one hour a day, five days a week, for one school year.

Where Shall the Class be Held

Any general metal or sheet metal shop having an ordinary amount of equipment may serve as a laboratory.

What Materials Shall be Used

It is suggested that the precious and semi-precious metals be used, such as copper, brass, pewter, and silver, according to the skill and financial status of the student, and in light of the structural requirements of the particular project undertaken.

Specific Objectives

1. To inculcate a spirit of appreciation for the skills necessary to make beautiful articles in the art metals.

2. To inculcate a spirit of appreciation for those design elements that best render an article beautiful in proportion and enrichment values.
3. To inculcate a spirit of appreciation for good materials used in the construction of the art-metal projects.
4. To develop consumer knowledges necessary to the wise selection of the heirlooms of tomorrow.
5. To develop creative abilities within the individual.
6. To satisfy the inborn urge to make something, and to provide a medium through which "self" may be expressed by other than academic means.
7. To develop a cultural background rich in the knowledge and information concerning both the art metals and the craftsmen who wrought them.
8. To provide information concerning industrial practices with reference to manufacturing methods, wages, hours, working conditions, occupational requirements, etc.

Method of Procedure

Activity in the subject is to include study of the following: materials, processes, design, historical culture and background of art metal, together with a

study of outstanding craftsmen, distinguishing characteristics of various national influences, etc. Obviously there will be two phases of the work, viz., A. Manipulative; B. Academic. In the following outlines of possible activities, these two aspects are treated separately. It is suggested that in actual practice the two be interwoven so as to produce an integrated whole. Naturally, a course that is set up to provide, at a certain specified time, the culture of early American silverware and craft has the tendency to become formalized rather than functional. The progress of the class and the interest arising at various times will dictate the proper combinations of academic and manipulative work.

The sequence into which the separate phases of the work has been organized seems logical, however, and is believed to be a proper order. For example, it would be impossible for a baby to learn to walk before it is old enough to be physically able. It would likewise be very difficult for a student to embellish a vessel before he is acquainted with the properties of the material with which he is working.

A. Manipulative Activity

To accomplish the manipulative goals and the attendant appreciations of workmanship, materials, and design, it is suggested that five required project units be set up.

First. A relatively small project having for the major experience the operation of "saw piercing." There will, of course, be many other operations involved. (See suggestion sheet for project number one).

Second. A project designed to give as the major experience the operation of "soldering with a blowpipe." (See suggestion sheet for project number two.)

Third. A project selected to give as the major experience the operation of "beating down." (See suggestion sheet for project number three.)

Fourth. A small project, not more than five inches in diameter and two inches in depth, designed to give practice in the operations involved in "metal spinning." (See suggestion sheet for project number four.)

Fifth. A larger project designed to develop additional skills in the operations involved in "metal spinning." (See suggestion sheet for project number five.)

The remainder of the time may be used by the student in making various other articles which he may choose and using any or all of the operations experienced in the previous projects and, in the case of the exceptional student, additional operations explained by individual demonstration.

Project Number One. To make a small project, such as a letter opener, bracelet, ears for a porringer, portions of a desk set, etc. The project is to be selected and designed individually by the student, with, of course, the instructor's help and approval.

Operation 1. Select the type of project to be constructed.

2. Design the project.
 - a. Make several sketches.
 - b. Choose the best sketch and develop a full size drawing.
3. Get out stock large enough to execute the project.
 - a. Carry out such operations as hack-sawing, cutting with tin snips, shears, or cold chisel.
4. Transfer the design.
5. Make holes for starting the saw, using either a punch or drill, depending upon the thickness of the metal.
6. Saw out the design, using a jeweler's saw and saw frame.
7. File the edges until smooth.

8. Burnish the edges with the burnishing tool.
9. Execute any incidental surface enrichment necessary to the design, such as chasing, forming, peening, etc.
10. Finish.

Project Number Two. To make a project designed to give as the major experience the operation of 'soldering with a blowpipe'. Such projects as candle sconces, jewel chests, vases, etc. are suggested. The project to be selected and designed individually by the student, with, of course, the instructor's approval.

- Operation 1. Select the type of project to be made.
2. Design the project.
 - a. Make several sketches.
 - b. Choose the best sketch and develop a full size drawing.
 3. Get out the stock large enough to execute the project.
 4. Transfer the design.
 5. Cut out the pieces required for the several parts of the project.
 6. File all edges smooth and in conformity with the design.
 7. Burnish all edges not to be soldered.
 8. Execute any incidental surface enrichment necessary to the design, such as chasing, piercing, peening, etc.

9. Form the various pieces to the necessary shapes.
10. Solder the various pieces to form the desired whole.
11. Remove excess solder.
12. Finish.

Project Number Three. To make a project designed to give as the major experience the operation of 'beating down'. Such projects as card trays, sugar and creamer trays, serving trays, cake plates, salad plates, ash trays, etc. are suggested. The project to be selected and designed individually by the students, with, of course, the instructor's approval.

- Operation 1. Select the type of project to be made.
2. Design the project.
 - a. Make several sketches.
 - b. Choose the best sketch and develop a full size drawing.
 - c. Make a template of heavy cardboard conforming to the shape of the drop center.
 3. Get out the stock.
 4. File and burnish the edges.
 5. Embellish the border or rim if the design calls for it.
 6. Hem the border or rim if the design calls for it.
 7. Lay out the lines between which the beating down will be done.

8. Beat down the center to conform to the template made in Operation 2. If certain metals are used, it will be necessary to anneal the material several times during the process.
9. Check the project for symmetry and alignment.
10. If the design calls for embossing as a part of the embellishment, do the embossing at this time.
11. Finish.

