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SURVEY OF DOMESTIC NEEDS IN ELECTRICITY

BY

CHARLES J. THOMPSON

THIS THESIS SUBMITTED IN PARTIAL FULFILMENT
OF THE REQUIREMENT FOR THE DEGREE OF
MASTER OF SCIENCE

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IN THE

DEPARTMENT OF EDUCATION
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CHAPTER I

INTRODUCTION

Origin of Study

This study originated in the writer's desire to discover what the average person needs to know, in order to utilize the electrical appliances available today.

After spending several years in teaching the practical and theoretical principles of electricity to high school students the writer has become convinced that courses emphasizing theoretical and mathematical content were regarded by the student, merely as material to be learned and remembered long enough to pass an examination, and then forgotten forever. Hence, it seemed that an investigation to discover what should be included in a course that would give boys and girls the greatest return for the time and effort spent, would be of much value not only to the writer but to teachers in general.

It seems reasonable that, if the teacher knows what information regarding electricity has been found useful by people in and around their homes, he will be better able to outline a course which not only will meet the daily domestic needs of the pupil but also will be of value to him after he has finished his course.

Our schools are frequently blamed for not giving pupils an opportunity to get the practical training which fits them best for everyday life. We must admit that the criticism

is well founded. On this point, Dr. Ross L. Finney¹ says,

"Sociologists have produced a good deal of writing during the last few years on the subject of waste in education. They, quite naturally, are acutely aware of the lack of parallelism between the academic process and the social process. Putting together Latin, the modern-languages requirements, the over-working of formal English, and the Mathematics constants, it seems perfectly safe to say that from one fourth to one half of the time of all secondary school students in the United States and the British Empire is still being wasted and what is the loss of these young people is also a loss to society."

A cursory survey of current text books confirms this idea. Few of them present the principles of electricity in such a manner that either junior or senior high school pupils are able to comprehend or apply them.

Purpose of the Study

The purpose of this study is twofold; (1) to discover what information has been found useful regarding electricity and the construction of the many common electrical appliances that are found today in the majority of homes; (2) to determine what items would probably be most valuable in a course in electricity.

Importance of the Study

According to the 1929 American Year Book², there are 24,257,159 customers using electricity in the United States. Of this number 19,721,486 or eighty-one and three-tenths

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1. Finney, Ross L. A Sociological Philosophy of Education. New York: The Macmillan Co., 1928.
 2. Growth of Statistics. The American Year Book, 1929. New York: p. 234.

per cent are residential. It is estimated that seventy per cent of the homes in the United States are supplied with electric service. Another writer¹ has this to say,

"Electric service has now become an integral part of the Nation's standard of living. It drives three-quarters of our industrial machinery; it operates our trolley cars and subways; it lights our streets, offices, and institutions; and it enters, to an increasing degree, into the conduct of the home. From the homemaker's standpoint, the development of domestic electric service is of far-reaching import. Not only are the benefits, in comfort and convenience, of electric service now available to the entire urban population, but they are rapidly being extended into the rural and farming areas of the country."

Table I, on page 4, gives the names and estimated numbers of different electrical appliances together with the estimated number of kilowatt-hours used by each in the United States during the year 1928, according to a recent estimate made by the National Electric Association.² The figures presented in this table show that electricity fills a large place in the modern household, and that the development of appliances for domestic use is of far reaching importance. Davison³ raises this question: "What shall be taught in order to give the homemaker enough information to meet intelligently this existing situation?" Following Table I, her answer is quoted from the Journal of Home Economics.

-
1. Davison, Eloise. What the Homemaker Needs to Know About Electricity. Journal of Home Economics, February, 1930. Baltimore: American Home Economics Association. p. 94.
 2. ibid.
 3. ibid.

TABLE I

Energy Used by Principal Electric Appliances and
the Probable Number in Use

Appliance	Probable Number in Regular Serv- ice in Year	Estimated Use of Current kw-hr Per Year For Each Appliance in Regu- lar Use
Lighting.....	19,430,000	300
Flatirons.....	14,500,000	72
Vacuum Gleaners.....	5,800,000	36
Washing Machines.....	4,250,000	24
Fans.....	4,165,000	16
Radio Sets.....	2,565,000	60
Toasters.....	2,270,000	50
Percolators.....	1,750,000	50
Space Heaters.....	1,300,000	40
Refrigerators.....	720,000	725
Ranges.....	675,000	1,500
Oil Burners.....	400,000	200
Sewing Machines.....	350,000	10
Ironing Machines.....	300,000	125

"(1) She will need a technical electrical vocabulary, though a small one. If the homemaker living in this electrical age could understand and incorporate into her working vocabulary these five words: watt, volt, ampere, circuit, fuse, she would be far better equipped to act and think intelligently about the service she has, as well as about the equipment she buys. An approximate understanding or a hazy idea is not enough. Much of the uncertainty and most of the fear which a few homemakers still feel toward electrical devices is due largely to a lack of understanding of these terms and how to use them.

(2) She needs to know the potentialities and limitations of the service she has in her own home. If her house is inadequately wired, and some houses are, she may be limited in the equipment she selects for her use. She must know that an inadequately wired house means either that she must curtail her uses or increase her electrical capacity by additional wiring. An electrically conscious homemaker will be as discriminating at this point as she is about the capacity of any room for the furniture she has to place in it. She should be

actively interested in the electrical capacity of any house she buys, rents, or builds in the light of the equipment she expects to use in it.

(3) She needs to know how to use advantageously whatever service she has at her command. This implies an understanding of the location as well as the capacity of the electrical circuits throughout her house; the size and limitations of the fuse for each circuit as well as its value to her as a safeguard. Applying this information means the difference between the uncertain or interrupted service which is the result of careless use or careless appreciation of her electrical capacity and the assurance which comes from using to advantage whatever service she has, even if it is limited.

(4) She needs some general information on the operation costs of electric lighting equipment, heating equipment, motor equipment. This resolves itself into understanding and interpreting the information stamped on the equipment she buys and uses in the light of the rate she pays for her service.

(5) She needs to become familiar enough with the agencies that are protecting against possible mistakes in the choice, installation, and use of electrical equipment so that she can avail herself of whatever service they render. The best agency for advice and assistance in such matters is the electricity supply company. Whatever training can be offered to her to help her toward wise selection, effective use, and intelligent care of the electrical service she has and the electrical equipment she buys would seem to find a legitimate place in the training planned to assist her in establishing and maintaining the best possible standard of living for herself and her family."

While the above quotation has to do with the girl's education in homemaking, it probably applies largely to the boy's.

In a study of the scientific interests of general science pupils, F. D. Curtis¹ found that electricity was second in a list of the forty-one most common interests of boys, and

1. Curtis, F. D. Some Values Derived From Extensive Reading of General Science. New York: Teachers College, Columbia University. Contributions to Education - No. 163, 1924.

seventh in a list of the forty-two most common interests of girls. A similar study by C.A. Pollack¹ placed electricity first for both boys and girls.

Since electricity ranks so high among the scientific interests of both boys and girls, we should have a course in junior or senior high school of such a practical nature that students will derive the greatest possible benefit from it. The course would probably be of value to more pupils if placed at the junior high school level, because a number drop out of school at the end of that period.

1. Pollack, C.A. "Children's Interests As a Basis of What to Teach in General Science." Educational Research Bulletin, Ohio State University III. January 9, 1924.

CHAPTER II

SIMILAR STUDIES

In the report of the American Vocational Association Committee¹ on "Standards of Attainment in Industrial-Arts Teaching", presented at the meeting of the Industrial-Arts section, American Vocational Association, New Orleans, Louisiana, Saturday, December 7, 1929, were a number of tables summarizing the replies to questionnaires sent to forty cities. The purpose of these questionnaires was to determine what a boy should know and be able to do by the close of the junior high school period in the following subjects: Operations in Woodwork, Operations in Household Mechanics, Electrical Construction, Operations in Sheet-metal, Operations in Printing, and Operations in Auto Mechanics.

The following table on Electrical Construction taken from the above mentioned report contains seventy items showing "What a Boy Should Know and Be Able To Do in Electrical Construction by the Close of the Junior High School Period". These items are arranged in descending order of importance as represented by the combined judgments of teachers from forty cities who answered the questionnaire. Since this table represented the opinion of teachers of Industrial-Arts from forty cities and may be considered a good source

1. Standards of Attainment in Industrial-Arts Teaching. (Report of the Committee, American Vocational Association, New Orleans, Louisiana: Saturday, December 7, 1929). Industrial Education Magazine, Vol. XXXI, No. 7, Jan. 1930.

of information, it was used in part as a basis for the check list used in this study.

TABLE II

What a Boy Should Know and Be Able To Do In Electrical Construction by the Close of the Junior High School Period

Units	Yes	No
1. Connect set of dry-cells in parallel.....	24	0
2. Connect set of dry-cells in series.....	24	0
3. Construct an electromagnet.....	24	0
4. Make common wire splices.....	24	0
5. Solder and tape splices.....	24	0
6. Construct simple bell circuit.....	24	0
7. Construct bell circuit, using one button and two bells in parallel.....	23	1
8. Construct an extension-cord, 110-v.....	23	1
9. Connect socket and plug.....	23	1
10. The same circuit using one button and two bells in series, See No. 7.....	23	1
11. Construct circuit using one bell to operate from two push-buttons.....	23	1
12. Detect and remove trouble in bell circuit...	23	1
13. Assemble electric iron, heater, or toaster plug.....	23	1
14. Construct circuit in which one button operates a bell and the other button operates a buzzer.....	22	2
15. Construct return-call system using same batteries.....	22	2
16. Test, find and replace fuses.....	22	2
17. Wire miniature battery-lamps.....	21	3
18. Connect feed-thru switch into an extension cord.....	21	3
19. Connect transformer in 110-volt line.....	20	4
20. Construct simple lighting-circuit, lamps in parallel.....	20	4
21. The same circuit in series.....	20	4
22. Construct and install a drop-cord.....	20	4
23. Construct a simple buzzer.....	20	4
24. Construct a simple telegraph system.....	19	5
25. Construct simple make-and-break switch.....	18	6
26. Connect thru a combination fuse and switch to a lamp circuit.....	18	6
27. Install a flush switch.....	18	6
28. Install a flush receptacle.....	18	6
29. Install a snap-switch.....	18	6

Table II (continued)

Units	Yes	No
30. Construct a simple electric motor.....	17	7
31. Construct circuit of 2 or 3 lamps, each operating independently of the others....	17	7
32. Use loom in running house wiring.....	16	8
33. Run wire using proper tubes and knobs.....	16	8

Additional Units Suggested

34. Read and care for meters of voltage,
amperage, and resistance.....
35. Survey of points in design and manufacture
of electrical equipment for home and
office use.....

