



A study of time and motion differentials in a generalized assignment in a home economics clothing laboratory class
by Alma Helene Lewis

A THESIS Submitted to the Graduate Committee In partial fulfillment of the requirements for the degree of Master of Science In Home Economics Education
Montana State University
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Abstract:

The purpose of this study was to determine the differences In the amount of time and motion used by students working In a sewing unit as contrasted to those out of the unit.

A unit arrangement of sewing and pressing equipment was organized In each of the two sewing laboratories at Montana State College. Two students from each class section were selected as controls working In the laboratory and were paired with two students assigned as the experimental group working In the unit. Records were kept by 44 different students from 11 sections for the three quarters—fall, winter, and spring—that this study was In progress.

Students were paired on the following basis: high school standing record obtained from the College Registrar's Office; home economics college prediction record obtained from the College Testing Bureau; and record of previous sewing Experience obtained from the College Instructors.

The time used In constructing a garment was recorded by the student. Distance traveled was measured by pedometers and these readings were recorded also.

The data secured showed that the experimental groups saved energy by traveling considerably less distance than the controls In the laboratory. The amount of time saved by working In the unit was negligible. All the students answering the questionnaire said they enjoyed working in the unit and would like to work in a laboratory arranged In this manner.

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A STUDY OF TIME AND MOTION DIFFERENTIALS IN A GENERALIZED
ASSIGNMENT IN A HOME ECONOMICS CLOTHING
LABORATORY CLASS

by

Alma Helene Lewis

A THESIS

Submitted to the Graduate Committee

in

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for the degree of

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at

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TABLE OF CONTENTS

ii

	PAGE
LIST OF APPENDIXES	iii
LIST OF TABLES	iv
LIST OF ILLUSTRATIONS	vi
ABSTRACT	1
INTRODUCTION AND HISTORY	2
PROCEDURE	9
Background	9
Methodology	17
RESULTS	37
Distance	37
Time	38
Grades	39
Attitudes	42
DISCUSSION	43
Distance Traveled	43
Time Used	44
Grades Secured	45
Attitudes	48
SUMMARY	50
CONCLUSIONS	51
ACKNOWLEDGMENTS	51
LITERATURE CITED AND CONSULTED	52

91031

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LIST OF APPENDIXES

111

PAGE

APPENDIX A.	Questionnaire on Sewing Conditions in Montana Homes	54
APPENDIX B.	Questionnaire Regarding Sewing Laboratory Equipment Sent to 11 Colleges or Universities in Western Area	57
APPENDIX C.	Time Sheet Used by Construction Class - Fall Quarter	59
APPENDIX D.	Cards Used to Record Time, Winter Quarter	62
APPENDIX E.	Cards Used to Record Time, Spring Quarter	63
APPENDIX F.	Cards Used to Record Pedometer Readings .	64
APPENDIX G ₁	Chart of Distance Traveled by Student 8, Section II, in Unit, May 26, 1948 . . .	65
APPENDIX G ₂	Chart of Distance Traveled by Student 17, Section II, in Laboratory, May 26, 1948	66
APPENDIX G ₃	Arrangement of Equipment in One Clothing Laboratory with the Unit Installed . .	67
APPENDIX H.	Questionnaire Given to Students to Obtain Reaction to Unit	68

LIST OF TABLES

iv

TABLE

PAGE

I. Average Time Per Week Spent by Rural and Urban Homemakers in Various Activities (Bureau of Home Economics, U. S. Department of Agriculture)	10
II. Record of Sewing Done in 165 Montana Homes . .	10
III. Number and Location of Sewing Equipment Used in 165 Montana Homes	14
IV. Information Used in Pairing Students in One Section, Spring Quarter Class	23
V. High School Standing, Home Economics Prediction, Time Spent, Distance Covered, and Grades Secured in Clothing Construction, Section I, Spring Quarter	25
VI. High School Standing, Home Economics Prediction, Time Spent, Distance Covered, and Grades Secured in Clothing Construction, Section II, Spring Quarter	26
VII. High School Standing, Home Economics Prediction, Time Spent, Distance Covered, and Grades Secured in Clothing Construction, Section III, Spring Quarter	27
VIII. High School Standing, Home Economics Prediction, Time Spent, Distance Covered, and Grades Secured in Clothing Construction, Section IV, Spring Quarter	28

IX. Record Giving Information Used in Pairing, Time Spent, and Final Grade Secured by 16 Students in Four Sections of Clothing Construction Class, Fall Quarter	30
X. Record Giving Information Used in Pairing, Time Spent, Distance Traveled, and Grades Secured by 12 Students in Three Sections of Repair and Renovation, Winter Quarter	31
XI. Record Giving Information Used in Pairing 16 Students in Four Sections of Clothing Construction Class, Spring Quarter	32
XII. Distance Traveled by Control Students in the Laboratory and Selected Students in the Unit While Constructing First and Second Garments, Spring Quarter	37
XIII. Time Used by Control Students in the Laboratory and Selected Students in the Unit While Constructing First and Second Garments, Spring Quarter	38
XIV. Grades Secured by Control Students in the Laboratory and Selected Students in the Unit While Constructing First and Second Garments, Spring Quarter	39
XV. Replies of 32 Students to Questionnaire on Attitude Toward Unit Arrangement of Sewing Equipment in Clothing Laboratory	42

LIST OF ILLUSTRATIONS

vi

PLATE

PAGE

I.	Original Arrangement of Equipment in One Laboratory - Fall Quarter	19
II.	Arrangement of Equipment in One Clothing Laboratory with the Unit Installed	20
III.	Views of Clothing Laboratory Showing Position of Equipment and Placement of Unit. Montana State College	21
IV.	(a) Unit Arrangement of Sewing and Pressing Equipment for Special Use of Students in Unit, Clothing Laboratory. Montana State College	22
	(b) Cabinet for Pressing Equipment Used by Controls Out of Unit and Remainder of Class. Clothing Laboratory. Montana State College	22

FIGURE

1.	Location of Sewing Equipment in 165 Montana Homes, 1948	15
2.	Highest, Lowest, Average and Median Distance Travelled by Students In and Out of Unit While Constructing First Garment. Spring Quarter . .	40
3.	Highest, Lowest, Average and Median Distance Travelled by Students In and Out of Unit While Constructing Second Garment. Spring Quarter . .	40

FIGURE

4. Highest, Lowest, Average and Median Hours
Spent by Students In and Out of Unit While
Constructing First Garment. Spring Quarter . 41
5. Highest, Lowest, Average and Median Hours
Spent by Students In and Out of Unit While
Constructing Second Garment. Spring Quarter . 41
6. Comparison of the Average of Final Clothing
Construction Grades of Selected Students In
and Out of Unit with Prediction of Home
Economics Achievement. Fall Quarter 47
7. Comparison of the Average of Final Clothing
Construction Grades of Selected Students In
and Out of Unit with Prediction of Home
Economics Achievement. Winter Quarter 47
8. Comparison of the Average of Final Clothing
Construction Grades of Selected Students In
and Out of Unit with Prediction of Home
Economics Achievement. Spring Quarter 47

ABSTRACT

1

The purpose of this study was to determine the differences in the amount of time and motion used by students working in a sewing unit as contrasted to those out of the unit.

A unit arrangement of sewing and pressing equipment was organized in each of the two sewing laboratories at Montana State College. Two students from each class section were selected as controls working in the laboratory and were paired with two students assigned as the experimental group working in the unit. Records were kept by 44 different students from 11 sections for the three quarters--fall, winter, and spring--that this study was in progress.

Students were paired on the following basis: high school standing record obtained from the College Registrar's Office; home economics college prediction record obtained from the College Testing Bureau; and record of previous sewing experience obtained from the College instructors.

The time used in constructing a garment was recorded by the student. Distance traveled was measured by pedometers and these readings were recorded also.

The data secured showed that the experimental groups saved energy by traveling considerably less distance than the controls in the laboratory. The amount of time saved by working in the unit was negligible. All the students answering the questionnaire said they enjoyed working in the unit and would like to work in a laboratory arranged in this manner.

INTRODUCTION

2

Time is limited and the way it is used varies greatly with individuals. The effective use of time in the home often differentiates between "housekeeping" and "homemaking". Some women spend so much time in the routine duties of housekeeping that they have no time or energy left for the all important task of homemaking. One of the aims of good management is the efficient use of time and energy in housekeeping in order to provide more time for homemaking.

Nickell and Dorsey define home management as the "dynamic force in homemaking, the mental work and power that put the machinery of housekeeping into action and keep it going".¹ Often homemakers are not aware of the problems in management that make housekeeping so time consuming. Watson² did a study at Iowa State College in 1941 to determine whether low income families were aware of their management problems. As test areas she used nutrition, clothing, child care, and money management. The conclusion of her study was that the majority of homemakers had serious problems in home management whether they recognized them or not.

¹ Paulena Nickell and Jean Muir Dorsey, Management in Family Living (New York: John Wiley and Sons, Inc., 1942), p. 28.

² Gertrude Elizabeth Watson, "Some Problems of the Low Income Homemaker and Her Awareness of These Problems", (unpublished Master's thesis, Iowa State College, 1941).

During the past twenty-five years, industry has undergone reorganization in many phases to increase production through a better utilization of time and energy of its workmen.³ A definite order of procedure for determining the best methods of production, called job analysis, has been developed. Relatively few studies using this procedure have been made in the field of homemaking to analyze the time and motion required to complete a household task. Gilbreth⁴ did some of the first studies using her own family for experimental purposes. Cushman,⁵ Cornell University, did a study on sewing conditions in nine homes using job analysis as the technique of her study.

It must be recognized that a wide difference exists in the tasks performed in an industrial plant and a home; however, some of the same principles apply to both situations. As a result of job analysis, new orders of procedure in performing many tasks were put into operation in industry. Output increased while use of time and motion decreased.⁶

³ Ralph M. Barnes, Motion and Time Study (New York: John Wiley and Sons, Inc., 1940), pp. 1-39.

⁴ Lillian Gilbreth, The Homemaker and Her Job (New York: D. Appleton and Company, 1928), p. 155.

⁵ Ella M. Cushman, "Organization of the Sewing Center in the Home", Bulletin 492 (Ithaca, New York: Cornell University Agricultural Experiment Station, reprint 1944), pp. 1-37.

⁶ Barnes, op. cit., pp. 1-39.

An analysis of any household task requires a preliminary investigation. This investigation should include:

- _____ "A study of the importance of the job as indicated by how often the job is done
- _____ A study of the people performing the job and their relation to it
- _____ A study of the method followed in doing the job--this would include the distance traveled and the time consumed
- _____ A study of the equipment and materials used in performing the job
- _____ A study of the surroundings of the working area as they relate to the satisfaction of the worker
- _____ An analysis of data collected."⁷

Most job analysis studies concerned with the mechanics of performing household tasks have centered about the kitchen. The findings of these studies have served as the basis for the great impetus for improving work centers in this area. The terms "food preparation center", "laundry center", and other specific centers are understood by the majority of homemakers even though a good many of them may not have their equipment organized into these work centers."⁸

⁷ Cushman, op. cit., reprint 1944, p. 5.

⁸ Lydia Ray Balderston, Housewifery (Chicago: J. B. Lippincott Company, revised 1936), pp. 1-3.

