Date: July 1956

Name: Everett Byrd Position: Graduate Student

Institution: Oklahoma A. & M. College Location: Stillwater, Oklahoma

Title of Thesis: LEFT-HANDEDNESS AS IT AFFECTS INDUSTRIAL ARTS STUDENTS

Number of Pages in Study: 58

Under Direction of What Department: School of Industrial Arts Education and Engineering Shopwork

Scope and Method of Study: The problems that left-handed students have in Industrial Arts courses, are more than in other courses. It involves the instructor, machinery, and the manipulation of hand tools. Thus, for this reason, the problems of a left-handed student are more serious in Industrial Arts. A questionnaire was filled out by high school and college students in Oklahoma and some left-handed people were interviewed personally. The respondents data was used as the basis for the report of this survey, other related information was acquired through extensive library research.

Findings and Conclusions: The left-handed person is not abnormal. Left-handed individuals enjoy advantages in some fields. The percentage of left-handed individuals is increasing. Forced change of handedness may present difficult maladjustments. Instructors are aware of the problems encountered by their left-handed students. Some of the suggestions for helping left-handed students are: individual instruction, encourage left-handed students to enroll in shop classes, provide left-handed tablet arm chairs, attach vises on right-hand corner of benches, and place the student at work stations so that the light comes over his right shoulder. Finally, encourage industrial arts teachers to become more cognizant of the difficulties encountered by left-handed students.

ADVISER'S APPROVAL C. L. Ihrig

LEFT-HANDEDNESS AS IT AFFECTS INDUSTRIAL ARTS STUDENTS

LEFT-HANDEDNESS AS IT AFFECTS INDUSTRIAL ARTS STUDENTS

A Report

By

EVERETT BYRD

Bachelor of Science

Northeastern State Teachers College

Tahlequah, Oklahoma

1949

Submitted to the School of
Industrial Arts Education and Engineering Shopwork
Oklahoma Agricultural and Mechanical College
in partial fulfillment of the requirements
for the degree of
MASTER OF SCIENCE
July, 1956

LEFT-HANDEDNESS AS IT AFFECTS INDUSTRIAL ARTS STUDENTS

EVERETT BYRD

MASTER OF SCIENCE

1956

REPORT APPROVED:

C. L. Hill
Associate Professor and Head,
School of Industrial Arts Education
and Engineering Shopwork

L. H. Bengtson
Associate Professor,
School of Industrial Arts Education
and Engineering Shopwork

M. R. Lohmann
Dean, Oklahoma Institute of Technology

Robert MacVicar
Dean of the Graduate School

ACKNOWLEDGEMENT

Grateful acknowledgement is hereby given to the following persons, without whose help it would have been virtually impossible to complete this writing: Mr. C. L. Hill, Head of the School of Industrial Arts and Engineering Shopwork, Oklahoma Agricultural and Mechanical College, Stillwater, Oklahoma, for his guidance and continuous leadership; and to Mr. John B. Tate and Mr. L. H. Bengston, Staff Members in the School of Industrial Arts and Engineering Shopwork, for their generous assistance and advice:

To my son Harley Andrew who inspired me to become interested in the problems that left-handers have while manipulating tools, also to my wife, Irene Delilia, most sincere appreciation is expressed for her assistance in typing the preliminary copies and continual inspiration which has made possible the completion of this problem.

E. B.

TABLE OF CONTENTS

CHAPTER I

THE STATEMENT OF THE PROBLEM

This study is an investigation of problems of left-handed students in industrial arts in the secondary schools in the state of Oklahoma. An attempt has been made to locate some of the problems, to find the cause of those problems, and to suggest possible solutions.

The Need for Present Study. In an attempt to locate problems of left-handed students in industrial arts, the writer has tried to find what adaptations have been made to equipment by industrial arts instructors to better fit tools and machinery for use by left-handed students. Information has been sought concerning changes that have been made in presenting instructional material to left-handed students. Data to ascertain whether or not left-handed students, because of their handedness, were advised not to enroll for industrial arts courses was also requested from instructors. In addition the writer hopes to present problems of left-handed students in such a way as to focus the attention of industrial arts teachers on those problems.

The Problem Stated. From the preceding information one can definitely see the problem that presents itself: Until the present time relatively little consideration has been given the left-handed student in selection and arrangement of classrooms and shops.

Organization of the Study. Chapter I of this report acquaints the reader with the statement of the problem and the methods used in obtaining the information necessary for this study. Chapter II reviews the history

and philosophy of industrial arts and gives in some detail the problems that instructors have in schools to-day with left-handed students. Chapter III reviews some facts about left-handedness, recommendations for a left- and right-handed alphabet to be taught in mechanical drawing, and current beliefs. Chapter IV is a summary of findings and recommendations.

Delimitations of the Study. The research part of this study will be limited to left-handed students and industrial arts instructors. The major portion of the study is concerned with the problems instructors have getting left-handed students to feel as important as other students and helping them develop their talents and to use them for the benefit of themselves and their fellow men.

Definitions of Selected Terms. It will be necessary to propose exact statements of definitions as they are used in this study, for they are in use by the writers of books and surveys that were used in gathering material for this report.

> Dominant. Ruling; governing; in Genetics, designating a character transmitted by one parent of a hybrid offspring, in which it appears to the exclusion of the contrasted character transmitted by the other parent.
>
> Genotypical. A type representative of a group of organisms; the most typical of a genus.
>
> Phenotypical. A type or strain of organisms distinguishable from others by some visibly manifested group of characters, as contrasted with genetic constitution.
>
> Ambidextrous. Able to use both hands equally well.
>
> Ambidexterity. The state or quality of being ambidextrous; duplicity; trickery.
>
> Artifact. Anything made or modified by human art.

Industrial Arts. According to the definition in the "Oklahoma Advisory Committee Report" of 1950, industrial arts affords the opportunity to meet the needs just mentioned. This definition is probably quoted more

extensively in Oklahoma industrial arts literature than any of the other quoted definitions of industrial arts.

> Industrial arts, as a school subject, may be defined as a study of the processes, tools, and machines by means of which the forces of nature are utilized and the raw materials of nature are changed by man to make them more valuable and pleasing. It includes an understanding of the native qualities of raw materials and of the natural forces, together with a knowledge of the methods and practices of utilizing and changing these materials and forces. It is also concerned with the social and economic problems incident to these changes. (38, page 34)

From this authoritative definition, the reader should be able to understand more clearly the meaning of the term "industrial arts".

Methods Used in Collecting Information. The information used in this study is based on different sources of information. Research forms filled out by 1200 high school students, 250 college students, and by personal interviews, when compiled and computed gave very valuable information. Several studies relating to left-handedness were summarized.

The Outcome of the Study. The writer assumes that the educational world in general has done very little to assist the left-handed individual. These assumptions are based on the following observations:

A. No exclusive left-handed retail stores.

B. Lack of left-handed equipment in school during writer's school life.

C. Teachers did not attempt to help left-handed students.

D. Observed teachers trying to change students from left- to right-handedness.

E. Writer's son left-handed.

F. Many superstitions about left-handedness.

G. Society's complete disregard for problems encountered by left-handed individuals.

The following chapter will furnish the reader with the necessary historical background in the field of industrial arts.

CHAPTER II

THE HISTORICAL BACKGROUND OF INDUSTRIAL ARTS

Industrial education had its beginning centuries ago but, due to its early unorganized form, it was not recognized as such. In early days the industrial problem was that of securing food and shelter for the family; father usually taught son but this responsibility could be assumed by any member of the tribe. The method used was usually that of demonstration and practice on the job. From this crude method came the organized apprenticeship training, which survived the blackout of the dark ages, gained strength during the Feudal Period, and reached its peak with the aid of the trade guilds during the Rennaissance.

Part A

Early History

Doubtless, much of the progress of industrial arts can be traced back to the influence of the trade guilds; because of their ideals in workmanship, their systematic methods of procedure and their pride in craftsmanship.

The guilds were originated to give social and economic protection to its members against neighbors and feudal lords who were trying to capitalize on their trade. The guilds were important because they provided members with the only education that was available during a time when all forms of learning were near a standstill. The influence of the guilds caused a gradual evolution from serfdom to freedom, and from laborer to owner.

The guilds operated very effectively up to the middle of the fourteenth century, then their influence began to weaken. This was due, in part, to restrictions that specified in detail just what each member could make. Other reasons for the decline were rivalry of trade rights and loss of close relationship between master and the apprentice. The following discussions will be centered around the early European leaders.

Martin Luther, (1453-1546) a protestant reformer, of German origin, was opposed to the type of education given by monastic and ecclesiastical schools. He proposed to have the powers come through the power of state. The right kind of school should be given to "all the people, noble and common, rich and poor"; it was to include both boys and girls. This was a remarkable advance.

Rabelias, (1483-1553) a Frenchman, introduced the objects and observation of processes into the methods of teaching.

Mulcaster, (1532-1611) a head master in England, was noted for his poor style of writing and was one of the first to advocate drawing. He recommended that teacher training be set up in colleges.

Bacon, (1561-1626) an Englishman, was known for his essays and substitution of nature for dialectics. He was the first to use the term "manual arts".

Comenius, (1592-1670) of Moravian origin, who practiced in Germany, is called the father of modern education and was responsible for the intergression of subject matter which was unheard of up to this time. He believed that pupil idleness was due to inefficient teaching.

Hartlib, (1600-1670) of German origin, practiced in England. He

was one of the first to suggest a bureau of labor in government and proposed that agricultural colleges be established in different parts of the country.

Sir William Petty, (1623-1687) of England, proposed to connect handwork with liberal arts and also that industrial occupation be a part of school work. He was a political economist, who believed in education for the upper class only. His chief aim in placing things and handwork in the school was to further general education and not to produce artisans.

Locke, (1632-1704) of England, wrote many essays on human understanding. He believed in educating for practical life and insisted that manual arts should be taught.

Budd, (1685-1735) an Englishman who practiced in America believed in compulsory education, allocation of land grants to schools, and that young people should have a choice of vocations.

Jacques Rousseau, (1712-1778) a great leader in the eighteenth century created much disturbance in the educational circle when he published a book entitled, Emile. This was the beginning of an educational upheaval that led to his being sent out of France. The educational philosophy that he proposed was too far advanced for that age of thinking. He believed that a child could learn much more by doing than by study or verbal instruction. His recognition of the fact that manual arts may be a means of mental training marked the beginning of a new era in education. However, he did not put his theory into practice.

