

A COMPARISON OF EMPLOYMENT RELATED TO TWO AREAS OF INDUSTRIAL ARTS
INSTRUCTION IN MONTANA, THE NORTHWEST, AND THE UNITED STATES

A Professional Paper
Presented to
the Faculty of the School of Education
Montana State University

In Partial Fulfillment
of the Requirements for the Degree
Master of Education

by
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August 1968

ACKNOWLEDGMENT

The completion of a study of this nature requires the cooperation of many individuals in a wide range of capacities. The investigator would like to thank the Montana State University faculty members who served on his graduate committee during the course of the year.

The investigator is particularly indebted to Dr. M. S. Monson of the School of Education for the time that he patiently spent in aiding the investigator to write this paper. Also, the investigator wishes to thank Michael Murphy of the Montana State Employment Service for the time and suggestions that he gave in helping to formulate and limit the problem that was studied. Finally, the investigator would like to thank his wife, Gwen, for the unceasing encouragement, without which the paper would have been much more difficult to complete.

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ABSTRACT

The purpose of this study was to compare employment related to industrial arts woodworking and metalworking in three geographic regions: Montana, the Northwest, and the United States. The 1960 Census Reports were used as a source of data since they were found to be the only source of statistics comprehensive enough for the purposes of the study.

The data on employment were grouped according to a scheme consisting of the following categories: (1) obtaining the raw materials, (2) processing the raw materials, (3) fabrication of products, (4) occupations in manufacturing, (5) occupations in construction, and (6) occupations in other industries. First, overall comparisons were made between metal-related and wood-related employment among the three geographic regions. Secondly, comparisons were made among the specific categories of the scheme. Finally, comparisons were made among occupations related to metalworking and woodworking in the three geographic regions.

It was concluded, as a result of the study, that wood-related employment was greater than metal-related employment in Montana and the Northwest, regardless of whether the total employment scheme was considered or whether only those categories related to traditional industrial arts were considered. In the United States, however, the metal-related employment was greater than the wood-related employment regardless of how the scheme was considered. The majority of wood-related employment in Montana and the Northwest was in obtaining and processing the raw materials. The majority of metal-related employment in Montana was also in these two categories. There was a higher percentage of metal-related employment in construction in Montana and the Northwest than in the United States. The wood-related occupations that accounted for the majority of the occupational employment in all three regions were the carpenters, painters, and cabinetmakers. The metal-related occupations that accounted for the majority of the occupational employment in all three regions were the machinists, plumbers, and sheet metal workers. Tool and die makers accounted for a rather large percentage of employment in the United States but not in the other two regions.

It was recommended that woodworking could be emphasized more than metalworking in Montana in view of the employment data. A good deal of emphasis, particularly in Montana, should be placed on activities and information related to the carpenter in woodworking instruction. In metalworking, activities and information should center around the machinist, the plumber, and the sheetmetal worker. Furthermore, it was recommended that similar studies be carried out in other industrial arts areas, especially when the 1970 Census Reports are published.

CHAPTER I

INTRODUCTION AND STATEMENT OF THE PROBLEM

Introduction

Since Richards (10) of Teachers College, Columbia University, proposed that manual training be changed to industrial arts in 1909, the instructional trend in this area, at least in ideal, has been toward a study of industry. The American Industrial Arts Association (2) defines industrial arts as a "study of industrial tools, processes, materials, products, and occupations pursued for general education purposes in shops, laboratories, and drafting rooms." The degree to which contemporary industrial arts programs are meeting this definition has been the object of much recent criticism.

One important study that is resulting in much controversy currently, relative to whether industrial arts is doing what it purports to do, is the national survey of industrial arts programs conducted by Schmitt (11). As a result of this survey it was found, among other things, that objectives related to the development of handskills were emphasized to a much higher degree than were those related to a study of industry. Schmitt summarized his conclusions with the following statement:

"The current industrial program is too narrow in scope. Not only is the content too narrow with respect to course offerings, but the instructional content within the courses themselves is too narrow as well. The current industrial arts program does not even measure up to the program recommended by the profession 10 to 20 years ago."

Thus, it appears as though industrial arts programs across the nation are not meeting the objectives considered to be their responsibility. In view of this, it seems that the logical approach for industrial arts educators, to provide a study of industry for students, would be to study industry themselves and base a program of instruction on that study.

The American Council of Industrial Arts Teacher Education (1) urges teachers at all levels to relate teaching content in industrial arts to industry. It stated that this should be done with three primary purposes in mind: (1) to provide the student with an understanding of modern industry, (2) to provide the student with exploratory experiences leading to career choices, and (3) to provide the student with fundamental skills relevant to industrial occupational adjustment. The last two of these three purposes, interestingly enough, are concerned with vocational guidance. Thus, it appears that industrial arts should not only concentrate on an overall understanding of industry, but serve a vocational guidance function as well.

Vocational guidance, as one of the responsibilities of industrial arts, is consistent with many authorities in the field, Johnson (5), for example, makes the following statement:

"One of the most important objectives of industrial arts involves the exploration of industry. Information about the world of work should be a natural outcome of the study of industry. As the student studies the various industries, he should gather information about employment opportunities."

In addition, Stephenson (12) emphasizes vocational guidance in industrial arts with this statement:

"Filling the need for vocational guidance information certainly presents an opportunity, a challenge, and a responsibility to every industrial arts teacher. Of course, the very character of industrial arts is 'vocational guidance' to a great degree. Students explore many industrial areas as part of their general education. They learn the basics of several large segments of industry and, in the process, develop and discover interests and abilities."