Units of Related Knowledge

1. Sources of electrical current.....	25	0
2. What are conductors and non- conductors of current.....	25	0
3. Principles of connecting dry-cells.....	25	0
4. Why splices should be soldered.....	25	0
5. Structure of a push-button.....	25	0
6. Structure of an electric bell.....	25	0
7. Cause and effect of short circuits.....	25	0
8. Use of extension-cords.....	25	0
9. Use of socket and plug.....	25	0
10. Use of fuses.....	25	0
11. Dangers of electricity.....	25	0
12. How to avoid dangers of electricity.....	25	0
13. Uses of common electrical household appliances.....	25	0
14. How to read the electric service meter....	25	0
15. General nature of electricity.....	24	1
16. Principles of electromagnetism.....	24	1
17. Uses of various common appliances.....	24	1
18. Structure of a dry cell.....	24	1
19. Uses of simple and compound bell circuits..	24	1
20. Sources of current for bells, other than dry-cells.....	24	1
21. Use of transformer in a 110-v line.....	24	1
22. Uses of switches.....	24	1
23. Effects of electricity.....	23	2
24. Rules of bell wiring.....	23	2
25. Action and principles of an electric motor.	23	2
26. How to figure costs per unit of consumption of electricity for household purposes....	23	2
27. Principles of the common incandescent lamp.	21	4
28. Common house-wiring insulation.....	20	5

Table II (continued)

	Units	Yes	No
29. When to use porcelain tubes, knobs, and wiring-loom.....		20	5
30. Uses of motor in industry.....		20	5
Additional Units Suggested			
31. Uses of storage-batteries.....			
32. Care of storage-batteries.....			
33. Ohm's Law and its applications.....			
34. Facts regarding static electricity.....			
35. Principles involved in selecting electrically driven machinery for home and office use.....			

Another study of somewhat similar nature is a thesis entitled, "A Basis of Selecting Curriculum Materials for a High School Course in Electricity," submitted in partial fulfillment of the requirements for the degree of Master of Arts, by D. C. Ellinger¹, University of Pittsburgh, Pittsburgh, Pennsylvania. This thesis was based on a questionnaire study of the needs and interests of 397 high school boys beginning the electrical course in Schenley High School, Pittsburgh, Pennsylvania, during the four years previous to June, 1924. This study was made for the purpose of determining what materials should be used in a course in electricity for senior high school.

The questionnaire submitted to the boys is given on the following page.

1. Ellinger, D.C. "A Basis of Selecting Curriculum Materials for a High School Course in Electricity." Thesis. University of Pittsburgh, Pittsburgh, Penn.: 1924.

Name	Course	
Class	Report Room	Date

Instructions-

- (a) Place at the top of your paper the information as indicated above.
 - (b) Answer as completely as possible the following questions.
 - (c) Make each answer brief, and place your answers in itemized form.
1. What electrical jobs about your home or work can you do?
 2. What electrical jobs or problems have confronted you about home or work which you could do with a better working knowledge of the subject?
 3. What things involving electricity have you observed or read about which you feel that you understand?
 4. What things suggested by Question 3 would you like to understand or know something about?

This questionnaire is very brief and may be criticized for lack of objectivity. Questions calling for judgment or opinion are usually of minor value, and the judgment or opinion of the boys would probably enter into many of the answers. The boys would also have to rely upon their memory to give some answers, which tends further to reduce the value of the study. The questions and instructions for answering them are somewhat confusing, and this may have lowered the percentage of replies. However, according to the author's report, seventy-five per cent of the returned questionnaires contained material of a usable nature.

The author reviews the major fields of electrical activities and lists the things which form the connecting link

between the students' world and the major fields of electricity as indicated by the replies to the questionnaires. He believes that the study shows the feasibility of selecting materials for the course on the basis of students' expressed needs and interests. None of the material in this thesis was used in the present study.

CHAPTER III

METHOD OF PROCEDURE

A check list technique was used in this study to obtain information from boys, girls, and parents concerning the knowledge of electricity which they had found useful. The data were secured from four hundred eighty nine unselected individuals.

Construction of Check List¹

Due to lack of any other materials of this type, the first check list prepared was purely subjective being composed of items based upon the writer's personal opinion only. This list was later partially revised, in accordance with the materials in Table II, showing, "What a Boy Should Be Able To Do In Electrical Construction by the Close of the Junior High School Period". Any item that was of a purely vocational or technical nature was omitted, because it was desired to make the check list used in this study as nearly as possible non-vocational and non-technical, and to contain only those items with which the average person would frequently come in contact. Six of the items were suggested by Professor E. W. Jones², of the Physical and Chemical Science Department of Kansas State Teachers College, Pittsburg, Kansas, author of Essentials of Applied Electricity.

1. For complete Check List see Appendix. p. 74.

2. Jones, E. W. Essentials of Applied Electricity. Milwaukee, Wisconsin: The Bruce Publishing Co., 1928.

The final check list contained eighty items. Fifty two are those a knowledge of which would generally be found useful about the home. Fourteen concern the electrical system of the automobile. The remaining fourteen are names of specialized appliances, such as, the commutator (an electrical device for making an alternating current direct or continuous), and the pyrometer (an instrument for measuring degrees of heat higher than those recorded by a mercurial thermometer).

Copies of this check list were given to both parents and pupils. The parents receiving the check list were requested to mark with (1) the items a knowledge of which they had found useful and to mark with (2) any other items which they thought it would be valuable for their sons or daughters to study. The pupils receiving the check lists were requested to mark with (1) the items, a knowledge of which they had found useful, and to mark with (2) any other items in which they were interested.

Location of Schools Where Study Was Carried On

This study was carried on with the aid of the following schools:

Crawford County Community High School.....	Cherokee, Kansas
Girard High School.....	Girard, Kansas
Senior High School.....	Pittsburg, Kansas
Lakeside Junior High School.....	Pittsburg, Kansas
Roosevelt Junior High School.....	Pittsburg, Kansas
College Senior High School, Kansas State Teachers College.....	Pittsburg, Kansas

Procedure

The check lists sent to parents were placed in the hands of junior high school pupils by the home room teachers in the Lakeside and Roosevelt Junior High Schools. The pupils took the check lists home to be marked according to directions, and later brought them back to the teachers. Four hundred, twenty-five check lists were sent out in this way. Two hundred, five were returned. Of this number one hundred, seventy-eight were marked according to directions, and were used in the final tabulations. Twenty-seven were returned without any markings.

The check lists were sent to the parents of junior high school pupils, on the assumption that they would probably be more interested in marking them because their children have several years yet to remain in school. These check lists were marked almost entirely by fathers, i.e. by 172, representing fifty-three occupations; while only six check lists were marked by mothers from five occupations. For this reason, the data given for parents must be considered as representing almost entirely the knowledge and interests of men. This fact limits the study, in that the knowledge found useful by girls cannot be compared with that found useful by their mothers.

The senior high school pupils were selected to mark the check lists used in this study, because they are more mature and probably have had more experience with the items than the junior high school pupils.

The check lists were given to pupils by their teachers, were marked immediately and returned. Three hundred, eleven check lists were secured in this way. One hundred, forty-seven were marked by boys, and one hundred, sixty-four by girls. The number of check lists secured from each school is shown in the following table:

TABLE III

Number of Check Lists Marked by Students in Each School

School	Number Marked by	
	Boys	Girls
Crawford County Community High School, Cherokee, Kansas.....	36	32
Senior High School, Girard, Kansas.....	56	51
Senior High School, Pittsburg, Kansas...	55	65
College Senior High School, K.S.T.C., Pittsburg, Kansas.....		16
TOTAL.....	147	164

CHAPTER IV

FINDINGS OF THE STUDY

The tables on the following pages contain the findings of the study. The data presented show that considerable common electrical knowledge has been found useful by the individuals marking the check lists. Since the returns were made by a representative group, it may be assumed that this information will be found useful by many others.

A study of the tables indicates that the boys and parents find a knowledge of many of the same things useful, probably because of the predominance of men who checked the lists. The girls, due probably to their lack of interest as well as lack of knowledge of the items, did not mark the check list as fully as did either the parents or boys.

Further study of the tables indicates that many of the boys and girls are interested in the same items. However, the girls do not show as much interest as the boys, probably for several reasons: (1) because other things command their attention, (2) because of a lack of contact with the items in the check list, (3) because of early training. According to their own reports, the boys are interested in nearly all of the items of which they have little, if any knowledge. The parents, although they have little knowledge of many of the items in which the boys and girls expressed an interest, believe they are valuable for them to study.

The Pearson, "product-moment", method was used in find-

ing the correlation between the different groups of data. The correlation between the numbers of parents and boys who found a knowledge of the items useful as shown in Table IV and Table V, is $+ .759 \pm .032$. This figure indicates significant relationship between parents and boys so far as a knowledge of useful items is concerned. This high correlation is probably due to the fact that the parents marking the lists were, in nearly all cases, the fathers.

The correlation between the numbers of boys and girls who found a knowledge of the items useful as shown in Table V and Table VI is $+ .505 \pm .056$. This marked degree of correlation seems to indicate that a knowledge of many of the items found useful by boys is also found useful by girls.

The correlation between the numbers of parents and girls who found a knowledge of the items useful as shown in Tables IV and VI is $+ .556 \pm .052$. This, also, indicates a marked degree of correlation. This correlation is lower than the correlation between boys and parents probably because the girls do not come in contact with as many of the items mentioned as do the men and boys.

The correlation between the per cent of pupils expressing an interest in the items of which they had little, if any knowledge, and the per cent of parents who considered the same items valuable for study, as shown in Table XII is $+ .609 \pm .047$. Again a marked degree of correlation seems to indicate that boys and girls are interested in a number of the items which parents think are valuable for them to study.