Rousseau's philosophy has been summarized by Anderson as follows:

> Instead of resorting for a livelihood to those high knowledges

> which are required for nourishing the soul and not the body, if you resort, in case of need, to your hands and the use which you have learned to make of them, all difficulties disappear; you have resources always ready at the moment of need. (1, page 50)

Francke, (1663-1727) of Germany, was one of the leaders for schools for the poor, with teacher training for qualifications of teachers. He believed that manual arts should be taught for economic purposes only. In his handwork instruction no classroom credit was given, however, it was used to serve as leisure time employment. This method had been proposed by other reformers during the seventeenth century but nothing was done about it until Francke, a professor of oriental languages, in Halle, Germany, started an orphanage. Francke's purpose for this type of instruction was to make the student more efficient.

Hecker, (1707-1768) of Germany, proposed the use of true-to-life objects and models for training pupils and actual manipulation of tools and materials. He was a former student of Franche, and founded a realschule in Berlin in 1747. His objectives were:

> To develop the tendencies of such young people as are not destined for studious pursuits but whose talents would fit them for business, for agriculture, for the industrial and fine arts, etc., and to afford them an introductory training for these pursuits. (1, page 43)

Hecker's aim was not to make master craftsmen out of his students, but to prepare them to enter industrial work and be able to transfer their training to the specific occupations they chose to enter.

Basedow, (1724-1790) of Germany, wrote many books on methods of teaching and felt that the recognition of individual ability should be given more attention. He, like Rousseau, believed that the best way to get knowledge was through the senses and through experience. However, when the thing needed in such instruction was not available he would

resort to models and drawings. Basedow's plan involved the vivid presentation to students either by objects or pictures.

Campe, (1746-1818) of Germany, followed in the footsteps of Basedow. He was a preacher and studied at Hall but was never ordained because of his rudeness. He was a leader in recognition of individual ability.

Pestalozzi, (1746-1827) a Swiss educator, was another great leader of the eighteenth and early part of nineteenth century. He advanced much further in his instructional theory than writers of the preceding century. His newly-advanced theory resulted in the supplanting of the old method of expressing thoughts verbally with handling, observing, and working with the object. Pestalozzi believed that the child developed mentally much faster through manual manipulation than by visual knowledge of the work.

Pestalozzi, called the "Father of Manual Training", instituted an industrial school for the poor, in which different tasks were performed. From childhood Pestalozzi had a strong desire to help poor children. The reformer prescribed and practiced the plan of having his artisans work in the following occupations: (a) farming, (b) spinning, and (c) weaving. In this experiment it was never believed that the tasks were related to intellectual development. Bennett has quoted the following paragraphs which were written by Pestalozzi:

> I have for a long time thought it probable that, under favorable circumstances, young children might be able to earn their own living without undue labor, provided that enough capital were advanced to organize an establishment, in which they would not only live, but at the same time receive a certain elementary education. I consider that any careful experiment in this direction would be of the highest importance to humanity.....
>
> I have proved that it is not regular work that stops the development of so many poor children, but the turmoil and irregularity of their lives, the privations they endure, the excess they indulge

> in when the opportunity offers, the wild rebellious passions so seldom restrained, and the hopelessness to which they are so often a prey.
>
> I have proved that children, after having lost health, strength, and courage in a life of idleness and mendicity, have, when once set to regular work, quickly recover their health and spirits, and grow rapidly. Such is the effect of altered circumstances, and the absences of disquieting influences. (3, page 112)

Pestalozzi's experiment with these children lasted five years. It was not a success financially, but Pestalozzi was convinced that the principles upon which he had based his experiment were sound. "There are two ways of instructing," said Pestalozzi, "either we go from words to things or from things to words. Mine is the second method." (3, page 119)

Fallenberg, (1771-1844) a Swiss educator, was a father, nobleman, private tutor and a lover of freedom. He, like Pestalozzi, had a strong desire to help the poor. He believed that education should be reformed and extended to meet more needs. In 1799 he established schools on his estate at Hofwyl in Berne, Switzerland. Fallenberg taught such subjects as agriculture, carpentry and cardboard work in addition to ordinary school subjects. He believed that theory and practice should be closely connected. (3, page 137)

Fallenberg had set a precedent for future schools to follow and it became quite popular. Its fame spread throughout Europe as well as the United States. The American Manual Labor Schools were examples of his philosophy. The students worked for their room and board and received instruction in industrial subjects during their off hours.

Heusinger, (1766-1837) a German philosopher, believed that handwork was the most important way of acquiring knowledge. As could be expected manual work was the center of his system.

Herbart, (1776-1841) of Germany, was interested in social influences. He insisted that interest is a prerequisite to instruction. He is most noted for his suggested five steps of teaching a lesson. The steps are: (1) preparation, (2) presentation, (3) comparison and association, (4) generalization, and (5) application. He believed in correlating one subject to another and the correlation of all subjects to life.

Fredrick Froebel, (1783-1852) a German educator and the son of a Lutheran minister, was very eager to capitalize on Heusinger's and Pestalozzi's ideas and methods. He has been given credit for placing handwork at the center of general education. Froebel was a student of Pestalozzi for two years and would naturally pattern after his ideas. Bennett gives the following remarks about Froebel:

> It was he who took Pestalozzi's idea of organic growth and developed it into the doctrine of self-activity which he made the very center of his educational theory. He took Pestalozzi's practice of training in observation and sense perception and expanded and systematized it until he produced the kindergarten gifts and occupations. (3, page 161)

Froebel realized the importance of controlling the energy of children by directing that energy into useful channels. He had trouble, while a student in school, accepting the educational principles of the day.

The Origin of Sloyd. The idea of the sloyd system originated in Germany but spread rapidly to the Scandinavian countries of Finland, Norway, Sweden, and Denmark. The leading factor favoring its acceptance can be attributed to the long winter nights and short working days. The people spent many hours within the four walls of their cottages with nothing to do, so it became the custom for the family to sit around the fire, in the evening, and make useful articles for the home. Some of these articles were hammer handles, axe handles, table spoons and any other articles made from wood that they might use. The mother and

daughter would spin, weave, knit and sew the clothing for the family. As time passed the people were able to sell some of their products made at home. This slowly transformed the home sloyd into domestic industries. Sometimes a certain village would become famous for a specific article and every boy in the village would be taught that particular branch of handiwork.

The introduction of power machinery, and factory system, gradually stole away the profits and the system of domestic industries vanished. The men were induced to leave home during the winter months in search of employment. The women no longer had the time for handicraft, either. It was now cheaper to buy the factory made articles. A large part of the population began to spend their lesiure hours in the production, sale, and use of brandy. The public health was impaired from this excess and, at the same time, crimes and public offenses increased. Domestic sloyd disappeared altogether. The boys and young men, no longer spent their evening by the home fireside, but away from home and often in public houses where liquor was obtained. The result was a breaking down of standards of both skill and character among the boys and young men.

The leaders in national policy foresaw the serious results of the social and industrial conditions of that time. They realized that the home life of former years could not be brought back again and sought to correct the social and industrial conditions by establishing schools in which sloyd was taught.

Early Sloyd Schools. The early sloyd schools were concerned mainly with the market value of the articles made. The boys were paid when and if the articles were sold. The pupils made what the market would purchase with little thought of its educational value. The teacher was more concerned with production and sales than with the educational value.

The early schools were on an economical basis yet the idea persisted that skill in sloyd and good character were developed together.

Educational Sloyd. Cygnaeus was the first director of popular education in Finland. He established a school in 1863, patterned after schools in Switzerland which he had visited. The time of the student was divided between studies, domestic industries, and work in the garden and field. Here he trained teachers before putting his plan for public schools into full operation. Under the law of 1866 the elementary school period covered six years. Two years were spent in the lower elementary and four years were spent in the higher elementary. Handwork was encouraged in the lower elementary but was compulsory throughout the higher elementary schools. The boys were taught woodwork and the girls needlework. Four to six hours each week were given to this pursuit. This was the first time any nation had made handwork an integral part of a national scheme of elementary education. Handwork was given a legitimate place with other subjects and was taught by the teacher himself.

In 1872 Salomon, with the aid of Abrahamson, opened an industrial school at Naas, Sweden. Many kinds of sloyd were taught here. The course covered two years. Seven hours were given to sloyd each day, three hours to other subjects. Two years later a similar school was started for girls. This same year Salomon was appointed inspector of a group of sloyd schools and he soon realized the need for training special sloyd teachers. He then opened a class for teachers at Naas side by side with those for children. Salomon's main purpose was to train children of workmen the love of work and teach them to use their hands.

Salomon visited Finland in 1877 and met Cygnaeus, founder of the folk school system of that country. It was from Cygnaeus that Salomon received the idea that sloyd should become an integral part of the course

of instruction of the elementary school, and that it should be organized on a pedagogic rather than an economic basis. Salomon returned to Sweden and after much study developed what he called the educational sloyd. He arranged short courses, five to six weeks for the folk-school teachers. The summer courses attracted teachers from every progressive country in the world and made Sweden sloyd famous.

In no respect was the contrast greater, between the Russian system and the Swedish system as developed by Salomon, than in the aim of the work. The purpose of the Russian system was definitely to train skillful, intelligent mechanics. Its purpose was strictly vocational. The Swedish purpose, on the contrary, was for general education. It was considered valuable for every child. The Russian system was devised by a government engineer and was put into operation, like other engineering enterprises, with speed in learning and the engineering result constantly in view. There was little regard for individual capacities; it was a mass-production system of special education. The Swedish system was worked out by an educator whose fundamental interest was the enrichment of the education of all children during the elementary-school period, with the recognization of individual-production system, not a mass-production system of general education. It was, in this respect, an important contribution to present-day ideals and practices in elementary education. (3, page 64)

The Russian System. A school of Trades and Industries, established in Moscow in 1830, became successful as a polytechnic school, in 1868. The course of instruction required six years for completion. Training was provided for civil engineers, mechanical engineers, draftsmen, foremen, and chemists. Theoretical instruction was given and, to supplement this, extensive workshops were provided in order to give the most thorough and effective practical instruction. Large contracts for actual work

were taken and carried out partly by hired workmen and partly by students. This plan of having students learn by imitation or the apprenticeship method was not satisfactory. For this reason, Victor Della-Vos, the director, worked out a new system in 1868, that involved the organization of instruction shops separate from the construction shops where orders for private individuals were filled. Students must complete the required course in the instruction shop before working in the construction shop. Some of the objectives as listed by Bennett were:

> The end sought in the new system was to teach the fundamentals of the mechanic arts: (a) in the least possible time; (b) in such a way as to make possible the giving of adequate instruction to a large number of students at one time; (c) by a method that would give to the study of practical shopwork "the character of a sound, systematical acquirement of knowledge"; and (d) so as to enable the teacher to determine the progress of each student at any time. (3, page 16)

The Russian plan was that of analyzing workshop operations into their elementary processes, of arranging these in a graduated series and making them the object of systematic drill by the student.