Project Number Four. To make a project designed to give as the major experience practice in the art of metal spinning. Small vessels such as bowls, cigarette humidors, porringers, bonbon dishes, nut cups, wine or cocktail glasses, etc. The project to be designed and selected individually by the students with, of course, the approval of the instructor.

Operation 1. Select the type of project to be made.

2. Design the project.
 - a. Make several sketches.
 - b. Choose the best sketch and develop a full size drawing.
 - c. Make a template to fit the outside of the form to be executed.
3. Get out the stock, making sure to allow 1/16 extra for trimming in the lathe.
4. Select a block of hard, close-grained wood and turn the chuck to fit the template made in Operation 2.

5. Sand smooth and oil with linseed oil to prevent checking.
6. Fit a follow block onto the back center, making sure the follow block is the same diameter as the bottom of the form or chuck.
7. Place the metal disc between the form and the follow block; center and trim it.
8. Spin the disc to fit the form.
9. Plannish the vessel to smooth the surface.
10. It is sometimes desirable at this time to use emery cloth or crocus cloth to produce further smoothness.
11. Trim the vessel to the desired height.
12. Remove the vessel from the form and burnish the edge.
13. If a base or appendages or stems are to be added they should be soldered on at this time.
14. Finish.

Project Number Five. To make a project designed to develop further skill and experience in the art of metal spinning. The procedure and processes are the same as for Project Number Four, except that a more difficult project will be made, requiring more skill, involving more material and consequently being a more elaborate project.

The remaining time is to be spent in original work, the student being permitted to design and make any project he desires. This project may include all of the operations and processes already learned, and, if the student has the ability, it may involve more advanced work. The work may culminate in one large project, in several small ones, or it may be confined chiefly to developing suitable designs. In short, the student is to have unlimited leeway in selecting the activities in which he will engage during the remainder of the year. The better students should have as much as three months to use in this manner; whereas it is conceivable that some of the slower students will accomplish little more than the prescribed course.

List of Suggested Art-Metal Projects

Escutcheons	Humidors
Bracelets	Tobacco
Watch fobs	Cigarette
Luggage tags	Cigar
Card holders	Smoking sets
Desk sets	Ash trays
Tray	Pipe racks
Corners	Trays
Blotter	Cocktail & Schnapps cups
Opener	Sherbets
Ink well	Goblets
Letter holders	Coffee sets
Book-ends	Pot
Trays	Tray
Bread	Creamer
Card	Sugar
Serving	Jewel boxes
Sandwich	Lanterns and lighting units
Beverage	Vases
Plates	Beakers
Cake	Placques
Ring salad	Grills
Dinner	Wood cradles
Salad, etc.	Houer d'Ourves holders
Candlesticks	Caricatures
Sconces	Nut scoops
Table	Paper weights
Wall	
Single	
Double	
Triple	
Candelabra	
Porringers	
Bowls	
Childs	
Mayonnaise	
Fruit and Candy	

Suggested Reference Readings for Various Operations

I. Piercing

Dixon, Wm., Manual for Metal Artists, Sheet No.26

Kronquist, Metal Craft and Jewelry. Chapter II,
Pages 20-32

Payne, Art Metal Work. Chapter VIII, Pages 61-72

Rose, Copper Work. Chapter II, Pages 25-29

II. Soft Soldering

Dixon, Wm., Manual for Metal Artists, Sheet No.28

Evans, Hammered Metal Work. Chapter XXII,
Pages 94-102. Plate No. 35, Page 231.
Plate No. 35, Page 232.

Kronquist, Metal Craft and Jewelry. Chapter VIII,
Pages 117-123

Payne, Art Metalwork. Chapter VI, Pages 49-50

Varnum, Pewter Design and Construction.
Chapter V, Pages 25-29

III. Hard Soldering

Cuzner, A Silversmith's Manual. Chapter III,
Pages 42-47

Dixon, Wm., Manual for Metal Workers. Sheet No.30

Evans, Hammered Metal Work. Chapter XXIII,
Pages 95-118. Plates Nos. 37, 38, 39, 40, 41.
Pages 233-37

Payne, Art Metal Work. Chapter XIV, Pages
126-127

Rose, Copper Work. Chapter X, Pages 103-104

Smith, Working in Precious Metals. Chapter XIV,
Pages 308-316, 330-339

IV. Etching

Dixon, Wm., Manual for Metal Artists,
Sheet No. 30

Payne, Art Metal Work. Chapters VI, VII,
Pages 42-60

V. Coloring

Evans, Hammered Metal Work. Chapter XXVI,
Pages 132-136

Kronquist, Metalcraft and Jewelry.
Chapter XI, Pages 173-179

Payne, Art Metal Work. Chapter V,
Pages 32-41

Rose, Copper Work. Chapter XVIII, Page 192

VI. Enameling

Payne, Art Metal Work. Chapter XVII,
Pages 157-165

Rose, Copperwork. Chapter XV, Pages 160-166

Smith, Working in Precious Metals.
Chapter XVIII, Pages 348-359

VII. Surface Enrichment

Evans, Hammered Metal Work. Plate No. 45,
Page 241

Varnum, Pewter Design and Construction.
Chapter XIII, Pages 108-118

Varnum, Industrial Arts Design. Chapter XIII,
Pages 160-178. Chapter XIV, Pages 179-193