Among others, Gross,⁹ Halbert,¹⁰ and Weaver¹¹ have done research in this field of work centers. Gross¹² summarized her findings in this statement, "Attention to working arrangements gave greater results than the detailed study of body movements since improved arrangements of necessity decreased number and duration of operations."

Sewing is one activity in the home which seems to be done with much wasted time and energy. Equipment frequently is spread over the entire house. Cushman¹³ did studies in nine homes charting the pathway of homemakers while making an apron, using equipment in original positions and again with equipment reorganized. In one home, 245 feet were traveled under the first arrangement and only 89 feet 4 inches when the equipment was arranged in a unit.

To find how sewing equipment was arranged in Montana homes, a questionnaire, formulated by the investigator, on kind and location of sewing equipment was sent to women in

⁹ Irma H. Gross and Esther Everett, "Work Simplification of Three Household Tasks", (unpublished Master's thesis, Michigan State College, 1944).

¹⁰ Elizabeth Helen Halbert, "The Adaptation of Work Simplification Methods to Household Activities", (unpublished Master's thesis, Purdue University, 1945).

¹¹ Elaine Knowles Weaver, "How Hard Do Homemakers Work?" (compiled for Eureka Williams Corporation, Bloomfield, Illinois).

¹² Gross, op. cit.

¹³ Cushman, op. cit., reprint 1944, pp. 1-37.

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seven counties. (Appendix A) This questionnaire was circulated by home demonstration agents to members of one club in each of seven counties. The results of the questionnaire indicated that few women had their equipment arranged in a convenient manner. Further findings of this survey will be given on pages 13-15 of this report.

No doubt the factors that make sewing a disagreeable task to many homemakers are the irritation and annoyance caused by scattered and unorganized sewing equipment, poor in quality and inadequate in amount.

It is the policy of Ella M. Cushman at Cornell University, upon request, to take her class in Home Management to homes in the vicinity to help homemakers with their problems. In her book, Management in Homes, she reports on the work her class did in helping three homemakers organize sewing centers in their homes.¹⁴ With the help of her class, she developed a sewing cabinet which contained all the equipment necessary for home sewing.¹⁵ The idea of a sewing center evolved from this and other studies. Cushman advocated the placing of these cabinets in rural schools in which home economics was taught, as well as in the clothing laboratories in high schools and colleges so that the organizing and grouping of sewing equipment would become an accepted custom.

¹⁴ Ella M. Cushman, Management in Homes (New York: The Macmillan Company, 1945), pp. 225-231.

¹⁵ Cushman, op. cit., reprint 1944, pp. 1-37.

Relatively few clothing laboratories have used the sewing center or unit arrangement for equipment. A questionnaire was sent to eleven western colleges or universities to ascertain to what extent unit arrangements were used.

(Appendix B) All the colleges contacted, as well as Montana State College, had the usual laboratory arrangement--tables down the center of the room, machines at one side, ironing boards at one end, and the fitting room and mirrors at another location.

A time and motion study was carried on by the investigator for three quarters in the clothing construction classes at Montana State College.

The aim of this study was to determine the differences in the amount of time and motion used by college students in the construction of garments under existing laboratory arrangements as contrasted to a unit arrangement.

By doing this study, the investigator hoped to find the answers to the following questions:

- _____ Will time be saved in clothing construction by a unit arrangement of equipment?
- _____ Will the amount of motion be reduced sufficiently to warrant setting up unit arrangements?
- _____ Will the girl enjoy her work more or less under this arrangement?

There are two reasons why the investigator chose this particular subject for study. A School of Homemaking is being

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8

established at the University of Saskatchewan, and the people responsible for the arrangement of sewing equipment are desirous of knowing whether unit arrangement is preferable to the usual laboratory arrangement. This school is to give practical training in homemaking and is not for professional training, so an approximation of home situations is desirable. The staff of the clothing department at Montana State College also expressed interest in such a study.

One of the primary considerations in an investigation of this kind is an analysis of the importance of the job, and that importance is indicated by the amount of work done and the necessity for its being done. Two situations under which sewing is done were investigated, the home and the college laboratory.

A study having bearing on the home situation was made by the Bureau of Home Economics, United States Department of Agriculture and recorded in Management in Daily Living.¹⁶

This study shows that rural and small town homemakers spend an average of from 5 to 6 hours a week on sewing and mending. The average time spent on all homemaking activities is approximately 50 hours per week. The average time spent in sewing and mending is one-tenth of the time spent on all activities. Laundering takes approximately the same amount of time.

Table I.

A survey conducted by the Bureau of Agricultural Economics to find "Women's Preferences Among Selected Textile Products" reveals that 65 per cent of the 729 women questioned make their own house dresses or have them made for them.¹⁷

¹⁶ Ruth Bonde, Management in Daily Living (New York: The Macmillan Company, 1944), p. 82.

¹⁷ Bureau of Agricultural Economics, Women's Preferences Among Selected Textile Products, Miscellaneous Publication No. 641, (Washington, D. C.: United States Department of Agriculture, 1947), p. 39.

TABLE I

AVERAGE TIME PER WEEK SPENT BY RURAL AND URBAN
HOMEMAKERS IN VARIOUS ACTIVITIES*

(Unprinted data. Bureau of Home Economics, U.S. Dept. of Agri.)

Activity	Average time spent by:							
	Farm home-makers		Other rural home-makers		Home-makers in cities under 100,000		Home-makers in cities of 100,000 or more	
	Hr.	Min.	Hr.	Min.	Hr.	Min.	Hr.	Min.
Homemaking								
Purchasing & management	2	10	2	45	4	40	5	29
Care of family	3	55	4	43	10	18	9	29
Preparing meals	15	14	13	54	10	49	9	14
Clearing away meals	7	36	6	45	5	11	4	3
Cleaning & care of house	9	37	9	26	7	38	7	20
Laundering	5	16	5	11	3	18	2	54
(Mending	1	34	1	27	1	39	1	24
(Sewing	3	59	4	45	2	19	2	38
Other homemaking	2	19	2	35	3	48	4	35
Total for homemaking activities	51	40	51	31	49	40	47	6

*Only part of table quoted.

The Montana survey that the investigator conducted shows that of the 165 women reporting, 83 per cent make some of their own clothes and 12 per cent make all of their children's clothes. Table II.

TABLE II

RECORD OF SEWING DONE IN 165 MONTANA HOMES

Clothing constructed	Number of women that	
	Make all	Make some
Children's clothes	20	10
Own clothes	12	137
Clothes for others	4	64

A good deal of time and thought have been given to improving laundering conditions, but little has been done to improve sewing conditions. The findings given in the surveys mentioned seem to justify further study in this field.

At Montana State College each clothing construction class is allowed approximately 22 laboratory periods of 2 hours each, a total of 44 hours per quarter. This allotment varies from quarter to quarter depending upon opening and closing dates, holidays, and other factors. One clothing class takes roughly one-fifth of the students' working hours. The curriculum in textiles and clothing includes many types of clothing construction classes.

A different class was used each quarter in this study. The construction requirements varied with the classes.

Requirements for the fall quarter class were:

- _____ to construct an unlined wool garment, preferably a one piece dress
- _____ to construct an article such as a rayon dickey or a blouse having a convertible collar.

Students in the class this quarter had had one previous college clothing construction course, or equivalent home or club experience which was sufficient to permit entrance.

Construction requirements for the winter quarter class were:

- _____ a wool make-over for self or others

- _____ a garment using some machine attachment such as ruffler or tucker
- _____ repairing a personal article
- _____ additional project of alteration of ready-made garment.

Students in this class had had one or two previous college construction courses.

In the spring quarter, students were taking their first college clothing construction class but their previous experience varied noticeably. Table IV, page 23, gives the background of students in one section of the spring quarter class. Background varied from no experience to three years in high school and six years in 4-H Club work. In view of this experience any student was privileged to challenge the course; a passing grade exempted her. Construction requirements for this quarter were two garments made of cotton or material offering similar problems. Either one of these garments was to include:

- _____ convertible or non-convertible collar
- _____ set in sleeves
- _____ bound or worked buttonholes
- _____ slide fastener.

It is also important in an investigation to consider the person concerned and her relation to the job. The principal reasons women give for doing sewing in the home seem to be:¹⁸

¹⁸ Bureau of Agricultural Economics, loc. cit.

- _____ for the sake of economy
- _____ in order to have garments that are individual
- _____ for convenience
- _____ for enjoyment
- _____ for better fit
- _____ for better workmanship.

College students sew either because it is a course required for their particular curriculum, or elect it because they want to learn to make clothes for themselves and later for members of their family.

Another consideration in an investigation is an analysis of the equipment and materials used in performing a job.

The survey made in Montana shows that of the rural homemakers questioned, few have done anything to group sewing equipment so that time and motion could be reduced when equipment was used. From the reports of the 165 women, only 17 had their sewing equipment arranged in a sewing or utility room. Table III shows the number and location of sewing equipment in these Montana homes; Figure 1 gives a graphic presentation of this information.

TABLE III
NUMBER AND LOCATION OF SEWING EQUIPMENT
USED IN 165 MONTANA HOMES

Room	Machine	Cutting equipment	Pressing equipment	Small equipment
Kitchen	15	87	102	16
Dining room	37	52	32	41
Utility room	17	17	17	17
Bedroom	35	4	6	44
Living room	40	8	4	12
*Sun porch	4	-	1	8
*Hall	1	-	-	-
*Basement	2	-	-	-
*No particular place	-	-	-	11
No answer	31	14	20	33

*Not charted in Figure 1

Table III shows that although 35 machines are used in the bedroom, only 4 women cut out and assemble garments there and only 6 women keep pressing equipment in that room. One hundred and two women do their pressing in the kitchen but only 15 machines are kept there.

It is evident that a good deal of extra walking is necessitated by having to move from room to room for various operations.

