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ABSTRACT

In order to ascertain the direction for further study and improvement of design instruction in the woodwork area, this study explored the current status of design in woodwork and questioned designers in wood and course content and occupational opportunities. A total of 89 (83 percent) educators and 42 (70 percent) leading designers returned questionnaires containing data used in this study. Some conclusions were: (1) Contemporary design concept is not being emphasized strongly enough by industrial arts woodwork educators, (2) Design literature is not being introduced and utilized in industrial arts woodworking courses, (3) Woodwork students lack instruction in the basic fundamentals of color, (4) Other industrial materials should be included in the woodworking courses, (5) Designers place a high degree of emphasis on most design topics than do educators, and (6) Job opportunities in wood-product design are not sufficiently presented to industrial arts woodworking students. This is a summary report of an Ed.D. dissertation by the same title submitted to the University of Oklahoma. (GR)

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DESIGN: CURRICULUM ANALYSIS FOR INDUSTRIAL ARTS WOODWORKING

A summary report of a dissertation by the same title submitted in partial fulfillment of the requirements for the degree of Doctor of Education

By

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University of Oklahoma, 1958

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FOREWORD

This study concerning design content for industrial arts woodworking has evolved as the result of a need for knowledge of wood-product design in the field of industrial education. This publication is offered with the hope that industrial educators will use it to upgrade their programs if such a need is evident.

One of the services of the Arkansas Research Coordination Unit is to disseminate findings of research and related activities in industrial and technical education to interested agencies and individuals within and outside the state.

Gratitude is expressed to Marion E. Maddox, Professor of Industrial Education, and Chairman of the author's graduate committee, for his assistance and guidance in the preparation of this publication.

Harold W. Moore
Associate Director

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THE PROBLEM AND METHODS OF PROCEDURE

The high level of technical development and achievement which our culture enjoys and maintains has placed design in a new perspective. One has at his fingertips innumerable products, designed by experts for his use and enjoyment. During no other period in the history of man has such a vast quantity of items been produced and sold on the open market. This trend is apt to continue since scientific and technological information doubles every thirteen to fifteen years. (15:18)

The designer, as an individual, plays a major role in the development of each new product. It is his unique handling of the specific design problem which determines the final outcome of the item. The designer must be aware of society's need and wants before society is aware of the need itself. So the designer becomes a kind of practical prophet, capable of analyzing trends and needs, taking this information and transforming it into some tangible item which is functional and attractive.

With such an emphasis and dependence upon manufactured items within our society, a need evolves which has never before been apparent. This need is that individuals have a sound knowledge of consumer products. An integral part of a person's education today should include an awareness of design, its functionality, appropriateness and aesthetic appeal. An educated person should not only be well versed in intellectual and academic matters, but should also be educated so that he can exercise good taste, and discriminate between poor

and good design. The Design Research Team sums it up by stating:

> To support such teaching, an effort should be made to bring the student of the industrial arts into a familiar relationship with good and poor design as it exists in works that can be seen and examined: in architecture, sculpture, textiles, interiors, furniture, and various manufactured objects. Experience will bring sophistication; and sophistication, refinement. The unsuitable, the distorted, the structurally or materially unsound, the shabby and shoddy, the imitative and hackneyed, will be seen for what they are, uninteresting and ugly. Banality and ugliness are sure to be rejected, and the search thereafter is likely to be for the suitable, the structurally sound, the inventive, the materially expressive--in short, the well-designed. (7:4)

But what is being done on the college and university level to prepare the individual for life in this technically-oriented world? One of the courses offered to try to fill such a need is the industrial arts woodworking course. This course deals with familiarizing students with products of the wood industry. An important facet of the wood industry is the furniture area, dealing with items which surround persons closely and constantly. These courses in woodworking are intended to provide experiences for the student which will enlarge his knowledge of wood, its characteristics, appropriate uses, its limitations and its place in design.

It is important that an individual realize early in his education that each period of history has its own unique design. For example, Rococo design was appropriate in its period and fulfilled the needs of the people during the seventeenth and eighteenth centuries. However, Rococo is out of place in our society today. (28:68) There is a design of our own time, reflecting our values, culture and period. The present design, however, may possibly appear grossly out of place in the year A.D. 2000. Students must be made aware that this time is

their time upon earth, and be encouraged to fully explore, utilize and enjoy their own unique design. Lindbeck states:

> This obligation does not begin and end with the discussion of contemporary design--it must be extended and presented in such a manner that the individual will recognize and appreciate good design from any period in history. There are logical reasons why the Colonial Style carries a very distinctive appearance. There are reasons, too, why the heavy Mission furniture was a popular and easily recognizable style. To maintain that there is no style other than contemporary would be prejudicial and misleading. One must instead suggest that the contemporary is most representative of this technological and machine age, and therefore more adequate for the Twentieth Century. (28:14)