VIII. Chasing, Repousse, Embossing

Dixon, Wm., Manual for Metal Arts.
Sheet No. 29

Kronquist, Metal Craft and Jewelry.
Chapter VI, Pages 69-96

Payne, Art Metal Work. Chapter XVI,
Pages 148-156

- VIII. Chasing, Repousse, Embossing - continued
 Rose, Copper Work. Chapter X, Pages 105-109
 Varnum, Pewter Design and Construction.
 Chapter XIII, Pages 108-117
- IX. Annealing
 Dixon, Wm., Manual for Metal Artists.
 Sheet No. 28
 Payne, Art Metalwork. Chapter IX, Pages 74-76
 Smith, Working in Precious Metals. Chapter XI,
 Pages 176-201
 Kronquist, Metalcraft and Jewelry. Chapter I,
 Page 12, PP5
 Rose, Copper Work. Chapter IX, Page 112
- X. Transferring Patterns
 Dixon, Wm., Manual for Metal Artists.
 Sheet No. 26
 Kronquist, Metalcraft and Jewelry. Chapter I,
 Page 11, Pp 3
- XI. Planishing
 Evans, Hammered Metal Work. Chapter XVIII,
 Pages 76-81. Plates 28-29, Pages 224-5
 Kronquist, Metalcraft and Jewelry. Chapter IX,
 Page 124, PP 73
 Varnum, Pewter Design and Construction.
 Chapter IV, Page 47
- XII. Pickling
 Evans, Hammered Metalwork. Chapter VI,
 Page 29-30
 Kronquist, Metalcraft and Jewelry.
 Chapter I, Pages 13-15
 Payne, Art Metal Work. Chapter VII, Page 58

- XIII. Spinning
 Reagan and Smith, Metal Spinning. Entire book.
 Cox and Weatherford. Moving Picture on Metal Spinning. Two Reel Film. Entire picture.
- XIV. Beating Down
 Evans, Hammered Metalwork. Chapter XIII, Pages 58-60. Plate No. 18, Page 214
 Payne, Art Metalwork. Chapter XI, Page 95-102
 Rose, Copper Work. Chapter VI, Page 59-64
 Varnum, Pewter Design and Construction, Chapter IV, Page 43-47
- XV. Turning Edges
 Evans, Hammered Metalwork. Plates No. 42-43 Pages 238-239
 Welch. Elements of Sheet Metal Work.
- XVI. Raising
 Evans, Hammered Metalwork. Chapter XVII, Pages 69-75. Plates 22, 23, 24, Pages 218-20
 Payne, Art Metalwork. Chapter XIII, Page 113-19. Chapter XIV, Page 120-31, Chapter XV, Page 132-39
 Rose, Copper Work. Chapter XI, Page 110-124
 Varnum, Pewter Design and Construction Chapter VII, Page 69-72 Chapter IX, Page 79-84
- XVII. Finishing
 Payne, Art Metalwork. Chapter V, Page 32-41
 Kronquist, Metalcraft and Jewelry. Chapter XI, Page 173-79

B. Academic Activity

It is desirable that the academic phase of this course be treated in a functional rather than in the traditional manner; consequently no 'best method' can be set forth. The ability of the instructor, the background and abilities of the students, available library facilities, interest, and many other factors all have a direct bearing upon the specific situations and to a great degree limit or regulate the type and extent of academic development.

There are, however, many ways of developing the academic aspects, suggested herewith, in a functional way. The manner in which this is done is left to the individual instructor. It would seem sufficient to suggest a number of topics or subjects for investigation and consideration. Inasmuch as the responsibility for starting and motivating activity on a functional basis rests with the instructor, three suggested subjects or topics for consideration are outlined. The purpose of these outlines is merely to suggest and motivate further activity according to the interests of the students. They are not intended to be used as a series of formal lectures. It is presumed that the instructor will use other or similar devices for sug-

gesting and motivating study on other topics.

Suggested Functional Units for Student
Investigation and Consideration

- I. History of Copper: Its effect on civilization, its contribution to civilization.
- II. Mining and Smelting of Copper: Deposits, methods, economics, labor.
- III. History of Pewter: Its effect and contribution to civilization. Labor guilds of the 14th century.
- IV. Metallurgy of Copper, Brass, Silver, Pewter: Properties, composition, sources, quantities.
- V. History and Stories of Famous Craftsmen: Paul Revere, Benvenuto Cellini, Georg Jensen, Frank Koralewsky, etc.
- VI. Comparative Values of Commercial Products: Consideration of quality, materials, weight, design, maker, retailer.
- VII. Elements of Good Design: What makes good design? How does it differ from poor design? Why is it important?
- VIII. Comparison of the Work of Various Nations or Tribes: Navajo Indians, Swedish silverwork, Colonial pewter and silversmithing, English, Italian, Scandinavian, Chinese, Japanese, etc.
- IX. The Contributions of Art Metal Work to the Culture of Civilization.
- X. Modern Methods of Manufacturing: Die stamping, spinning, handsmithing, plating, cleaning and polishing, labor conditions.

Suggested Devices for Developing Topics
in a Functional Way

Field trips to jewelry stores, factories,
department stores.

Motion pictures of modern manufacturing methods
and processes.

Special exhibits of reproductions either made
by the students or borrowed.

Models in miniature of the outstanding works of
famous craftsmen, industrial processes and operations,
etc.

Scrap books of excellent designs, clippings
about famous craftsmen, etc.

Talks before student body or other groups on
various topics, prepared and delivered by the students.

Portfolio of original designs, color-rendered.

Suggested Outline for a Discussion on
Historical Facts About Copper

I. Discovery

- A. About 10,000 years ago.
- B. Accidental discovery.
- C. Found by savages
 - 1. Camp fires
 - 2. Forest fires
 - 3. Etc.