Although industrial arts certainly cannot assume the guidance and occupational information responsibilities of the professional counselor, it can well serve as an essential part of the total guidance program. Novak (7), in fact, goes so far as to say that "the shop teacher should know more than anyone else in the school about the world of industry." One of the reasons that industrial arts seems to lend itself to a guidance function lies in the fact that it is, by definition, an "activity-centered" course. Activity, according to Paulsen (9), is essential to guidance, as illustrated by the following statement:

"Group processes must, however, provide for the personal involvement of the pupils in the activity and for the assimilation of facts in relation to personal characteristics and goals. Career conferences, per se, are not the answer. Rather, activities for the pupil must be devised so they have the experience of inquiry, discussion, reaction, and personal evaluation."

Again, however, it appears that industrial arts programs are not serving this guidance function, at least in the opinion of some critics. Haslett (4), in regard to this, states as follows:

"Most authorities say that one of the more important of industrial arts objectives is to provide information and experience which will make the student more competent to choose

vocations. Yet, far too many industrial arts programs do not meet this objective, largely because it cannot be met through project construction. To reach this objective, industrial arts departments must plan for the dissemination of related occupational information."

Thus, Haslett feels that industrial arts is not meeting its guidance and occupational information responsibilities due to a lack of planning. In combining this with what was cited above from Paulsen, it appears that activities planned in terms of occupations would be a plausible and effective way of meeting these responsibilities. Olson (8), in agreement with this proposal, states, simply, that "the content of industrial arts should be derived from activities of people working in industry."

Industrial arts, like any other school subject area, is dependent on the element of time. With the limitations imposed by time upon what instructional areas may be included, industrial arts curriculum planners must look, then, to what is important enough to warrant inclusion in a course of study in the time allotted to it. Importance in planning industrial arts activities in relation to occupations would be determined by what occupations are "important". One indication of the importance of an occupation would be the number employed in that occupation. If carpenters, for example, outnumbered cabinetmakers ten to one, the former would certainly be more important, in the present context, than the latter.

It seems, then, that a study of employment, in terms of the number employed, would serve a useful function in determining industrial

arts programs. To base a program entirely on such a study, however, would certainly be a controversial issue. The fact remains, though, that such a study could serve an important part, if not determining course content and activities, certainly as one aspect of industry on which one could choose related instruction, occupational information, and audiovisual aids.

Even in view of the importance that a study of employment appears to have in planning industrial arts, the investigator, in a rather thorough review of the literature, found only one such study. McGovern (6), using the standard industrial classification of the United States Department of Labor, ranked areas of industrial arts according to the number employed in related industries. He found, as a result of the study, that the various areas would rank as follows: drafting, metalwork, electricity-electronics, power mechanics, and general woodworking. In comparing these results to the nationwide survey conducted by Schmitt (11), it was found that industrial arts courses are not in this order across the nation. Although drafting was found to be the most emphasized area in both studies, woodworking, which occupies last place in terms of employment, ranked in the second position. Also, metalworking, which occupies second place in employment, occupied the third position in industrial arts programs nationally. Thus, it appears that industrial arts programs are not emphasized in relation to employment in industry.

In studying employment relative to industrial arts in a given geographic area, for whatever purposes one has in mind, the study must not be limited to employment nationally. Rather, employment should be studied in the area under consideration as well. Industrial arts should give due consideration for local industry as well as industry across the nation. As Gerrish (3) stated, "It would be hard to believe that schools of Muskegon, Michigan did not do some exploration of the foundry industry." In this particular city, there is a high concentration of employment in the foundry industry.

In summary, industrial arts should be a study of industry. Employment would be one indication of what instructional areas and information should be included in such a program. There has, however, been very little research on employment with this purpose in mind. To be effective and applicable, such research should not only consider employment nationally, but locally as well.

Statement of the Problem

The purpose of this study was to investigate and compare employment related to two areas of industrial arts instruction: woodworking and metalworking. Three geographic regions were considered in the study: Montana, the Northwest, and the United States. It was the desire of the investigator to gather information concerning the following:

(7)

1. What should be the relative emphasis, in the three geographic regions, of industrial arts woodworking and metalworking based on employment related to these instructional areas?
2. Within what areas of industry, related to metalworking and woodworking, does most of the employment exist in the three regions?
3. Within what occupations, related to woodworking and metalworking, does most of the employment exist in the three regions?

By gathering information relative to the above, the investigator hoped to be able to make recommendations for industrial arts based on employment in Montana, the Northwest, and the United States.

CHAPTER II

DESIGN OF THE STUDY

Sources and Procedures for Collecting Data

The 1960 Census Reports served as a source of data for the study. The number of people employed in industries and occupations related to industrial arts woodworking and metalworking were tabulated for the United States and the following five states: Montana, Washington, Oregon, Idaho, and Wyoming. In addition, the number of people employed in each occupation, according to the industry in which they were employed, was also tabulated. The data collected on the five states was then added together to represent employment in the Northwest.

To establish what occupations and industries were related to the two areas of industrial arts instruction under consideration, the following procedures were used: (1) The definitions of occupations and industries included in the Census Reports were scanned and those that pertained to woodworking or metalworking were noted. (2) The survey of industrial arts programs across the nation conducted by Schmitt (11) was referred to in order to establish what areas of industrial arts woodworking and metalworking were currently included in programs across the nation. As a result of this referral, two additional occupations were added to wood-related employment: painters and upholsterers.