The resultant influence of this school was so great that it was responsible for the opening of the school of mechanic arts at the Massachusetts Institute of Technology in Boston in 1876. The impetus given by this school, and others comparable, resulted in the movement to establish manual training schools all over the United States.

Part B

History of the Development in America

When this country was first colonized the people had little or no time for a regular school curriculum, but everyone worked with his hands in order that civilization in the colonies might survive. The children were taught reading and writing as a safeguard to democracy. The necessary skills in handwork were handed down from father to son and from mother to daughter.

Examples in Colonial America. The earliest attempt at industrial education in America was in New Mexico and California by the Franciscans in 1630. The pupils were taught reading, writing, singing, and playing on musical instruments up to nine years of age. From nine years on the work was almost wholly industrial, consisting of tailoring, shoemaking, carpentering, carving, blacksmithing, and stonecutting. At first the missionaries were the teachers, but later the most skilled of the native artisans took their places. During the Indian rebellion in 1680 all this training was destroyed, but was later re-established in Texas. (3, page 73)

Many trades were available in Colonial America. The skills and knowledge of these trades were handed down through a form of apprenticeship training. The apprenticeship training was like a father-son relationship; and the craftsman was to clothe, feed and teach him the skills of the trade.

The colonies in America were a haven for a group of people in Europe who wanted a place to practice their religious beliefs. Some people were released from prison if they agreed to come to America and stay. In 1820, Joseph Neff and William Maclure organized what was known as the manual labor movement in the United States. Maclure, a great social worker and philanthropist believed that the school could be self supporting from the products made and sold by the school. This plan failed as did many others because of poor organization, administration and the financial part was not successful.

Down to the close of the first quarter of the nineteenth century the history of vocational education in the United States was little different from that of Europe through the Middle Ages. In the earliest period of American history some form of apprenticeship constituted the chief means of training for all but the common laborer, but almost from

the first efforts were made to provide some sort of school for the learned professions.

Industrial Arts in the Nineteenth Century. During the period from 1820 to 1860, the educational leaders began to realize the need of a curriculum of instruction, different from the regular textbook variety. As a result of this thinking the Mechanic Institute Movement was started. This was primarily for the purpose of instruction in secondary and technical education subjects. The most famous of these institutes were: the Ohio Mechanics Institute in Cincinnati, the Worchester County Free Institute, the General Society of Mechanics and Tradesmen in New York City, the Mechanic Arts at the Massachusetts Institute of Technology, and the Franklin Institute of Philadelphia.

It was with the passage of the Morrill Act in 1862, which provided for the establishment of the land grant colleges, that training in the higher phases of agriculture and mechanical occupations became an established function of American Public education. In 1870, Massachusetts introduced, by law, industrial drawing into its public schools. At that time there was a lack of an effective and economical method for introduction of actual work with tools.

Engineering colleges were in search of a method to provide practical training in the use of tools and machinery for their students. It was the Russian exhibit at the Centennial Exposition, in Philadelphia, in 1876 that two American leaders, Professor John D. Runkle of Massachusetts Institute of Technology, Boston, and Dr. Woodward of Washington University, St. Louis, discovered what they believed to be the long sought method. This method was introduced by those who were seeking to employ handwork in the schools as a means of liberal culture as well as the colleges of mechanical engineering. In one of his clearest characterizations of the

system Runkle said:

> Russia for the first time, has built up a school for instruction -- not construction, but instruction in the use of tools. We think that they make this instruction just as systematic as our instruction is in mathematics, chemistry, drawing, or any other subject. The instruction is given to classes. (1, page 159)

The need for handwork in schools had long been recognized and it was Runkle's proclamation of his discovery of the Russian system and his plan for using it, not only in engineering but also in general education, which marks the beginning of the manual training movement.

It was Runkle's report to the Corporation of the Massachusetts Institute of Technology on the Russian System of Shopwork that led to its adoption and to the establishment of a School of the Mechanic Arts.

In St. Louis, experiments had been carried on in workshop instruction, at Washington University, since its founding in the early sixties. Calvin M. Woodward, Professor of Mathematics and Mechanics received fresh encouragement from Runkle's discovery. A school organized by Dr. Woodward became the pattern of a new kind of secondary school, the manual training high school. Many schools of this type were established in the nineteen eighties and nineties.

Meanwhile, the development of the kindergarten in this country was giving a powerful impetus to the movement for industrial education in the public school. An association, formed in the city of New York for the support of a practical kind of kindergarten, was reorganized in 1885 as the Industrial Education Association of New York City. Due to its success, in persuading schools to introduce industrial education, a demand for trained "industrial teachers" was created. The Association met this demand by establishing what later became Teachers College of Columbia University. This continues to be one of the most influential centers for the promotion of industrial education.

The acceleration of the movement for industrial education was due to many factors; the extension of school education through compulsory education laws, the successful employment by Sequin of hand training in the education of the feeble-minded, and the continued progress of the Industrial Revolution. The teachers of the country have gradually changed their attitude from comparative indifference to that of active support. (1, pages 155-156)

Reasons for Instituting Manual Training in Public Schools. Much of the early public support of the manual training movement was due to a sincere conviction that the introduction of handwork would serve as a substitute for apprenticeship. It would provide a form of industrial training to care for the increasing demand for mechanics regardless of trades or occupations. Interest in manual education was stimulated by the failure of the apprenticeship system and was further aided or influunced by the manual labor movement, the organization of the land-grant colleges, and the criticism of the academic tendencies of the period. A still greater factor in instituting manual training as a subject in the public schools was the acceptance of manual training, by educators, as possessing distinct merit in keeping with the conception of formal discipline.

Financing of Early Schools. Private individuals or organizations were responsible for the promotion of many of the early experiments with manual training in connection with the public schools. Of the ten cities establishing manual training departments during the period from 1874 to 1884 six were operating with the aid of support other than public school funds. The four cities to establish manual training courses in the public schools during this period with funds raised by taxation were:

Montclair, New Jersey; New Haven, Connecticut; Baltimore, Maryland; and Eau Claire, Wisconsin. New Haven later had manual training work stimulated by a trust fund.

Superintendents of schools were responsible for the initiation of two of the six manual training departments started with private funds. The remaining four were started by organizations or individuals interested in providing for as many as possible, the benefits of manual training.

Following is a resume of the latter philantropic supported experiments as given by Ray Stombaugh.

> Jamestown, New York. Jamestown appears to be the first public school system in the United States to be successful in the attempt to introduce manual training into the schools in an effort to meet the demands of the public for a more practical education. The beginning was made in the fall of 1874 when a printing press, type, and fixtures were purchased with part of a fund received from annual school exhibits. The school system provided the teacher and the room, but all other expenses were largely cared for by this fund. This practice evidently continued for some time, for in the report of 1889-1890 the statement is made that "the state has assumed partial responsibility for carrying on work formerly supported by funds obtained by exhibitions put on by teachers and pupils."
>
> Gloucester, Massachusetts. The early experiments with manual training in Gloucester were made under the patronage of Miss Marian Hovey, one of the trustees of the estate of George O. Hovey. In September, 1878, Miss Hovey placed a sum of money at the disposal of the school committee "to be expended for the industrial education of boys." Miss Hovey supported the experiment for a period of over two years. At the end of that time the work was dropped, since the city did not feal that it was financially able "to undertake such an experiment on a large scale in the public schools."
>
> Peru, Illinois. The first attempt to include shopwork in the public school program of Peru was in January, 1884, when "Mr. Joseph Carter, then Superintendent of Schools, upon his own responsibility, and with his own money, purchased twenty sets of carpentry tools and ten workbenches, and fitted up the basement of one of the school buildings as a workshop."
>
> Baltimore Manual Training School. To the manual training school established at Baltimore, Maryland, in March, 1884, belongs the distinction of being the first school of the type to be founded and supported by public funds. The School of Mechanic Arts, the St. Louis Manual Training School , and the Chicago Manual Training School, were already in operation, but each of the first two schools named was affiliated with an institution of higher learning and all three were supported with private funds aided by tuition fees. The

establishment of the Baltimore Manual Training School marked a new era, for it was the first institution of this type to become an integral part of a city public school system, tax supported and free to the residents of the city.

Types of Work Offered in Early Schools. All of the ten cities offered some form of woodworking; carpentry is listed by five cities; joinery by four; and woodworking by one. An examination of the type of work offered shows the courses listed under carpentry to consist largely of tool processes and joinery, so that at least nine cities were offering courses in their schools which might well be classified under the heading of joinery. (39, pages 47-50)

From the information available within the reports of the schools offering manual training courses during the first decade, teaching methods and devices were very limited. The most common practice appears to have been class instruction through teacher demonstration and practical application on the part of the pupil. Baltimore made use of excursions as a teaching device. Montclair and Toledo made use of illustration as a teaching device.

Part C

The Current Situation

History points out that the Russian and Swedish systems of education were instrumental in the development of industrial education courses in America. In the later part of the nineteenth century manual training began taking a strong foothold in the public school curriculum. Struck makes the following statement:

> Educators became concerned with the whole child. The training of the mind would not adequately meet the need of the child; the muscles must also be trained. The educators thought that general industrial education was needed rather than training in some specific trade; however, it was found that general industrial education was not efficient trade training, and the words "manual training", became obsolete. (24, page 33)

The manual training movement enjoyed its highest development from 1900 to 1917, then came another change proposed by Bonser and Russell saying that boys and girls do not feel as confident of themselves in

industrial life as in other fields in which they have had academic training. They thought the school should help the student define his aim in life as he now sees it. Then he must be guided by determined and sympathetic instruction in the direction of his goal. This idea was a big factor in the development of the present study of industrial arts. Out of this study came a new type shop, known as the general shop.

The manual training movement and general education have made rapid changes in order to keep up with a fast changing world. The stages through which manual training has developed are: the Russian, sloyd, arts and crafts, and the industrial stage.

Trends in Industrial Arts Since 1917. In 1917 Congress passed the Smith Hughes Vocational Education Act and as a result American began a nation-wide program of vocational education. Agriculture, industrial trades, and home making education were subsidized by federal funds. In the years to follow there occurred many clashes of opinion between industrial arts and vocational education. This was due to the close relationship of the two fields with no clear cut line to determine where each one's responsibility started and ended.