The industrial arts woodworking class, with its opportunities to explore such an important industry as wood, seems the ideal class in which to re-emphasize present-day design. In such a situation students can approach and explore the design problem. But instead of ending the experience of designing in a frustrating situation of never seeing their item completed, the students can go readily into the technical skill of their designs, actually constructing them and seeing them in their completeness. (9) The Scandinavians, known throughout the world for their gracefully designed items which are both functional and high in aesthetic appeal, use such an approach to design. Their designers are artists and craftsmen as well. It is a common practice for the designer to build a full size model as a part of the design process.

In order that a direction be ascertained as to further study in design instruction in the woodwork area, it is necessary that the current status of design in woodwork be explored, designers in wood questioned and opinions compiled so that appropriate measures can be taken to improve design instruction in woodwork courses.

THE PROBLEM

Statement of the problem. The purpose of this study is fourfold: (1) to identify design topics which are fundamental to instruction in the area of industrial arts woodwork, (2) to determine the degree of emphasis presently placed on selected design content topics in industrial arts woodwork classes at the college level, (3) to determine the extent to which industrial arts woodwork educators and industrial wood-product designers agree on design content topics, and (4) to determine in what specific areas wood-product designers are utilized in industry.

Specific questions to be answered:

1. What degree of emphasis do industrial arts woodwork educators place upon design content topics selected for industrial arts woodwork courses at the college level?
2. What degree of emphasis do industrial wood-product designers place upon design content topics selected for industrial arts woodwork at the college level?
3. What degree of difference exists between the industrial educators and industrial designers in regard to selected design content topics?
4. What are the occupational opportunities available in which a knowledge of wood design is necessary?

DEFINITION OF TERMS

Design is a simple and direct solution to a problem which involves planning, selecting material and determining the appearance of functional objects.

Industrial arts design is a part of industrial arts curriculum which deals with the basic elements and principles of design as they

apply to the creation of industrial objects.

Industrial designers are persons engaged in creating, planning and developing industrial products for manufacture.

Contemporary design is a term encompassing products which are planned and developed to meet the needs of living today.

Industrial arts is a study of the tools, materials, processes, products and occupations of industry.

Wood industry refers to any business which makes wood or wood-products its major concern.

Wood design refers to designed objects utilizing wood as the primary material.

Woodwork class is a facet of industrial arts which is organized to provide an opportunity for students to gain knowledge and skill relating to the wood industry.

Functional denotes fulfilling a useful purpose or activity for which an item is designed.

Industrial education is a generic term applying to all types of education related to industry, including industrial arts education, vocational industrial education and technical education.

Aesthetic, taken from the Greek word "aisthetikos," meaning sense of perception. The general meaning being, relating to, or responsive of, the beautiful.

Traditional design denotes design which reflects the basic aesthetic concepts, materials and techniques of past periods, as opposed to contemporary design, or design of this time.

Industrial design is a process of analyzing, creating, planning,

and developing articles for mass production.

Machine age is that period in history, following the eighteenth century, in which machinery has been fundamental to the production of industrial products.

Bauhaus School was a school of design, started in Dessau, Germany, 1925, by Walter Gropius. This school's prime objective was to create forms which symbolize the machine age. The principles of the Bauhaus being:

> that most students should face the fact that their future should be involved primarily with industry and mass production rather than with industrial craftsmanship;
>
> that teachers in schools of design should be men who are in advance of their profession rather than safely and academically in the rearguard;
>
> that schools of design should, as the Bauhaus did, bring together the various arts of painting, architecture, theatre, photography, weaving, typography, etc., into a modern synthesis which disregards conventional distinction between the "fine" and "applied" arts;
>
> that it is harder to design a first rate chair than to paint a second rate painting--and much more useful;
>
> that a school of design should have on its faculty the purely creative and disinterested artist, such as the easel painter, as a spiritual counterpoint to the practical technician in order that they may work and teach side by side for the benefit of the student;
>
> that thorough manual experience of material is essential to the student of design--experience at first confined to free experiment and then extended to practical shop work;
>
> and, lastly, that because we live in the 20th century, the student architect or designer should be offered no refuge in the past, but should be equipped for the modern world in its various aspects, artistic, technical, social, economic, and spiritual, so that he may function in society not as a decorator but as a vital participant. (28:88)

SOURCES OF DATA AND PROCEDURE

Sources of data for this study include a survey of the opinions of a group of selected educators who are presently engaged in the teaching of woodworking classes on the college level, and a national panel of selected leaders in the field of industrial wood-product design. Professional industrial designers were selected for this study because of their highly specialized training. Awareness of the design process qualifies these designers as reliable sources from which to seek opinions in regard to the importance of content topics for design instruction presented to the industrial arts woodwork student.