Treatment of the Data

To make an overall comparison of employment related to the two areas of industrial arts under consideration, some method which would

allow for a comparatively complete representation had to be devised. To do this, the investigator consulted with Michael Murphy, Chief of Research, Montana State Employment Service Headquarters, Helena, Montana. As a result of this consultation, a scheme was devised which grouped employment related to both woodworking and metalworking into the following six categories: (1) obtaining the raw materials, (2) processing the raw materials, (3) fabrication of products, (4) occupations in manufacturing (other than the fabrication of products), (5) occupations in construction, and (6) occupations in other industries. By using this scheme, employment in industries as well as occupations could be included without counting a given employee twice. This was possible since data were available that grouped those employed in a given occupation into the industry that they were employed. Therefore, if there happened to be a number of carpenters, for example, that were employed in those industries that dealt with wood product fabrication, they would not be included in the occupational categories. For this reason, the proposed scheme was considered to be a rather complete representation of employment.

The data for wood-related employment and metal-related employment were grouped into the various categories of the scheme by definition. Totals were then computed for wood and metal-related employment in each of the geographic regions by adding together the number falling into each category of the scheme. These totals were then changed to percentages of the combined wood- and metal-related employment for each of the

three geographic regions. An overall comparison of wood-related employment to metal-related employment was then made.

Traditionally, industrial arts is related to employment included in the last four categories of the scheme. Therefore, once comparisons had been made relative to the total employment scheme, these four categories were considered by themselves. Comparisons were then made in a manner similar to that done for the total employment scheme, but with the exclusion of the two categories dealing with raw materials.

Once the overall comparisons had been made, comparisons among each of the categories and for each of the three regions were undertaken. To make such comparisons possible, the number employed in each category was changed to percentages of the total employed in all categories.

Finally, employment in occupations related to metalworking and woodworking were compared among the three regions.

From this analysis of data, conclusions were made and recommendations were proposed.

Definitions of Terms

The following definitions of terms were proposed by the investigator for the purposes of the study:

Industrial Arts - A study of industrial tools, processes, materials, products, and occupations pursued for general education purposes in shops, drafting rooms, and laboratories. (2)

Woodworking - A study of tools, processes, materials, products, and occupations related to wood.

Metalworking - A study of tools, processes, materials, products, and occupations related to metals.

Employment - The total number of people at work in a given occupation or industry or combination thereof.

Wood-Related Employment - Employment in any occupation or industry involved with wood and so defined by the 1960 Census Reports or determined by present industrial arts woodworking instruction.

Metal-Related Employment - Employment in any occupation or industry involved with wood and so defined by the 1960 Census Reports or determined by present industrial arts metalworking instruction.

The Northwest - The geographic region including the following states: Montana, Washington, Oregon, Idaho, and Wyoming.

Scheme - A plan of employment comparison in which employment related to a given industrial arts instructional area is grouped into the following categories: (1) obtaining the raw materials, (2) processing the raw materials, (3) fabrication of products, (4) occupations in manufacturing, (5) occupations in construction, and (6) occupations in other industries.

Relative Percent - The percentage of employment in a given category or occupation in comparison to the total employment in specified categories or occupations.

Limitations of the Study

The source of data for the study was limited to the 1960 Census Reports. This limitation could likely affect the validity of the study due to the obsolescence of the statistics. It was, however, necessary to impose this limitation for the following reasons:

1. The Bureau of Labor Statistics does not provide data on a sufficient number of occupations to serve the purposes of

this study.

2. The Bureau of Labor Statistics does not provide data on occupations according to the industry in which these occupations are found.
3. The employment services in the various states collect data only on employment in industries that are significant according to criteria they have specified.
4. The employment services in the various states do not collect data on employment in occupations.

It was believed by the investigator that this limitation would not seriously affect the conclusions of the study.

Significance of the Study

It is the opinion of the investigator that a study of employment would provide useful information on which to base certain aspects of industrial arts instruction. The data should prove to be of value to industrial arts educators and school administrators who are involved in curriculum or instructional improvement. It is hoped that guidance counselors will be able to apply the data in this study in planning a cooperative program of guidance through the industrial arts department in their particular school. Furthermore, the study should serve as a basis for carrying out a similar study upon publication of the 1970 Census Reports. In the end, it is hoped that this study will play some part in improving industrial arts instruction in the State of Montana.

CHAPTER III

ANALYSIS OF THE DATA

Logicality in the presentation of data is a problem faced by many writers. The data presented in this chapter is in a progression moving from the general to the specific. Information will first be presented relative to the overall wood-related and metal-related employment in the three geographic areas under consideration. Secondly, from this overall comparison, a detailed comparison will be undertaken using the data from the overall employment scheme. Thirdly, a comparison of metal-related and wood-related occupations in the three areas will be presented. In view of this, the material has been divided into two major sections: the overall comparison of employment and a comparison of employment by occupation.

Overall Comparison of Wood-Related and Metal-Related Employment

Data with regard to the scheme for employment comparison proposed by this writer in Chapter II is shown in Tables I and II for Montana, the Northwest, and the United States. These tables will serve as the basis for the overall employment comparison which this first section deals with. Wood-related and metal-related employment for the three geographic regions was divided into six categories: (1) obtaining the raw materials, (2) processing the raw materials, (3) fabrication of products, (4) occupations in other manufacturing, (5) occupations in construction, and (6) occupations in other industries. Totals were also computed for both subject areas as well as the three regions.