In some college sewing laboratories, the equipment is generally located in one room but is widely separated. The answers received from the nine western colleges or universities indicated that none of their laboratories were arranged on the unit basis, nor were the laboratories at Montana State

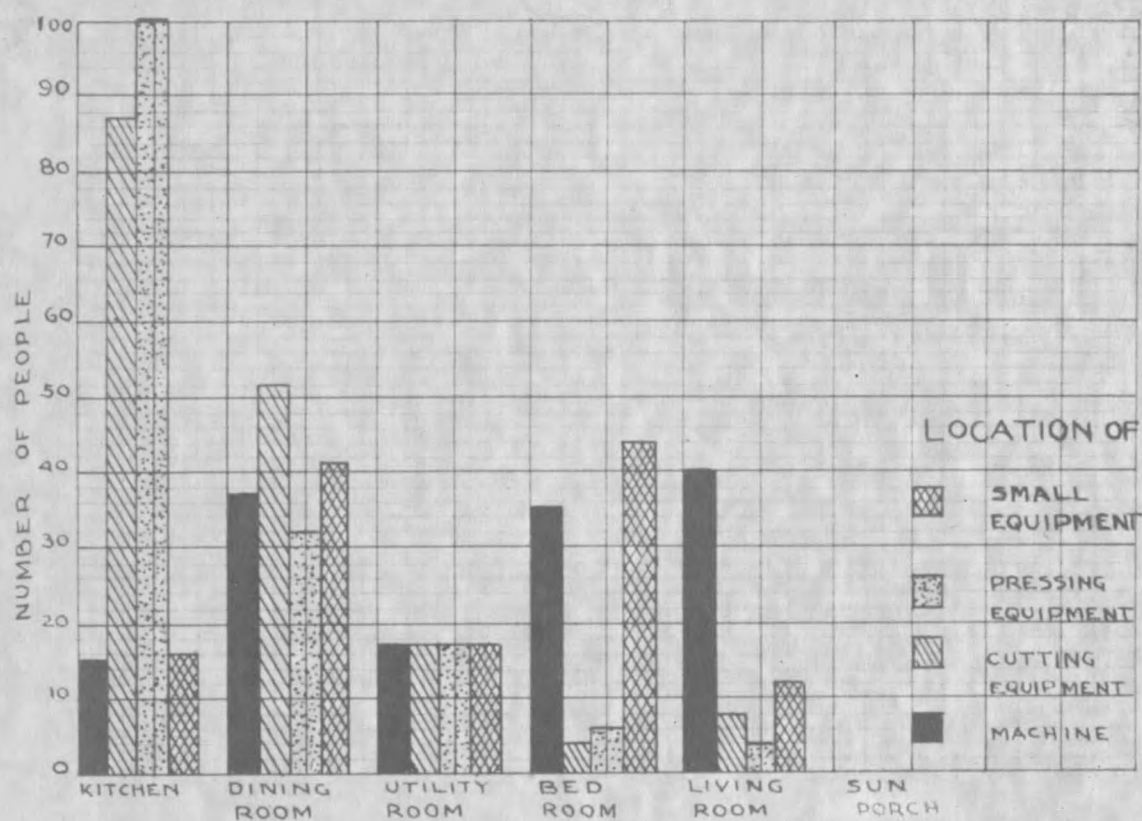


FIG. 1. LOCATION OF SEWING EQUIPMENT IN
165 MONTANA HOMES 1948

College. Under such an arrangement the student cuts out her garment on the work table, goes to a machine at one side of the room to stitch, returns to the table for basting, goes to the end of the room each time she needs to press, returns to the table for basting or to the machine for stitching, and goes to another room for fittings.

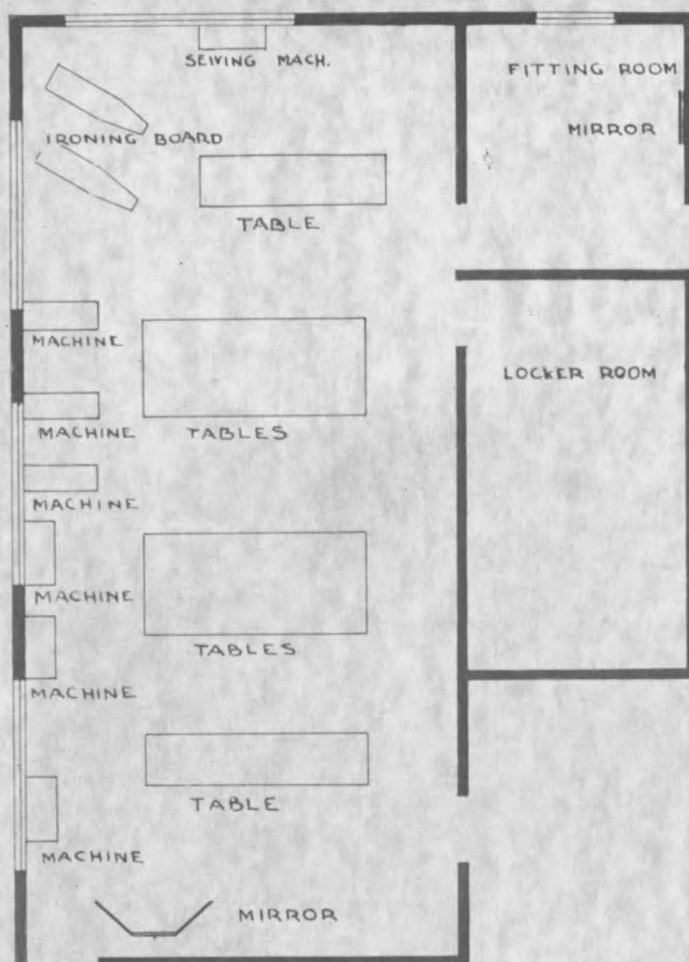
Methodology:

In a preliminary investigation analyzing a household task it is important to study the method followed in performing the task. In a study such as this concerning the time and motion used by students in constructing clothing, it is of still greater importance. When analyzing the method used in completing a job, the distance traveled and the time consumed should be considered.

When this study was undertaken fall quarter, the investigator found the clothing laboratories at Montana State College arranged in what is considered the usual laboratory manner. Plate I. In order to carry out this study, the investigator organized a unit at one end of the room which would accommodate two students. Plates II, III, and IV. In arranging this unit, the only equipment that had to be removed from the regular laboratory was one sewing machine. An additional machine was purchased and placed in the regular laboratory for use winter and spring quarters. The same procedure was followed in setting up a duplicate unit in the second clothing laboratory. Each unit contained two sewing machines, two tables, two orange crates, one ironing board, and one orange crate fastened to the wall above the ironing board to hold pressing equipment. Each girl assigned to the unit had for her own use: a sewing machine either electric or treadle, a work table, and a crate in which to keep equipment. The two

girls shared the use of the ironing board and pressing equipment. Plate IV. The latter included one electric control iron, one steam iron, pressing cloths of wool and cotton, seam roll, ham, sleeve board, dish of water, and sponge. These were placed in the crate above the ironing board and could be reached without extra steps--with the exception of the steam iron. The electric iron was kept on the ironing board but the steam iron was shared with students in the laboratory. Frequently the girl in the unit had to go to one of the other ironing boards to get the steam iron.

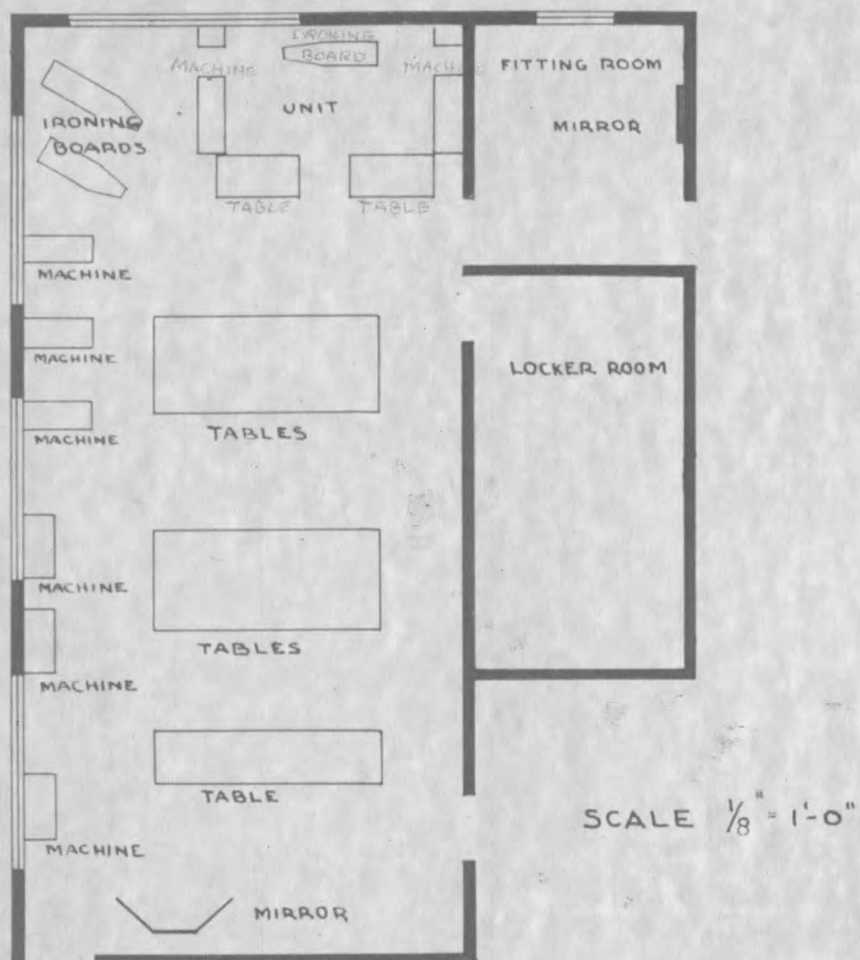
Tables and machines are often moved in the laboratory. The position of each piece of equipment was marked on the floor with paint to insure having it in exactly the same position for each class. When the investigator was not there to do so, the presiding teacher checked the position of equipment at the beginning of each class period.



SCALE $\frac{1}{8}" = 1'-0"$

ORIGINAL ARRANGEMENT OF EQUIPMENT IN
ONE LABORATORY — FALL QUARTER

PLATE I



ARRANGEMENT OF EQUIPMENT IN ONE CLOTHING
LABORATORY WITH THE UNIT INSTALLED



VIEWS OF CLOTHING LABORATORY SHOWING POSITION OF
EQUIPMENT AND PLACEMENT OF UNIT.
MONTANA STATE COLLEGE



UNIT ARRANGEMENT OF SEWING AND PRESSING EQUIPMENT
FOR SPECIAL USE OF CONTROLS IN UNIT CLOTHING LABORATORY,
MONTANA STATE COLLEGE.



CABINET FOR PRESSING EQUIPMENT USED BY CONTROLS OUT OF
UNIT AND REMAINDER OF CLASS. CLOTHING LABORATORY
MONTANA STATE COLLEGE.

PLATE IV

In order to have a basis for pairing the students to be used in this study, the following information was tabulated for every girl in each section of a class: high school standing secured from College Registrar's Office; home economics prediction obtained from the College Testing Bureau; high school, home, and club experience records obtained from College instructors. Table IV gives this information for one section of a class.

TABLE IV
INFORMATION USED IN PAIRING STUDENTS IN ONE SECTION
SPRING QUARTER CLASS

SECTION I

Student*	High school standing	Home economics prediction	Other experiences	Position of selected students to unit
1	M	B	2 yrs. H.S. 1 yr. 4-H	In
2	H	B	None	
3	H	A	At home	In
4	Not on file	---	2 yrs. H.S.	
5	H	B	2 yrs. 4-H	
6	H	B	2 yrs. H.S.	
7	H	B	None	
8	M	B	None	Out
9	L	C	None	
10	H	B	1 yr. 4-H	
11	Not on file	---	1 yr. H.S.	
12	H	A	None	Out
13	H	B	None	
14	H	A	None	
15	Not on file	---	1 yr. H.S.	
16	Not on file	---	Home	
17	Not on file	---	None	

* Student 1 was paired with student 8, both having a high school rating of medium and a home economics prediction of B. Student 3 was paired with student 12, both having high school standing of high and a prediction of A.

Prediction record, time spent, and grade obtained for all students in each of the four sections are to be found in Tables V, VI, VII, and VIII.

The home economics prediction is expressed by letters. The Testing Bureau at Montana State College gives the following information regarding the letters used. "The letters A, B, C, and D are used to express expected success in Agriculture, Science, Engineering, Home Economics, and Secretarial Studies. These are arrived at by means of various weights applied to the factors, High School Standing, Psychology Placement Grade, and Mathematics Placement Grade. A denotes that the student has a very high likelihood of succeeding in the type of work for which the A index is given. B indicates the chance of success is good; C that it is only fair; and D indicates that failure is likely to result should the student try that type of college work."