II. Early History

- A. Name "copper" is derived from the Greek "kypron." (Latin--Cuprum)
 - 1. Name of Island of Cyprus, later called Cuprum.
- B. Island of Cyprus renowned for its copper mines.
 - 1. First source of supply for Greeks and Romans.
- C. Copper and copper alloys found in profusion in prehistoric ruins of Egypt dating back to the fourth dynasty (3800 to 4700 B.C.).
 - 1. Crude pictures of furnaces indicate Egyptians had knowledge of smelting and alloying.
- D. Ruins of Mycenaen, Phoenician (1100 B.C.), Babylonian (600 B.C.), and Assyrian (600 or 700 B.C.) civilizations yield a variety of copper objects.
- E. Copper is one of the six metals mentioned in the Old Testament.
 - 1. The most important of the seven mentioned by ancient historians.
- F. Greek historians relate copper found by Cadmus on Isle of Euboea.
 - 1. Copper called "chalkos" by ancient historian Homer.
- G. Copper known and used by the people seven generations after Adam.

1. Tubal-cain was the instructor of every artifice in brass and iron. (Gen. 4:22)
- H. Hebrew historians make no distinction between copper and its alloys.
1. First alloying of metals took place when trade with western world was established and the Phoenicians brought tin from England to Greece and Rome (as early as 1000 B.C.).
- I. Copper deposits in the Early Ages.
1. Euboea and Cyprus furnished Greece and Rome.
 2. Spain also sent copper to them.
 - a. Some of the same mines are still worked at the present time.
 3. Egyptians drew their supply of copper from Arabia.
 - a. It is supposed that one of the objects of Ramses the Great had in view when he dug the canal across the isthmus of Suez in about 1350 B.C. was to connect the copper producing territory of the Arabian Peninsula with his kingdom on the Nile.
 - b. Even today, archeologists find traces of mines buried in the sand, and in them tablets with inscriptions proving them to be almost beyond the ken of the historian.
- J. Articles made of Early Copper.
1. Israelites had bronze weapons in the time of King David.
 2. Homer, Greek poet, represents his heroes as fighting with arms made of bronze.
 3. The Colossus of Rhodes--one of the Seven Wonders of the World--an enormous figure of a man who stood across the entrance to the Harbor of the Ancient City of Rhodes--was made of bronze.
 - a. Completed in 280 B.C.
 - b. About 110 feet high.
 4. Used for money by earliest Romans.
 - a. Copper and zinc.
 5. During reign of Julius Caesar--about 95 years B.C.--pure copper was used for money.

III. Copper in Middle Ages

- A. About the beginning of the ninth century we find a very important use of copper and its alloys.
 - 1. Christian religion.
 - 2. Church bells.
 - 3. Charlemagne (King of the Franks, crowned Emperor of the Romans by the Pope, took the name of Carolus Augustus), first brought Church bells into general use about 800 A.D.
 - 4. Earliest mention of bells about seventh century.
 - 5. This provided the first great impetus for the use of copper.
- B. The use of bronze in tools and ornaments was fully developed by the Danes and Scandinavians.
 - 1. Pins, buttons, clasps, rings, bracelets, trumpets, etc.
 - 2. Richly decorated.
 - 3. Most beautiful forms found in Scandinavia.
- C. Development and improvements in the manufacture of gunpowder and the consequent greater use of bronze cannon under the reign of Edward III (1312-1377) made the importance of copper still greater.

IV. Modern History of Copper

- A. Modern copper fields have no history beyond 1835 except:
 - 1. Spain
 - 2. Germany
 - 3. Japan.
- B. Copper was discovered in:
 - 1. United States in Massachusetts in 1632.
 - 2. Granby, Connecticut in 1709.
 - a. Both ventures took out very little ore.
 - 3. New Jersey, 1719.
 - 4. Vermont (principal U.S. source until 1884) in beginning of 18th century.

5. Lake Superior mines by Jesuit missionaries--latter part of 16th century.
6. Ontanagon River in 1771.
7. Tennessee in 1850; neglected until 1890 because of Civil War.

C. Important copper discoveries:

1. 1884--Copper Harbor Michigan.
 - a. These Lake Superior mines were known and worked by the Indians of some prehistoric race.
2. 1882--Montana.
3. 1872--Arizona.
4. 1875--Mexico.
5. 1880--Canada.
6. 1850--Australia and South Africa.

V. Importance of copper in modern civilization

- A. There is scarcely a branch of human endeavor where copper is not found as an important means of attaining greater perfection.

1. Machinery.
2. Delicate instruments for:
 - a. Astrology
 - b. Engineering
3. Electricity
 - a. Lines
 - b. Generators and dynamos
4. Ship building
5. Dyes
6. Chemistry
 - a. Reagent
7. Almost unbounded use.

Suggested Outline for a Discussion on
Mining, Smelting and Production of Modern Copper

I. Deposits

A. Montana

1. Largest producing copper district in the world.
 - a. Butte is principal deposit.
 - b. First copper produced in 1882.

B. Utah

1. Second ranking mine in United States in production.

C. Michigan

1. Oldest mine still producing in United States today.
 - a. Discovered in 1884.

D. Arizona, Colorado (lead and zinc mines are replaced by copper at great depths).

E. Mexico (after 1875).

1. Second to Montana in world production.

F. Chile

1. Has world's largest deposit--not developed.

G. Bolivia, Australia, South Africa.

II. Ores

A. There are nearly 200 distinct copper ores.

The principal and most important can be divided into seven groups.