At a meeting of 500 educators who assembled in Washington, in August, 1943, John W. Studebaker, in speaking of education in connection with the war effort implied that the secondary schools are expected to train its youth how to handle tools, read maps and blueprints, and have respect for thoroughness and ethical precision. In speaking of the army he said it is an army of specialists and they must come through the schools. Radio operators, telephone and telegraph linemen, master mechanics and many others are needed by the army.

In reviewing the task of training young men and women for the war

effort it is evident that the industrial arts courses have emphasized the important needs in the basic training for industry.

Because industry is demanding highly skilled and technical men in its specialized mass production, it is important that education keep abreast with modern industries. This can be done by industrial arts without altering its objectives. Industrial arts has been built on the basis that it fits the needs of the pupil by furnishing him with experiences that will make it easier for him to adjust himself to modern and efficient living.

Part D

Current Philosophical Beliefs

The American Public as a whole, teachers and educators in particular, have continually attempted to improve the educational opportunities for its youth. Behind all the changes in theory and practice, the ultimate aim has been improvement of education for the group as a whole and the individual in particular. The ever growing desire is to make education a means toward a better life both socially and economically for, not only a group or groups, but as far as possible to include every individual of our society.

The recognition of the need of industrial arts in the schools has been steadily increased until it has, in comparatively recent years, been given a legitimate place in the curriculum. The purpose of this chapter is to point out the need of a broad industrial arts program in our curriculum and also to point out its contribution to education in general. Each community must have an industrial arts program that will best meet the particular needs of its youth. As the needs of youth change, from time to time, so must our industrial arts program change.

Definitions. The terms, industrial arts, vocational industrial education, vocational education, and industrial education represent different areas in the field of learning. While these areas have some interrelationships, each occupies a definitely separate area in the field of educational experiences. The average person and many teachers often use the terms erroneously. That the reader may better understand the areas of learning covered by the several phrases, it would be appropriate to offer definitions of several significant terms.

What is Industrial Arts? One of the earlier definitions of industrial arts may be found in Bonser's book, Industrial Arts for Public School Administrators.

> Industrial arts is a study of the changes made by man in the form of materials to increase their values, and of the problems of life related to these changes, of the appropriate usage of products made, and the social changes resulting from these changes and products. (5, page 2)

This definition is relatively old, but it is used by many modern writers. The change of the value of materials with the change of form, is evidenced by the difference in the value of a finished milling machine, and the rough steel from which it was made.

Wilbur, in his book, Industrial Arts in General Education, includes this definition:

> Industrial arts is a phase of general education which deals with industry-its organization, materials, occupations, processes, and products-and with the industrial and technological nature of society. (45, page 2)

This definition clearly expresses the function of industrial arts in the public school, and its relationship to general education. Industrial arts can not be considered separate and apart from general education. It is considered as one of the integral parts of education. The purpose of general education is to transmit the social culture and assist

the individual in becoming an asset to himself and to society.

The State Advisory Committee for Industrial Arts in Oklahoma has given the following definition of industrial arts:

> Industrial arts is a group of school subjects that contribute to the attainment of the goal of general education by furnishing guided experiences in the use of tools, materials and machines, and insights into those phases of industry that have become an important part of our social culture. (38, page 34)

This is probably the most clear and concise definition, of industrial arts in its contribution to general education, now available.

Many objectives have been compiled by educators throughout the country but none more appropriate than those proposed by the State Advisory Committee, which consist of a Policies Committee of Oklahoma Teachers representing the Oklahoma Industrial Arts Association. They proposed the following objectives as a guide to the industrial arts program in Oklahoma.

(1) Industrial Arts is complementary to other school subjects and provides opportunity to apply knowledge learned in other school subjects.
(2) Develops an appreciation of applied knowledge and skills.
(3) Provides a knowledge of industrial drawing, the language of industry, and methods of expressing ideas by means of drawings.
(4) Contributes to later vocational efficiency.
(5) Stimulates students' knowledge and appreciation of good design.
(6) Instills a satisfaction in personal creative achievement.
(7) Develops the ability to analyze a job into its processes and organize them into correct procedure.
(8) Contributes to consumer knowledge and induces an appreciation of the value of industrial materials and the need for their conservation.
(9) Trains in industrial and home safety (including fire prevention).
(10) Acquaints students with industrial information and induces a recognition of the standards of industrial attainment.
(11) Develops avocation interests.
(12) Trains individuals to be more resourceful in dealing with the material problems of life.
(13) Stimulates correct attitudes toward an orderly shop and home and their enviroment.
(14) Aids in making vocational choices.
(15) Develops qualities of leadership.
(16) Develops cooperative attitudes in work habits.
(17) Develops an appreciation of the dignity and importance of the occupation of one's neighbor. (29, page 60)

The Oklahoma Advisory Committee did not stop with the completion of this list of objectives. Realizing that objectives are of little value unless they are interpreted in terms of methods of attaining each objective, the committee listed many ways by which each objective might be attained. These, they warned, should be used as a working list only, to be modified to fit the individual requirements of the teacher and school.

The philosophy of industrial arts is revealed by its objectives. Like any other division within the public school curriculum, each objective contributes to the objectives of general education. Industrial arts is no longer considered the ideal place for boys who are poor in academic subjects but is accepted as a phase of general education.

The present day philosophy of industrial arts is the result of the contributions of many great educational philosophers through the ages. Some very early philosophers of education, who pointed the way to present day concepts, are Martin Luther, Rabelias, Bacon, Comenius, Petty, Locke, and Budd. Then came Rousseau with an educational philosophy far advanced for his age of thinking. Franke and Hecker put Rousseau's theories into practice. Then came Pestalozzi who is called the "Father of Manual Training". It was Fallenberg who set an example for American Manual Labor Schools. Then came Froebel followed by Cygneaus and Salomon.

Life Adjustment Education. The National Commission of Life Adjustment Education for Every Youth is often referred to as the "Commission". The Commission's concept of life adjustment education is as follows:

> Life adjustment education is designed to equip all American youth to live democratically with satisfaction to themselves and profit to society as home members, workers, and citizens. It is concerned especially with a sizable proportion of youth of high school age (both in school and out) whose objectives are less well served by our schools than the objectives of preparation for either a skilled occupation or higher education. (10, page 30)

A broad industrial arts program, one that can be adjusted to the particular needs of a given group or community, is the goal. The country must have well informed, resourceful teachers who have the interest of the individual youth at heart, one who is capable of adjusting his courses wisely to fit the particular needs of his boys and himself. He must have the support and understanding of a well informed public, as well as the administrators of the school. Life adjustment must be his ultimate aim.

One of the important life adjustment problems is that of the left-handed student. Too few teachers do anything that will ease the troubles of the left-handed student in his school work. The chapter which follows will present some of the problems which teachers should detect in their students and what steps should be taken to remedy the situation.

CHAPTER III

LEFT-HANDEDNESS

The educational system of American is under-going a tremendous change. This is due to the fact that educators are striving to give the youth of to-day every possible chance for life adjustment. In this report we are concerned with this change as it is affecting and is likely to affect the high school and college student, with emphasis upon the effects right-handed teachers and equipment have upon left-handed students in industrial arts.

Literature Available. There was very little literature available on this subject. Surveys and studies in book form were dated before 1940. The most recent ones are magazine articles, reviews of older surveys, and the writer's opinion. Most of them were about the same with personal opinions added. There are no available studies on left-handedness in industrial arts that the writer could find. Most of the studies made were in connection with psychology and educational studies in stuttering, calmness, nervousness, and other ailments connected with the brain. All the surveys and studies found were made on high school students, with the exception of one or two on workers in factories. The reason for the studies of grown people was to determine whether different types of jobs were easier for either left-handed or right-handed people.

Review of Literature on Handedness. A review of the literature of educational, industrial arts, medical, and psychological research has revealed a wealth of material on handedness in its relation to difficulties in speech, visual, emotional, and neural disorders.

> Laterality of function has in recent years been recognized as presenting many problems much more comprehensive and complicated than were suspected by earlier writers on handedness. (10, page 30)

This statement reveals a growing knowledge of the importance of handedness. It also implies the need for growing research in all fields of human endeavor, for efforts of individuals may be handicapped to some degree by handedness.

As in most research, theories of the cause and the origin of laterality have been developed. In general, there are two dominant theories for the cause of left-handedness. A clear, yet sufficiently brief statement of the hypothesis may be found in John J. B. Morgan's book, Child Psychology.

An examination of the old manual training and the new industrial arts ideas shows there were no previsions made to take care of left-handed students. Since so many problems which seemed more important occured, the students were either forced to be right-handed or left to work out their handedness problems for themselves.

While it is clear that in the early days of the world's history the usual condition was one of right-handed tribes, many of the arrows and artcraft of the early Indians were made by left-handed persons or sinistrads.

Although left-handedness is not considered an oddity to-day, men in the past have thought it to be different or awkward. In some languages the word for left-handed and awkwardness was the same.

The Bible mentions the right hand eighty times, ambidexterity twice, and the left hand twelve times. Not once is the right hand referred to in a dishonorable fashion. The blessed are always on the right and the damned on the left.

It is a right-handed world. If you doubt that, ask any of the

thousand left-handers in the United States. This alarming situation results from the fact that right-handers outnumber the left-handers. As a matter of fact, psychologists do not know the ratio exactly, probably because most of them are right-handed and do not care. Because of the one-sided majority, the world is set up for the righties.

This is indicated by a study of chimpanzees made by A. Finch in 1940. He found that among the chimps, left-handedness, right-handedness, and ambidextrousness are about even. Or in words of one syllable, a chimpanzee just does not care. A human being at infancy is the same way. He will reach with whatever hand, or occasionally a foot which is most convenient. But after 7 months to 2 years in this lopsided world, he begins, most of the time, to show a preference for his right hand.

The current trend among authorities is to discourage parents from forcing a child who is naturally left-handed to change. At one time parents acted as if Junior were some kind of a monster if he reached for something with his south paw. Now, at the urging of psychologists, the attitude is: "What does it matter as long as he reaches."

Benjamin Franklin at one time wrote a letter advocating the training of the left hand to the level of the right. In England some societies stress this ambidextrous development. Psychologists generally do not favor this movement.

The primary thought of industrial art teachers in this day and age demand that all schools and teachers concern themselves with the overall problems that the left-handed student faces and help develop them into happy individuals where they will be useful and successful citizens. The modern teachers are growing more conscious of the fact that the happy, useful student is well on his way toward becoming a useful and successfully adjusted citizen, in his left-handed after-school life.

It is, however, extremely important for parents and teachers of a confirmed left-handed child to try to teach him properly and to help him make his more difficult adjustments to life. There are, incidentally, tests which can show the degree of left-handedness and thus give a guide as to how far to go with any changes. Such testing should be done by a clinical psychologist because left-handedness is a very complex trait bound up with the reactions, including eyes and feet of the whole child.