Explanation for Table IV

Table IV, on page 22, gives the data obtained from the lists that were checked by 178 parents, indicating the items, a knowledge of which they have found useful. The items are arranged in descending rank order according to the frequency of checking.

The per cent of parents checking each item varies from sixty-four and six-tenths to five per cent. A knowledge of only one item was found useful by sixty-four and six-tenths per cent, five items by more than fifty per cent, and forty-six items by more than twenty-five per cent. The remaining thirty-four items were checked by from twenty-four and seven-tenths to five per cent.

It is perhaps significant that no item was checked by more than sixty-four and six-tenths per cent of the parents. A knowledge of electricity is not general enough, and parents have had little opportunity to learn much about it, in school at least. Therefore, it could not be expected that a very high percentage would have a knowledge of many items. This imposes on the school the obligation for teaching those things which are socially valuable.

The fact that fifty per cent or more of the parents found a knowledge of only six items useful and only twenty-six and four-tenths per cent found forty-six items useful leads the writer to believe that there is justification for instruction in electricity in junior or senior high school. Since twenty-five per cent find a knowledge of more than half of the items

useful, the other seventy-five per cent would probably find the knowledge useful if they possessed it.

The items, a knowledge of which has been found useful, are the ones which are frequently used in everyday life. The following were checked by at least fifty per cent of the parents:

Making common wire splices.....	64.6
Testing, finding, and replacing fuses.....	56.7
Assembling electric iron, heater, or toaster plug	56.7
Use of fuses.....	55.6
Soldering and taping splices.....	55.0
Use of switches.....	51.1

A knowledge of all these items is important and may be used in any home where there is electricity.

The item, "Making common wire splices", ranks highest being checked by sixty-four and six-tenths per cent. A knowledge of this item is quite important, as repair of drop cords, extension cords, and fixture wiring frequently saves time and eliminates danger if it is properly done. Fuses are used in practically all circuits and burn out if forced to carry an overload. The use of the fuse should be understood, the location of the fuse block should be known, and the individual should know how to test and replace the fuses. This saves time, prevents much inconvenience, and eliminates fire hazard.

The attachment plugs for the different appliances frequently receive hard usage, and need to be reassembled using new parts. Again time is saved and inconvenience and expense prevented if the individual can do the job properly.

All splices to be safe should be soldered and taped

properly, and knowledge is required to do this satisfactorily.

Switches are used in all circuits, and while they are usually simple, a knowledge of them is very useful when one fails to work.

The items just given are representative of those ranking highest. Some others which rank lower are perhaps equally important. The item, "Meaning of the terms, voltage, ampere, current, watt, kilowatt, kilowatt-hour, circuit, short-circuit, ground, and convenience outlet", is just below the twenty-five per cent mark, with a rank of forty-eight. Yet this item is considered quite important by teachers of electricity. A knowledge of the meaning of these terms is necessary if one is to understand anything about the subject and deal intelligently with it.

"Code rules for wiring", which is fourth from the last, seems important enough to be taught. It falls in this place probably because of a lack of knowledge concerning it. A knowledge of this item is valuable, because it contains instructions for all types of wiring.

The last three items in the list, "Magnetic compass", "Use of pyrometer", and "Electroplating", are probably the least used around the home, which accounts for their being last in this table.

TABLE IV

Items a Knowledge of Which 178 Parents Found Useful: Number (N.) of Parents Checking Each Item; Percentage (Pct.) of Parents Checking Each Item; Rank Order (R.O.) of the Items Checked

Item	N	Pct	R O
Making common wire splices.....	115	.646	1.0
Assembling electric iron, heater or toaster plug.....	101	.567	2.5
Testing, finding and replacing fuses..	101	.567	2.5
Use of fuses.....	99	.556	4.0
Soldering and taping splices.....	98	.550	5.0
Use of switches.....	91	.511	6.0
Construction and use of spark plug....	83	.466	7.0
Repairing light socket.....	82	.464	8.0
Common house wiring and insulation....	80	.449	9.5
Dangers of electricity.....	80	.449	9.5
Principles of connecting dry cells....	79	.443	11.5
Use of automobile storage-battery.....	79	.443	11.5
Reading an electric service meter.....	78	.438	13.0
Use of porcelain tubes, knobs, wiring-loom.....	77	.432	14.0
Sources of electrical current.....	76	.426	15.0
Connecting dry cells in series.....	75	.421	17.5
Construction and installation of a drop-cord.....	75	.421	17.5
Cause and effect of short circuits....	75	.421	17.5
Making simple repairs on household electrical appliances.....	75	.421	17.5
How to avoid dangers of electricity...	74	.415	20.0
Construction of an extension cord for 110 volts.....	73	.410	21.5
Testing for automobile battery troubles.....	73	.410	21.5
Calculation of light bill from meter reading.....	72	.404	23.5
Testing for trouble in the automobile lighting system.....	72	.404	23.5
Connecting dry cells in parallel.....	71	.398	25.0
Care of automobile storage-battery....	69	.387	26.5
Locating trouble in the automobile horn.....	69	.387	26.5
Construction of common electrical household appliances.....	68	.382	28.0
Materials that will conduct electricity.....	67	.376	29.0
Materials that will not conduct electricity.....	63	.353	30.5

Table IV (continued)

Item	N	Pet	R O
Adjusting breaker points in automobile ignition system.....	63	.353	30.5
Installation of a snap switch.....	61	.342	32.0
Locating trouble in the automobile starter.....	60	.337	33.5
Operation of electric windshield wiper.....	60	.337	33.5
Proper size of fuse to use in a circuit.....	59	.331	36.0
Locating trouble in the ignition system.....	59	.331	36.0
Changing the charging rate of the automobile generator.....	59	.331	36.0
Construction of a simple lighting circuit with lamps in parallel.....	55	.308	38.0
Construction of a simple lighting circuit with lamps in series.....	54	.303	39.0
Capacity of light cords and fixture sockets for carrying current.....	53	.297	40.0
Construction of automobile storage battery.....	52	.292	41.5
Construction and use of ignition coil.	52	.292	41.5
Installation of a flush switch.....	50	.280	43.0
Constructing and wiring bell circuits.	49	.275	44.0
Wiring miniature battery lamps.....	48	.269	45.0
Structure of a push button.....	47	.264	46.0
Construction of electric flatiron.....	44	.247	47.0
Meaning of the following terms: voltage, ampere, current, watt, kilowatt, kilowatt-hour, circuit, short-circuit, ground and convenience outlet.....	43	.241	48.0
Detection and removal of trouble in a bell circuit.....	41	.230	49.5
Action and principles of an electric motor and generator.....	41	.230	49.5
Construction of a simple buzzer.....	40	.224	52.5
Installation of a flush switch.....	40	.224	52.5
Structure of an electric bell.....	40	.224	52.5
Construction of lighting-circuit using three-way switches.....	40	.224	52.5
Construction of a simple electric motor.....	39	.219	55.5
Construction of a percolator.....	39	.219	55.5
Principles of the telephone.....	38	.213	57.0
Constructing a bell circuit using one button for two bells.....	37	.207	59.0

Table IV (continued)

Item	N	Pct	R O
Constructing a bell circuit using two buttons either of which will operate a single bell.....	37	.207	59.0
Construction of an electric curling iron.....	37	.207	59.0
Structure of a dry cell.....	36	.202	62.0
Construction of weatherproof outdoor circuits.....	36	.202	62.0
Principles of the common incandescent lamp.....	36	.202	62.0
Principles involved in selecting electrically-driven machinery for home and office use.....	35	.196	64.0
Construction of a simple telegraph system.....	34	.191	65.0
Connection of a transformer to 110 volt line.....	31	.174	66.0
Electrical toys.....	30	.168	67.5
Care of volt meters and ammeters.....	30	.168	67.5
Construction of an electromagnet.....	29	.162	69.0
Use and construction of a rheostat....	28	.157	70.5
Use and construction of a thermostat..	28	.157	70.5
Farm lighting system.....	27	.151	72.5
Construction of a commutator.....	27	.151	72.5
Construction of an electric pad.....	24	.134	74.0
Construction of a small transformer...	23	.129	75.5
Principles of electromagnetism.....	23	.129	75.5
Code rules for wiring.....	22	.117	77.0
Magnetic compass.....	20	.111	78.0
Use of pyrometer.....	15	.084	79.0
Electroplating.....	9	.050	80.0

Explanation for Table V

Table V, on page 28, gives the data obtained from the lists that were checked by 147 boys, indicating the items a knowledge of which they have found useful. The items are arranged in descending rank order according to the frequency of checking.

The per cent of boys checking each item varies from seventy-six and one-tenth to six and one-tenth per cent. A knowledge of only one item was found useful by seventy-six and one-tenth per cent, thirty-one items by more than fifty per cent, and seventy-two items by more than twenty-five per cent. The remaining eight items were checked by from six to twenty-five per cent.

It is perhaps significant that no item was checked by more than seventy-six and one-tenth per cent of the boys. A knowledge of electricity is not general enough to expect that a high percentage would have a knowledge of many items. Therefore, as stated in the explanation of Table IV, the responsibility for teaching those things which are socially valuable rests with the school.

Boys have had more opportunity to study electricity; and, perhaps, because of their interest in it, they have learned more than the parents. Fifty per cent of the boys have found useful a knowledge of thirty one items, while fifty per cent of the parents have found useful a knowledge of only six items. The fact that seventy-five per cent of the boys found a knowledge of only one item useful, and that only twenty-five per cent

found a knowledge of as many as seventy-two items useful, leads the writer to believe that more boys would find a knowledge of electricity useful if they only possessed it. This, again, emphasizes the need for instruction in electricity.

The items a knowledge of which boys have found most useful are the ones which are frequently used in every day life. Three of the six items ranking highest for boys are found among the six items ranking highest for parents.

They are:

- Making common wire splices
- Use of fuses
- Use of switches.

The other three of the six highest for boys are:

- Construction and use of spark plug
- Use of automobile storage battery
- Principles of connecting dry cells.