Industrial design literature was researched to locate industrial designers who have, within the past three years, contributed special design achievements dealing directly with wood-product design. Sixty designers were chosen to make up the panel of experts. These people had been chosen to represent their profession by either writing an article about some phase of wood-product design or by publishing pictures describing the development of a particular design. This technique of panel selection was utilized on the assumption that persons who contribute work for publication, display a more professional attitude, thereby making more suitable and qualified panel members. A letter was mailed to 60 industrial designers, in which each was asked to serve as a member of the panel.

A questionnaire was enclosed with the letter (Appendix I). Acceptance of the assignment as a panel member was made known by returning the completed questionnaire. Two weeks after letters and questionnaires were mailed to prospective panel members, a follow-up

letter was mailed to those who had not responded. A total of 42 questionnaires, or 70 per cent were returned by the panel before the end of the established terminal date. Completed questionnaires were returned by leading designers from 19 states and the District of Columbia (Table I).

Colleges and universities offering industrial arts woodwork courses were invited to participate in the study. These were selected from the Industrial Teacher Education Directory. (19) The institution was selected by random in order to give equal chance and independence to each member of the sample. This was accomplished by assigning a number to each school and consulting a table of random numbers to determine the final choice. The person responsible for teaching the woodwork courses in each selected school was the chosen individual for replying to the questionnaire. One hundred and seven teachers were asked to make up the sample of educators (Appendix II). A questionnaire and a letter were mailed to each selected industrial arts educator. After a two-week period, a follow-up letter and another questionnaire were sent to those who had not replied to the first request. A total of 89 completed forms were returned before the end of the final date, which made a total of 83 per cent returns for the educational group.

Questionnaire. Design content topics forming the basis for the questionnaire were selected from current literature. Textbooks, magazines, and studies were examined for material which pertains to the various aspects of designing articles of wood. The content items were selected and arranged in an order appropriate to the different levels of the design process (Appendix I).

TABLE I

DISTRIBUTION OF INDUSTRIAL DESIGNERS PARTICIPATING IN THE STUDY

State	Questionnaire		Per Cent Returned
	Mailed	Returned	
Arkansas	5	5	100
California	9	6	66.6
Florida	1	1	100
Idaho	1	1	100
Illinois	6	3	50
Indiana	2	1	50
Massachusetts	2	0	0
Michigan	1	0	0
Missouri	2	1	50
New York	13	10	76.9
North Carolina	1	0	0
Ohio	2	2	100
Oklahoma	5	5	100
Oregon	1	1	100
Pennsylvania	1	0	0
Rhode Island	1	1	100
South Carolina	1	0	0
Texas	2	1	50
Washington	3	3	100
Washington D.C.	1	1	100
Total	60	42	70

STATISTICAL PROCEDURES

The statistical treatment used to test the two hypotheses was the one-way analysis of variance. A computer which was programmed to handle the one-way analysis of variance was utilized to give an F statistic between the means of the two samples. The F statistic was computed for each topic listed in the questionnaire. Null hypotheses were rejected in cases where the value of F exceeded the 5 per cent level of significance (3.92 for one degree of freedom in the numerator and 129 degrees of freedom in the denominator). When significance was noted at the .05 level, a further test was made at the .01 level of significance.

ASSUMPTIONS

1. It is assumed that the woodwork teacher, on the college level, has enough background in design to enable him to understand design terms which are used in the instrument.

2. It is assumed that classroom time is being devoted to the study of design in industrial arts woodwork courses.

3. It is assumed that the industrial arts teacher is teaching his courses according to the way he feels they should be taught.

4. It is assumed that a knowledge of design is considered, by educators, an important aspect of the industrial education curriculum.

5. It is assumed that the design content items which are selected for the questionnaire are appropriately chosen and will yield valid results.

6. It is assumed that the industrial designer, in general, is familiar with the industrial arts teacher education program and has

some knowledge of industrial arts woodworking.