While it is a problem to be left-handed, it is not so much of a problem that it needs to be the cause of any great difficulty for a normal boy or girl. Indeed normal and bright children make necessary adjustments with considerable ease; and with a little effort, parents and teachers can help their southpaws make these adjustments even more easily.

In Mr. Hokes' article, "Facts about Left-Handedness", he stated that about 75 per cent of babies show their final hand preference before eighteen months of age. Most mothers however, at some time or other, are convinced that their child will be left-handed. (19, page 82)

Neither the mother nor the child should ever develop a complex on the subject. The child should use whichever hand he chooses in performing his duties. If the child appears to be left-handed, he should not be corrected whenever he uses the left hand. If a left-handed child has been changed to a right-hander and he later begins to have speech defects, he should be changed back to the left hand which was originally preferred. If handedness was the cause, the hesitancy or stuttering may leave in time.

Some children who are changed from left-handedness to right-handedness do stutter. A great number who are changed experience no bad effects.

Many children are so weakly left-handed that a change will produce no bad effects. Other children are so strongly left-handed that they violently resist the change. With this latter group the emotional upset

may be alarming. Nervousness, stuttering, and other defects may appear. Before the handedness of a child is changed, a very careful psychological study should be made.

In some states there are laws against changing a left-handed person to right-handed; and it is not done, as a rule, in the better schools. Left-handedness is just as natural as right-handedness and should be so considered. People must be educated to an appreciation of this fact.

Josephine Mitchell Smith, did some research with the blind trying to determine "Which Hand is the Eye of the Blind".

> In reading blindscript, extension is very slightly superior to flexion and, the more significant conclusion which can be drawn, the left hand is decidedly superior to the right when used as a sense organ. (15, page 75)

In 1923 Mrs. M. L. Sikes, a piano and organ teacher with several years of teaching experience, reported that she could foretell success in music by the simple device of observing which hand was favored in practice. According to her notions, if the left is used more than the right the beginning student will be more likely to succeed.

Whether or not these speculations and apparent findings are accepted there remains a point that many teachers do not stress sufficiently the training of the left hand. An ambidextrous individual therefore, has a certain advantage as he proceeds toward his technical goals in music. (18, page 34)

Later investigation shows a somewhat higher per cent of left-handedness in the total population dealt with than was the case in previous investigations.

On the basis of some tests used by Haefner to measure proficiency in the various school subjects of the two groups of students studied, no reliable differences were found between the school achievement of the left-handed group and that of the right-handed group. There is a

suggestion that the left-handed group is slightly more variable in school achievement than is the right-handed group.

According to John B. Watsons' discussion on behaviorism there is no reliable difference between the average height and the average weight of the two groups of children being compared. The right-handed group shows considerably larger variation in weight and larger average overweight than does the left-handers. The right-handers show superior hand strength as compared with the opposite handed students, although the difference is not great. (44, page 3)

Hand preference does not seem to be closely related to the interest of students. The interest in the various school subjects seems to be only slightly affected by their hand preference. The left-handed group plays and prefers a somewhat larger number of games than the right-handed group.

Measured by a somewhat crude instrument, the left-handers seemed to be slightly better adjusted to the school situation than were the right-handers. It is interesting to note, though somewhat astonishing, that 25 years ago only 2 to 4 per cent of the total number of students were left-handed. Some psychologists say that it will continue to rise; not because more left-handed babies are born, but because parents and teachers are at last beginning to understand and accept the fact that left-handed children are perfectly normal and need not be changed to using their right hands. Consequently, enlightened parents and teachers do not put so much pressure as formerly upon them to change.

The left-handed child should be made aware that he belongs to an important group. Each year, for example, Harry Truman, who writes with his right hand, while president had his picture taken throwing out the first baseball of the season with his more natural left. Michelangelo,

Raphael, Leonardo Da Vinci, and President Garfield are other notable members of the clan which includes many modern celebrities, also the Dionne quintuplets.

According to the survey made by the writer in junior-senior high schools and colleges even right-handers have trouble in school with reading, spelling, and number relationships; and they also may stutter. Any teacher should know that these difficulties are by no means confined to the left-handed. There were approximately twelve hundred and fifty surveyed. They were of the mixed sex, and of junior and senior high school age. It was given in connection with a youth survey, for the social benefit of the community for the teen agers. The questionnaire was of three parts, with a total of seventy seven questions. There were two hundred fifty without comments, there were six and five tenths per cent that were left-handed. The per cent is a little higher than the male adult college group, with approximately five tenths per cent of the high school group having trouble doing things because they are left-handed. The most common among the boys was playing ball without being taught to do it left-handed, the comments were that there are never left-handed gloves available. Writing ranks second, because, of the arms on the wrong side of tablet arm chairs for left-handed students. Third, at the tables some one is always bumping into their arm. With the girls, sewing comes first, and eating second. The survey was given to both high school and college students for the purpose of determining the percentage of the left-handed students.

The writer personally interviewed one hundred and four people at random who were left-handed and ranging from junior high school students to laborers sixty years of age. Some were observed in shop classes, on field trips and visits to shops, others were in different types of work,

including two left-handed barbers. Only in one case did the left-handed person seem consious of his left-handedness and did not care to discuss it. There were no tools and conveniences for the left-handed student available for the one hundred and four oral surveys. Twenty of the older people questioned were made to use their right hand in school at an early age, later returning to the desired left hand, without any serious defects, such as stuttering or nervousness. All expressed the desire for a more convenient place to purchase tools and other needs for the left-handed people. Twenty five thought left-handedness was a habit. In some positions and different places they had an advantage over the right-handers.

Left-Handedness in American Schools To-day. It has been more than sixty five years since the beginning of the Manual Training Movement in the American schools and ideals and courses of study have changed. Along with the changes many problems have arisen. Every decade creates its new philosophies and concepts of things and how to cope with them in preparing for future activities in life. Each generation has its own ideas as to what problems are most important and how they should be administered.

Industrial arts, or manual training as it was called during the early part of this century, introduced into its curriculum bench woodworking, mechanical drawing, forging, sheetmetal work, foundry, and many other courses which require skilled hands and mental ability.

There are more than seven million left-handed persons in the United States. Approximately 7 per cent of all boys and 5 per cent of all girls are left-handed. These percentages lead us to assume that 7 out of every 100 boys enroll in industrial arts classes are sinistrads.

Sinistrads are no different from their right-handed brothers in that they feel the fundamental need for creating and making things with

their hands. In areas where motor skill and dexterity are needed, however, the left-handed student meets with difficulties, for example, in school he is likely to run into the problem of right-handed arm chairs on which an extended right arm is supposed to suffice as a writing surface. It is very difficult for the left-handed person to write on this type of chair. There are only two solutions. Either he will have to twist his arm into a pretzel-like shape to write or arrange to have a vacant chair at his left.

Over an extended period the left-handers may be taught to write as right-handers, but people would be surprised how many left-handers immediately revert to their own type of writing as soon as this course is over. The problem is extremely acute if a child is a backhanded left-hander. This type is the individual who twists his wrist to resemble the neck of a swan and approaches a piece of writing paper from the rear.

As a youngster matures he begins receiving invitations to social events, he sits next to a right-hander and as they try to eat their ice cream and cake, their elbows knock. Does the right-hander do anything about this? No. He does not quite understand what is wrong. So the left-hander must time his bites to come in between those of his neighbor. The simple solution, of course, would be to place the lefty at the end of the table where no one would be on his left.

There are many problems about the matter of eating. Utensils, liquids, etc., are placed for the convenience of the right-hander. The lefty must make the adjustment. Probably the most difficult adjustment is in the use of a butterknife, the type which is curved where the handle turns into the blade. If a person is right-handed, it has never occurred to them that it is very awkward for a left-hander.

Even a pair of scissors is made for the right-hander. Something

about the way scissors are manufactured makes them rub a left-hander across the back of the thumb in a most irritating and, if used long enough, blistering sort of way.

There are some concessions made to the left-handed minority, particularly in the field of sports. Left-handed baseball gloves, golf clubs, shotguns, and fishing reels are examples, but they usually cost more, some banks have printed left-handed checks.

Some consolation is offered by law authorities who say that a lefty who keeps his money in a pocket on the left side has a better chance of escaping a pickpocket, who automatically goes for the right side. But even that probably would not hold true in case he ran into a left-handed pickpocket.

The general public should accept left-handedness as perfectly normal. A child should never be told he is using the "wrong" hand. This acceptance is not always easy because the word "left" itself originally meant "sinister"--the modern French term for it means the same as clumsy--and there are many common expressions which emphasize this. People say, for example, "that is a left-handed compliment" when they mean that it is not a compliment at all.

Different Theories About Left-Handedness. The first time any parent sees their son take a determined grip with his left hand on a wooden hammer and drive the pegs through his newly acquired peg board they were keenly aware of the fact they had brought a left-handed individual into a right-handed world.

Doing research on Inheritance of Left-Handedness one of the first things H. E. Jordan discovered was that 98 per cent of all parents and potential parents hope for right-handed children. Another is that nearly half of all children go through a left-handed stage.

Data founded on the structural difference theory is comprehensive and generally related to reading, writing, speech, and nervous disorders, any or all of which may result in stuttering or stammering. Doctor Samuel T. Orton made an extensive investigation of a specific reading disability called strephaeymbolia. His finding indicated that word-blindness generally is caused by conflicts between the right and left hemispheres of the brain. As reported in an article by James N. Emery, psychologists and physicians generally agree that one hemisphere of the brain is more dominant than the other in the control of the bodily activity. In the case of left-handed people, it is the right side of the brain that controls the left side of the body as well as the central functions. The opposite is true for right-handed people. Forcing a left-handed individual to perform in a right-handed manner may cause cerebral conflicts which may result in illnesses of the neural system, uncertainty, hesitancy, and awkwardness. From any or all of these results of mental conflict there may grow cases of stuttering and stammering in various degrees of severity.

Floyd L. Ruch, in his book Psychology and Life, presents the belief that changing a naturally left-handed child to a right-handed performer is apt to disturb the normal dominance of the cerebral cortex. He also says speech disorders may result from other causes as well. Again, Robert Clark says, "When a natural hander is changed to other hander, speech defects are likely to occur." In these few citations have been presented points stressed by people who follow the theory of structural difference.