A knowledge of the construction and use of the spark plug is of value to any one who takes care of his own or another's car. He should know how to test and locate a defective plug when necessary. Some information concerning the use, and particularly the care of the automobile battery, is valuable to anyone operating his own car.

Where dry cells are used, there should be a knowledge of the different ways of connecting them so that they will serve best the purpose for which they are being used.

The four items ranking lowest are:

- Construction of a commutator
- Code rules for wiring
- Construction of an electric pad
- Use of pyrometer.

Boys probably have little contact with these items which in the writer's opinion is the reason for the low rank given them.

TABLE V

Items a Knowledge of Which 147 Boys Found Useful; Number (N.)
of Boys Checking Each Item; Percentage (Pct.) of Boys
Checking Each Item; Rank Order (R.O.) of the
Items Checked

Item	N	Pct	R O
Making common wire splices.....	112	.761	1.0
Construction and use of spark plug....	108	.735	2.0
Use of automobile storage-battery.....	106	.721	3.0
Use of fuses.....	104	.707	4.0
Use of switches.....	102	.693	5.0
Principles of connecting dry cells....	101	.687	6.0
Dangers of electricity.....	99	.673	7.0
Materials that will not conduct electricity.....	94	.639	8.0
Connecting dry cells in series.....	92	.612	10.0
Materials that will conduct electricity.....	92	.612	10.0
Care of automobile storage-battery....	92	.612	10.0
Sources of electrical current.....	89	.605	12.0
Soldering and taping splices.....	88	.598	13.0
Assembling electric iron, heater or toaster plug.....	87	.591	14.5
Testing, finding and replacing fuses..	87	.591	14.5
Repairing light socket.....	86	.585	16.0
Structure of a push button.....	83	.564	17.5
Locating trouble in the automobile horn.....	83	.564	17.5
How to avoid dangers of electricity...	82	.557	19.0
Structure of an electric bell.....	81	.551	20.0
Cause and effect of short circuits....	80	.554	21.5
Structure of a dry cell.....	80	.554	21.5
Construction of an extension cord for 110 volts.....	78	.530	23.5
Testing for trouble in the automobile lighting system.....	78	.530	23.5
Making simple repairs on household electrical appliances.....	77	.523	25.0
Use of porcelain tubes, knobs, wiring-loom.....	76	.517	26.0
Construction of common electrical household appliances.....	75	.510	28.5
Construction of automobile storage- battery.....	75	.510	28.5
Testing for automobile battery troubles.....	75	.510	28.5
Locating trouble in the automobile starter.....	75	.510	28.5

Table V (continued)

Item	N	Pct	R O
Principles of the telephone.....	74	.503	31.0
Common house wiring and insulation....	72	.489	32.0
Construction and use of ignition coil.	71	.482	33.0
Construction of a simple buzzer.....	70	.476	34.0
Constructing and wiring bell circuits.	69	.469	35.0
Meaning of the following terms: volt- age, ampere, current, watt, kilo- watt, kilowatt-hour, circuit, short- circuit, ground and convenience outlet.....	68	.462	36.0
Reading an electric service meter.....	67	.455	37.0
Construction and installation of a drop-cord.....	66	.448	38.0
Locating trouble in the ignition system.....	65	.442	39.5
Changing the charging rate of the automobile generator.....	65	.442	39.5
Proper size of fuse to use in a circuit.....	62	.421	41.0
Installation of a snap switch.....	60	.408	42.0
Adjusting breaker points in automobile ignition system.....	59	.401	43.0
Wiring miniature battery lamps.....	58	.394	45.0
Electrical toys.....	58	.394	45.0
Operation of electric windshield wiper.....	58	.394	45.0
Connection of a transformer to 110 volt line.....	57	.387	47.5
Action and principles of an electric motor and generator.....	57	.387	47.5
Construction of a simple lighting circuit with lamps in parallel.....	54	.367	49.5
Principles of the common incandescent lamp.....	54	.367	49.5
Detection and removal of trouble in a bell circuit.....	53	.360	52.5
Construction of a simple telegraph system.....	53	.360	52.5
Construction of a simple electric motor.....	53	.360	52.5
Magnetic compass.....	53	.360	52.5
Construction of an electromagnet.....	52	.353	56.5
Constructing a bell circuit using one button for two bells.....	52	.353	56.5
Construction of a simple lighting circuit with lamps in series.....	52	.353	56.5
Principles of electromagnetism.....	52	.353	56.5
Constructing a bell circuit using two buttons either of which will operate a single bell.....	51	.346	59.5

Table V (continued)

Item	N	Pct	R O
Capacity of light cords and fixture sockets for carrying current.....	51	.346	59.5
Use and construction of a rheostat....	49	.333	61.5
Care of volt meters and ammeters.....	49	.333	61.5
Calculation of light bill from meter reading.....	48	.326	63.0
Construction of an electric curling iron.....	47	.319	64.5
Construction of weatherproof outdoor circuits.....	47	.319	64.5
Construction of a percolator.....	46	.312	66.0
Electroplating.....	45	.306	67.0
Construction of a small transformer...	43	.292	68.0
Installation of a flush switch.....	38	.258	69.0
Construction of electric flatiron....	37	.251	71.0
Farm lighting system.....	37	.251	71.0
Principles involved in selecting electrically-driven machinery for home and office use.....	37	.251	71.0
Installation of a flush receptacle....	32	.217	73.0
Use and construction of a thermostat..	29	.197	74.0
Connecting dry cells in parallel.....	27	.183	75.5
Construction of lighting-circuit using three-way switches.....	27	.183	75.5
Construction of a commutator.....	25	.170	77.0
Code rules for wiring.....	24	.163	78.0
Construction of an electric pad.....	22	.149	79.0
Use of pyrometer.....	9	.061	80.0

Explanation for Table VI

Table VI, on page 34, gives the data obtained from the lists that were checked by 164 girls, indicating the items, a knowledge of which they have found useful. The items are arranged in descending rank order according to the frequency of checking.

The per cent of girls checking each item varies from fifty-four and two-tenths to six-tenths of one per cent. A knowledge of only one item was found useful by more than fifty per cent, and nine items by more than twenty-five per cent. Seventy-one items were checked by from twenty-three and seven-tenths to six-tenths of one per cent.

Less checking was done by girls than either parents or boys. It is perhaps significant that only one item was checked by more than fifty per cent of the girls, and only nine items by as many as twenty-five per cent. This tends to show that girls in general have little knowledge of electricity. Since the girls as homemakers must have some knowledge of electricity, if they are to utilize fully the conveniences at their disposal, the school should provide instruction in this phase of homemaking.

The following twelve items ranking highest are those a knowledge of which would probably be useful to any woman or girl in the home:

Dangers of electricity.....	54.2
Use of fuses.....	43.9
How to avoid dangers of electricity.....	38.4
Assembling electric iron, heater, or toaster plug	35.9

Construction of common electrical household appliances.....	32.9
Use of switches.....	32.3
Testing, finding, and replacing fuses.....	31.0
Calculation of light bill from meter reading.....	29.2
Reading an electric service meter.....	28.6
Cause and effect of short circuits.....	23.7
Making simple repairs on household electrical appliances.....	23.1
Construction of an electric curling iron.....	21.3

The value of most of these items has been mentioned heretofore. It is significant that the item, "Dangers of electricity" should rank highest. Many girls are afraid of electricity, and much of the fear and uncertainty felt toward electrical devices is largely due to a lack of understanding of the elementary principles of electricity. A knowledge of "How to avoid dangers of electricity" will help remove the fear and uncertainty felt toward electrical devices.

If the girl has a knowledge of the "Construction of common electrical household appliances" and "Making simple repairs on electrical household appliances" she may be able to save time and avoid inconvenience by making repairs when needed.

A knowledge of "Reading an electric service meter", and "Calculation of light bill from meter reading", may save time and money for the homemaker in keeping a budget or expense account.

Poor connections frequently exist in the electrical appliances used. These poor connections may cause short circuits with disastrous results to the appliance. A knowledge of "Cause and effects of short circuits" will aid the homemaker

in locating and preventing them.

The girls give the following six items lowest rank:

Construction of a commutator.....	1.8
Use of pyrometer.....	1.8
Connection of a transformer to 110 volt line.....	1.2
Locating trouble in the ignition system.....	1.2
Construction of weatherproof outdoor circuits....	.6
Adjusting breaker points in automobile system....	.6

Girls probably have little contact with these items which, in the writer's opinion, accounts for the rank given them.

TABLE VI

Items a Knowledge of Which 164 Girls Found Useful: Number
(N.) of Girls Checking Each Item; Percentage (Pct.)
of Girls Checking Each Item; Rank Order (R.O.)
of the Items Checked

Item	N	Pct	R O
Dangers of electricity.....	89	.542	1.0
Use of fuses.....	72	.439	2.0
How to avoid dangers of electricity...	63	.384	3.0
Assembling electric iron, heater or toaster plug.....	59	.359	4.0
Construction of common electrical household appliances.....	54	.329	5.0
Use of switches.....	53	.323	6.0
Testing, finding and replacing fuses..	51	.310	7.0
Calculation of light bill from meter reading.....	48	.292	8.0
Reading an electric service meter.....	47	.286	9.0
Cause and effect of short circuits.....	39	.237	10.0
Making simple repairs on household electrical appliances.....	38	.231	11.0
Construction of an electric curling iron.....	35	.213	12.0
Principles of the telephone.....	34	.207	13.0
Materials that will not conduct electricity.....	33	.201	14.0
Sources of electrical current.....	32	.195	15.0
Materials that will conduct electricity.....	31	.189	16.0
Electrical toys.....	30	.182	17.0
Construction of a percolator.....	29	.176	18.0
Use of automobile storage-battery.....	27	.164	19.0
Operation of electric windshield wiper.....	26	.158	20.0
Repairing light socket.....	25	.152	21.0
Making common wire splices.....	24	.146	22.5
Structure of a push button.....	24	.146	22.5
Soldering and taping splices.....	23	.140	24.0
Care of automobile storage-battery....	21	.127	25.0
Proper size of fuse to use in a circuit.....	20	.121	26.0
Structure of an electric bell.....	19	.115	27.5
Common house wiring and insulation....	19	.115	27.5
Constructing and wiring bell circuits..	16	.097	30.0
Farm lighting system.....	16	.097	30.0
Construction of electric flatiron.....	16	.097	30.0
Installation of a flush switch.....	15	.091	34.5
Use of porcelain tubes, knobs, wiring-loom.....	15	.091	34.5