The average enrollment in a construction class was 17. Four girls were selected from each class section for this study. Two of these girls were assigned as controls to places in the laboratory. Their paired partners were assigned to work in the experimental unit. In the course of the study, students of varying predictable ability were used. Whenever possible a student in the experimental group approximated her partner in the control group with regard to prediction ability and records of achievement.

TABLE V

HIGH SCHOOL STANDING, HOME ECONOMICS PREDICTION, TIME SPENT, DISTANCE COVERED,
AND GRADES SECURED IN CLOTHING CONSTRUCTION, SECTION I, SPRING QUARTER

Student	High school	Home economics prediction	Time in hours		Distance in feet		Grade		Position of student to unit
			1st garment	2nd garment	1st garment	2nd garment	1st garment	2nd garment	
1	M	B	28.0	21.5	1267	1046	84 C	90 B	In
2	H	B	--	21.0			71 D	54 F	
3	H	A	46.5	41.5	782	279	89 B	68 D	In
4	Transfer		--	--			71 D	45 F	
5	H	B	--	11.0			49 F	43 F	
6	H	B	46.0	18.0			82 C	86 B	
7	H	B	--	27.5			42 F	74 D	
8	M	B	30.0	23.0	1626	--	85 B	68 D	Out
9	L	C	34.0	17.0			93 B	79 C	
10	H	B	--	--			88 B	69 D	
11	Transfer		--	11.0			97 A	93 B	
12	H	A	31.5	14.0	1766	2112	90 B	90 B	Out
13	Transfer		40.0	24.0			76 C	83 C	
14	Transfer		38.0	17.0			86 B	93 B	
15	Transfer		43.0	--			76 C	84 C	
16	Transfer		--	--			82 C	91 B	
17	Transfer		56.0	--			82 C	85 B	
Class High			56.0	41.5			97 A	93 B	
Class Low			28.0	11.0			42 F	43 F	
Class Average			39.8	18.4			78 C	75 C	
Class Median			38.5	17.5			84 C	83 C	

-- Signifies no record available for student.

TABLE VI

HIGH SCHOOL STANDING, HOME ECONOMICS PREDICTION, TIME SPENT, DISTANCE COVERED,
AND GRADES SECURED IN CLOTHING CONSTRUCTION, SECTION II, SPRING QUARTER

Student	High school	Home economics prediction	Time in hours		Distance in feet		Grade		Position of student to unit
			1st garment	2nd	1st garment	2nd	1st garment	2nd	
1	Transfer		--	--			64 D	79 C	
2	H		--	--			60 D	61 D	
3	M	C	50.0	27.0			85 B	95 A	
4	M	C	29.0	10.0	1003	1014	86 B	93 B	In
5	L	C	--	--			74 C	83 C	
6	L	D	40.5	--			48 F	55 E	
7	Transfer		31.0	--			93 B	81 C	
8	H	B	--	--	--	--	77 C	92 B	In
9	M	B	49.0	--			81 C	93 B	
10	M	C	32.0	--	1795	--	96 A	95 A	Out
11	H	C	--	--			76 C	72 D	
12	Transfer		44.5	23.5			97 A	90 B	
13	H	B	37.0	--			82 C	76 C	
14	Transfer		50.0	21.0			88 B	95 A	
15	Transfer		58.0	--			76 C	83 C	
16	Transfer		--	--			88 B	86 B	
17	H	B	34.0	15.0	4752	1452	85 B	70 D	Out
18	Transfer		--	--			80 C	91 B	
Class High			50.0	31.0			97 A	95 A	
Class Low			29.0	15.0			48 F	55 F	
Class Average			41.6	23.5			80 C	81 C	
Class Median			39.0	22.0			82 C	83 C	

-- Signifies no record available for student.

TABLE VII

HIGH SCHOOL STANDING, HOME ECONOMICS PREDICTION, TIME SPENT, DISTANCE COVERED,
AND GRADES SECURED IN CLOTHING CONSTRUCTION, SECTION III, SPRING QUARTER

Student	High school	Home economics prediction	Time in hours		Distance in feet		Grade		Position of student to unit
			1st garment	2nd garment	1st garment	2nd garment	1st garment	2nd garment	
1	H	B	--	--			94 B	90 B	
2	M	D	44.0	17.5	422	528	88 B	71 D	Out
3	M	B	40.5	--			85 B	92 B	
4	H	B	44.0	29.5	2147	1014	86 B	89 B	Out
5	H	A	28.0	14.0	449	132	90 B	92 B	In
6	H	B	33.0	10.0			88 B	86 B	
7	Transfer		38.0	16.0			83 C	84 C	
8	H	B	--	17.0			87 B	73 D	
9	H	B	44.0	--			91 B	87 B	
10	H	B	44.0	11.0			95 A	84 C	
11	L	C	26.0	17.0	2640	1320	79 C	89 B	In
12	M	D	37.5	15.0			72 D	80 C	
13	Transfer		36.0	20.0			91 B	86 B	
14	H	B	54.5	15.0			88 B	85 B	
15	Transfer		36.5	--			60 E	76 C	
16	M	C	34.0	--			98 A	96 A	
17	M	C	36.0	25.0			73 D	81 C	
18	Transfer		--	32.0			98 A	89 B	
Class High			54.5	32.0			98 A	96 A	
Class Low			33.0	10.0			60 E	76 C	
Class Average			40.1	18.9			85 B	85 B	
Class Median			38.0	17.0			88 B	86 B	

-- Signifies no record available for student.

TABLE VIII

HIGH SCHOOL STANDING, HOME ECONOMICS PREDICTION, TIME SPENT, DISTANCE COVERED,
AND GRADES SECURED IN CLOTHING CONSTRUCTION, SECTION IV, SPRING QUARTER

Student	High school	Home economics prediction	Time in hours		Distance in feet		Grade		Position of student to unit
			1st garment	2nd	1st garment	2nd	1st garment	2nd	
1	L	C	33.0	--			86 B	95 A	
2	H	A	36.0	18.5	1346	660	80 C	80 C	Out
3	Transfer		--	--			70 D	60 D	
4	Transfer		--	--			87 B	80 C	
5	H	B	44.0	15.0	475	290	87 B	55 E	In
6	M	C	68.0	--			63 E	75 C	
7	Transfer		--	--			79 C	90 B	
8	L	D	45.0	--			93 B	95 A	
9	H	C	40.0	--	1373	--	90 B	70 D	Out
10	L	D	40.0	--			81 C	70 D	
11	M	C	46.0	15.0	422	--	92 B	90 B	In
12	Transfer		42.0	--			71 D	70 D	
13	Transfer		--	--			Inc.	Inc.	
14	Transfer		--	--			Inc.	60 E	
15	H	B	33.25	--			85 B	95 A	
16	H	B	41.0	--			74 D	85 B	
	Class High		68.0	18.5			93 B	95 A	
	Class Low		33.0	15.0			70 D	60 E	
	Class Average		42.0	16.2			70 D	79 C	
	Class Median		40.0	15.5			81 C	80 C	

-- Signifies no record available for student.

Table IX shows the record of the information used in selecting and pairing the 16 selected students for fall quarter.

Twelve students were used for the study for winter quarter. Pairing was done on the same basis as in the previous quarter. This time, students with A, B, and C home economics prediction were used. Table X gives the record of the information used in pairing the students.

At the outset of the study the investigator raised the question--what basis should she use as a means of pairing students? The information available regarding students consisted of high school standing and home economics prediction. Whether this would be a sound basis for pairing could be discovered only by recording these predictions and the final grade the students achieved from the course. Records for fall and winter quarter, Tables IX and X, showed a close correlation between home economics prediction and final grade achieved. In view of this fact, the same procedure for pairing students was followed for the spring quarter study, Table XI.

In referring to Table XI, student 5, Section III, has a rating of high and a prediction of A, while student 4, Section III, has a rating of high but a prediction of only B. This pairing was necessary as no other student with a comparable rating had comparable experience. These factors hold true regarding the pairing of students 12 and 2, Section III, and students 5 and 2, Section IV.

TABLE IX

RECORD GIVING INFORMATION USED IN PAIRING, TIME SPENT, AND
FINAL GRADE SECURED BY 16 STUDENTS IN FOUR SECTIONS
OF CLOTHING CONSTRUCTION CLASS, FALL QUARTER

Position to unit	Stu- dent	Sec- tion	High school standing	Home economics prediction	Time		Final grade
					Hrs.	Min.	
In	1	I	H	B	18	54	B
Out	2	I	H	B	33	15	B
In	3	I	L	C	*--	--	F
Out	4	I	L	C	39	--	D
In	5	II	H	B	24	30	B
Out	6	II	H	C	21	45	A
In	7	II	L	D	18	--	F
Out	8	II	M	D	33	30	D
In	9'	III	H	C	25	45	C
Out	10	III	H	C	14	30	C
In	11	III	M	C	32	10	C
Out	12	III	M	C	39	30	C
In	13	IV	H	B	28	8	B
Out	14	IV	H	C	19	7	B
In	15	IV	M	C	30	--	C
Out	16	IV	M	B	*--	--	F

*--Indicates no record available for student

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TABLE X

RECORD GIVING INFORMATION USED IN PAIRING, TIME SPENT,
DISTANCE TRAVELED, AND GRADES SECURED BY 12 STUDENTS
IN THREE SECTIONS OF CLOTHING REPAIR AND RENOVATION,
WINTER QUARTER

Position to unit	Stu- dent	Sec- tion	High school standing	Home economics prediction	Time		Distance in feet	Final grade
					Hrs.	Min.		
In	1	I	H	B	41	20	728	B
Out	2	I	H	B	18	50	976	B
In	3	I	H	B	28	30	1102	B
Out	4	I	H	C	22	--	1294	C
In	5	II	H	C	30	--	2112	C
Out	6	II	H	C	23	--	3537	B
In	7	II	H	A	21	30	945	B
Out	8	II	H	A	33	--	887	B
In	9	III	M	C	26	20	1432	C
Out	10	III	M	C	23	--	2333	B
In	11	III	M	C	22	--	924	C
Out	12	III	M	C	*--	--	*--	B

*--Indicates no record available for student

TABLE XI

RECORD GIVING INFORMATION USED IN PAIRING 16 STUDENTS
IN FOUR SECTIONS OF CLOTHING CONSTRUCTION CLASS,
SPRING QUARTER

Position in unit	Student	Section	High school standing	Home economics prediction	Other experiences
In	1	I	M	B	2 yrs. H.S.
Out	8	I	M	B	1 yr. 4-H 3 yrs. H.S.
In	3	I	H	A	At home
Out	12	I	H	A	None
In	4	II	M	C	Quite a lot
Out	10	II	M	C	At home
In	8	II	H	B	Very little
Out	17	II	H	B	1 yr. H.S.
In	5	III	H	A	2 yrs. H.S.
Out	4	III	H	B	2 yrs. H.S.
In	12	III	L	C	6 yrs. 4-H
Out	2	III	M	D	1 yr. H.S.
In	5	IV	H	B	1 yr. H.S.
Out	2	IV	H	A	3 yrs. H.S.
In	11	IV	M	C	2 yrs. H.S.
Out	9	IV	H	C	1 yr. H.S.