The second major theory of handedness is the learning theory which is not so widely accepted; it does not answer all the questions that the cortical-dominance theory answers. One of the strong supporters of the learning theory of handedness is John B. Watson. In his book, Behaviorism, he says that there is no fixed differentiation of response until social

usage begins establishing handedness. It is Watson's belief that handedness is not an "instinct" and possibly not even structurally determined. It is socially conditioned. In his article on the various theories of handedness, he does not account for the present number of left-handed individuals and does not account for the fact that each year brings a new group of left-handed people into the world.

In various studies some points that pertain to the intelligence of pupils and to the handedness of teachers have been presented. June E. E. Downey states that apparently retarded or sub-normal children may be left-handed rather than low in native intelligence. This apparently low intelligence is actually the result of right-handed instruction to which the left-handed student has been subjected but which has not met the challenge of his handedness. Christie Jeffries has presented data from a survey of one hundred twenty-seven principals. The result of that survey are reported in the New Jersey Educational.

There is no general agreement as to why people are left-handed. Most people and some authorities, believe that it is an hereditary trait somewhat similar to the color of one's hair and eyes. But no matter what the reason, there are a great many left-handed people.

There is evidence that most babies under 6 months slightly prefer the left hand. Between the sixth and the eleventh months of age, this dwindles to a little less than 50 per cent, and it continually lowers through the first years of school with the greatest number changing between the ages of 3 and 7 years.

This is perfectly all right so long as passive and casual means are used to encourage right-handedness. In spite of what may have been heard to the contrary, there is not an iota of evidence that the change to right-handedness will do damage to either the speech, the emotions, or the

mental development of left-handed children.

When parents and others show displeasure and scorn at left-handed efforts, there may be damage. It is the same as the emotional upset that any child, right- or left-handed, feels when he is laughed at, rebuked, or ridiculed for any reason.

There are just as many natural right-handers who stutter as there are reformed left-handers. It is the manner of the change and not the actual change itself which causes trouble.

There is a group of adults who advocate an Association for the Protection of the Rights of Left-Handers. Members would be allowed to use their left hands in taking oaths, saluting, and so on, and they would be furnished with clothing on which the buttons were reversed.

As long as the left-handed are a minority group, this is not likely to happen, but it does point up the fact of how important it is to help left-handed children adjust to their environment.

There are certain things at which a left-handed person cannot excel, for example, no left-handed individual is likely to follow Billy Rose to fame via the shorthand method. The commonly used system of shorthand is definitely designed for right-handed people. Some machines, such as comptometers, are also designed for right-handed use.

On the other hand, it is known how valuable left-handed pitchers and firstbasemen are. Indeed, some psychologists suggest that the fame of the big league "southpaws" has had much to do with the increase in the number of children who grow up to be left-handed. A left-handed polo or tennis player is an uncanny opponent.

Unfortunately, few teachers have had special education in helping left-handed children. Too often the school seems to say, "If you are left-handed, that is just too bad. This is a right-handed world and

you had better comply." Teachers, not knowing what to do, often give the left-handed child less help than others or try to make him conform.

In writing, the child who is probably teased by his fellows will endeavor to follow the teacher's directions and example closely. With a right-handed desk, a right-handed position for his paper, and a writing system designed for right-handed people, the results are bound to be poor. The teacher's encouragement may help some children to learn to write right-handed. This is desirable if it can come without emotional strain, but the confirmed lefty must learn to write, too. At best, it will be a difficult job because the very fact that a person writes from the body outward is an aid to right-handed people. The child should be encouraged to slant his paper so that it runs along his arm and should be allowed to write with a modified backhand slant. Remember that there is nothing sacred about the slant of writing so long as it is readable. Some teachers have found that left-handed children can learn to write more easily on the blackboard. The important thing is to give the child the proper conditions--those most natural for him--under which to write, and then let him follow his own natural inclinations.

There is no evidence that left-handedness, whether it is allowed to develop naturally or whether the child learns to use his right hand, has any more effect on his ability to learn to read than the color of his hair or the size of his feet.

All teachers should remember, though, that on many tests, especially if taken in a right-armed chair, the southpaw is at a manual inconvenience; and, if a child becomes upset because he is "different" from other children, the teacher should find tasks in which his special characteristic of left-handedness is highly advantageous.

At home, instead of demanding a child to eat with his right hand,

his folks should arrange to seat him so the left elbow is free for movement. A small child should eat with whichever hand best suits him. Later, perhaps not until adolescence, he will probably develop enough skill with his right hand so that he can use it satisfactorily for eating and thus avoid one of the problems of "looking awkward." But, even in the teens, handedness should be no issue; the left-handed individual desires to be like the rest and the desire to impress his girl friend will be strong enough motivation.

It goes without saying that left-handedness is more of a problem than right-handedness, but it need not be a major problem if parents and teachers will only remember to treat it naturally and to do everything they can to make the left-handed child comfortable and naturally accepted.

S. T. Orton doing research on Speech Problems found in one school system that only ten per cent of the stutterers either had been or were left-handed. On the other hand, it often happens that a man who loses his right arm and must use his left arm for working begins to stutter or hesitate in his speech. The problem is not altogether clear, nor is all the evidence on one side.

There is a formula indicating the degree of handedness for any person. It is arrived at by means of a test which shows to what extent a child or adult is given to the use of either hand. For instance, one child will be found to be practically 100 per cent left-handed and another 65 per cent left-handed.

A disease or accident to the brain of a child may cause him to change from one hand to another. This is usually a choice of the least damaged side of the brain. An accident of either hand, arm or infantile paralysis causing the change to another hand does not affect the speech and writing

of a person as the result of forced training would cause.

Reading disabilities are not caused by forcing a left-handed child to change to his right hand, but they might be intensified by a mistaken attempt to change the child's natural tendencies.

When a child is strongly left-handed it usually causes poor penmanship to force him to use his right hand. The fact that a left-handed child writes with a technique different from that of his schoolmates sets him off from the rest. Does this fact in anyway determine the professional and occupational choices open to him? Does he finally drift into some occupation to which he can most easily adapt his left-handedness or is handedness not a factor? Every day observation of the members of faculties of different universities seems to indicate that there are fewer left-handed persons among the faculty members than there are among the general population.

In a scientific report published by the Society for Research in Child Development of the National Research Council, Dr. Gertrude Hildreth concludes from her test material that the decision to change a child's handedness, or to leave it alone, is an individual matter, depending on age, intelligence, personality, etc. She says that we live in a right-handed world, and left-handedness makes for awkwardness from the workshop to the dinner table. If a child is not predominantly left-handed, she believes he can be helped to shift. Training should begin by the age of three or so, before speech habits are definitely formed. It is the way the shift is made, she contends, not the shift itself, that results in emotional strain and confusion. Many parents insist that the left-handed child shift from left to right but a few are obliged to shift because of injury.

Both heredity and custom indicate that the right hand shall dominate

and the left hand shall be its handmaiden. The question of why there are a few sinistrads in a world where right-handedness is so common has never been satisfactorily answered, but the theories on handedness may be of interest here.

The Mechanical Theory. This theory claims that such things as the position of the foetus and bone measurements determine the hand that will be preferred. The mechanical theory has been largely discredited.

The Habit Theory. The basis for the habit theory is that there is social pressure on the child forcing him to use his right hand. He copies those around him in hand preference. Under this theory comes the supposition that primitive man held his shield over his heart with his left hand, leaving his right one free for battle, thus giving the right hand dominance in use. This theory is questionable as a reliable explanation to the cause of handedness.

The Environment Theory. There are some who consider right- and left-handedness caused by the child's environment. The behaviorist school of psychology has adopted Plato's idea that handedness is the result of nursing and education. This theory assumes that there is no inherent tendancy one way or the other but that the encouragement of the child's parents and such influences bring about a final predominance of one hand or the other.

The Inheritance Theory. The factor of heridity in hand preference is being firmly established by research. Since the left-handed trait is common, it would be expected to occur repeatedly in an occasional family, merely by chance. When left-handedness appears frequently in a family, it is probably due to some inherited peculiarity, perhaps

affecting the development of the brain.

The Brain Dominance Theory. The possibility that hand preference is related to parts of the brain is argued by certain writers while doubt is cast upon this view by others. Supporters of this theory say that the active side of the brain, which is definitely larger, is always on the side opposite the individual's master hand; thus a right-handed person uses the left side of his brain. This dominance of one lobe of the brain is a recent development in evolution and is a fundamental character distinguishing man from all other members of the primate order. The speech center is also located in the dominant lobe of the brain which explains stuttering of persons who are forced to change from the left hand to the right. This in some way upsets the speech center.

The theory that hand preference is the result of eye preference is a view frequently occurring in current writing. A person who is left-handed, left-eyed, and left-footed is called ambilateral. Footedness does not seem as important as eyedness and handedness, but when a selection of the foot is made it is generally on the same side as the master hand.

Some Current Beliefs About Left-Handedness. Seems the educators have a theory about meeting the individual needs of students.

Convicts at the Oklahoma State Penitentiary are learning something new in education. For the first time in history they are making left-handed tablet armed chairs for both the Oklahoma College for Women at Chickasha and the high school at Kinta, Haskell County. Inmates working in the furniture factory behind the walls have manufactured hundreds of the regulation study room chairs. This is the first time the left-handed student has been given a break.

S. N. Stallings, superintendent of prison industries, reported that approximately eight per cent of the students throughout the state are left-handed. He reported that is the percentage of left-handed arm chairs being manufactured in the prison.

Modern parents who spend much time to make sure their children grow up right-handed are wasting a lot of energy. Everyone seems to be catering to the southpaws. Even the banks have begun advertising "left-handed check books." The book is the reverse of the normal check book. It opens from the right so a left-handed person can hold the flap down with his right hand and write with his left. The stub, too, is at the opposite end of the standard check book.

Experience with children teach people to let children's "handedness" alone. If a child is left-handed that is what they are. Teachers and parents should not trifle with the fact but accept it. There is no hardship in left-handedness and often there are advantages. To be sure, things are adjusted to right-handed people's convenience, but those who are left-handed seem to manage very well indeed. Try being otherhanded for just one day and a person will see how uncomfortable, how unhappy and how irritable it will make a left-handed child when he tries to change his natural way.

Left-handed persons are closer to being ambidextrous than right-handed folks, according to three University of Wisconsin psychologists. The psychologists tested 64 students and found that the southpaws could handle tasks with either hand better than right-handed subjects. They also found that left-handed persons could move their favored hands much faster between knobs on a control panel than their right hands. Right-handed subjects, they learned, moved both hands at about the same speed.

In any sport the "southpaw" holds most of the trumps, even though

he often does not know how to play them. The left-handed pitcher and batter are definitely preferred, the left-handed fencer holds a tremendous advantage, and the left-handed boxer has his power in a useful place. It is chiefly inside the classroom that use of the left hand appears to be a handicap.