Table VI (continued)

Item	N	Pct	R O
Construction of an electric pad.....	15	.091	34.5
Testing for automobile battery troubles.....	15	.091	34.5
Locating trouble in the automobile horn.....	15	.091	34.5
Meaning of the following terms: voltage, ampere, current, watt, kilowatt, kilowatt-hour, circuit, short-circuit, ground and convenience outlet.....	15	.091	34.5
Principles of connecting dry cells....	14	.085	39.5
Construction of a simple telegraph system.....	14	.085	39.5
Installation of a snap switch.....	14	.085	39.5
Locating trouble in the automobile starter.....	14	.085	39.5
Construction and installation of a drop-cord.....	13	.079	42.5
Construction and use of spark plug....	13	.079	42.5
Connecting dry cells in series.....	12	.073	45.0
Wiring miniature battery lamps.....	12	.073	45.0
Magnetic compass.....	12	.073	45.0
Connecting dry cells in parallel.....	11	.067	48.5
Construction of an electromagnet.....	11	.067	48.5
Use and construction of a thermostat..	11	.067	48.5
Principles involved in selecting electrically-driven machinery for home and office use.....	11	.067	48.5
Construction of an extension cord for 110 volts.....	10	.060	51.5
Testing for trouble in the automobile lighting system.....	10	.060	51.5
Construction of a bell circuit using one button for two bells.....	9	.054	55.0
Detection and removal of trouble in a bell circuit.....	9	.054	55.0
Construction of a simple buzzer.....	9	.054	55.0
Construction of a simple electric motor.....	9	.054	55.0
Construction of automobile storage battery.....	9	.054	55.0
Construction of a simple lighting circuit with lamps in series.....	8	.048	60.0
Installation of a flush receptacle....	8	.048	60.0
Structure of a dry cell.....	8	.048	60.0
Code rules for wiring.....	8	.048	60.0
Principles of the common incandescent lamp.....	8	.048	60.0

Table VI (continued)

Item	N	Pct	R O
Action and principles of an electric motor and generator.....	7	.042	63.0
Constructing a bell circuit using two buttons either of which will operate a single bell.....	6	.036	66.5
Construction of a small transformer...	6	.036	66.5
Principles of electromagnetism.....	6	.036	66.5
Electroplating.....	6	.036	66.5
Care of volt meters and ammeters.....	6	.036	66.5
Changing the charging rate of the automobile generator.....	6	.036	66.5
Construction of a simple lighting circuit with lamps in parallel.....	5	.030	72.0
Construction of a lighting circuit using three-way switches.....	5	.030	72.0
Use and construction of a rheostat....	5	.030	72.0
Capacity of light cords and fixture sockets for carrying current.....	5	.030	72.0
Construction and use of ignition coil.	5	.030	72.0
Construction of a commutator.....	3	.018	75.5
Use of pyrometer.....	3	.018	75.5
Connection of a transformer to 110 volt line.....	2	.012	77.5
Locating trouble in the ignition system.....	2	.012	77.5
Construction of weatherproof outdoor circuits.....	1	.006	79.5
Adjusting breaker points in automobile ignition system.....	1	.006	79.5

Explanation for Table VII

Table VII, on the following page, gives the combined data obtained from all the check lists, marked by 489 individuals, indicating the items a knowledge of which, they had found useful. The items are arranged in rank order according to frequency of marking.

The rank order of the items is slightly different from that given by parents, boys, or girls separately. With few exceptions, the more common items, a knowledge of which was found useful around the home and in connection with the automobile are ranked at the top. For example, in this table, the item, "Use of fuses", ranks first. The parents and boys (see Table VIII, p. 44) each gave it fourth place, while the girls gave it second place. The item, "Use of pyrometer", is given the lowest rank in this table. It is also given the lowest rank by the boys. Parents and girls also give it very low rank; being second and fifth, respectively, from the last.

TABLE VII

Items a Knowledge of Which 489 Individuals Found Useful: Number (N.) of Individuals Checking Each Item; Percentage (Pct.) of Individuals Checking Each Item, Rank Order (R.O.) of the Items Checked

Item	N	Pct	R O
Use of fuses.....	275	.56	1.0
Dangers of electricity.....	269	.55	2.0
Making common wire splices.....	251	.51	3.0
Assembling electric iron, heater or toaster plug.....	247	.50	4.0
Use of switches.....	246	.50	5.0
Testing, finding and replacing fuses..	239	.48	6.0
How to avoid dangers of electricity...	219	.44	7.0
Construction of automobile storage battery.....	215	.43	8.0
Soldering and taping splices.....	209	.42	9.0
Construction and use of spark plug....	204	.41	10.0
Construction of common electrical household appliances.....	197	.40	11.0
Principles of connecting dry cells....	194	.39	12.5
Cause and effect of short circuits....	194	.39	12.5
Repairing light socket.....	193	.39	14.0
Reading an electric service meter....	192	.39	15.0
Making simple repairs on household electrical appliances.....	190	.38	17.0
Materials that will conduct electricity.....	190	.38	17.0
Materials that will not conduct electricity.....	190	.38	17.0
Sources of electrical current.....	187	.38	19.5
Use of automobile storage battery.....	187	.38	19.5
Testing for automobile battery troubles.....	186	.37	21.0
Connecting dry cells in series.....	179	.36	22.0
Common house wiring and insulation....	171	.34	23.0
Calculation of light bill from meter reading.....	168	.34	24.5
Use of porcelain tubes, knobs, wiring-loom.....	168	.34	24.5
Construction of an extension cord for 110 volts.....	161	.32	26.5
Operation of electric windshield wiper.....	161	.32	26.5
Locating trouble in the automobile horn.....	159	.32	28.0
Locating trouble in the automobile starter.....	158	.32	29.0

Table VII (continued)

Item	N	Pct	R O
Construction and installation of			
a drop-cord.....	154	.31	30.5
Structure of a push button.....	154	.31	30.5
Care of automobile storage-battery....	153	.31	32.0
Locating trouble in the ignition			
system.....	151	.30	33.0
Principles of the telephone.....	146	.29	34.0
Testing for trouble in the automobile			
lighting system.....	143	.29	35.0
Proper size of fuse to use in a			
circuit.....	141	.28	36.0
Structure of an electric bell.....	140	.28	37.0
Installation of a snap switch.....	135	.27	38.0
Constructing and wiring bell circuits.	134	.27	39.0
Construction and use of ignition coil.	128	.26	40.0
Adjusting breaker points in			
automobile ignition system.....	126	.25	41.5
Meaning of the following terms: volt-			
age, ampere, current, watt, kilo-			
watt, kilowatt-hour, circuit, short-			
circuit, ground and convenience			
outlet.....	126	.25	41.5
Structure of a dry cell.....	124	.25	43.0
Construction of a simple buzzer.....	119	.24	44.5
Construction of an electric curling			
iron.....	119	.24	44.5
Wiring miniature battery lamps.....	118	.24	46.5
Electrical toys.....	118	.24	46.5
Construction of a simple lighting-			
circuit with lamps in parallel.....	114	.23	49.0
Construction of a simple lighting-			
circuit with lamps in series.....	114	.23	49.0
Construction of a percolator.....	114	.23	49.0
Changing the charging rate of the			
automobile generator.....	113	.23	51.0
Connecting dry cells in parallel.....	109	.22	52.5
Capacity of light cords and fixture			
sockets for carrying current.....	109	.22	52.5
Action and principles of an electric			
motor and generator.....	105	.21	54.0
Detection and removal of trouble in			
a bell circuit.....	103	.21	55.5
Installation of a flush switch.....	103	.21	55.5
Construction of a simple telegraph			
system.....	101	.20	57.5
Construction of a simple electric			
motor.....	101	.20	57.5
Constructing a bell circuit using			
one button for two bells.....	98	.20	59.5

Table VII (continued)

Item	N	Pot	R O
Principles of the common incandescent lamp.....	98	.20	59.5
Construction of electric flatiron.....	97	.19	61.0
Constructing a bell circuit using two buttons either of which will operate a single bell.....	94	.19	62.0
Construction of an electromagnet.....	92	.18	63.0
Connection of a transformer to 110 volt line.....	90	.18	64.0
Magnetic compass.....	85	.17	65.5
Care of volt meters and ammeters.....	85	.17	65.5
Construction of weatherproof outdoor circuits.....	84	.17	67.0
Principles involved in selecting electrically driven machinery for home and office use.....	83	.16	68.0
Use and construction of a rheostat....	82	.16	69.0
Principles of electromagnetism.....	81	.16	70.0
Installation of a flush receptacle....	80	.16	71.5
Farm lighting system.....	80	.16	71.5
Construction of a small transformer...	72	.14	73.5
Construction of a lighting circuit using three-way switches.....	72	.14	74.5
Use and construction of a thermostat..	68	.13	75.0
Construction of an electric pad.....	61	.12	76.0
Electroplating.....	60	.12	77.0
Construction of a commutator.....	55	.11	78.0
Code rules for wiring.....	54	.11	79.0
Use of pyrometer.....	27	.05	80.0

Explanation for Table VIII

Table VIII, on the following page, gives the comparative rank order of the items marked by parents, boys, and girls respectively. Four items are given equal rank by parents and boys, i.e. "Making common wire splices", "Use of fuses", "Testing for trouble in the automobile lighting system", and "Wiring miniature battery lamps". Three items, "Use of switches", "Sources of electrical current", and "Wiring miniature battery lamps", were given equal rank by parents and girls. One item, "Wiring miniature battery lamps", was given equal rank by parents, boys, and girls. None other than "Wiring miniature battery lamps" was given equal rank by boys and girls alone.