1. Native copper (CU) (pure copper)
 - a. Lake Superior and Bolivia principally.
2. Oxide ores
 - a. Combination of oxygen and copper.
 - b. Cuprite and Melanconite good examples.
3. Carbonic ores
 - a. Combination of carbon and copper.
 - b. Malachite and Azurite good examples.
 - c. Used as semi-precious gems when pieces of sufficient hardness can be found.

4. Sulphide ores
 - a. Carbonation of sulphur and copper.
 - b. Chalcote, Bornite, Chalcopyrite.
 5. Sulphate of Copper
 - a. Sulphur and copper.
 - b. Chalconthite (an alteration product--secured from cupriferous mine water).
 6. The Arsenides
 - a. Arsenic and copper.
 - b. Enargite most important.
 7. The Chlorides
 - a. Chlorine and copper.
 - b. Atacamite most important.
- B. The sulphide group most important for commercial purposes.
1. Native copper of Lake Superior region next (mined extensively there).
 2. Carbonates next in importance.
 - a. Rich in copper and easily smelted.
- C. Nearly all mines carry other metals.
1. Silver, lead, zinc, and gold are common.
 2. Very true in western United States.
- D. Principal ores, with percentage of copper.
1. Cuprite (Cu_2O), copper oxide - 89% copper.
 2. Chalcocite (Cu_2S), copper sulphide - 80% copper.
 3. Chalcopyrite (CuFeS_2), copper pyrite - 35% copper, 30% iron.
 4. Enargite ($3\text{Cu}_2\text{AsS}_5$), copper sulphoarsenite 48% copper--Buttes most common and valuable.
 5. Bornite ($3\text{CuSFe}_2\text{S}_3$), copper and iron sulphide. 56% copper, 16% iron, 28% sulphur. An important commercial ore.
 6. Azurite ($2\text{CuCO}_3\text{Cu}(\text{OH})_2$), blue carbonate of copper. A copper carbonate with 55% copper. Most beautiful dark blue color, used for semi-precious jewels.
 7. Malachite ($\text{CuCO}_3\text{Cu}(\text{OH})_2$), a copper carbonate. 58% copper. Dark green--semi-precious stones--little commercial value because of small deposits.
 8. Adgadonite (Cu_6As), copper arsenide (Chile and Lake Superior)--85% copper.

9. Horsfordite (Cu_6Sb), a copper antimonide--76% copper--Asia Minor.
10. Covellite (CuS), copper sulphide. 66% copper--valuable commercial ore--Utah and Wyoming.
11. Chrysocolla ($3\text{CuO} \cdot 2\text{SiO}_2 \cdot 6\text{H}_2\text{O}$), a hydrous copper silicate--36% copper. Commercial ore and semi-precious stones.
12. Stannite ($\text{Cu}_2\text{SSn}_2\text{S}_3\text{Fe}_2\text{S}_3$), a copper, tin, and iron sulphide. 30% copper, 13% iron, 27% tin--Ireland and England.

III. Mining

A. Shaft

1. Butte, Montana
 - a. Entire city honeycombed.
2. Michigan
 - a. The Red Jacket shaft of the Calumet and Hecla mine is the deepest copper shaft in the world--4,920 feet.

B. Open pit

1. Bingham, Utah.

IV. Extracting Copper from its ores.

A. Dry Method

1. Roasting the ores
 - a. Heap roasted.
 - b. Pile 40 ton of ore over one cord of wood.
 - c. Fire the wood--which in turn fires the sulphur.
 - d. May burn for several weeks.
2. Smelting.

B. Wet Method

1. Place ores in acid solution.
 - a. Acid dissolves copper, impurities drawn off--copper precipitated.
2. Too expensive for commercial use.

C. Electrolytic Method

1. Suspending large piece of copper in acid solution (called "Anod")
 - a. Sulphuric acid - 15%
Water - 75% Sodium chloride, small amount.

2. Suspend thin piece of copper opposite anode (called "cathode").
3. Pass electric current from cathode to anode.
4. Impurities fall to the bottom of tank and leave pure copper.
5. Costs about \$12.00 per ton and produces copper 99.93% pure.
6. Bulk of the world's copper is so treated.
7. Best conductor of electricity, having conductivity of 104%.

V. Smelting

A. Blast Furnace

1. Coke is used for fuel.
2. Air heated to 800° F. for blast.
3. Largest blast furnace is at the Washoe Works--Anaconda Mine, Montana.
 - a. 80 feet long.
 - b. 2700 ton capacity (ore).

B. Reverberatory Furnace

1. Heat is reflected to the ore.
 - a. Gives steady but less fierce heat.
2. Used on sulphide ores, as sulphur assists in the reduction of the ores.
3. First one in 1765, Yorkshire, England.
4. Largest--Anaconda Mine, Montana.
 - a. 119 feet long.
 - b. 300 tons capacity.

C. Bessemer Converter

1. Cylindrical shell--4' diameter, 10' height.
2. Air forced through the melting ore at 14 pounds pressure.
3. Very rapid--15 tons of ore can be converted in an hour.
4. Product is blister copper used as anodes for electrolytic method.