7. It is assumed that the industrial arts woodworking courses involve the construction of student-designed projects.

REPORT OF FINDINGS

This chapter contains a description of findings obtained by a questionnaire sent to a sample of industrial arts woodwork educators and a panel of wood-product designers. It is organized into four major divisions involving (1) the degree of emphasis placed upon selected design content topics by a sample of industrial arts woodwork educators, (2) the degree of emphasis placed upon these same design content topics by a panel of industrial wood-product designers, (3) a comparison of the degree of emphasis placed upon selected design content topics by industrial arts woodwork educators with the degree of emphasis placed upon these same topics by the industrial wood product designers, and (4) occupational opportunities in which a knowledge of wood-product design is necessary.

DEGREE OF EMPHASIS PLACED UPON SELECTED DESIGN CONTENT TOPICS BY INDUSTRIAL ARTS WOODWORK TEACHERS

One hundred and seven industrial arts teachers were mailed a copy of the questionnaire and asked to rate each design topic according to the degree of emphasis they placed on that particular topic in their industrial arts woodworking classes. Eighty-nine teachers responded by returning completed questionnaires. A five-point rating scale was utilized to enable the educator to indicate the degree to which he emphasized each topic in his woodwork classes. The value of the scale ranged from 1 to 5, with the largest number representing the highest degree of emphasis and the smallest number indicating the

lowest degree of emphasis. The rating scale with its number equivalent is as follows:

5---Extensive emphasis

4---Slightly above average emphasis

3---Average emphasis

2---Slightly below average emphasis

1---Little emphasis

Averaging the responses did not always provide a whole number; consequently, the following key was used in order that each fractional part of a number could be properly recorded:

4.50 to 5 = 5---Extensive emphasis

3.50 to 4.49 = 4---Slightly above average emphasis

2.50 to 3.49 = 3---Average emphasis

1.50 to 2.49 = 2---Slightly below average emphasis

.50 to 1.49 = 1---Little emphasis

Ratings which the group of 89 educators assigned to various selected design topics in each of the five major categories are illustrated in Tables II through VI. Indicated in the last column of each table is the mean rating for each topic. Also, a key has been provided at the bottom of each table in order that a specific degree of emphasis can be determined for each design topic.

DEGREE OF EMPHASIS PLACED UPON SELECTED DESIGN CONTENT TOPICS BY INDUSTRIAL WOOD-PRODUCT DESIGNERS

Sixty industrial wood-product designers were asked to rate each design topic according to the degree of emphasis they felt it should receive in a course of industrial arts woodwork at the college level.

TABLE II

EDUCATORS' RATING OF TOPICS PERTAINING TO DESIGN BACKGROUND INFORMATION

Topic	Responses of educators					Mean rating*
	5	4	3	2	1	
1. Leaders who influenced the contemporary design concept.	1	12	21	15	40	2.09
2. Present-day designers of wood products.	7	16	23	18	25	2.57
3. Contributions of the Bauhaus School.	1	3	16	11	58	1.63
4. Influence of "Machine Age" on today's design.	14	31	28	7	9	3.38
5. Role of the designer in today's society.	12	21	33	11	12	3.11
6. Appreciation for good design.	47	19	9	3	1	4.33
7. Job opportunities in the design field.	6	12	27	15	19	2.56
8. Companies that produce contemporary wood products.	6	15	38	23	7	2.91
9. Literature pertaining to industrial design.	7	18	38	21	6	3.00
10. Literature relating to industrial materials.	9	12	13	7	1	3.24

*Key: 4.50 to 5-----Extensive emphasis
3.50 to 4.49--Slightly above average emphasis
2.50 to 3.49--Average emphasis
1.50 to 2.49--Slightly below average emphasis
.50 to 1.49--Little emphasis

TABLE III

EDUCATORS' RATING OF TOPICS PERTAINING TO THE FUNDAMENTALS OF DESIGN

Topic	Responses of educators					Mean rating*
	5	4	3	2	1	
1. Principles and elements of design.	27	24	28	9	1	3.75
2. "Honest" selection and usage of materials.	37	33	15	4	0	4.15
3. Meaning of "function" in the design process.	44	26	15	3	1	4.22
4. Aesthetic appeal of a design.	29	38	13	8	0	4.01
5. Basic knowledge of instrument drawing.	8	22	31	12	16	2.93
6. Concept of "simplicity" in a design.	14	34	31	12	7	3.60
7. Design vocabulary.	7	24	26	19	13	2.92
8. Basic understanding of color.	9	11	34	16	19	2.72
9. Concept of appropriate color.	23	36	24	3	3	3.82
10. Free-hand sketching.	12	32	24	14	7	3.31
11. Techniques of research.	9	15	29	13	23	2.71

*Key: 4.50 to 5------Extensive emphasis
3.50 to 4.49---Slightly above average emphasis
2.50 to 3.49---Average emphasis
1.50 to 2.49---Slightly below average emphasis
.50 to 1.49---Little emphasis