TABLE VIII

Comparative Rank Order of Items Found Useful by 178 Parents,
147 Boys, and 164 Girls

Item	Parents	Boys	Girls
Making common wire splices.....	1.0	1.0	22.5
Assembling electric iron heater or toaster plug.....	2.5	14.5	4.0
Testing, finding and replacing fuses	2.5	14.5	7.0
Use of fuses.....	4.0	4.0	2.0
Soldering and taping splices.....	5.0	13.0	24.0
Use of switches.....	6.0	5.0	6.0
Construction and use of spark plug..	7.0	2.0	42.5
Repairing light socket.....	8.0	16.0	21.0
Common house wiring and insulation..	9.5	32.0	27.5
Dangers of electricity.....	9.5	7.0	1.0
Principles of connecting dry cells..	11.5	6.0	39.5
Use of automobile storage battery...	11.5	3.0	19.0
Reading an electric service meter...	13.0	37.0	9.0
Use of porcelain tubes, knobs, wiring-loom.....	14.0	26.0	34.5
Sources of electrical current.....	15.0	12.0	15.0
Connecting dry cells in series.....	17.5	10.0	45.0
Construction and installation of a drop-cord.....	17.5	38.0	42.5
Cause and effect of short circuits..	17.5	21.5	10.0
Making simple repairs on household electrical appliances.....	17.5	25.0	11.0
How to avoid dangers of electricity.	20.0	19.0	3.0
Construction of an extension cord for 110 volts.....	21.5	23.5	51.5
Testing for automobile battery troubles.....	21.5	28.5	34.5
Calculation of light bill from meter reading.....	23.5	63.0	8.0
Testing for trouble in the automobile lighting system.....	23.5	23.5	51.5
Connecting dry cells in parallel....	25.0	75.5	48.5
Care of automobile storage-battery..	26.5	10.0	25.0
Locating trouble in the automobile horn.....	26.5	17.5	34.5
Construction of common electrical household appliances.....	28.0	28.5	5.0
Materials that will conduct electricity.....	29.0	10.0	16.0
Materials that will not conduct electricity.....	30.5	8.0	14.0
Adjusting breaker points in automobile ignition system.....	30.5	43.0	79.5
Installation of a snap switch.....	32.0	42.0	39.5

Table VIII (continued)

Item	Parents	Boys	Girls
Locating trouble in the automobile starter.....	33.5	28.5	39.5
Operation of electric windshield wiper.....	33.5	45.0	20.0
Proper size of fuse to use in a circuit.....	36.0	41.0	26.0
Locating trouble in the ignition system.....	36.0	39.5	77.5
Changing the charging rate of the automobile generator.....	36.0	39.5	66.5
Construction of a simple lighting circuit with lamps in parallel....	38.0	49.5	72.0
Construction of a simple lighting circuit with lamps in series.....	39.0	56.5	60.0
Capacity of light cords and fixture sockets for carrying current.....	40.0	59.5	72.0
Construction of automobile storage battery.....	41.5	28.5	55.0
Construction and use of ignition coil.....	41.5	33.0	72.0
Installation of a flush switch.....	43.0	69.0	34.5
Constructing and wiring bell circuits.....	44.0	35.0	30.0
Wiring miniature battery lamps.....	45.0	45.0	45.0
Structure of a push button.....	46.0	17.5	22.5
Construction of electric flatiron...	47.0	71.0	30.0
Meaning of the following terms: voltage, ampere, current, watt, kilowatt, kilowatt-hour, circuit, short-circuit, ground and convenience outlet.....	48.0	36.0	34.5
Detection and removal of trouble in a bell circuit.....	49.5	52.5	55.0
Action and principles of an electric motor and generator.....	49.5	47.5	63.0
Construction of a simple buzzer.....	52.5	34.0	55.0
Installation of a flush receptacle..	52.5	73.0	60.0
Structure of an electric bell.....	52.5	20.0	27.5
Construction of lighting-circuit using three-way switches.....	52.5	75.5	72.0
Construction of a simple electric motor.....	55.5	52.5	55.0
Principles of the telephone.....	57.0	32.0	13.0
Constructing a bell circuit using one button for two bells.....	59.0	56.5	55.0
Constructing a bell circuit using two buttons either of which will operate a single bell.....	59.0	59.5	66.5

Table VIII (continued)

Item	Parents	Boys	Girls
Construction of an electric curling iron.....	59.0	64.5	12.0
Structure of a dry cell.....	62.0	21.5	60.0
Construction of weatherproof outdoor circuits.....	62.0	64.5	79.5
Principles of the common incandescent lamp.....	62.0	49.5	60.0
Principles involved in selecting electrically driven machinery for home and office use.....	64.0	71.0	48.5
Construction of a simple telegraph system.....	65.0	52.5	39.5
Connection of a transformer to 110 volt line.....	66.0	47.5	77.5
Electrical toys.....	67.5	45.0	17.0
Care of volt meters and ammeters....	67.5	61.5	66.5
Construction of an electromagnet....	69.0	56.5	48.5
Use and construction of a rheostat..	70.5	61.5	72.0
Use and construction of a thermostat	70.5	74.0	48.5
Farm lighting system.....	72.5	71.0	30.0
Construction of a commutator.....	72.5	77.0	75.5
Construction of an electric pad.....	74.0	79.0	34.5
Construction of a small transformer.	75.5	68.0	66.5
Principles of electromagnetism.....	75.5	56.5	66.5
Code rules for wiring.....	77.0	78.0	60.0
Magnetic compass.....	78.0	52.5	45.0
Use of pyrometer.....	79.0	80.0	75.0
Electroplating.....	80.0	67.0	66.5

Explanation for Table IX

Table IX, on the following page, gives the data concerning the items in which 147 boys expressed an interest, but which they had not found useful. The items are arranged in descending rank order according to the frequency of marking.

A comparison of this table with Table V shows that the boys are interested in nearly all of the items concerning which they report having little if any knowledge. In general the items which rank highest in Table V, showing what items have been found useful, are the ones ranking lowest in this table. The following three items rank highest in this table:

- Code rules for wiring
- Use of pyrometer
- Farm lighting system.

The above items rank near the bottom of Table V, the item, "Use of the pyrometer", being given the lowest rank.

The three items ranking lowest in this table are the three highest in Table V although not in the same order.

They are:

- Making common wire splices
- Use of automobile storage batteries
- Construction and use of spark plug.

The item, "Changing the charging rate of the automobile generator", is the fortieth item in this table and in Table V.

TABLE IX

Items in Which 147 Boys Expressed Interest, but Which They
Have Not Found Useful: Number (N.) of Boys Checking
Each Item, Rank Order (R.O.) of Items Checked

Item	N	R O
Code rules for wiring.....	92	1.0
Use of pyrometer.....	88	2.0
Farm lighting system.....	83	3.0
Construction of a simple electric motor.....	81	4.0
Construction of lighting-circuit using three way switches.....	80	5.5
Principles involved in selecting electrically- driven machinery for home and office use....	80	5.5
Construction of an electric pad.....	79	7.0
Installation of a flush switch.....	78	8.0
Installation of a flush receptacle.....	76	10.0
Calculation of light bill from meter reading..	76	10.0
Use and construction of a thermostat.....	76	10.0
Construction of a small transformer.....	75	12.5
Construction of weatherproof outdoor circuits.	75	12.5
Construction of a simple telegraph system....	74	14.5
Construction of electric flatiron.....	74	14.5
Constructing a bell circuit using one button for two bells.....	72	17.5
Constructing a bell circuit using two buttons either of which will operate a single bell..	72	17.5
Connection of a transformer to 110 volt line..	72	17.5
Action and principles of an electric motor and generator.....	72	17.5
Construction of an electromagnet.....	70	20.5
Locating trouble in the ignition coil.....	70	20.5
Construction of a commutator.....	69	22.0
Detection and removal of trouble in a bell circuit.....	68	23.0
Construction of an electric curling iron.....	67	24.0
Common house wiring and insulation.....	66	26.5
Care of volt meters and ammeters.....	66	26.5
Operation of electric windshield wiper.....	66	26.5
Adjusting breaker points in automobile ignition system.....	66	26.5
Construction of a percolator.....	65	29.5
Capacity of light cords and fixture sockets for carrying current.....	65	29.5
Proper size of fuse to use in a circuit.....	64	31.0
Constructing and wiring bell circuits.....	63	33.5
Wiring miniature battery lamps.....	63	33.5
Construction of a simple lighting-circuit with lamps in series.....	63	33.5
Locating trouble in the automobile starter....	63	33.5

Table IX (continued)

Item	N	R O
Construction of a simple lighting-circuit with lamps in parallel.....	62	37.0
Installation of a snap switch.....	62	37.0
Reading an electric service meter.....	62	37.0
Use and construction of a rheostat.....	61	39.5
Changing the charging rate of the automobile generator.....	61	39.5
Magnetic compass.....	59	41.5
Principles of the telephone.....	59	41.5
Electroplating.....	58	43.0
Construction of a simple buzzer.....	57	44.5
Testing for automobile battery troubles.....	57	44.5
Construction and installation of a drop-cord..	56	46.5
Construction and use of ignition coil.....	56	46.5
How to avoid dangers of electricity.....	54	49.0
Testing for trouble in the automobile lighting system.....	54	49.0
Meaning of the following terms: voltage, ampere, current, watt, kilowatt, kilowatt-hour, circuit, short-circuit, ground and convenience outlet.....	54	49.0
Principles of electromagnetism.....	53	52.0
Electrical toys.....	53	52.0
Principles of the common incandescent lamp....	53	52.0
Locating trouble in the automobile horn.....	52	54.0
Testing, finding and replacing fuses.....	51	55.0
Soldering and taping splices.....	49	56.0
Making simple repairs on household electrical appliances.....	48	57.5
Construction of automobile storage-battery....	48	57.5
Construction of an extension cord for 110 volts.....	47	59.5
Assembling electric iron, heater or toaster plug.....	47	59.5
Connecting dry cells in parallel.....	46	61.5
Repairing light socket.....	46	61.5
Cause and effect of short circuits.....	45	63.0
Sources of electrical current.....	42	64.0
Connecting dry cells in series.....	41	66.0
Use of porcelain tubes, knobs, wiring-loom....	41	66.0
Dangers of electricity.....	41	66.0
Structure of a push button.....	39	68.0
Use of switches.....	38	69.5
Materials that will conduct electricity.....	38	69.5
Principles of connecting dry cells.....	37	71.5
Structure of a dry cell.....	37	71.5
Structure of an electric bell.....	36	73.0
Construction of common electrical household appliances.....	35	74.0

Table IX (continued)

Item	N	R O
Care of automobile storage-battery.....	34	75.0
Use of fuses.....	33	76.0
Materials that will not conduct electricity...	32	77.0
Making common wire splices.....	30	78.0
Use of automobile storage battery.....	27	79.0
Construction and use of spark plug.....	26	80.0

Explanation for Table X

Table X, on the following page gives the data concerning the items in which 164 girls expressed an interest, but which they had not found useful. The items are arranged in descending rank order according to the frequency of marking.