TABLE I

EMPLOYMENT IN MAJOR METAL-RELATED INDUSTRIES AND OCCUPATIONS IN MONTANA,
THE NORTHWEST, AND THE UNITED STATES ACCORDING TO THE
PROPOSED SCHEME - 1960 CENSUS

	Montana	North- west	United States
Obtaining Raw Materials (Mining)	4364	10697	94908
Processing Raw Materials (Primary Metal Industries)	4920	21271	1227382
Fabrication of Products (Metal Fabrication Industries)	300	15243	1292248
Occupations in Other Manufacturing (1)	361	20517	836745
Occupations in Construction (1)	762	8459	260279
Occupations in Other Industries (1)	1142	7315	257132
Totals	11849	83502	3968694

(1) includes welders, machinists, tool and die makers, job setters, boilermakers, hammermen, forgemen, blacksmiths, sheetmetal workers, filers, grinders, and plumbers and pipefitters.

TABLE II

EMPLOYMENT IN MAJOR WOOD-RELATED INDUSTRIES AND OCCUPATIONS IN MONTANA,
THE NORTHWEST, AND THE UNITED STATES ACCORDING TO THE
PROPOSED SCHEME - 1960 CENSUS

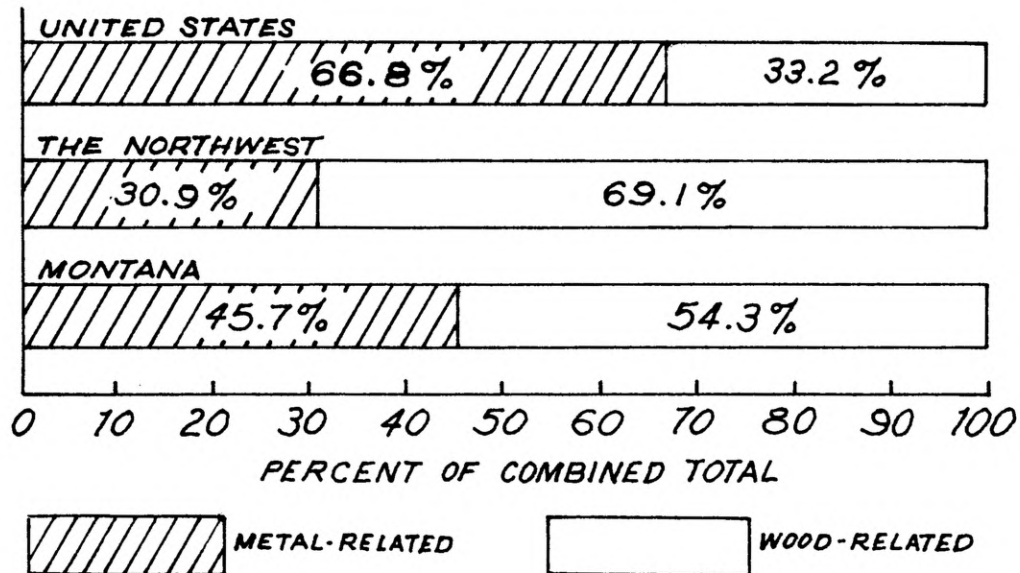
	Montana	North- west	United States
Obtaining the Raw Materials (Logging)	2311	34273	165137
Processing the Raw Materials (Sawmills and Planing Mills)	5987	106408	517186
Fabrication of Products (Furniture and Fixtures Industry)	124	6493	375497
Occupations in Other Manufacturing (1)	56	4433	140244
Occupations in Construction (1)	2993	28558	652728
Occupations in Other Industries (1)	532	6285	150231
Totals	12003	186450	2001023

(1) includes carpenters, cabinetmakers, patternmakers, and painters other than construction and maintainance.

Using the proposed scheme, it was readily apparent that the total wood-related employment was greater than the total metal-related employment in both Montana and the Northwest. In the United States in its entirety, however, the reverse was true with more workers in the metal-related employment areas. Figure 1 presents the contrasts among the three geographic regions more clearly. The data for this figure were obtained from the totals of employment in both subject areas and the three geographic areas from Tables I and II.

FIGURE 1

A COMPARISON OF WOOD-RELATED AND METAL-RELATED EMPLOYMENT
ACCORDING TO THE PROPOSED SCHEME IN MONTANA, THE NORTH-
WEST, AND THE UNITED STATES



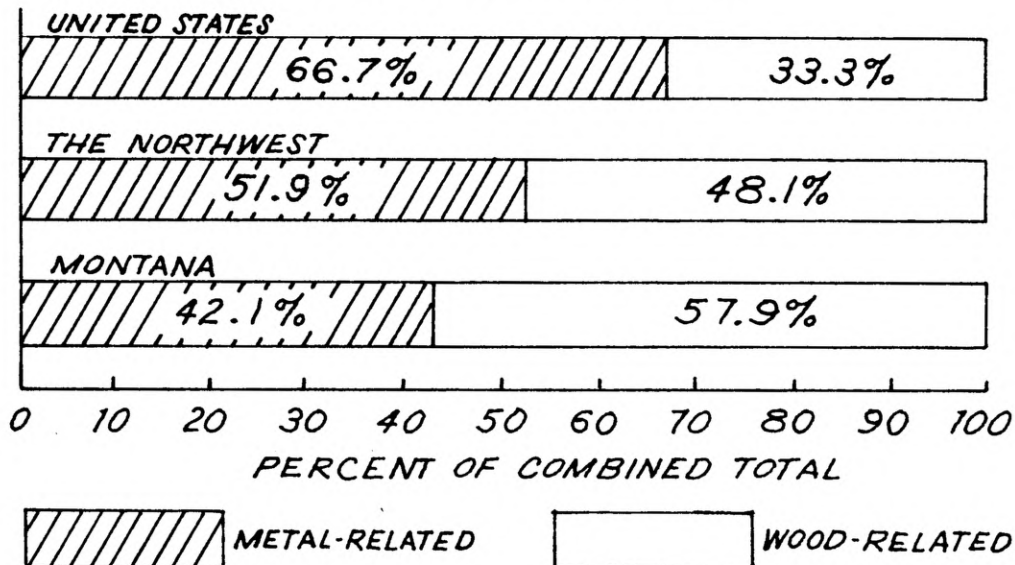
When the United States is considered in its entirety, approximately two thirds of the total employment by the scheme was found to be metal-related with the remaining one-third in the wood area. In the Northwest, however, nearly the opposite situation existed with approxi-