TABLE IV

EDUCATORS' RATING OF TOPICS PERTAINING TO WOOD TECHNOLOGY

Topic	Responses of educators					Mean rating*
	5	4	3	2	1	
1. Physical properties of different species.						
a. Expansion and contraction.	31	27	24	4	3	3.89
b. Relative hardness.	30	31	23	5	0	3.97
c. Color and grain character.	40	30	15	4	0	4.19
d. Bending strength.	20	22	33	9	5	3.48
e. "Oily" quality.	11	17	31	18	12	2.97
f. Resistance to decay.	12	29	29	13	6	3.31
g. Relative strength.	19	33	30	6	1	3.70
2. Mositure content testing and control.	28	24	19	13	5	3.64
3. Ease of laminating.	19	29	24	13	4	3.52
4. Aesthetic appeal.	23	31	30	5	0	3.81
5. Specification writing and purchasing.	11	24	35	14	5	3.25

*Key: 4.50 to 5------Extensive emphasis
3.50 to 4.49---Slightly above average emphasis
2.50 to 3.49---Average emphasis
1.50 to 2.49---Slightly below average emphasis
.50 to 1.49---Little emphasis

TABLE V

EDUCATORS' RATING OF TOPICS PERTAINING TO WOOD PRODUCTS AND RELATED MATERIALS

	Topic	Responses of educators					Mean rating*
		5	4	3	2	1	
1.	Plastic laminates.	18	21	29	11	10	3.29
2.	Interior and exterior finishes.	21	35	26	6	1	3.78
3.	Particle board and hardboard.	15	31	30	11	2	3.52
4.	Wood Adhesives.	38	32	17	2	0	4.19
5.	Textiles, such as upholstery fabrics.	5	14	26	22	22	2.53
6.	Metal and plastic hardware items.	10	16	41	17	5	3.10
7.	Hardwood and softwood plywood.	26	30	30	2	1	3.88
8.	Vinyl plastic.	3	17	27	23	19	2.57
9.	Acrylic plastic.	3	14	25	23	24	2.43
10.	Insulation and acoustical board.	2	9	28	26	24	2.31
11.	Ceramic tile.	2	2	20	24	41	1.88
12.	Glass.	3	4	19	22	41	1.94

*Key: 4.50 to 5------Extensive emphasis
3.50 to 4.49---Slightly above average emphasis
2.50 to 3.49---Average emphasis
1.50 to 2.49---Slightly below average emphasis
.50 to 1.49---Little emphasis

TABLE VI

EDUCATORS' RATING OF TOPICS PERTAINING TO DEVELOPMENT OF SKILL IN USING TOOLS AND MATERIALS

	Topic	Responses of educators					Mean rating*
		5	4	3	2	1	
1.	Use of common woodwork handtools.	43	28	15	2	1	4.24
2.	Safe use of portable power tools.	52	25	11	1	0	4.43
3.	Handling and storage of materials.	24	27	33	4	1	3.78
4.	Treatment of plywood edges.	23	26	34	4	2	3.72
5.	Clamping and holding techniques.	42	28	18	1	0	4.25
6.	Electronic glue drying processes.	19	22	14	20	14	3.13
7.	Hardware installation.	19	25	29	15	1	3.52
8.	Application of plastic laminates and veneers.	19	24	28	15	3	3.46
9.	Reading and intrepreting drawings.	31	23	23	10	2	3.80
10.	Selection and application of adhesives.	36	36	10	5	2	4.11

*Key: 4.50 to 5------Extensive emphasis
3.50 to 4.49---Slightly above average emphasis
2.50 to 3.49---Average emphasis
1.50 to 2.49---Slightly below average emphasis
.50 to 1.49---Little emphasis

Forty-two designers responded, making a total of 70 per cent returns for the group. Mean ratings placed on design topics by designers are illustrated in Tables VII through XI. The degree of emphasis placed on each design topic may be determined by consulting a key located at the bottom of each table.

A COMPARISON OF THE DEGREE OF EMPHASIS PLACED UPON SELECTED DESIGN TOPICS BY EDUCATORS WITH THE DEGREE OF EMPHASIS PLACED ON THE SAME TOPICS BY INDUSTRIAL WOOD-PRODUCT DESIGNERS

A one-way analysis of variance was applied to the null hypotheses that:

> There is no significant difference between the degree of emphasis placed on selected design content topics by industrial arts woodwork teachers and the degree of emphasis placed on these same topics by a panel of professional industrial designers.