Suggested Outline for a Discussion on
Historical Review of the Use of Pewter

- I. The use of pewter goes back to the time of the Romans (27 B.C. - 470 A.D.).
 - A. Supplanted wooden ware and used extensively for:
 - 1. Household utensils, such as:
 - a. Spoons
 - b. Plates
 - c. Containers
 - d. Salt cellars
 - e. Trays
 - B. Particularly used in countries having a shortage of wood and pottery.
- II. Early pewter industry carried on by itinerant workers.
 - A. Itinerants traveled from town to town in the early Middle Ages, repairing and recasting damaged wares.
 - B. Pewter frequently composed of 80 parts tin, 20 parts lead.
- III. Rise of the Industry
 - A. Pewterers guild organized under Edward III (A.D. 1348).
 - 1. Stationary and organized pewterers.
 - B. High Ideals
 - 1. Prohibit dishonest products.
 - 2. Protect industry by eliminating those outside the guild.
 - C. Pewter universally used by the middle and upper classes for table and sideboard.
 - 1. Silver plate used only on tables of highest nobles and in royal palaces.
 - D. With power came desire for more power.
 - 1. Pewterers secured power to supervise

alloys, to destroy poor pewter and pewter products; to search for inferior material and to regulate apprentices and apprenticeships.

2. They punished offenders, siezed poor products, etc.
3. They maintained one of the best of the first labor organizations--the Guilds of the Middle Ages.

IV. Decline of the Industry

A. Desire for power caused downfall of the Guild.

1. Strict control and tightened monopoly caused discord among workers.
2. Civil wars caused decadence in the quality of the material.
3. Right of search was abandoned.
4. It was discovered that Britannia metal (a new metal) could be silver plated.
5. And introduction of cheap earthenware and china caused uses for pewter to die out.

B. Who maintained ideals of Guilds?

1. The workmen themselves.
2. Any successful guild should and must be guided by this original spirit.

V. Colonial Pewter

A. Colonist used pewter, along with copper, extensively.

1. Such silversmiths as Paul Revere, Reed and Borton have made history immortal in their metals.

B. An excellent product was used.

1. Design was good.
 - a. Influenced at first by English trends.
 - b. Simplicity, as in all colonial design, marks the finest works.

C. Earthenware, china, and cheapened pewter caused the repetition of that vicious cycle that consummated the downfall of pewter in the Middle Ages.

VI. Modern Pewter

A. W. H. Varnum, University of Wisconsin, caused revival of interest in pewter.

1. Asked to repair ancient fraternity pewter tankard.
2. Discovered Britannia, modern metal used as base metal for plating, to be an excellent grade of pewter.
3. Published "Pewter Design and Construction" in 1926.

B. Modern Formulae

1. 91 parts tin
1.5 parts copper
7.5 parts antimony.

C. Rise of Popularity

1. Practically all silversmiths manufactured a great deal of very good product.
2. Metal became a "rage."
3. People used and liked it.

D. Cycle Completed

1. About 1934 unscrupulous companies saw a chance to "clean up" on this wave of popularity.
2. Flooded the market with a very thin, very cheap quality of so-called pewter.
3. Highly adulterated with lead.
4. Millions of families, heretofore not financially able to buy pewter, were gullible and bought.
5. Every drugstore, every department store, and many novelty and chain stores of the "15¢" variety stocked and sold pewter that could be bought for \$1.00 to \$2.00 a piece or set.
6. Result: Product turned black, dented very easily, was so flimsy it literally fell apart, and the public now thinks pewter a very poor metal.

E. Government Regulations

1. Codes established by United States Government set forth formulas and strict regulations.

2. In the future, pewter products should be of high quality.
3. Public favor should return.
4. The use of pewter will again be established in its rightful place and remain until some other incident completes the oft-repeated cycle.

Suggested Cultural Readings

- I. The Porringer.
 Varnum, Pewter Design and Construction
 Chapter VII, Pages 63-72
 Rose, Copper Work. Chapter XII, Pages 137-41.
- II. History of Copper
 Payne, Art Metal Work. Chapter II, Page 14.
 Rose, Copper Work. Chapter I, Page 14.
- III. Historical Review of Pewter.
 Varnum, Pewter Design and Construction.
 Chapter I, Page 11.
- IV. Famous Craftsmen
 Gibson, The Goldsmith of Florence.
 Part I, Chapter IV - The Armorer, Page 49
 Part II, Chapter IX - The Goldsmith of
 Florence, Page 133
 Part III, Chapter X - Boston's Handyman,
 Page 151
 Part IV, Chapter XII - Mastersmith, Page 187
 Smith, Made in America
 Chapter III, Page 28 - Paul Revere, Silversmith
 Chapter IV, Page 38 - Duncan Phyfe, Cabinetmaker
 Chapter V, Page 47 - Thomas Jefferson, The
 First American Architect.
- V. Metallurgy
 Smith, Working in Precious Metals
 Chapter I, Page 1 - The Scope of Metallurgy
 Chapter II, Page 3 - Craftsmanship and Science
 Chapter XX, Page 371 - Substitutes for
 Precious Metals.

Suggested Reference Books for General Cultural Reading

- Avery, C. L. Early American Silver
 Oman, C. C. English Domestic Silver
 Bigelow, F. H. Historic Silver of the Colonies and
 Its Makers
 Roth, H. L. Oriental Silverwork

Hayden, Arthur	Chats on Old Silver
Meyers, L. G.	Some Notes on American Pewterers
Gask, Norman	Old Silver Spoons of England
O'Brien	Paul Revere's Own Story
Symonds	The Autobiography of Benvenuto Cellini
Burgess, F. W.	Chats on Old Copper and Brass
Lowes, E. L.	Chats on Old Silver
Cripps, W. J.	Old English Plate
Bailey, C. T. P.	Knives and Forks