A comparison of this table with Table VI shows that the girls are interested in many of the items, of which they report having little if any knowledge. In general the items which rank highest in Table VI showing what items have been found useful are the ones ranking lowest in this table. However the data in this table are somewhat different from the data in Table IX which gives the expressed interests of boys, in that the items ranking highest in this table are not the ones ranking lowest in Table VI which gives the items a knowledge of which has been found useful.

TABLE X

Items in Which 164 Girls Expressed Interest, but Which They Have Not Found Useful: Number (N.) of Girls Checking Each Item, Rank Order (R.O.) of Items Checked

Item	N	R O
Repairing light socket.....	74	1.5
Operation of electric windshield wiper.....	74	1.5
How to avoid dangers of electricity.....	72	3.0
Locating trouble in the automobile starter....	71	4.0
Locating trouble in the automobile horn.....	70	5.0
Making simple repairs on household electrical appliances.....	69	6.5
Testing for trouble in the automobile lighting system.....	69	6.5
Reading an electric service meter.....	65	8.5
Principles of the telephone.....	65	8.5
Construction of electric flatiron.....	64	10.5
Meaning of the following terms: voltage, ampere, current, watt, kilowatt, kilowatt-hour, circuit, short-circuit, ground and convenience outlet.....	64	10.5
Assembling electric iron, heater or toaster plug.....	63	12.0
Construction of an electric curling iron.....	62	13.0
Calculation of light bill from meter reading..	61	14.0
Magnetic compass.....	60	15.0
Cause and effect of short circuits.....	59	18.0
Common house wiring and insulation.....	59	18.0
Farm lighting system.....	59	18.0
Materials that will conduct electricity.....	59	18.0
Construction and use of spark plug.....	59	18.0
Construction of a percolator.....	58	21.0
Testing for automobile battery troubles.....	57	22.0
Constructing a bell circuit using one button for two bells.....	55	24.0
Structure of an electric bell.....	55	24.0
Construction of an electric pad.....	55	24.0
Sources of electrical current.....	54	26.5
Testing, finding and replacing fuses.....	54	26.5
Proper size of fuse to use in a circuit.....	53	28.5
Locating trouble in the ignition system.....	53	28.5
Dangers of electricity.....	52	30.5
Use of switches.....	52	30.5
Construction of a simple electric motor.....	50	33.0
Structure of a push button.....	50	33.0
Code rules for wiring.....	50	33.0
Materials that will not conduct electricity...	49	35.0
Constructing and wiring bell circuits.....	47	37.0

Table X (continued)

Item	N	R O
Detection and removal of trouble in a bell circuit.....	47	37.0
Construction of common electrical household appliances.....	47	37.0
Construction and installation of a drop-cord..	46	40.0
Construction of a simple telegraph system....	46	40.0
Construction of weatherproof outdoor circuits.	46	40.0
Principles involved in selecting electrically driven machinery for home and office use....	45	42.0
Constructing a bell circuit using two buttons either of which will operate a single bell..	44	43.5
Electrical toys.....	44	43.5
Care of automobile storage-battery.....	43	45.0
Action and principles of an electric motor and generator.....	42	46.5
Construction and use of ignition coil.....	42	46.5
Wiring miniature battery lamps.....	41	48.0
Use of fuses.....	40	49.5
Adjusting breaker points in automobile ignition system.....	40	49.5
Construction of a simple buzzer.....	39	51.0
Principles of connecting dry cells.....	38	55.0
Construction of an extension cord for 110 volts.....	38	55.0
Construction of a simple lighting-circuit with lamps in parallel.....	38	55.0
Construction of a simple lighting-circuit with lamps in series.....	38	55.0
Installation of a snap switch.....	38	55.0
Changing the charging rate of the automobile generator.....	38	55.0
Capacity of light cords and fixture sockets for carrying current.....	38	55.0
Construction of automobile storage-battery....	37	59.0
Structure of a dry cell.....	35	60.5
Use of automobile storage-battery.....	35	60.5
Use of porcelain tubes, knobs, wiring-loom....	34	63.0
Construction of lighting-circuit using three-way switches.....	34	63.0
Principles of the common incandescent lamp....	34	63.0
Connecting dry cells in series.....	33	65.0
Making common wire splices.....	32	66.5
Connection of a transformer to 110 volt line..	32	66.5
Construction of a small transformer.....	31	68.5
Principles of electromagnetism.....	31	68.5
Connecting dry cells in parallel.....	29	71.0
Use and construction of a thermostat.....	29	71.0
Care of volt meters and ammeters.....	29	71.0
Construction of an electromagnet.....	28	74.0

Table X (continued)

Item	N	R O
Soldering and taping splices.....	28	74.0
Installation of a flush switch.....	28	74.0
Electroplating.....	25	76.0
Construction of a commutator.....	24	77.5
Use of pyrometer.....	24	77.5
Installation of a flush receptacle.....	22	79.5
Use and construction of a rheostat.....	22	79.5

Explanation for Table XI

Table XI, on the following page, gives data concerning the items which 178 parents have not found useful, but which they considered valuable for their sons and daughters to study. The items are arranged in descending rank order according to frequency of marking.

A study of this table shows that many of the parents consider items of which they have little if any knowledge valuable for their sons or daughters to study.

It is perhaps significant that the two items "Meaning of the following terms: voltage, ampere, current, watt, kilowatt, kilowatt-hour, circuit, short-circuit, ground, and convenience outlet" and "Code rules for wiring", rank highest in this table.

A knowledge of these items is valuable as heretofore mentioned and parents probably realize that a knowledge of these items will help their sons or daughters to understand the use and construction of electrical appliances.

TABLE XI

Items Which 178 Parents Have Not Found Useful but Which They
Consider Valuable for Pupils to Study: Number (N.)
of Parents Checking Each Item; Rank Order
(R.O.) of Items Checked

Item	N	R O
Meaning of the following terms: voltage, am- pere, current, watt, kilowatt, kilowatt- hour, circuit, short-circuit, ground and convenience outlet.....	95	1.0
Code rules for wiring.....	90	2.0
How to avoid dangers of electricity.....	89	3.0
Principles of the telephone.....	88	4.0
Dangers of electricity.....	84	5.0
Capacity of light cords and fixture sockets for carrying current.....	82	6.0
Action and principles of an electric motor and generator.....	79	7.0
Locating trouble in the ignition system.....	76	8.0
Calculation of light bill from meter reading..	74	10.0
Construction of electric flatiron.....	74	10.0
Principles involved in selecting electrically driven machinery for home and office.....	74	10.0
Construction and installation of a drop-cord..	73	12.0
Construction of a simple electric motor.....	72	13.0
Locating trouble in the automobile starter....	71	14.0
Construction of an electric pad.....	70	15.0
Reading an electric service meter.....	69	17.0
Construction of a simple telegraph system.....	69	17.0
Farm lighting system.....	69	17.0
Testing for trouble in the automobile lighting system.....	68	19.5
Testing for automobile battery troubles.....	68	19.5
Proper size of fuse to use in a circuit.....	67	22.5
Structure of an electric bell.....	67	22.5
Construction of an electric percolator.....	67	22.5
Construction of an electric curling iron.....	67	22.5
Construction of common electrical household appliances.....	66	25.5
Connection of a transformer to 110 volt line..	66	25.5
Common house wiring and insulation.....	64	27.5
Construction and use of a small transformer...	64	27.5
Making simple repairs on household electrical appliances.....	63	30.0
Materials that will not conduct electricity...	63	30.0
Construction and use of ignition coil.....	63	30.0
Constructing a bell circuit using two buttons either of which will operate a single bell..	62	32.5
Electroplating.....	62	32.5

Table XI (continued)

Item	N	R O
Adjusting breaker points in automobile ignition system.....	61	35.0
Construction of weatherproof outdoor circuits.....	61	35.0
Principles of electromagnetism.....	61	35.0
Care of automobile storage-battery.....	60	38.5
Changing the charging rate of the automobile generator.....	60	38.5
Construction of lighting circuit using three-way switches.....	60	38.5
Structure of a dry cell.....	60	38.5
Cause and effect of short circuits.....	59	42.0
Operation of electric windshield wiper.....	59	42.0
Constructing a bell circuit using one button for two bells.....	59	42.0
Locating trouble in the automobile horn.....	58	44.5
Magnetic compass.....	58	44.5
Materials that will conduct electricity.....	57	47.5
Constructing and wiring bell circuits.....	57	47.5
Use and construction of a thermostat.....	57	47.5
Use of a pyrometer.....	57	47.5
Care of volt meters and ammeters.....	56	50.0
Use of automobile storage battery.....	55	52.0
Detection and removal of trouble in a bell circuit.....	55	52.0
Use and construction of a rheostat.....	55	52.0
Testing, finding and replacing fuses.....	54	54.5
Installation of a flush switch.....	54	54.5
Use of switches.....	53	58.0
Repairing light socket.....	53	58.0
Installation of a snap switch.....	53	58.0
Structure of a push button.....	53	58.0
Principles of the common incandescent lamp....	53	58.0
Electrical toys.....	52	61.5
Construction and use of an electromagnet.....	52	61.5
Construction of an extension cord for 110 volts.....	51	63.0
Construction of a simple buzzer.....	50	64.0
Sources of electrical current.....	49	66.0
Construction and installation of a drop cord..	49	66.0
Construction and use of a commutator.....	49	66.0
Wiring miniature battery lamps.....	47	68.5
Installation of a flush receptacle.....	47	68.5
Construction and use of a spark plug.....	46	70.0
Assembling electric iron, heater or toaster plug.....	45	71.0
Construction of a simple lighting circuit with lamps in parallel.....	44	72.0
Construction of a simple lighting circuit with lamps in series.....	43	73.0

Table XI (continued)

Item	N	R O
Use of fuses.....	40	74.5
Use of porcelain tubes, knobs, wiring-loom....	40	74.5
Soldering and taping splices.....	39	76.0
Connecting dry cells in parallel.....	35	77.0
Connecting dry cells in series.....	34	78.0
Principles of connecting dry cells.....	32	79.0
Making common wire splices.....	29	80.0

Explanation for Table XII

Table XII, on the following page, shows the relative per cents of parents who considered the items of value for study, and the pupils (boys and girls) interested in the items. The items in this table are those of which the individuals report having little if any knowledge.