mately two-thirds of the workers in jobs related to wood. Montana had nearly an equal distribution in employment between the two areas with a slight majority of the workers in wood-related employment. Thus, metal-related employment was high in the United States, low in the Northwest, and approximately equal to wood-related employment in Montana.

Industrial Arts programs are traditionally involved with the last four categories of the scheme, as noted previously: fabrication of products, occupations in other manufacturing, occupations in construction, and occupations in other industries. In order, then, to make a comparison relative to industrial arts as it is presently, these last four categories were considered alone. Figure 2 presents such a comparison. Again, the source of data is Tables I and II.

FIGURE 2

A COMPARISON OF WOOD-RELATED AND METAL-RELATED EMPLOYMENT ACCORDING TO THE FOUR CATEGORIES OF THE PROPOSED SCHEME CONSIDERED TO BE RELATED TO TRADITIONAL INDUSTRIAL ARTS INSTRUCTION IN MONTANA, THE NORTHWEST, AND THE UNITED STATES



It was apparent that the same relative contrasts in employment exist when only the last four categories of the scheme were considered as those that existed when the entire employment scheme was considered. The least change in employment proportions occurred in the United States as a whole. Again, two-thirds of the employment was concentrated in the metals area. In the Northwest, the contrast was decreased with the employment nearly equal in both areas. In Montana nearly sixty percent of the employment is wood-related when the four categories related to industrial arts were considered.

Thus, regardless of whether the total scheme for wood-related and metal-related employment is considered or whether only employment related to traditional industrial arts is considered, there were more wood-related workers than metal-related workers in the Northwest and Montana. In the United States, however, there was a higher percentage of workers in the metals areas. Next, each of the specific categories of the scheme will be considered.

Table III presents the wood-related employment data from Table I in a relative percent form. Nearly half of those employed in the wood area in Montana and nearly sixty percent of the group in the Northwest were employed in processing the raw materials. This category thus accounted for the largest single group of workers, according to the scheme, in these two geographic regions. In the United States, this category accounted for only slightly over one-quarter of the total employment.

In the category which included those workers who work in obtaining the raw materials for the wood industry, there was a higher proportion of workers in Montana and the Northwest than in the United States in its entirety. Approximately nineteen percent of the total workers in the scheme were included in this group in both Montana and the Northwest. In the United States, however, approximately eight percent of the workers fell into this group.

TABLE III

RELATIVE PERCENT OF EMPLOYMENT IN MAJOR WOOD-RELATED
INDUSTRIES AND OCCUPATIONS IN MONTANA, THE NORTHWEST
AND THE UNITED STATES ACCORDING TO THE PROPOSED
SCHEME - 1960 CENSUS

	Montana	North- west	United States
Obtaining the Raw Materials	19.3	18.4	8.3
Processing the Raw Materials	49.9	57.0	25.7
Fabrication of Products	1.0	3.5	18.8
Occupations in Other Manufacturing	0.5	2.4	7.1
Occupations in Construction	24.9	15.3	32.6
Occupations in Other Industries	4.4	3.4	7.5
Totals	100.0	100.0	100.0

These two categories that are related to raw materials accounted for nearly three-fourths of the workers in the total scheme in Montana and over three-fourths of the workers in the Northwest. In the United States, however, these two categories accounted for approximately one-third of the total wood-related employment. Thus, Montana and the Northwest had the majority of their wood-related workers in obtaining and

processing the raw materials, whereas in the United States the minority of the wood-related employment was found in these two categories.

To make valid comparisons of employment related to traditional industrial arts among the three geographic regions, the remaining four categories of the scheme were treated separately due to the wide contrasts in the categories related to raw materials. Table IV presents the relative percent of employment in the three geographic regions for only the four categories of the scheme considered to be related to traditional industrial arts programs: (1) fabrication of products, (2) occupations in other manufacturing, (3) occupations in construction, and (4) occupations in other industries.

TABLE IV

RELATIVE PERCENT OF EMPLOYMENT IN FOUR CATEGORIES OF
THE PROPOSED SCHEME CONSIDERED TO BE RELATED TO
TRADITIONAL INDUSTRIAL ARTS WOODWORKING IN MONTANA,
THE NORTHWEST, AND THE UNITED STATES - 1960 CENSUS

	Montana	North- west	United States
Fabrication of Products	3.3	14.0	28.5
Occupations in Other Manufacturing	1.5	9.7	10.6
Occupations in Construction	80.8	62.5	49.5
Occupations in Other Industries	14.4	13.8	11.4
Totals	100.0	100.0	100.0

It is apparent from the data in Table IV that wood-related employment in construction was the largest of the four categories in all three geographic regions. Over three-fourths of the workers in Montana and

nearly two-thirds of the workers in the Northwest were included in this category. In the United States, however, workers in this group accounted for slightly less than half of the total employment in the four categories considered.