It may at times be an advantage to use the left hand as in some positions on the baseball team where the left-hander is referred to as a southpaw. While a left-handed catcher or third basemen would not prove satisfactory, but left-handed pitchers may be very good. A football player who can pass left-handed may be a good man on a football team. It is the opinion of some teachers that in writing shorthand left-handedness is a decided disadvantage. In typewriting it may be an advantage, as most of the work is done by the left hand on the standard typewriter.

Proposed Left-Handed Alphabet. After considering the problems of left-handed students who enroll in mechanical drawing the fact remains that certain letters are difficult to make, if the left-hander attempts to use the same instructional guide alphabet as right-handers, or makes the letters the same way as recommended to the right-handed student. There is a strong argument in favor of a system for the left-handed student as well as for the right. In doing so a good form of lettering could be taught to the left-handed students as easily and as accurately as the right-handed.

Adopted Right-Handed Alphabet. Figure 1. Professor of Engineering Drawing Thomas E. French has an adopted alphabet in his revised edition of engineering drawing book, 1948. (16, page 25) This is a system of single stroke vertical capitals which are primarily for right-handed students. Many people think that lettering is plain printing, but there

is an individuality in lettering, as there is in hand-writing; but it must be based on fundamentals such as the order of the stroke. Vertical strokes are all made downward and horizontal strokes from left to right. The first requirement is to learn the form and peculiarity of each of the letters.

Proposed Left-Handed Alphabet. Figure 2. According to a survey made by Melvin L. Betterley, Assistant Professor in the Illinois Institute of Technology, such a proposed alphabet was based upon the survey of approximately sixteen hundred students. (4, page 34) Since ninety-one out of the one hundred left-handers indicated that the right hand alphabet was difficult for them, Mr. Betterley recommends for approval an alphabet for the left-handed. This questionnaire was used over a period of two years. The biggest advantage for Betterley's argument is that the student can see where he wants the stroke to go which is a good point for an argument if we want the left-handed student to visualize good letter form as he letters. The greatest change from the right-handed alphabet is in the horizontal strokes which are more easily made from right to left. The circular letters are made with strokes similar to the right-handed alphabet with the exception of differences in the beginning and ending points.

In conclusion this proposed alphabet may be used only as a guide for left-handers and a foundation for better and faster lettering for most of the left-handed students in printing and writing.

The writer believes that in the future necessary equipment for left-handers will be furnished.

The facts listed in this chapter reveal that:

A. Left-handedness is not abnormal.

B. Left-handed individuals enjoy advantages in some fields.

Fig. 1
Lettering Guide
for Right-Handed Students

Fig. 2
Lettering Guide
for Left-Handed Students

C. The percentage of left-handed individuals is increasing.

D. Forced change of handedness may present difficult maladjustments.

E. There is a limited amount of research in this field.

The attitudes of thoughtfulness toward fellow workers, of cooperation with the group to which one belongs, of eagerness to learn and achieve, and of honesty in work can be developed more easily through industrial arts activities than through most of the other school experiences.

It would be of great importance if teachers would give special attention to left-handed students the first day in school, by the time they were ready to enroll in industrial arts courses many of their problems would be overcome. Industrial arts experiences are an aid in forming desirable habits. The new movement of life adjustment education for every youth has a great appeal for the average teacher and especially for the industrial arts teacher.

The next chapter will discuss left-handedness as it effects industrial arts students, and make some recommendations as how to cope with problems of a left-handed student.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

Thus far in this study the writer has discussed left-handedness in general and to conclude the study a summary will be given as to how left-handedness effects the student in the industrial arts shops.

As a part of this summarization, some suggestions for better instruction by the teacher and improvement of shop equipment will be discussed.

Instruction sheets are generally used in the shops, but little has been done to adapt them specifically for the use of left-handed students. Most of the demonstrations made before assembled groups of students are made in a right-handed manner, but individualized instruction is given to many of the left-handed students. Instructors feel that they have little difficulty diagnosing the manipulative faults of left-handed students. Students are not forced to perform all operations in a right-handed manner, but the speed with which left-handed students work and the quality of their work is below that of other students. Few left-handed students evade shop courses because of their handedness.

Left-handed students have access in only a few cases to special tools to aid them in their work. However, the use of jigs and fixtures for the adaptation of machines for left-handed students has been given a slightly higher rating by the teachers. According to the data, about half of the left-handed students know how to and do change the fence on the table saw for ripping stock. Most of the instructors seem to feel that other machinery of a woodworking nature does seem especially adaptable for use in a left-handed way. It is known that most hand tools are ambidexterous in design and use. One exception is the hand drill.

Ranking first is the fact that the problems of left-handed students are the same as those faced by right-handed students, with the exception of their preference for the use of the left hand.

Student answer sheets yielded information concerning specific tools, machines, and operations that were considered the most difficult from the standpoint of the performance of left-handed students. Other items on the student answer sheet yielded these results. All left-handed students indicated that their tasks and projects were as good in their own eyes as the work done by the other students. The majority of these students admitted that they could not work as accurately with their right hand as they could with their left hand.

In the drawing area, students seem to experience the most difficulty with triangles. The operations with which they have the most trouble are inking drawings and lettering. The woodworking area received the greatest number of returns. Students indicated most trouble with hand drills, and marking gauge. The machines offering the biggest problems to the most left-handed students are the joiner and the wood lathe.

In the metalworking area, students listed tin snips as giving more difficulty than any other tool. The greatest frequency of difficulty recorded among the machines occurred with the drill press. In the printing area the greatest difficulty recorded was with the conventional right-handed composing stick.

Findings in the drawing area indicate that by reversing the instruments as they are used on the board, the left-hander can make normal progress. Drawing instructors felt that the problems of left-handed students are the same problems that face right-handed students, with the exception of lettering.

This study has attempted to locate problems of left-handed students

in industrial arts in the secondary schools in the state of Oklahoma. The classification of secondary schools includes both junior and senior high schools.

The review of literature in the related fields gave evidence of a wealth of information concerning handedness and its relation to speech, visual, neural, and emotional disturbances. One of the growing fields of research on left-handedness is that of physical education. No data was revealed that was specifically related to the subject of left-handedness and its relationship to industrial arts education.

The review did yield data concerning the theories of handedness. The two most predominant are the cerebral-dominance and the learning theories. The former seems to account for more of the causes of handedness than does the latter. In addition, one survey showed that in the opinion of school administrators, left-handedness has not been detrimental to good teaching.

Items concerning general methods of instruction and student performance and some important facts revealed by the surveys made by the writer are listed.

1. Most teachers teach several different courses, generally in more than one shop area.

2. The enrollment in the greatest percentage of classes is boys.

3. The percentage of left-handed students to the total students averages six and two-tenths with a range from one to seventeen per cent.

4. Eighty-nine per cent of the instructors interviewed were right-handed; eleven per cent are either ambidexterous or left-handed.

5. Instruction sheets are used, to a high degree, in school shops, but, as yet, they are not adapted for use by left-handed students.

6. Individual demonstrations are not made--by most of the teachers--for the benefit of left-handed students.

7. Teachers have relatively little difficulty diagnosing manipulative faults of left-handed students.

8. The quality of workmanship of left-handed students is below that of other students.

9. Left-handed students seem to work more slowly than do right-handed students.

10. Left-handed students do not have to perform all operations in a right-handed manner.

11. Most students use a right-handed alphabet guide for lettering, rather than a left-handed one.

12. T-square and triangles are reversed, generally, from the position used by right-handed students.

13. While left-handed students do not have an appreciable advantage over right-handed students on pedestal machines or on a metal lathe, left-handers do have some advantage in filing, changing feed and speed, and engaging and disengaging back gears on the lathe.

14. Left-handed students set type with conventional sticks; left-handed sticks are not used.

15. Printing presses are operated in a right-handed manner by left-handed students.

16. Printing instructors are not too certain that problems of left-handed students, with the exception of a preference for the left hand, are the same as those faced by right-handed students.

17. Printing presses have not been equipped with left-hand feed boards.

18. In the woodworking and crafts area, students rarely have access to special left-handed tools.

19. Hand tools, with a few exceptions seem to be ambidexterous in design and use.

20. Few benches have been equipped with vises on the right corner for left-handed students.

21. Table saws may be adapted for left-handed use by moving the fence to the left of the blade.

22. Left-handed drawing students list the inking of drawings and lettering as the two most difficult operations.

23. In the metalworking area, left-handed students give tin snips as the most troublesome tool, and the burring machine and lathes the most difficult machines. They list no specific operations.

24. Left-handed students in the printing classes complained about the composing stick. Some evidence was given of their experiencing difficulty with feed boards on platen presses.

CONCLUSIONS

The review of the related literature revealed no data pertaining to left-handedness and its relation to industrial arts. General references had to be drawn from studies in other fields. Such facts seem to indicate slow progress in research on this subject in industrial arts education as compared to research on the subject in other educational fields. When the summary of the study is considered, a number of conclusions may be drawn. Most teachers conduct several classes which are made up entirely of boys, though some classes enroll only girls or both boys and girls. The large percentage of all classes of boys may account in a way for the wide range of left-handedness among the students since medical men and psychologists readily acknowledge a range of left-handedness to be greater among males than among females.

While only a small per cent of the teachers responsible for returns received were left-handed or ambidexterous, it seems that an increase in the number of left-handed demonstrations given before assembled groups may well be increased. The careful observant teacher has probably observed left-handed students who did not seem confused at the right-handed instructor's movements during a group demonstration. A student subconsciously manipulates his left hand when the instructor demonstrates with his right hand. Unknowingly, the student had adopted a reversed manner of manipulating the tool used in the demonstration. When the student comes to apply the lesson just taught, he may wonder why it is not entirely clear to him, why his hands seem to want to hold the tool one way, his memory telling him the opposite is correct. This is one of the problems to be considered by the teacher, on whom most of the responsibility for courses and methods has fallen.

Individual instruction is given to some left-handed students but

special instruction sheets have not been made. It would seem that half the problem is solved, but the follow-up has not been developed. To review what he has been taught, the left-handed student must turn to right-handed instruction sheets. This evidences an inconsistency. The apparent efficiency with which teachers are able to diagnose the manipulative faults of left-handers and the practice of permitting them to perform operations in a left-handed manner wherever possible are evidence of the considerations that instructors give to left-handed students.