A method of recording time was next considered. A time sheet listing dress construction techniques such as basting and stitching was developed fall quarter. (Appendix C). The investigator explained the use of this sheet to the students. As the time sheet required recording the minutes spent on various construction items, an electric clock was installed in a prominent place in the laboratory. A check was made within a few days to see if the students understood how to use the time sheet and apparently they did. However, when the time sheets were checked by the investigator at the end of the quarter, it was evident that a number of students had neglected to enter the entire amount of time spent in constructing their garments. While there were 36 hours of laboratory time in fall quarter allowed for constructing this garment, one student had entered only 14 hours on her time sheet, and some did not even hand in their records. Because the students failed to keep accurate records, such data as collected have little significance. Table IX.

Fall quarter observations showed clearly that the time sheet was too detailed for the students to keep accurately. To simplify this, the investigator decided to have the winter quarter students record their time on cards. These cards did not have the construction items listed but asked for a recording of the entire time spent in class periods whether in actual construction or in participating in a discussion demonstration. Time spent out of class was to be entered in a separate column.

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(Appendix D). Because the units of work this quarter dealt with repair and renovation, the time spent by individuals would of necessity vary, making it impossible to use the data. However, winter quarter gave the investigator the opportunity to have the students try out the revised time cards. The spring quarter card was similar to that used winter quarter except that it provided a space for recording the garment constructed and comments. (Appendix E).

The motion element was to be checked by the use of stepmeters which register each step taken by the control. Since they were unobtainable, pedometers were secured for use during winter and spring quarters. As pedometers change only every 1/40 mile or 132 feet, they do not serve the purpose of this study as well as stepmeters would have done. It was possible to secure only four pedometers; had more been available, a larger sampling would have been possible. The pedometers were worn by the selected students while their class section was in session. Readings were recorded at the beginning and again at the end of the period. (Appendix F).

As a means of checking the accuracy of the pedometers, the investigator charted the movements of a control in the laboratory and a student in the unit during two laboratory periods winter quarter. It was found that the pedometers were not recording the entire distance traveled. As a result, the investigator had the pedometers checked by a watchmaker who corrected the timing. Another reason they were not registering

entire distance was that the pedometers were worn above the knee and the step did not have enough force to clock the pedometer. For these reasons the tabulated records showing distance traveled winter quarter (Table X) could not be analyzed. To keep a check on the accuracy of the pedometers, the investigator again charted the movements of two students, one in the unit and her paired partner in the laboratory during two entire periods each week for the entire spring quarter. The laboratory was drawn to scale and transparent paper was placed over the map. Every floor movement of the students was charted by means of numbers. (Appendix G₁). At the end of the period, the investigator checked the charted distance with the pedometer readings. Students in the spring quarter class wore their pedometers on the ankle to insure enough force to register the distance traveled.

In an investigation, it is important to check the effect of the surroundings of the working center as they relate to the satisfaction of the worker.

Cushman¹⁹ makes the following statement: "To most women the satisfying part of sewing is the creative part. If the confusion and annoyance, as well as the expenditure of time and energy undergone in assembling, using, and putting away sewing equipment could be reduced to the minimum, and if the mechanical phases of the job could become as well ordered and

¹⁹ Cushman, op. cit., reprint 1944, p. 5.

automatic as possible, the worker would be able to put her best efforts, physical, mental, and spiritual, into the higher creative phases of the work. The establishment of such conditions might be the factor which would make sewing a permanent institution in many homes."

In an attempt to find how the students felt about the conditions under which they worked, the investigator talked with the girls about the unit. During hours when the laboratory was free for extra work, the use that the students made of the unit as contrasted to the ordinary laboratory was noted. At the end of spring quarter, a short questionnaire was given to each of the controls and to each of the girls working in the unit, since at some time during the quarter the controls also had access to the use of the unit during free hours. The questionnaire was given to determine the reaction of each girl to working in or out of the unit. (Appendix H).

RESULTS

37

This study was carried on during fall, winter, and spring quarters.

The data collected spring quarter were more complete and accurate than for fall and winter. For these reasons the investigator used the data from spring quarter for more critical analysis. Pedometers were used to record distance traveled by the controls in the laboratory and the selected students in the unit while constructing two garments. Table XII.

TABLE XII

DISTANCE TRAVELED BY CONTROL STUDENTS IN THE LABORATORY AND SELECTED STUDENTS IN THE UNIT WHILE CONSTRUCTING FIRST AND SECOND GARMENTS, SPRING QUARTER

Control group				Experimental group			
In laboratory				In unit			
Stu- dent	Sec- tion	Distance in feet		Stu- dent	Sec- tion	Distance in feet	
		1st garment	2nd garment			1st garment	2nd garment
8	I	1626	--	1	I	1267	1046
12	I	1766	2112	3	I	782	279
10	II	1795	--	4	II	1003	1014
17	II	4752	1452	8	II	--	--
4	III	2147	1014	5	III	449	132
2	III	422	528	11	III	2640	1320
2	IV	1346	660	5	IV	475	290
9	IV	1373	--	11	IV	422	--
High		4752	2112			2640	1320
Low		422	528			422	132
Average		1897	1153			1005	969
Median		1685	1014			782	652

-- Signifies no record available.

Table XIII shows the amount of time used by the students working in the unit and by those out of the unit while constructing their two garments.

TABLE XIII

TIME USED BY CONTROL STUDENTS IN THE LABORATORY AND
SELECTED STUDENTS IN THE UNIT WHILE CONSTRUCTING
FIRST AND SECOND GARMENTS, SPRING QUARTER

Control group				Experimental group			
In laboratory				In unit			
Stu- dent	Sec- tion	Time in hours		Stu- dent	Sec- tion	Time in hours	
		1st garment	2nd garment			1st garment	2nd garment
8	I	30.0	23.0	1	I	28.0	21.5
12	I	31.5	14.0	3	I	46.5	41.5
10	II	32.0	--	4	II	29.0	10.0
17*	II	34.0	15.0	8	II	--	--
4	III	44.0	29.5	5	III	28.0	14.0
2	III	44.0	17.5	11	III	26.0	17.0
2	IV	36.0	18.5	5	IV	44.0	15.0
9	IV	40.0	--	11	IV	46.0	15.0
High		44.0	29.5			46.5	41.5
Low		30.0	14.0			26.0	10.0
Average		36.4	19.5			35.3	19.1
Median		36.0	18.0			29.0	15.0

* Student 17, Section II, not used in obtaining median.

-- Signifies no record available.

The grades the students secured on each garment are tabulated in Table XIV.

TABLE XIV

GRADES SECURED BY CONTROL STUDENTS IN THE LABORATORY AND SELECTED STUDENTS IN THE UNIT WHILE CONSTRUCTING FIRST AND SECOND GARMENTS, SPRING QUARTER

Control group				Experimental group			
In laboratory				In unit			
Student	Section	Grades		Student	Section	Grades	
		1st garment	2nd garment			1st garment	2nd garment
8	I	85	68	1	I	84	90
12	I	90	90	3	I	89	68
10	II	96	95	4	II	86	93
17	II	85	70	8	II	77	92
4	III	86	89	5	III	90	92
2	III	88	71	11	III	79	89
2	IV	80	80	5	IV	87	55
9	IV	90	70	11	IV	92	90
High		96	95			92	93
Low		80	68			77	55
Average		88	79			86	84
Median		87	76			87	90

Tables XII, XIII, and XIV also record the high, low, average, and median for distance, time, and grade for all the students studied. These figures are used in formulating the graphs--Figures 2, 3, 4, and 5--referred to in the discussion.

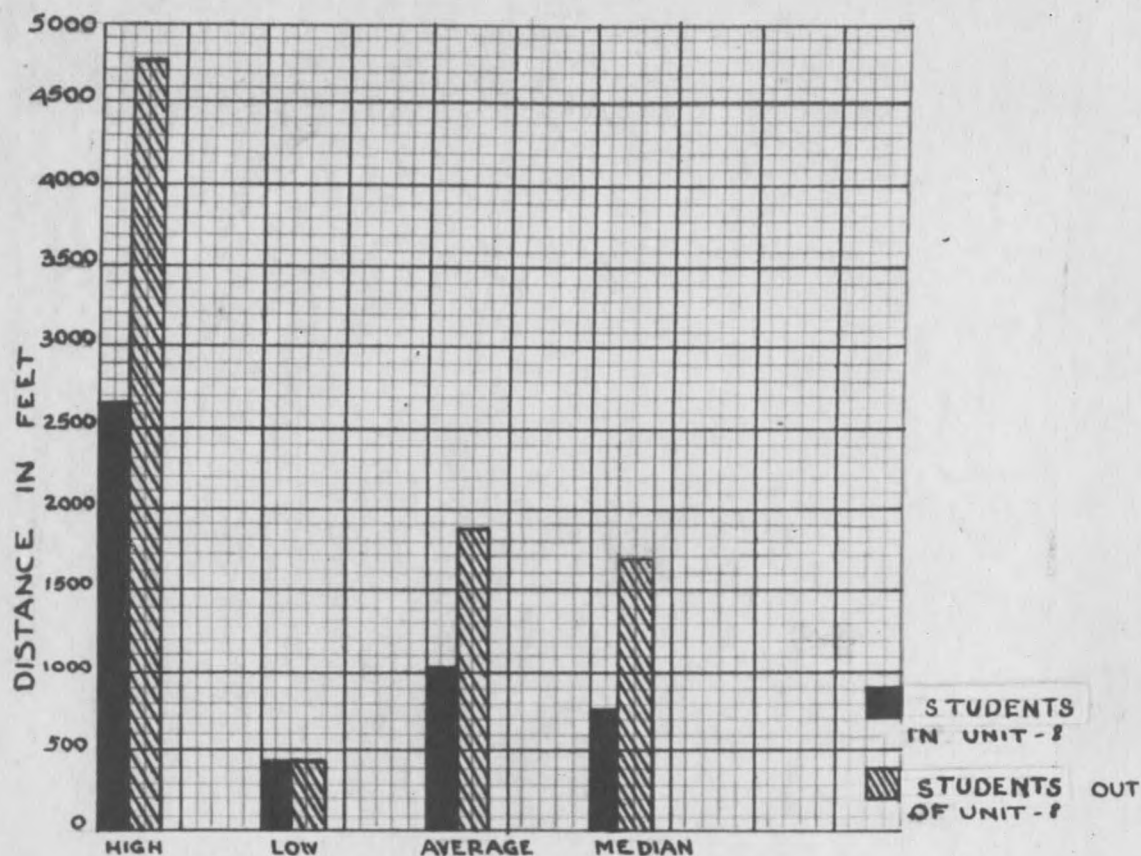


FIG. 2. HIGHEST, LOWEST, AVERAGE AND MEDIAN DISTANCE TRAVELLED BY STUDENTS IN AND OUT OF UNIT WHILE CONSTRUCTING FIRST GARMENT. SPRING QUARTER