Bibliography of Visual Aids For a Course in Art Metal Work

Books

Avery	Early American Silver
Bailey	Knives and Forks
Bigelow	Historic Silver of the Colonies and Its Makers
Burgess	Chats on Old Copper and Brass
Cripps	Old English Plates
Cuzner	A Silversmith's Manual
Dixon	Designs Manual for Metal Artists
Evans	Hammered Metal Work
Gash	Old Silver Spoons of England
Gawthorp	Art of Brass Repousse'
Gelletly	Chart of Civilization
Gibson	The Goldsmith of Florence
Hayden	Chats on Old Silver
Hooper and Shirley	Handicraft in Wood and Metal
Jephcott	Simple Jewelry
Jordan	Simple Beaten Metal Work
Kronquist	Metalcraft and Jewelry
Lemas	Applied Art
Lowes	Chats on Old Silver
Lukowitz	Interesting Art Metal Work
Mersereau	Materials of Industry
Meyers	Some Notes on American Pewterers
O'Brien	Paul Revere's Own Story
Oman	English Domestic Silver
Payne	Art Metal Work With Inexpensive Equipment
Reagan and Smith	Metal Spinning
Reeve	Pewter Work
Rose	Copper Work
Roth	Oriental Silverwork
Smith	Working in Precious Metals
Smith, Suzan	Made in America
Symonds	Autobiography of Cellini
Varnum	Industrial Arts Design Pewter Design and Construction
Welch	Elements of Sheet Metal Work
Wrought Iron Designers Company	Art in Iron, Volume U - Designs and Silhouettes

Catalogues

American Brass and Foundry Company, Kenosha, Wisconsin
 Lewis and Company, Albany New York. Catalogue
 Number Twenty-one.
 Metal Crafts Supply Company, Providence, Rhode Island
 Paleschuck, B., 37 Allen Street, New York, New York
 Revere Copper and Brass, Inc., Rome, New York
 Roycrofters, East Aurora, New York
 Selmer, Inc., Elkhart, Indiana
 William Dixon, Inc., Newark, New Jersey
 Wrought Iron Designers, 541 West 35th Street, New York,
 New York

Motion Pictures

American Brass Company, Waterbury Connecticut
 From Mine to Consumer
 The Story of Anaconda
 Department of Visual Instruction, Extension Division,
 Oregon State College, Corvallis, Oregon
 Metal Spinning
 Rothacker, Douglas D., 729 Seventh Avenue, New York, N.Y.
 Monel Metal
 The Story of Monel Metal
 University of California Extension Division, Berkeley
 or Los Angeles
 Gold
 United States Bureau of Mines, 4800 Forbes Street,
 Pittsburg, Pennsylvania
 The Story of Copper
 Silver: Heirlooms of Tomorrow

Brochures

Kensington, Incorporated, New Kensington, Pennsylvania

Metal Crafts Supply Company, Providence, Rhode Island
Things In and About Metal

William Dixon, Incorporated, Newark, New Jersey

Magazines

American Home

Arts and Decoration

Better Homes and Garden

Good Housekeeping

House and Garden

House Beautiful

Industrial Arts and Vocational Education

Popular Homecraft

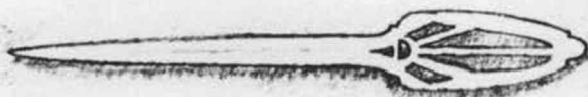
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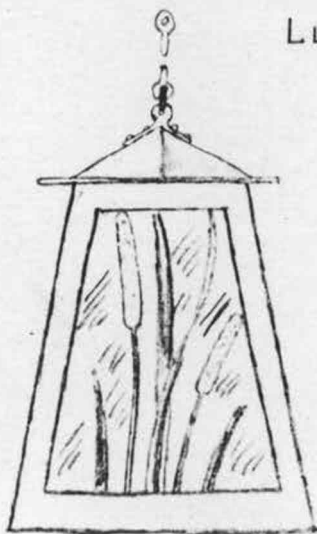
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PORRINGER HANDLE



LETTER OPENER

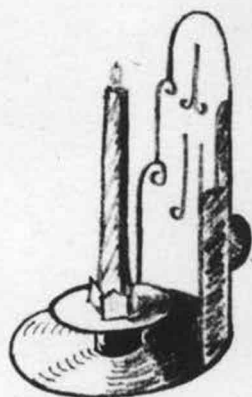


PORCH LIGHT



BOOK END

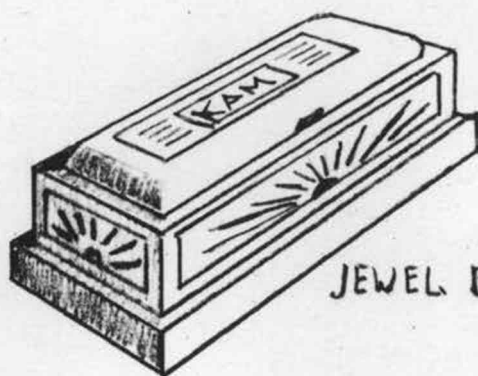
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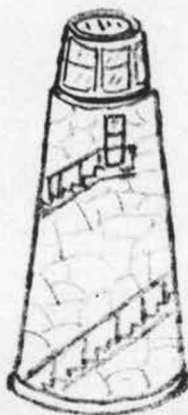
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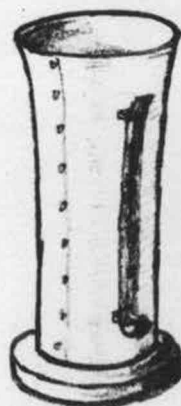
JEWEL BOX