The null hypotheses was rejected for 24 topics. The sample of industrial educators emphasized two topics significantly more in their woodwork classes than the panel of designers would emphasize them. These topics were all in respect to the category pertaining to development of skill in using tools and materials and included topics, safe use of portable power tools, and clamping and holding techniques. The panel of designers emphasized twenty-two topics significantly higher than the industrial educators. Six of these topics pertained to the category of design background information and included: leaders who influenced the contemporary design concept; present-day designers of wood products; contributions of the Bauhaus School; role of the designer in today's society; job opportunities in the design field; and literature pertaining to industrial design. The following eight topics rated significantly higher by the panel of

TABLE VII

PANEL RATING OF TOPICS PERTAINING TO DESIGN BACKGROUND INFORMATION

	Topic	Responses of panel 5	4	3	2	1	Mean rating*
1.	Leaders who influenced the contemporary design concept.	11	14	10	5	2	3.64
2.	Present-day designers of wood products.	5	18	14	4	1	3.52
3.	Contributions of the Bauhaus School.	6	15	12	3	6	3.29
4.	Influence of "Machine Age" on today's design.	10	17	9	3	3	3.67
5.	Role of the designer in today's society.	24	9	4	2	3	4.17
6.	Appreciation for good design.	30	6	4	0	2	4.48
7.	Job opportunities in the design field.	10	22	7	0	3	3.86
8.	Companies that produce contemporary wood products.	4	13	15	5	5	3.14
9.	Literature pertaining to industrial design.	7	14	14	7	0	3.50
10.	Literature relating to industrial materials.	9	12	13	7	1	3.50

*Key: 4.50 to 5------Extensive emphasis
3.50 to 4.49---Slightly above average emphasis
2.50 to 3.49---Average emphasis
1.50 to 2.49---Slightly below average emphasis
.50 to 1.49---Little emphasis

TABLE VIII

PANEL RATING OF TOPICS PERTAINING TO FUNDAMENTALS OF DESIGN

	Topic	Responses of panel					Mean rating*
		5	4	3	2	1	
1.	Principles and elements of design.	28	10	3	0	1	4.52
2.	"Honest" selection and usage of materials.	30	9	2	0	1	4.59
3.	Meaning of "function" in the design process.	20	16	5	0	1	4.28
4.	Aesthetic appeal of a design.	19	20	10	0	1	4.14
5.	Basic knowledge of instrument drawing.	8	9	19	5	1	3.42
6.	Concept of "simplicity" in a design.	16	15	11	0	0	4.11
7.	Design vocabulary.	8	14	18	2	0	3.66
8.	Basic understanding of color.	11	15	12	2	2	3.73
9.	Concept of appropriate color.	16	18	5	2	1	4.09
10.	Free-hand sketching.	11	16	11	4	0	3.80
11.	Techniques of research.	6	16	16	2	2	3.52

*Key: 4.50 to 5------Extensive emphasis
3.50 to 4.49---Slightly above average emphasis
2.50 to 3.49---Average emphasis
1.50 to 2.49---Slightly below average emphasis
.50 to 1.49---Little emphasis

TABLE IX

PANEL RATING OF TOPICS PERTAINING TO WOOD TECHNOLOGY

Topic	Responses of panel					Mean rating*
	5	4	3	2	1	
1. Physical properties of different species.						
a. Expansion and contraction.	15	14	11	1	1	3.98
b. Relative hardness.	9	15	15	2	1	3.69
c. Color and grain character.	19	10	11	1	1	4.07
d. Bending strength.	7	16	17	1	1	3.64
e. "Oily" quality.	5	9	22	3	3	3.24
f. Resistance to decay.	8	10	21	0	3	3.48
g. Relative strength.	11	17	12	1	1	3.86
2. Moisture content testing and control.	8	16	11	5	2	3.55
3. Ease of laminating.	8	14	15	3	2	3.55
4. Aesthetic appeal.	16	12	10	2	2	3.90
5. Specification writing and purchasing.	7	10	21	4	0	3.48

*Key: 4.50 to 5------Extensive emphasis
3.50 to 4.49---Slightly above average emphasis
2.50 to 3.49---Average emphasis
1.50 to 2.49---Slightly below average emphasis
.50 to 1.49---Little emphasis