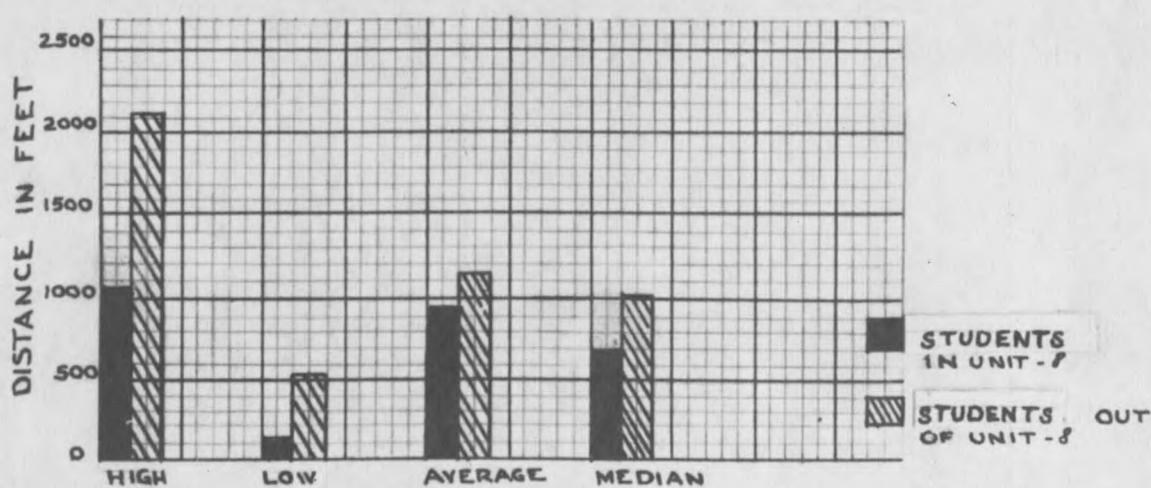


FIG. 3. HIGHEST, LOWEST, AVERAGE AND MEDIAN DISTANCE TRAVELLED BY STUDENTS IN AND OUT OF UNIT WHILE CONSTRUCTING SECOND GARMENT. SPRING QUARTER

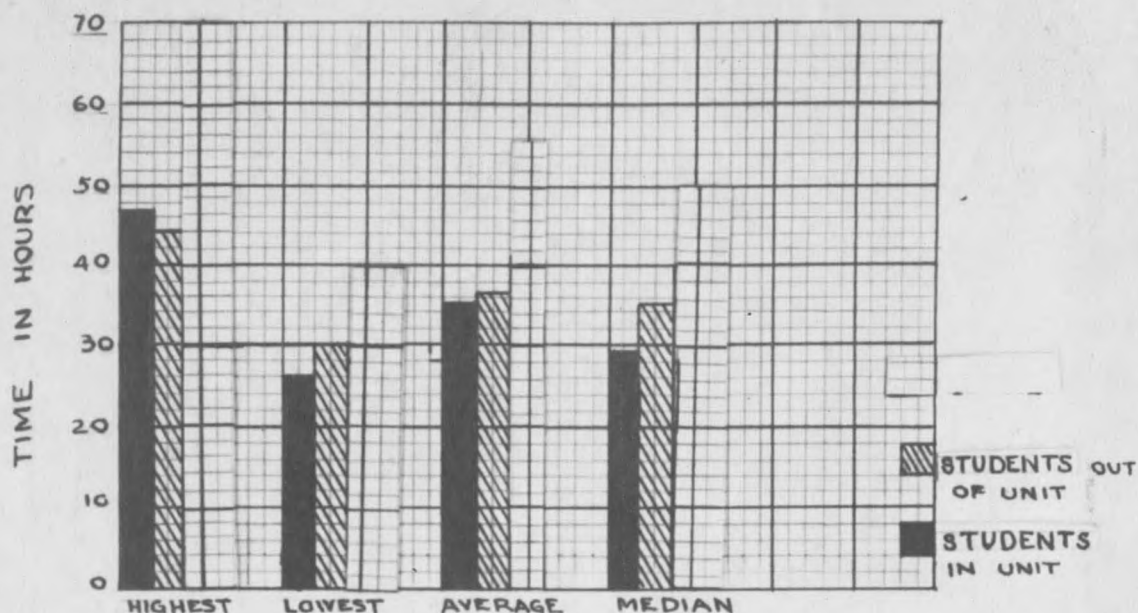


FIG. 4. HIGHEST, LOWEST, AVERAGE AND MEDIAN HOURS SPENT BY STUDENTS IN AND OUT OF UNIT WHILE CONSTRUCTING FIRST GARMENT. SPRING QUARTER

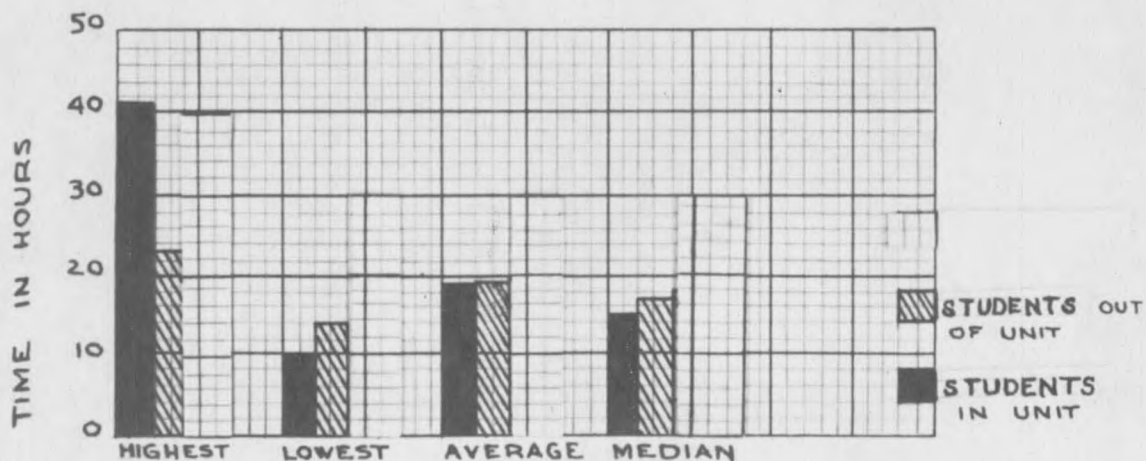


FIG. 5. HIGHEST, LOWEST, AVERAGE AND MEDIAN HOURS SPENT BY STUDENTS IN AND OUT OF UNIT WHILE CONSTRUCTING SECOND GARMENT. SPRING QUARTER

A questionnaire regarding the unit arrangement was given to the 44 students. (Appendix H). Table XV gives the replies of 32 students answering the questionnaire. While only 22 students were assigned to the units, all other students had an opportunity to work in the unit out of class period at some time during the quarter.

TABLE XV

REPLIES OF 32 STUDENTS TO QUESTIONNAIRE ON ATTITUDE
TOWARD UNIT ARRANGEMENT OF SEWING EQUIPMENT
IN CLOTHING LABORATORY

No. of students answering	Reasons given for preferring or enjoying unit arrangement
32	More convenient and less confusing
15	Did not have to wait for machine and iron
6	Saved steps
3	Did not have to alter tension or stitch on machine
2	Did not have to remove thread when leaving machine for few minutes
1	Not inclined to talk so much

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DISTANCE TRAVELED

The conditions spring quarter were most favorable for conducting the study on time and motion differentials in a generalized assignment in a home economics clothing laboratory class. Not only was the class this quarter more homogeneous than the preceding classes, but the pedometers had been used winter quarter and checked for accuracy. The cards for recording time and distance traveled had been used in the previous quarter and revised for spring quarter use. In view of this fact the investigator has used this data for analysis and discussion.

Previous studies on unit arrangement of home work centers show a saving of distance traveled.²⁰ To see if the assumption that a similar saving would be true under this situation, the investigator, in addition to having the students keep their pedometer readings of distance traveled, charted the movements of a control in the laboratory and her paired partner in the unit. This charting was done for one laboratory period of two hours. The student in the unit moved 73 feet in two trips to the ironing board and one trip to the instructor. She moved from her work table to the machine by merely turning her chair. (Appendix G₁). In the same period of time, her paired control in the laboratory moved 154 feet

²⁰ Balderston, loc. cit.

from her assigned place at one table in 3 trips to a machine and 1 trip to the ironing board. (Appendix G₂).

The data collected on distance traveled by the students showed that the unit arrangement did reduce the amount of distance that had to be covered in the construction of a garment. There was a saving of 47 per cent on the average distance covered in the construction of the first garment and 16 per cent on the second garment. When comparing the average and median distances covered by the controls in the laboratory with the students in the unit, the overall saving of distance is evident. Figures 2 and 3.

The distance traveled by all the controls and the experimental groups in constructing the second garment was considerably less than that for the first garment because only half as much time was allowed for the construction of this garment. Laboratory time used in constructing the first garment was seven weeks and for the second garment three weeks.

TIME USED

The average time saved by the experimental group in the unit on the construction of the first garment was one hour and on the second garment one-half hour. However, the figures for the median show a truer picture and a greater saving: on the first garment, seven hours; and on the second garment, three hours. Table XIII and Figures 4 and 5. The laboratory assignments were such that the average student should have

been able to complete the work without putting in additional outside time. Approximately 30 class hours were allowed for the construction of the first garment. Four students working in the unit stayed within this time allotment while only one student out of the unit completed the work in 30 hours or less. Table XIII.

GRADES SECURED

While an analysis of grades was not an aim of this study, it was interesting to the investigator to see results obtained by students working in the unit as contrasted with those out of the unit.

Table XIV gives the grades for each garment constructed secured by students used in this study. On the first garment, the median grade of 87 is the same for all students whether in or out of the unit. On the second garment, the median grade for the students in the unit rose to 90, while for the control students it dropped to 75. Students were working to a closing date when constructing their second garments.

The investigator realizes the following factors could easily influence the level of achievement of students in a clothing construction class: college classification--whether freshman, sophomore, junior, or senior; the amount and quality of sewing experience; whether or not the clothing construction course was elected or required in the curriculum; the difficulty of the garment constructed.

The grades obtained each quarter by the controls and the students working in the unit, with a home economics prediction of A, were averaged. This average grade was compared with the home economics prediction ability grade of A. The same was done for students with B, C, and D prediction. Figures 6, 7, and 8 show graphically this relationship for the students for each of the three quarters. Students with a home economics prediction of A never reached this level of achievement as far as grades were concerned. However, Figure 6 shows that no students with an A prediction were used in the study made fall quarter. As shown in Figure 7, no students with a D prediction were used during winter quarter.

Students with B prediction did reach their level of achievement with one exception. Students with home economics ability prediction of C exceeded their expectation. Students with D prediction varied in their achievements.