Another contrast is seen in the percent of workers in wood product fabrication. In the United States over a quarter of the workers considered were in this industry, whereas approximately one-half of this percent were found in this category in the Northwest. In Montana, workers in the wood fabrication industry accounted for only slightly over three percent of the total employment in the four categories.

The category which includes those workers in wood-related occupations in manufacturing, other than wood product fabrication, accounts for approximately ten percent of the total employment in the four categories in both the Northwest and the United States as a whole. In Montana this category included only slightly more than one percent of the employment under consideration. This category represented the smallest percentage of workers in all three regions. In Montana, however, the percentage of workers employed in this category was considerably less than the other two geographic regions.

There appeared to be little difference among the three regions in employment in the remaining category which includes, specifically, those workers employed in industries other than those included in the three other categories. Wood-related employment in this category accounted for

approximately fourteen percent of the total employment considered in both Montana and the Northwest. This category in the United States accounted for a slightly smaller percentage of workers, with approximately eleven percent of the total included.

Thus, significant differences existed in employment in the four categories considered to be related to present-day industrial arts woodworking among the three geographic regions. In all three regions employment in occupations in construction was the largest group of workers. This statement was particularly found to be true in Montana and the Northwest. The Manufacturing industries, represented by wood product fabrication and occupations in other industries, included a particularly small percentage of workers in Montana. The Northwest, although approximately equal to the United States in the percentage of workers in these two categories, was significantly lower than the United States the percentage of workers in wood product fabrication.

Now, a comparison of metal-related employment, similar to that just completed for wood-related employment, will be undertaken. Table V presents an overview of metal-related employment in all six categories of the scheme for the three regions under consideration in a relative percent form.

TABLE V

RELATIVE PERCENT OF EMPLOYMENT IN MAJOR METAL-RELATED
INDUSTRIES AND OCCUPATIONS IN MONTANA, THE NORTHWEST,
AND THE UNITED STATES ACCORDING TO THE PROPOSED
SCHEME - 1960 CENSUS

	Montana	North- west	United States
Obtaining the Raw Materials	36.9	12.8	2.4
Processing the Raw Materials	41.5	25.5	30.9
Fabrication of Products	2.6	18.2	32.6
Occupations in Other Manufacturing	3.0	24.5	21.1
Occupations in Construction	6.4	10.1	6.6
Occupations in Other Industries	9.6	8.9	6.4
Totals	100.0	100.0	100.0

The category of processing the raw materials accounted for nearly the largest percentage of workers in all three regions with the only exception being the United States with a slightly greater percentage in the fabrication of products category. Approximately forty percent of the total metal-related workers in Montana and approximately one-fourth of the total in the Northwest were included in this category. In the United States approximately one-third of the workers were included in processing the raw materials of the metals industries.

The category which included those who work in obtaining the raw materials, specifically metal mining, also accounted for a large percentage of the workers in Montana with nearly one-third of the total included. In the other two regions this category was not as significant. In the Northwest, approximately thirteen percent of the total metal-related employment was included in obtaining the raw materials, or metal

mining. In the United States this category represented the smallest number of workers with only slightly over two percent of the total included.

These two raw material categories dealing with obtaining and processing metal accounted for over three-fourths of the total metal-related employment in Montana and thus represented the majority of the workers in this area in the State. In the other two geographic regions, however, these two categories represented the minority of the metal-related employment with slightly over one-third of the total in both areas.

For reasons noted previously, on page 18, the remaining four categories were considered separately, similarly to that done for the wood-related employment previously. Table VI shows these four categories in a relative percent form.

TABLE VI

RELATIVE PERCENT OF EMPLOYMENT IN FOUR CATEGORIES OF
THE PROPOSED SCHEME CONSIDERED TO BE RELATED TO
TRADITIONAL INDUSTRIAL ARTS METALWORKING IN MONTANA,
THE NORTHWEST, AND THE UNITED STATES - 1960 CENSUS

	Montana	North- west	United States
Fabrication of Products	11.7	29.6	48.8
Occupations in Other Manufacturing	14.1	39.8	31.6
Occupations in Construction	29.7	16.4	9.9
Occupations in Other Industries	44.5	14.2	9.7
Totals	100.0	100.0	100.0

The first category, fabrication of metal products, accounted for nearly half of the workers in the four categories across the United States. In the Northwest, this category was also significant with nearly one-third of the total of the four categories included within it. In Montana, however, this was the smallest category, accounting for less than twelve percent of the total.

Metal workers employed in manufacturing (other than those in metal fabrication) represented the second-largest category in the United States with nearly one-third of the total included within it. In the Northwest this was the largest of those categories considered and accounted for nearly forty percent of the total metal-related employment in the four categories. In Montana, however, this category represented only slightly over fourteen percent of the total.

The two manufacturing categories, fabrication of metal products and occupations in other manufacturing, accounted for nearly eighty percent of the metal-related employment across the nation in the four categories considered and nearly seventy percent in the Northwest. In Montana these two categories accounted for only slightly more than one-quarter of the total workers considered.