Generally, the problems of left-handed students, with the exception of their preference for the use of the left hand, seem to be the same as those faced by right-handed students. This seems to indicate that their handedness is the determining factor in the quality of work and slower speed noted for left-handed students. The drawing area is perhaps the best suited to the instruction of left-handed students since the instruments lend themselves completely to the reversals required for left-handed use.

In the opinion of the co-operating teachers, it seems that printing and metalworking do not lend themselves very well to left-handed performance. That fact is probably due to the high degree of mechanization usually found in these two shop areas.

None of the shops seems to consider the left-hander in the assignment of students to work stations. They might best be placed at the extreme left of lateral rows of individual benches and at the right hand corner work station of benches. The building of left-handed bench stops or bench hooks and the installation of a few vises on the right corners of benches would greatly aid left-handers.

It may be generally concluded that left-handedness gives students many problems in school shops.

Relatively few of the difficulties listed by left-handed students were operations. Troubles center around tools and machines. In drawing, when the T-square is placed with the head on the right side of the board, additional freedom is given the student for his left hand. In addition, the placement of the T-square at the right side of the board removes the complicated crossing of arms which accompanies the left-hander's use of T-square and triangles in a right-handed position while he is trying to draw with his left hand. The difficulty encountered in lettering is probably due to the use of a right-handed alphabet when a left-handed alphabet should be used. The trouble encountered in inking drawings is generally due to the order of procedure. For left-handed students, this order should be from the top down and from right to left. This maintains the vertical direction used by right-handed students but reverses the lateral direction.

Tin snips give the greatest trouble in the metals area. This difficulty could be removed if left-handed tin snips were purchased for the use of left-handed students. The difficulty encountered with the drill press is probably due to the location of the hand lever. Since the left-handed student has most of his control in his left hand, he is unable to exert the necessary control needed for drilling when he controls the hand lever with his right hand.

No left-handed composing sticks are available in catalogues of printing equipment houses. Platen presses are not equipped with left-handed feed boards because the fly-wheel is on the left of the platen. It is considered unsafe to feed from the left and take from the right of the platen.

In woodworking and crafts, hand drills are among the tools listed most frequently as giving difficulty. Drills afford no prospect of

adaptation, since the direction of the twist of the drill or bit determines the direction in which the tool must be operated. Table saws should not give too much trouble unless a student tries to saw "across his body."

In general, instructors seem to be aware of the problems encountered by their left-handed students. They seem to be making some attempts to adapt instruction and tools and equipment for the use of left-handed students, and they have shown considerable interest in the study.

RECOMMENDATIONS

The writer makes the following recommendations for the consideration of other students and teachers.

1. Instructors should continue to give individual instruction to their left-handed students.

2. Student interviews should be conducted by the instructor to determine the exact cause of the difficulties of the left-handed students in his shop.

3. Instructors should continue to encourage left-handed students to take shop courses, expecially those in the drawing and in the woodworking and crafts areas.

4. If speech, visual, emotional, or neural disturbances are the result of left-handers performing in a right-handed way, the student should be re-trained to his natural handedness.

5. The adaptation of equipment through the use of jigs and fixtures should be continued, and further experimentation in this line should be conducted.

6. A further study of the problems of left-handed students should be made on an experimental basis in which an investigator would work directly with left-handed students in the shop.

The writer fully realizes that this report has several limitations as stated in the beginning but at the same time it will reveal some interesting information relative to left-handedness. It is anticipated that teachers who read this report or parts of it will become more conscious of the problems confronted by the left-handed student in his endeavors to accept the right-handed instructions of teachers and others.

A BIBLIOGRAPHY

1. Anderson, Lewis Flint, History of Manual and Industrial School Education, D. Appleton and Company, New York, 1926, 251 pages.

2. Bennett, Charles A., History of Manual and Industrial Education to 1870, The Manual Arts Press, Peoria, Illinois, 1926, 461 pages.

3. Bennett, Charles A., History of Manual and Industrial Education, 1870 to 1917, The Manual Arts Press, Peoria, Illinois, 1936, 566 pages.

4. Betterley, M. L., South Paw in Industrial Arts, Bulletin 1950, Illinois Institute of Technology, 82 pages.

5. Bonser, Frederic G., Industrial Arts for School Administrators, New York, Bureau of Publications, Teacher's College, Columbia University, 1930, 95 pages.

6. Bonser, F. G., and L. C. Mossman, Industrial Arts for Elementary Schools, New York, Macmilliam Company, 1927, 165 pages.

7. Clark, Robert, Again Those Left-Handers, Journal of Education, CXXI December, 1938, 304 pages.

8. Cole, Luella, Instruction in Penmanship for the Left-Handed Child, The Elementary School Journal, February, 1939, 395 pages.

9. Daily Oklahoman, Left-Handed Student to Get Break in Prison-Made Chairs, by J. Nelson Taylor, October 28, 1953.

10. Downey, June E., Laterality of Function, Psychological Bulletin, February, 1933, 97 pages.

11. Emery, James Newell, The Right to be Left-Handed, Journal of Education, CXXI November, 1938, 270 pages.

12. Finch, G., Chimpanzee Handedness, Science and Industrial Arts, 1940, Magazine, 140 pages.

13. Finch, G., Chimpanzee Handedness, Science Magazine, August 1, 1941, Volume 94, Number 2432, 155 pages.

14. Fletcher, C. H., Handwriting Analysis, Banders Monthly, 1949, 96 pages.

15. Fracker, C. C., One Hand, One Ear, One Voice, Personnel J., 1946, 121 pages.

16. French, T. E., and Svensen, C. L., Engineering Drawing, McGraw Hill Book Company, Fifth Edition (Revised), New York, 1948, 437 pages.

17. Heafner, Ralph, Educational Significance of Left-Handedness, Bureau of Publications, New York City, 1929, 95 pages.

18. Hicks, Thelma K., When Left is Right, Parent's Magazine, 21, April, 1946, 96 pages.

19. Hoke, R. E., Facts About Left-Handedness, Ladies Home Journal, July, 1946, 120 pages.

20. Jeffries, Christie, Are Left-Handed Teachers Handicapped, New Jersey Educational Review, XVIII, November, 1944, 123 pages.

21. Jordan, H. E., The Inheritance of Left-Handedness., American Breeders Magazine, August, 1911, 111 pages.

22. Kenyon, J. H., Handedness, Good Housekeeping, June, 1945, 118 pages.

23. King, T. G., and Octting, E. R., South Paws in Your Shop, School Shop, Volume 10, May, 1951, 32 pages.

24. Kurtz, Factory Management, Engineer Magazine, 1941, 141 pages.

25. Miller, Walter, Daedalus and Thespis., Research Bulletin, October 1, 1931, 497 pages.

26. Milne, L. J., and M. J., Right and Left-Handedness, Science Magazine, 1948, 210 pages.

27. Morgan, John B., Child Psychology, New York, Farrar and Rinehart, Inc., 1942 (Revised), 450 pages.

28. Norris, Robert B., What's the Truth About Left-Handers?, Better Homes and Gardens, September, 1951, 130 pages.

29. Oklahoma State Department of Education, Industrial Arts in Oklahoma, Bulletin Number 105, 1951, 129 pages.

30. Orton, Samuel T., Strephaoybolia., Psychological Bulletin, XC April 7, 1928, 99 pages.

31. Orton, S. T., Reading, Writing, and Speech Problems, Norton and Company, New York, 1937, 475 pages.

32. Popenoe, Paul, Left-Handedness, Hygeia, October, 1938, 894 pages.

33. Rife, D. C., Palmpatterns and Handedness, Science, August, 1941, 121 pages.

34. Ruch, Floyd L., Psychology and Life, Chicago, Scott, Foresman and Company, 1941, 715 pages.

35. Schiller, A., Theories of Handedness, Journal of Applied Psychology, XIX Siptember, 1935, 95 pages.

36. Society, For Research in Child Development, The Genesis of Hand Preference, 1936, 315 pages.

37. Sotzin, Heber A., A Half Century of Industrial Arts Retrospect, The Industrial Arts Teacher, 9:5, February, 1950, 96 pages.

38. State Advisory Committee for Oklahoma School, Industrial Arts in Oklahoma, Oklahoma City, State Department of Education, Capital Building, 1950, 164 pages.

39. Stombaugh, Ray, A Survey of the Movements Culminating in Industrial Arts Education in Secondary Schools, Teachers College Contribution to Education, Number 279, Columbia University, New York, 1936, 192 pages.

40. Stormberg, Eugene, and Eleroy, Left-Handedness as a Factor Influencing Academic Achievement, The Journal of Social Psychology, November, 1938, 335 pages.

41. Stromberg, Left-Handedness as a Factor Influencing Academic Achievement, New York Press, 1938, 492 pages.

42. Struck, Ferdinand T., Foundations of Industrial Education, J. Wiley and Sons, Incorporation, New York, 1938, 492 pages.

43. Travis and Johnson, W., Stuttering Research Findings, Journal of Iowa State Medical Society, 1936, 193 pages.

44. Watson, John B., Behaviorism, New York, W. W. Norton and Company, Incorporation, 1925, 251 pages.

45. Wilber, Gordon O., Industrial Arts in General Education, Scranton, International Textbook Company, 1948, 362 pages.

VITA

Everett Byrd
candidate for the degree of
Master of Science

Report: LEFT-HANDEDNESS AS IT AFFECTS INDUSTRIAL ARTS STUDENTS

Major: Industrial Arts

Biographical:

Born: June 23, 1914, at Porum, Oklahoma

Undergraduate Study: Connors Junior Agriculture and Mechanical College, Warner, Oklahoma, 1946-1947, Northeastern State Teachers College, Tahlequah, Oklahoma, 1948-1949

Graduate Study: Oklahoma Agriculture and Mechanical College, Stillwater, Oklahoma, 1949-1950 and 1955-1956

Experiences: Worked as Assistant Director of Short Courses at Oklahoma Agriculture and Mechanical College, Stillwater, Oklahoma, from July 1950 to July 1955. August 1955 entered Housing at Oklahoma Agriculture and Mechanical College, Stillwater, Oklahoma, as resident of a man's dormitory.

Member of Iota Lamba Sigma.

Date of Final Examination: July 18, 1956

REPORT TITLE: LEFT-HANDEDNESS AS IT AFFECTS INDUSTRIAL ARTS STUDENTS

NAME OF AUTHOR: Everett Byrd

REPORT ADVISER: Mr. C. L. Hill

The content and form have been checked and approved by the author and report adviser. "Instructions for Typing and Arranging the Theses" are available in the Graduate School Office. Changes or corrections in the report are not made by the Graduate School Office or by any committee. The copies are sent to the bindery just as they are approved by the author and faculty adviser.

NAME OF TYPIST: Jeanie Hill