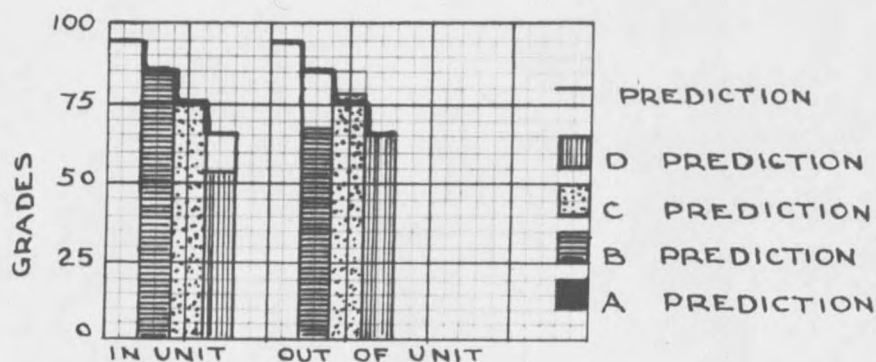


FIG. 6. COMPARISON OF THE AVERAGE OF FINAL CLOTHING CONSTRUCTION GRADES OF SELECTED STUDENTS, IN AND OUT OF UNIT WITH PREDICTION OF HOME ECONOMIC ACHIEVEMENT. FALL QUARTER

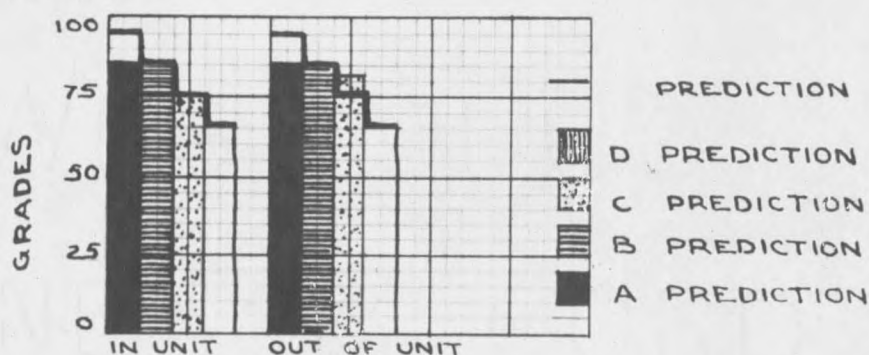


FIG. 7. COMPARISON OF THE AVERAGE OF FINAL CLOTHING CONSTRUCTION GRADES OF SELECTED STUDENTS, IN AND OUT OF UNIT WITH PREDICTION OF HOME ECONOMIC ACHIEVEMENT. WINTER QUARTER

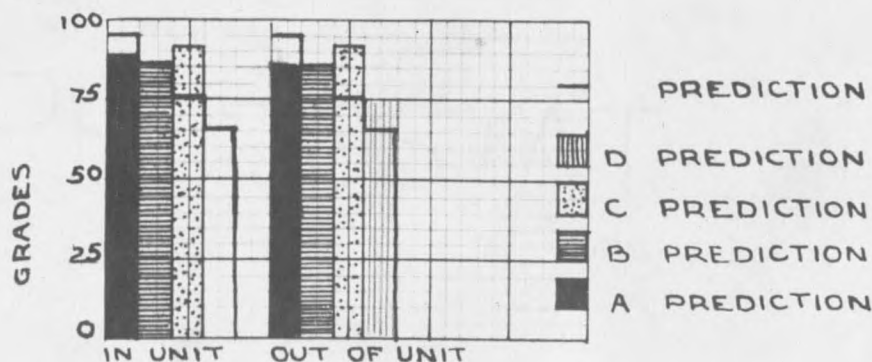


FIG. 8. COMPARISON OF THE AVERAGE OF FINAL CLOTHING CONSTRUCTION GRADES OF SELECTED STUDENTS, IN AND OUT OF UNIT WITH PREDICTION OF HOME ECONOMIC ACHIEVEMENT. SPRING QUARTER

ATTITUDES

Attitudes can not be measured with the pedometer or clock but are perhaps one of the most important factors to consider in this evaluation. The girls enjoyed working in the unit and said they would like to work in a laboratory arranged in this manner. Table XV. Reasons the students gave for preferring to work in the unit were that they were able to set the tension and stitch on their machine and keep it uniform for the period. They preferred the unit arrangement because it was convenient, thus reducing confusion.

Any work center that is well organized makes working more pleasurable. The unit provided each girl with a place of her own in which to work. In present day living, a good deal of emphasis is being placed on the fact that a feeling of security helps to bring about success. To some degree this could apply to providing a girl with a place in a unit where she would have this feeling of belonging.

In a study dealing with human beings the behavior factors are multiple. It is not easy to analyze why humans behave the way they do in certain situations. The students forget to record time or distance. They step with varying degrees of force--some more slowly than others. Fatigue varies with individuals and from day to day. People react differently to the same situation. Personality traits, behavior patterns, home and work experience background, past and present mode of

living, physical and mental health, college course load, social activities, physical and mental dexterity, and coordination are but a few of the factors that influence behavior and achievement.

In evaluating the use of unit arrangement for sewing equipment, three factors have been considered: distance traveled, time used, and attitudes. This study showed that the unit arrangement of sewing and pressing equipment saved distance traveled and time used in the construction of garments. Students expressed preference for the unit arrangement.

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1. The results of this study indicate that the unit arrangement of sewing equipment reduced the average distance travelled in the construction of the first garment by 47 per cent and by 16 per cent on the second garment.

2. The average time saved by students working in a unit arrangement was one hour on the first garment and one-half hour on the second garment. However, four of the eight students working in the unit finished their garments within the allotted time while only one of the eight students in the laboratory did so.

3. All of the 22 students in the experimental group enjoyed working in the unit. Of the 22 students working in the laboratory, the 10 who answered the questionnaire and had had an opportunity to work in the unit outside of class period indicated their preference for it.

CONCLUSIONS

51

It would be to the advantage of the students if the sewing and pressing equipment in the clothing laboratories were arranged on the unit basis.

ACKNOWLEDGMENTS

The writer wishes to thank the Department of Household Equipment, Iowa State College, for the loan of three pedometers; the Home Economics Department, Agricultural Extension Service, Montana State College, for printing and circulating the questionnaire through their home demonstration agents; and to express sincere thanks to Miss Elizabeth Birong, Department of Home Economics, Montana State College, for her guidance and suggestions given during the time this study was in progress.

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QUESTIONNAIRE ON SEWING CONDITIONS IN MONTANA HOMES

54

Name of County _____ Date _____

Put check (✓) in column or block that most closely answers the question for you:

1. How much do you sew?

	<u>Make all</u>	<u>Make some</u>
a. Children's clothes	☐	☐
b. Your own clothes	☐	☐
c. Clothes for others	☐	☐

2. Do you have electricity? Yes ☐ No ☐

a. Private plant ☐

b. Public Utility ☐

3. What kind of machine have you?

a. Non-electric ☐ Electric ☐

b. Upright ☐ Portable ☐

c. What make have you?

Singer ☐ White ☐ New Home ☐ Eldredge ☐

Any other make? (give name) _____

d. How old is your machine? No. of years ☐

4. Have you had sewing instruction?

a. Taught by member of the family ☐

b. Extension Service ☐

c. Singer Course ☐

d. Adult class (vocational or highschool) ☐

e. College ☐

f. None ☐

5.

a. Do you have a daughter at M. S. C.? Yes ☐ No ☐

b. Have you had a daughter at M. S. C. ? Yes ☐ No ☐

c. Did she take or is she taking any clothing construction classes? Yes ☐ No ☐

d. What is she doing now? _____

e. Where is she living? _____

6. Do you have a separate sewing or utility room? Yes ☐ No ☐

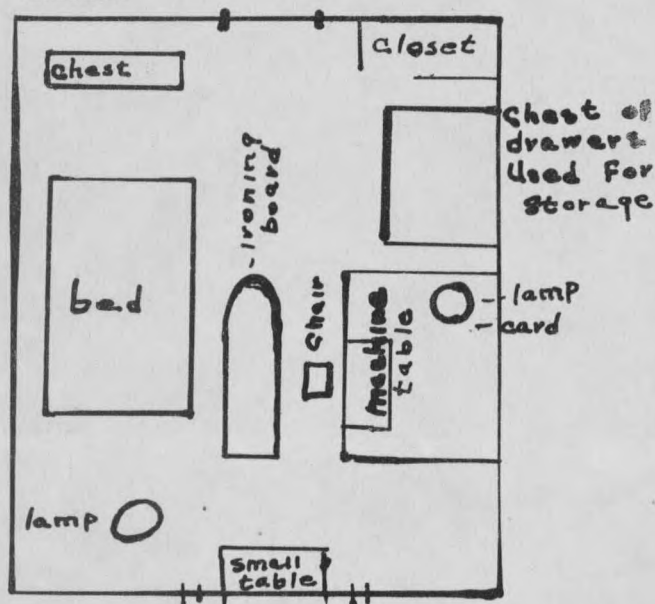
7. If so, where is it located? Basement ☐ Ground Floor ☐ Second Floor ☐

8. If you have a sewing room, make a sketch showing location of:

- a. Sewing machine
- b. Work or cutting table
- c. Ironing board
- d. Iron
- e. Pressing equipment
- f. Storage space

SAMPLE:

DRAW HERE:



9. If you do not have a sewing room --

a. Where do you have your machine?

Bedroom ☐ Living Room ☐ Dining Room ☐
 Kitchen ☐ Sun Porch ☐

b. Is this the room where you do your sewing? Yes ☐ No ☐

c. If not where do you put your machine when you do sew?

Bedroom ☐ Living Room ☐ Dining Room ☐ Kitchen ☐
Sun Porch ☐

d. Where do you cut out your garments? Kitchen table ☐

Dining Room table ☐ card table ☐ floor ☐ bed ☐

e. Where do you press when making a garment? Kitchen ☐

Dining Room ☐ Bedroom ☐ Sun Porch ☐

f. What kind of iron do you use? flat iron ☐ gas ☐

electric - (control ☐ non-control ☐ steam ☐)

g. What pressing equipment besides an iron do you use?

sleeve board ☐ seam roll ☐ pressing cushions ☐

home made pressing cloth ☐ commercial pressing cloth ☐

h. In what room do you keep your small sewing equipment? (such as
sheers, etc.) Kitchen ☐ Dining Room ☐ Bed Room ☐

Sun Porch ☐ no particular place ☐

i. Where do you keep this equipment? in a box ☐ sewing cabinet ☐

basket ☐ sewing machine drawers ☐ put away loose ☐

j. Where is the box, basket kept? drawer ☐ shelf ☐ closet ☐

floor ☐

10. Check equipment that you have on hand that is in good condition.

sheers (over 6 $\frac{1}{4}$ ") ☐ scissors (under 6 $\frac{1}{4}$ ") ☐ tape measure

(numbered on opposite ends) ☐ tailors chalk ☐ pin cushion ☐

needle cushion or container ☐ dressmakers pins ☐ trans-

parent 6" ruler ☐ thimble ☐ button box or bag ☐ con-

tainer for scraps at machine ☐

APPENDIX B

QUESTIONNAIRE REGARDING SEWING LABORATORY EQUIPMENT
SENT TO 11 COLLEGES OR UNIVERSITIES
IN WESTERN AREA

I am doing a study to determine the differences in the amount of time, energy and motion used by college students in the construction of a garment under existing laboratory arrangements as contrasted to a unit arrangement.

I am interested in knowing what colleges and universities have clothing laboratories and would appreciate it very much if you would answer the following questions and return this form to me as promptly as possible.

1. How many clothing laboratories do you have? _____
2. Is your lab(s) arranged on a unit basis? Yes _____ No _____
3. How many units have you? _____
4. Check equipment included in a single unit:
Sewing machine -- how many? _____
Work table -- how many? _____
Ironing board -- how many? _____
Iron -- how many? _____
Pressing equipment -- how many? _____
Additional equipment -- how many? _____
5. How many girls use equipment in unit at one class period?