Employment in metal-related occupations in construction was rather large in Montana and accounted for nearly one-third of the total. In the Northwest, about one-half this percent, or approximately sixteen percent of the workers, were in this category. Across the nation, employment in metal occupations in construction accounted for approximately ten percent

of the total workers in the four categories under consideration.

The remaining category which included occupations in other industries showed significant contrasts among the three geographic regions also. This category represented the largest percentage of metal workers in Montana and included approximately forty-five percent of the total. On the other hand, this category accounted for the smallest percentage of workers in both the Northwest and the United States. Approximately fourteen percent of the total were found in this category in the Northwest and in the United States approximately ten percent of the total was included.

Thus, in metal-related employment that is comparable to traditional industrial arts, most of the workers were found in the manufacturing area in both the Northwest and the United States. In the State of Montana, however, most of the metal-related employment was found in construction and other industries.

Comparison of Employment in Major Occupations

Wood-Related Occupations. Table VII shows the relative percent of employment, in the three geographic regions, in major occupations related to woodworking: carpenters, cabinetmakers, upholsterers, painters, and patternmakers. The carpenters clearly represented the largest occupational group in all three regions. There were significant differences in the actual percentage of carpenters in the three regions, however. In Montana nearly three-fourths of the total group were carpenters. In the Northwest

nearly two-thirds of the total employment in the occupations considered were carpenters. The United States had the smallest percentage of the workers considered in the carpentry area with slightly over half of the total of the occupational groups considered.

TABLE VII

RELATIVE PERCENT OF EMPLOYMENT IN MAJOR OCCUPATIONS
RELATED TO INDUSTRIAL ARTS WOODWORKING IN MONTANA, THE
NORTHWEST, AND THE UNITED STATES - 1960 CENSUS

	Montana	North- west	United States
Carpenters	73.8	66.0	55.6
Cabinetmakers	3.5	5.1	4.4
Upholsterers	2.6	3.3	3.7
Painters, construction and maintainance	18.4	19.4	25.1
Painters, exc. const. and maintainance	1.6	4.7	8.6
Patternmakers	0.1	1.5	2.6
Totals	100.0	100.0	100.0

The second-largest occupational group in all three regions was the construction and maintainance painters. This group accounted for approximately one-fourth of the total in the United States and approximately nineteen percent of the total in both the Northwest and Montana. Thus, in comparison with the carpenters, a reversal in trend was evident in the respect that there was a higher percentage of construction and maintainance painters in the United States than in the other two geographic regions.

These two occupational groups represented a large majority of the total occupational employment considered. In Montana over ninety percent of the total was represented, in the Northwest over eighty-five percent

of the total was represented, and in the United States over eighty percent of the total was represented.

The next largest percentage of workers in all three regions was represented by the cabinetmakers. There was a slightly larger percentage of workers in this occupation in the Northwest (5.1 percent) than in either Montana (3.5 percent) or the United States (4.4 percent).

The three remaining occupational groups, in order of their relative size in all three regions, were the upholsterers, painters, (except construction and maintainance), and patternmakers. When these three groups were combined, they represented a smaller percentage of the total in Montana (4.3 percent) and the Northwest (9.5 percent) than in the United States (14.9 percent).

Thus, it was apparent from the data that the carpenters, by far, represented the largest occupational group in all three regions and there was a higher percentage of these workers in the Northwest, and particularly in Montana, than in the United States in its entirety. In the other five occupational groups, with the exception of the cabinetmakers in the Northwest, there was a higher percentage of workers in the United States than in the other two regions.

Metal-Related Occupations. Table VIII shows the relative percent of employment in metal-related occupations similar to that which was presented in the previous section for wood-related occupations. In comparing wood-related occupational employment with metal-related occupational employment,

it was apparent that one singular occupational group did not dominate the employment picture in the latter as the carpenters did in the former.

Machinists represented the largest occupational group in all three regions with approximately one-third of the total in each. In Montana, however, there was little difference between the percentage of employment of machinists and that for plumbers, with the latter accounting for approximately one-third of the total also. In the other two regions, the plumbers also represented the second-largest occupational group with approximately one-fourth of the total in the Northwest and approximately one-fifth of the total in the United States.

TABLE VIII

RELATIVE PERCENT OF EMPLOYMENT IN MAJOR OCCUPATIONS
RELATED TO INDUSTRIAL ARTS METALWORKING IN MONTANA, THE
NORTHWEST, AND THE UNITED STATES - 1960 CENSUS

	Montana	North- west	United States
Blacksmiths	4.5	8.2	1.5
Boilermakers	6.2	2.4	1.7
Forgemen and Hammermen	0.1	0.3	0.8
Annealers and Temperers	0.0	0.4	1.4
Jewelers, Watchmakers, and Smiths	4.4	3.2	2.4
Jobsetters	0.0	2.0	2.7
Machinists	33.9	33.4	35.3
Metal Molders	1.0	1.9	3.5
Plumbers and Pipefitters	33.8	24.4	21.7
Rollers and Rollhands	0.0	0.6	2.0
Structural Metal Workers	3.9	6.5	4.2
Tinsmiths and Sheetmetal Workers	11.7	12.3	9.5
Tool and Die Makers	0.4	4.2	12.8
Metal Heaters	0.0	0.2	0.5
Totals	100.0	100.0	100.0

Tinsmiths and sheetmetal workers, although significantly smaller in percentage than either the machinists or the plumbers, represented the third-largest occupational group in Montana and the Northwest, and the fourth-largest occupational group in the United States. In both Montana and the Northwest this group accounted for approximately twelve percent of the total. In the United States, this group accounted for slightly less of the total than in the other two regions with approximately ten percent.