MUG

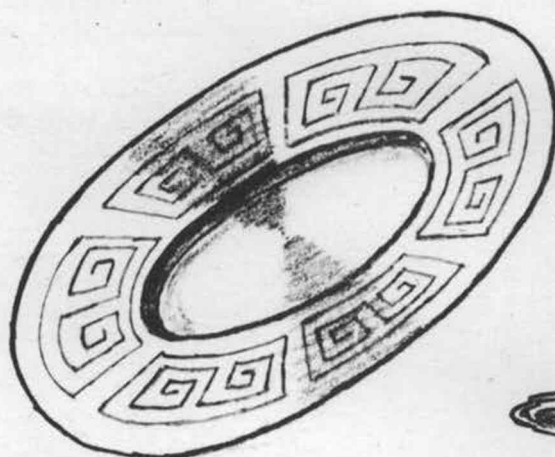


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VASE

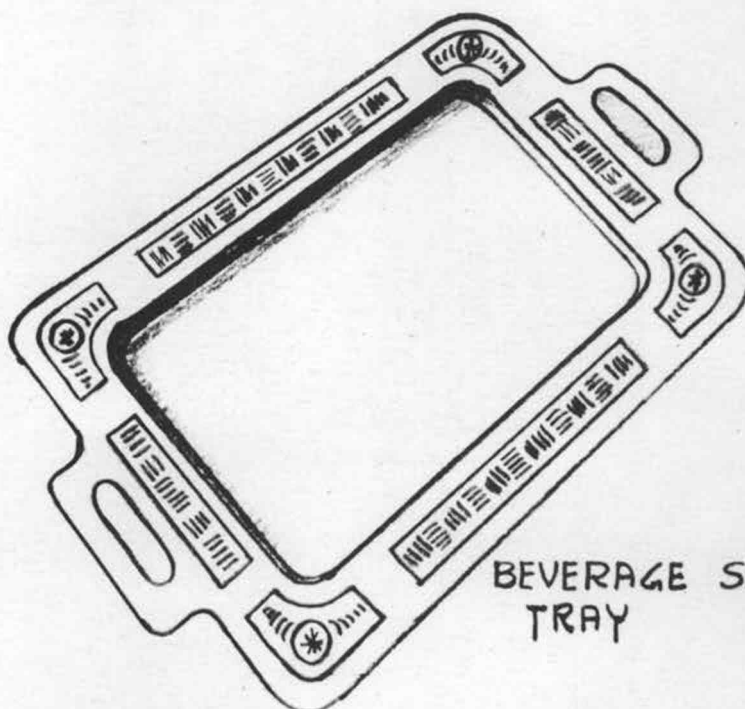
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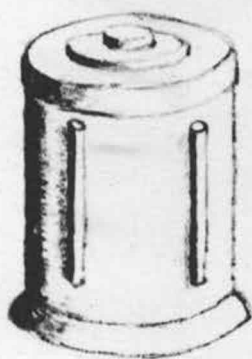


ASH TRAY



BEVERAGE SERVING
TRAY

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HUMIDOR



GOBLET



CREAMER & SUGAR



VASE

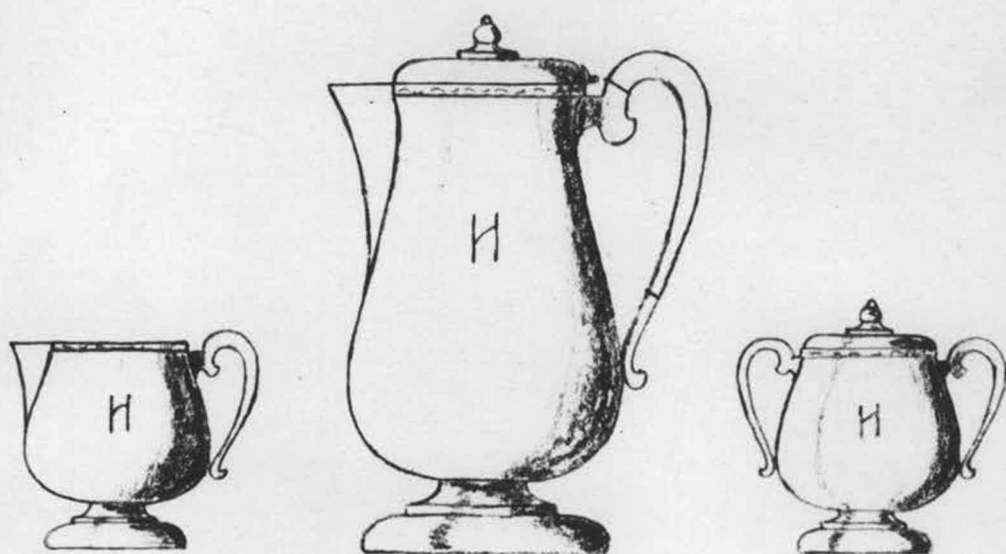


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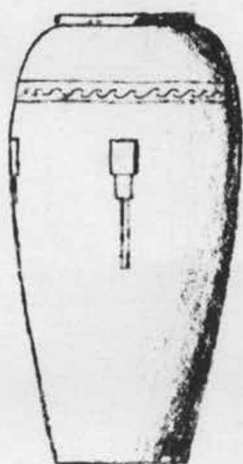


VIOLET BOWL

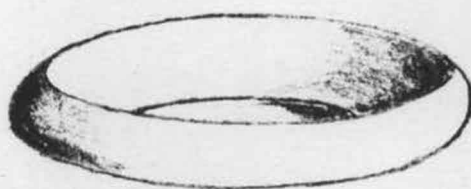
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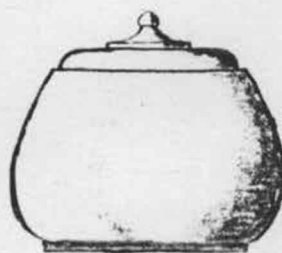
COFFEE SET



VASE



LARGE BOWL



ROSE BOWL