If you have usual laboratory arrangement, please check the following:

1. Ironing boards -- how many? _____
Work tables -- how many? _____
Irons -- how many? _____

Pressing equipment -- how many? _____

Additional equipment -- how many? _____

2. How many girls use this equipment at one class period?

3. What is approximately the size of your laboratory?

Length _____ Width _____

4. Are all ironing boards in one position in the room?

Yes _____ No _____

5. If not, how are they arranged?

Thanking you for your assistance, I am

Yours sincerely,

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RECORD OF TIME SPENT IN CONSTRUCTING A GARMENT

Name _____, Sec. _____

	Mark	Pin	Baste	Fit	Rib	Re- baste	Re- fit	Stitch	Remove		Turn	Press	Trim	Finish		Any other Process
									Basting	Cut				Hand	Machine	
1. Tucks																
2. Darts																
3. Gathers																
4. Plaits																
5. Seams:																
Waist-lengthwise																
Side																
Gore																
Crosswise																
Yoke																
Shoulder																
Skirt-lengthwise																
Side																
Gore																
Crosswise																

	Mark	Pin	Baste	Fit	Rip	Re-baste	Re-fit	Stitch	Remove Bastings	Cut	Turn	Press	Trim	<u>Finish</u>		Any other process
<u>Yoke</u>																
<u>Waistline</u>																
<u>Tape</u>																
6.																
<u>Buttonhole-stay</u>																
(bound)																
<u>Binding</u>																
<u>Facing</u>																
<u>Buttonhole-stay</u>																
(worked)																
<u>Buttonholing</u>																
7. <u>Fasteners-buttons</u>																
<u>Snap</u>																
<u>Hooks & Eyes</u>																
8.																
<u>Edge finishes</u>																
<u>Neckline-Facing</u>																
<u>Binding</u>																
Sleeve:																
<u>Self-hem</u>																

						Re-	Re-		Remove							<u>Finish</u>		Any other
Mark	Pir	Baste	Fit	Rip	baste	fit	Stitch	Basting	Cut	Turn	Press	Trim	Hand	Machine			process	

APPENDIX D

CARDS USED TO RECORD TIME, WINTER QUARTER

Name	In Class	Class Out of Class	Out of Unit, check for each day
Jan. 21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
Feb. 1			
2			
3			
Feb. 4	In Class	Out of Class	Out of Unit
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
Total		Total	

APPENDIX E

CARDS USED TO RECORD TIME, SPRING QUARTER

Name	Class Section			Article			
	In Class	Out of Class	Out of Unit		In Class	Out of Class	Out of Unit
April. 24				May 7			
25				8			
26				9			
27				10			
28				11			
29				12			
30				13			
May 1				14			
2				15			
3				16			
4				17			
5				18			
6				19			
	In Class	Out of Class	Out of Unit		In Class	Out of Class	Out of Unit
May 20				May 29			
21				30			
22				31			
23				June 1			
24				2			
25				3			
26				4			
27				5			
28							
Totals							

1/ Any comments regarding work done in this class.
 2/ What difficulties did you encounter?
 3/ What do you feel should be given more stress?

APPENDIX F

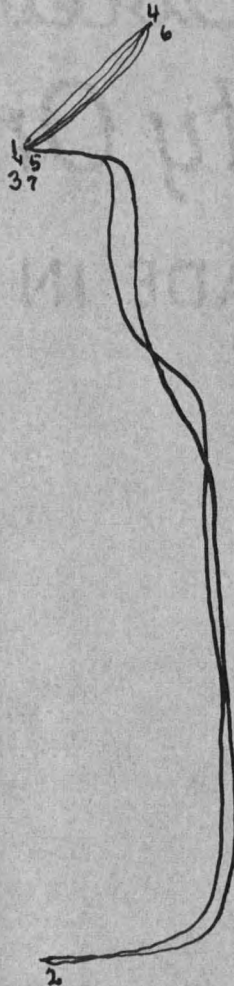
CARDS USED TO RECORD PEDOMETER READINGS

Name	Reading at beginning period	Reading at end of period	Distance travelled	Check
Jan. 21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
Feb. 1				
2				
3				
	Reading at beginning period	Reading at end of period	Distance travelled	Check
Feb. 4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				

APPENDIX G1

CHART OF DISTANCE TRAVELED BY STUDENT 8, SECTION II, IN UNIT
MAY 26, 1948

65



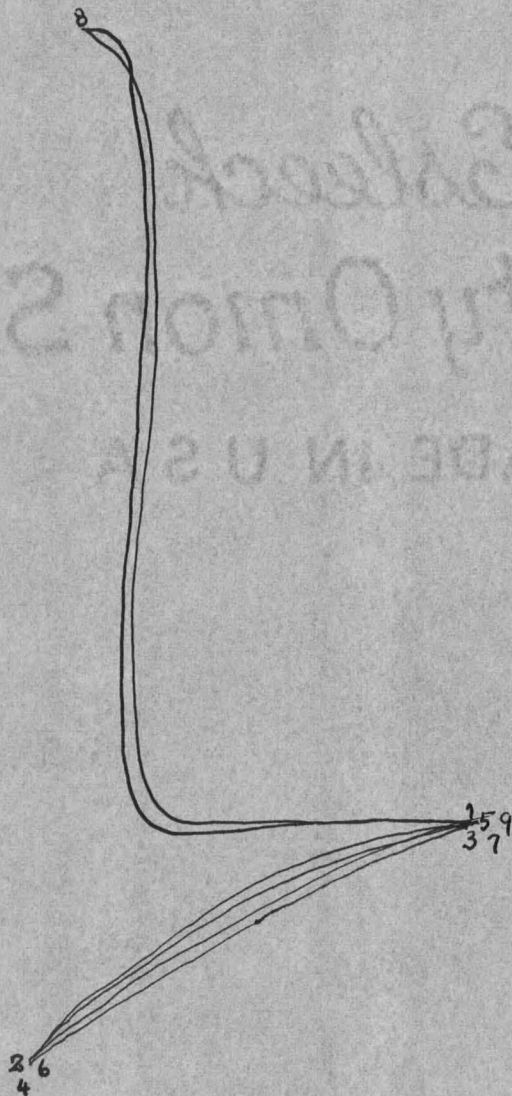
1-2	340"
2-3	340"
3-4	50
4-5	50"
5-6	50"
6-7	50"
12	880"
	73'

2nd pedometer reading .125
1st " " .125

APPENDIX G₂

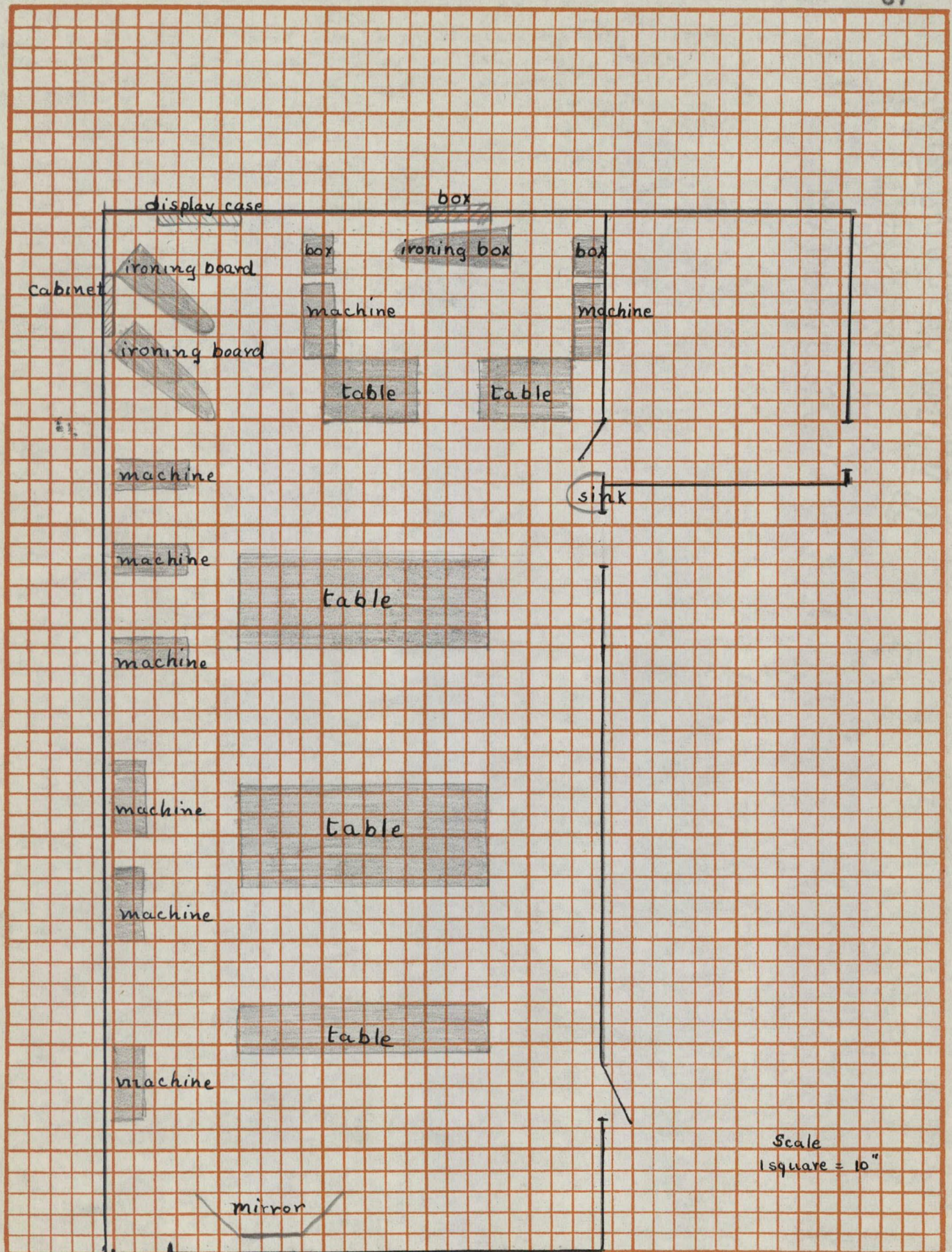
CHART OF DISTANCE TRAVELED BY STUDENT 17, SECTION 2,
IN LABORATORY
MAY 26, 1948

66



1-2	180"
2-3	180"
3-4	180"
4-5	180"
5-6	180"
6-7	180"
7-8	380"
8-9	380"
12	1840"
	153.5

2nd pedometer reading 6 mi. 375
1st " " 6 mi. 35
Change .025
.025 = 132'



ARRANGEMENT OF EQUIPMENT IN ONE CLOTHING LABORATORY
WITH THE UNIT INSTALLED

APPENDIX H

QUESTIONNAIRE GIVEN TO STUDENTS TO OBTAIN REACTION TO UNIT

Dear Student:

68

This is to thank you for your co-operation in my research work and to ask one last favor of you. Enclosed you will find a paper with some questions to be answered. Please leave the paper with Miss Birong or Miss Osborn at your next class period.

Your help in this problem has made this study possible. Please believe that I appreciate it.

Yours sincerely,

Helene Lewis

- (1) Did you like working in the unit? YES _____ NO _____
Why or why not?

- (2) Have you any suggestions to make to improve the unit?

Did you like the arrangement? YES _____ NO _____

- (3) Do you think you saved time or finished your garment sooner because of being in the unit? YES _____ NO _____

- (4) Would you like it if the entire laboratory here could be set up in units?
YES _____ NO _____

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Lewis. A. H.

A study of time and
motion differentials.

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