When these three groups -- machinists, sheetmetal workers, and plumbers -- were combined they represented the large majority of the total occupational employment in all three regions. In Montana this threesome accounted for nearly eighty percent of the total and in the other two regions it accounted for approximately seventy percent of the total.

Tool and die makers represented the third-largest occupational group in the United States and accounted for approximately thirteen percent of the total. In the other two regions, this occupation was relatively insignificant with less than one-percent in Montana and approximately four percent in the Northwest.

Of the remaining occupations, which constituted the minority of the total, the percentage of blacksmiths, boilermakers, and jewelers was higher in both Montana and the Northwest than in the United States. Also, the percentage of structural steel workers was higher in the Northwest (6.5 percent) than in either Montana (3.9 percent) or the United States (4.2 percent).

On the other hand, the occupations of forgers and hammermen, annealers and temperers, jobsetters, metal molders, rollers and roll-hands, and metal heaters represented a smaller percentage of the total in Montana and the Northwest than they did when the United States was considered in its entirety.

Thus, in summary, it was found that most of the employment related to woodworking was included in the occupations of carpenters, painters, and cabinetmakers. In metal-related employment, most of the workers were employed as machinists, plumbers, and sheetmetal workers. The next chapter includes a summary of the study, conclusions, and recommendations.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to compare employment related to industrial arts woodworking and metalworking in three geographic regions: Montana, the Northwest, and the United States. The 1960 Census Reports were used as a source of data since they were found to be the only source of statistics comprehensive enough for the purposes of the study.

The data on employment were grouped according to a scheme consisting of the following six categories: (1) obtaining the raw materials, (2) processing the raw materials, (3) fabrication of products, (4) occupations in manufacturing, (5) occupations in construction, and (6) occupations in other industries. First, overall comparisons were made between metal-related and wood-related employment among the three geographic regions. Secondly, comparisons were made among the specific categories of the scheme. Finally, comparisons were made among occupations related to metalworking and woodworking in the three geographic regions.

Conclusions

The following conclusions were made based on an analysis of the employment data:

1. There was more wood-related employment than metal-related employment in Montana and the Northwest, regardless of whether employment related to raw materials was considered or not. The opposite, however, was true in the United States.
2. The majority of the wood-related employment in Montana and the Northwest was in obtaining and processing the raw materials.

3. The construction industry accounted for a large proportion of wood-related employment in all three regions, but the proportion was especially large in Montana and the Northwest.
4. The percentage of workers employed in the fabrication of wood products was particularly low in comparison to that in the entire United States.
5. The percentage of wood-related workers in manufacturing was lower in Montana and the Northwest than in the United States.
6. Employment in occupations related to woodworking, in order of the percentage employed, was the same in all three regions: carpenters, painters, cabinetmakers, upholsterers, and patternmakers. There was, however, a larger percentage of carpenters in Montana and the Northwest than in the United States.
7. Although painters represented the second-largest wood-related occupational group, most of them were employed as construction and maintenance painters.
8. The majority of metal-related workers in Montana were involved in processing and obtaining the raw materials.
9. When only employment considered to be related to traditional industrial arts metalwork was considered, there was a higher percentage of these workers in Montana in the construction industry and other non-manufacturing industries.
10. Employment in metal manufacturing was less in the Northwest and Montana than in the United States. In the two larger geographic regions, however, metal manufacturing accounted for the majority of the employment.
11. Machinists represented the largest metal-related occupational group in all three regions.
12. Plumbers accounted for the second-largest metal-related occupational group in all three regions. In Montana, however, the plumbers accounted for nearly the same percentage of metal-related employment as the machinists did.
13. Sheetmetal workers accounted for the third-largest occupational group related to metals in Montana and the Northwest and the fourth-largest in the United States.
14. Tool and die makers accounted for a larger percentage of workers in the United States than in the other two regions, and accounted for the third-largest occupational group in the nation.

15. Blacksmiths, boilermakers, and jewelers accounted for a larger percentage of workers in Montana and the Northwest than in the United States.

Recommendations

The following recommendations for industrial arts became evident to the investigator based on the employment data analyzed in this study:

1. For a total study of industry in Montana, attention should be given to raw materials, particularly processing, in both industrial arts woodworking and metalworking, but especially so in the former.
2. Industrial arts programs in Montana would appear to be justified in giving more emphasis to woodworking than metalworking. If this is done, however, more emphasis should be given to the construction aspects of woodworking rather than manufacturing.
3. In all industrial arts woodworking programs, particularly in Montana, a good deal of emphasis should be given to the occupation of the carpenter.
4. Finishing, as an instructional area of industrial arts, should receive a good deal of emphasis in all programs.
5. Based on employment in occupations, industrial arts programs should emphasize activities and information in woodworking in the following order: carpentry, finishing, cabinetmaking, upholstering, and patternmaking.
6. In industrial arts metalworking, activities and information related to the construction industry should be emphasized more than those related to manufacturing.
7. The majority of the activities in industrial arts metalworking should be related to the following three occupations, in order of emphasis: machinists, plumbers, and sheetmetal workers.
8. Activities and information related to the occupation of the plumber should be particularly emphasized in Montana industrial arts programs.
9. Studies on employment should be conducted on other areas of industrial arts instruction.

10. Studies related to employment growth in occupations and industries should be undertaken to see which are experiencing the most growth.
11. Upon publication of the 1970 Census Reports, a study similar to this should be undertaken to up-date the data.

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