TABLE X

PANEL RATING OF TOPICS PERTAINING TO WOOD PRODUCTS AND RELATED MATERIALS

	Topic	Responses of panel 5	4	3	2	1	Mean rating*
1.	Plastic laminates.	9	13	17	2	1	3.64
2.	Interior and exterior finishes.	12	17	11	2	0	3.93
3.	Particle board and hardboard.	5	12	22	3	0	3.45
4.	Wood adhesives.	16	14	9	3	0	4.02
5.	Textiles, such as upholstery fabrics.	3	17	16	6	0	3.40
6.	Metal and plastic hardware items.	3	18	19	2	0	3.52
7.	Hardwood and softwood plywood.	11	10	17	4	0	3.66
8.	Vinyl plastic.	3	10	24	4	1	3.24
9.	Acrylic plastic.	5	10	23	4	0	3.38
10.	Insulation and acoustical board.	3	4	22	12	1	2.90
11.	Ceramic tile.	2	3	22	14	1	2.79
12.	Glass.	2	4	22	14	0	2.86

*Key: 4.50 to 5------Extensive emphasis
3.50 to 4.49---Slightly above average emphasis
2.50 to 3.49---Average emphasis
1.50 to 2.49---Slightly below average emphasis
.50 to 1.49---Little emphasis

TABLE XI

PANEL RATING OF TOPICS PERTAINING TO DEVELOPMENT OF SKILL IN USING TOOLS AND MATERIALS

	Topic	Responses of panel					Mean rating*
		5	4	3	2	1	
1.	Use of common woodwork hand-tools.	18	10	9	5	0	3.98
2.	Safe use of portable power tools.	19	8	10	5	0	3.98
3.	Handling and storage of materials.	4	16	17	5	0	3.45
4.	Treatment of plywood edges.	4	20	12	6	0	3.52
5.	Clamping and holding techniques.	6	18	13	5	0	3.60
6.	Electronic glue drying processes.	4	14	17	7	0	3.36
7.	Hardware installation.	10	8	16	8	0	3.48
8.	Application of plastic laminates and veneers.	8	16	14	4	0	3.67
9.	Reading and interpreting drawings.	20	17	4	1	0	4.33
10.	Selection and application of adhesives.	14	10	15	3	0	3.83

*Key: 4.50 to 5------Extensive emphasis
3.50 to 4.49---Slightly above average emphasis
2.50 to 3.49---Average emphasis
1.50 to 2.49---Slightly below average emphasis
.50 to 1.49---Little emphasis

designers were related to the category dealing with fundamentals of design: principles and elements of design; "honest" selection and usage of materials; basic knowledge of instrument drawing; concept of "simplicity" in a design; design vocabulary; basic understanding of color; free-hand sketching; and techniques of research. Seven topics emphasized significantly higher by the panel of designers concerned the category of wood products and related materials which included: textiles, such as upholstery fabrics; metal and plastic hardware items; vinyl plastic; acrylic plastic; insulation and acoustical board; ceramic tile; and glass. One topic was contained in the category of development of skill in using tools and materials and pertained to reading and interpreting drawings.

OCCUPATIONAL OPPORTUNITIES AVAILABLE IN WHICH A KNOWLEDGE OF WOOD DESIGN IS NECESSARY

Twenty-five occupational areas in which a knowledge of wood design was necessary were listed by the panel of designers. The following five areas were mentioned at least 11 times each: furniture design, interior design, architecture, cabinet design and object design. The remaining 20 areas were mentioned from one to four times each.

CONCLUSIONS

1. Information concerning leaders, both past and present, who have been influential in developing the contemporary design concept, is not being emphasized strongly enough by industrial arts woodwork educators.

2. An adequate amount of industrial design literature is not being introduced and utilized in industrial arts woodworking courses.

3. Design terminology is not stressed adequately or strongly enough in today's woodworking courses.

4. Industrial arts woodwork students do not receive adequate instruction in the basic fundamentals of color.

5. In addition to wood, woodworking courses should include the study and usage of other industrial materials in order to improve the function, quality and aesthetic appeal of a wood-product design.

6. Industrial designers and woodwork educators agree on design topics pertaining to wood technology. Teachers are stressing the physical properties of wood to the degree that designers feel such topics should be emphasized.

7. Industrial wood-product designers placed a higher degree of emphasis on most design topics than did the educators.

8. Although industrial arts woodwork educators tend to underemphasize design in their classes, they do adequately stress an appreciation for good design.

9. Information about job opportunities in wood-product design is not sufficiently presented to industrial arts woodworking students.

RECOMMENDATIONS

1. The entire number of design topics listed in the questionnaire should be emphasized in industrial arts woodworking at the college level. The importance of these topics has been validated to the extent that the panel of designers rated each topic at no lower than average emphasis.

2. More emphasis should be placed on design in industrial arts woodwork programs, particularly in the realm of original, creative aspects of design.

3. Other industrial materials should be utilized in the woods program so students can gain experience in combining different materials with wood to achieve a higher level of aesthetic appeal and a more functional wood product.

4. Industrial arts woodwork teachers should become more aware of the wood-product design industry in order that they be better prepared to discuss job opportunities, design literature, leaders in the design field, and design terminology.

5. All of the design topics used in the questionnaire should be made available to woodwork teachers so they will have a core of design content from which to work.

6. If industrial arts woodwork courses are to emphasize design topics considered necessary by industrial wood-product designers, then a revision of course objectives seems necessary, with more attention given to the design process.

PROBLEMS FOR FURTHER STUDY

1. An investigation should be made to determine the extent to which designers are needed in some of the major areas of the wood-product industry.

2. A study should be directed at a re-evaluation of the objectives of industrial arts woodworking with the idea of orientating the program more toward wood-product design rather than strictly skill development.

3. Research should be conducted to ascertain the feasibility of utilizing the present woodwork program facilities for teaching wood-product design.

4. A survey of the wood industry should be made to determine the specific needs of that industry in order that the objectives of industrial arts woodwork can be more accurately defined.

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A SURVEY OF OPINION REGARDING DESIGN FOR INDUSTRIAL ARTS WOODWORKING

Rating Scale:

5---Extensive emphasis.

4---Slightly above average emphasis.

3---Average emphasis.

2---Slightly below average emphasis.

1---Little emphasis.

		5	4	3	2	1
I.	TOPICS PERTAINING TO DESIGN BACKGROUND INFORMATION					
0.	(Example) Influence of arts and crafts movement.		✓			
1.	Leaders who influenced the contemporary design concept.					
2.	Present-day designers of wood products.					
3.	Contributions of the Bauhaus School.					
4.	Influence of "Machine Age" on today's design.					
5.	Role of the designer in today's society.					
6.	Appreciation for good design.					
7.	Job opportunities in the design field.					
8.	Companies that produce contemporary wood products.					
9.	Literature pertaining to industrial design.					
10.	Literature relating to industrial materials.					
11.						
12.						
13.						
II.	TOPICS PERTAINING TO THE FUNDAMENTALS OF DESIGN					
1.	Principles and elements of design.					
2.	Honest selection and usage of materials.					
3.	Meaning of "function" in the design process.					
4.	Aesthetic appeal of a design.					
5.	Basic knowledge of instrument drawing.					
6.	Concept of "simplicity" in a design.					
7.	Design vocabulary.					
8.	Basic understanding of color.					
9.	Concept of appropriate proportions.					
10.	Free-hand sketching.					
11.	Techniques of research.					
12.						
13.						
14.						
III.	TOPICS PERTAINING TO WOOD TECHNOLOGY					
1.	Physical properties of different species.					
a.	Expansion and contraction.					
b.	Relative hardness.					
c.	Color and grain character.					
d.	Bending strength.					
e.	"Oily" quality.					
f.	Resistance to decay.					
g.	Relative strength.					

		5	4	3	2	1
2.	Moisture content testing and control.	2.				
3.	Ease of laminating.	3.				
4.	Aesthetic appeal.	4.				
5.	Specification writing and purchasing.	5.				
6.		6.				
7.		7.				
8.		8.				

IV. TOPICS PERTAINING TO WOOD PRODUCTS AND RELATED MATERIALS

1.	Plastic laminates.	1.					
2.	Interior and exterior finishes.	2.					
3.	Particle board and hardboard.	3.					
4.	Wood adhesives.	4.					
5.	Textiles, such as upholstery fabrics.	5.					
6.	Metal and plastic hardware items.	6.					
7.	Hardwood and softwood plywood.	7.					
8.	Vinyl plastic.	8.					
9.	Acrylic plastic.	9.					
10.	Insulation and acoustical board.	10.					
11.	Ceramic tile.	11.					
12.	Glass.	12.					
13.		13.					
14.		14.					
15.		15.					

V. TOPICS PERTAINING TO DEVELOPMENT OF SKILL IN USING TOOLS AND MATERIALS

1.	Use of common woodwork handtools.	1.					
2.	Safe use of portable power tools.	2.					
3.	Handling and storage of materials.	3.					
4.	Treatment of plywood edges.	4.					
5.	Clamping and holding techniques.	5.					
6.	Electronic glue drying processes.	6.					
7.	Hardware installation.	7.					
8.	Application of plastic laminates and veneers.	8.					
9.	Reading and interpreting drawings.	9.					
10.	Selection and application of adhesives.	10.					
11.		11.					
12.		12.					
13.		13.					

VI. PLEASE LIST JOB OPPORTUNITIES IN WHICH A KNOWLEDGE OF WOOD DESIGN IS NECESSARY

1.
2.
3.
4.
5.
6.

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