The correlation between the two groups of data contained in this table is $+ .609 \pm .047$. This marked degree of correlation indicates that boys and girls are interested in a number of the items that parents think it valuable for them to study. Therefore, the writer feels that some importance may be attached to this fact in selecting the items to be included in a course of study in electricity.

TABLE XII

The Percentage of Parents Who Considered Certain Items of Value for Study, and the Percentage of Pupils Interested in the Same Items

Item	Parents	Pupils
Farm lighting system.....	.38	.45
Code rules for wiring.....	.50	.45
Operation of electric windshield wiper.....	.33	.45
Calculation of light bill from meter reading	.41	.44
Construction of electric flatiron.....	.41	.44
Construction of an electric pad.....	.39	.43
Locating trouble in the automobile starter..	.39	.43
Construction of a simple electric motor.....	.40	.42
Construction of an electric curling iron....	.37	.41
Constructing a bell circuit using one button for two bells.....	.33	.40
Reading an electric service meter.....	.38	.40
Common house wiring and insulation.....	.35	.40
How to avoid dangers of electricity.....	.50	.40
Principles involved in selecting electric- ally driven machinery for home and office use.....	.41	.40
Construction of a percolator.....	.37	.39
Principles of the telephone.....	.49	.39
Locating trouble in the automobile horn.....	.32	.39
Testing for trouble in the automobile ignition system.....	.38	.39
Locating trouble in the ignition system.....	.42	.39
Construction of a simple telegraph system...	.38	.38
Repairing light socket.....	.38	.38
Magnetic compass.....	.32	.38
Detection and removal of trouble in a bell circuit.....	.30	.37
Proper size of fuse to use in a circuit.....	.37	.37
Making simple repairs on household electrical appliances.....	.35	.37
Meaning of the following terms: voltage, am- pere, watt, kilowatt, kilowatt-hour, cir- cuit, short-circuit, ground and conven- ience outlet.....	.53	.37
Constructing a bell circuit using two buttons either of which will operate a single bell.....	.34	.36
Action and principles of an electric motor and generator.....	.44	.36
Construction of lighting-circuit using three-way switches.....	.33	.36
Use of pyrometer.....	.32	.36
Testing for automobile battery troubles.....	.38	.36

Table XII (continued)

Item	Parents	Pupils
Constructing and wiring bell circuits.....	.32	.35
Assembling electric iron, heater or toaster plug.....	.25	.35
Installation of a flush switch.....	.30	.34
Construction of a small transformer.....	.35	.34
Adjusting breaker points in automobile ignition system.....	.34	.34
Wiring miniature battery lamps.....	.26	.33
Connection of a transformer to 110 volt line	.37	.33
Testing, finding and replacing fuses.....	.30	.33
Cause and effect of short circuits.....	.33	.33
Use and construction of a thermostat.....	.32	.33
Capacity of light cords and fixture sockets for carrying current.....	.46	.33
Construction of a simple lighting-circuit with lamps in series.....	.24	.32
Construction of a simple lighting-circuit with lamps in parallel.....	.24	.32
Construction and installation of a drop-cord	.27	.32
Installation of a snap switch.....	.29	.32
Construction of an electromagnet.....	.29	.31
Installation of a flush receptacle.....	.26	.31
Electrical toys.....	.29	.31
Materials that will conduct electricity.....	.32	.31
Changing the charging rate of the automobile generator.....	.33	.31
Construction and use of ignition coil.....	.35	.31
Sources of electrical current.....	.27	.30
Construction of a simple buzzer.....	.28	.30
Dangers of electricity.....	.47	.30
Construction of a commutator.....	.27	.30
Care of volt meters and ammeters.....	.31	.30
Structure of an electric bell.....	.37	.29
Use of switches.....	.29	.28
Structure of a push button.....	.29	.28
Construction of weatherproof outdoor circuit	.34	.28
Principles of the common incandescent lamp..	.29	.28
Construction of an extension cord for 110 volts.....	.28	.27
Principles of electromagnetism.....	.34	.27
Construction of automobile storage-battery..	.41	.27
Construction and use of spark plug.....	.25	.27
Construction of common electrical household appliances.....	.37	.26
Electroplating.....	.34	.26
Materials that will not conduct electricity.	.35	.26
Principles of connecting dry cells.....	.17	.24
Connecting dry cells in parallel.....	.19	.24
Soldering and taping splices.....	.21	.24

Table XII (continued)

Item	Parents	Pupils
Use of porcelain tubes, knobs, wiring-loom..	.22	.24
Care of automobile storage-battery.....	.33	.24
Connecting dry cells in series.....	.19	.23
Use of fuses.....	.22	.23
Structure of a dry cell.....	.33	.23
Use and construction of a rheostat.....	.30	.23
Use of automobile storage battery.....	.30	.20
Making common wire splices.....	.16	.19

CHAPTER V

ITEMS SUGGESTED BY THIS STUDY FOR A COURSE IN ELECTRICITY

The primary purposes of this study were; (1) to discover what knowledge of electricity was found useful by the average person, (2) to use this material in outlining a course in electricity.

Four main things are shown by the data received:

1. A knowledge of each item has been found useful by parents, boys, or girls, the percentage varying from seventy-six and one-tenth per cent to six-tenths of one per cent.
2. Boys are interested in all items, the percentage varying from seventy-six and one-tenth to six and one-tenth per cent.
3. Girls are interested in all items, the percentage varying from fifty-four and two-tenths to six-tenths of one per cent.
4. Parents think that all items which they have not found useful, are valuable for their sons and daughters, the percentage varying from fifty-three to sixteen per cent.

The question now arises, "What criteria shall be used in selecting items for a course in electricity?"

W. W. Charters¹, a prominent authority on curriculum construction, in discussing different bases for selecting material for the course of study, says "Importance is determined in the last analysis by use".

Some writers and teachers consider the interests of boys and girls a good criterion. Thomas L. Hopkins²,

1. Charters, W. W. Curriculum Construction. New York: The Macmillan Co., 1923. p. 65.

2. Hopkins, Thomas L. Curriculum Principles and Practices. Chicago: The Bruce Publishing Co., 1928. p. 140.

another curriculum expert, makes the following statement on this point,

"While this criterion is of great importance it must be interpreted and utilized with extreme caution. Many times immature pupils will show great interest in activities or items of content out of which nothing of real value can grow".

It is difficult to say just how much value should be attached to interests in this study, because they change from time to time. Parents probably feel a need for more knowledge of electricity than they possess. Therefore, they wish their sons and daughters to have more information about the subject. This opinion, or feeling, is not objective, because it represents only personal judgment or opinion and, because of this, its value as a criterion for selecting material for a course in electricity seems small.

Probably the most important criterion to be used in selecting the items from this study for a course in electricity is that of use. In the absence of a more valid standard it will be emphasized largely in this chapter.

The writer is assuming that if knowledge of an item was found useful by twenty-five per cent of the individuals checking the lists, there is ample justification for including it in the course. Therefore, since twenty-five per cent of parents, boys, and girls find useful a knowledge of forty-seven, seventy-two, and nine items respectively, there should be a course of some type in the junior or senior high school, preferably in the former, because so many pupils drop out at

this level.

On this basis, if the data from the lists checked by boys alone were used, a total of seventy-two, or all except eight items would be included, while only forty-six items would be included for parents, and nine for girls. The fact that twenty-five per cent of the girls had a knowledge of only nine items seems to indicate that more instruction should be given in electricity, and that the girls would find use for a knowledge of many more items.

The following, proposed list is taken from Table VII, because it gives the combined data for parents, boys, and girls, with the items arranged in descending rank order. It contains forty-three items which were marked by at least twenty-five per cent of the individuals. They are given in order as follows:

- Use of fuses
- Dangers of electricity
- Making common wire splices
- Assembling electric iron, heater, or toaster plug
- Use of switches
- Testing, finding, and replacing fuses
- How to avoid dangers of electricity
- Construction of automobile storage battery
- Soldering and taping splices
- Construction and use of spark plug
- Construction of common electrical household appliances
- Principles of connecting dry cells
- Cause and effect of short circuits
- Repairing light socket
- Reading an electric service meter
- Making simple repairs on household electrical appliances
- Materials that will not conduct electricity
- Materials that will conduct electricity
- Sources of electrical current
- Use of automobile storage battery
- Testing for automobile battery troubles
- Connecting dry cells in series
- Common house wiring and insulation

Calculation of light bill from meter reading
Use of porcelain tubes, knobs, wiring-loom
Construction of an extension cord for 110 volts
Operation of electric windshield wiper
Locating trouble in the automobile horn
Locating trouble in the automobile starter
Construction and installation of a drop-cord
Structure of a push button
Care of automobile storage-battery
Locating trouble in the ignition system
Principles of the telephone
Testing for trouble in the automobile lighting system
Proper size of fuse to use in a circuit
Structure of an electric bell
Installation of a snap switch
Constructing and wiring bell circuits
Construction and use of ignition coil
Adjusting breaker points in automobile ignition system
Meaning of the following terms: voltage, ampere, current,
watt, kilowatt, kilowatt-hour, circuit, short-circuit,
ground and convenience outlet
Structure of a dry cell.

With two exceptions, "Construction of a simple buzzer",
and "Changing the charging rate of the automobile generator",
the proposed list contains the forty-three items ranked
highest by boys.

The proposed list contains the forty-three items ranked
highest by parents with the following six exceptions:

Connecting dry cells in parallel
Changing the charging rate of the automobile generator
Construction of a simple lighting circuit with lamps
in parallel
Construction of a simple lighting circuit with lamps
in series
Capacity of light cords and fixture sockets for carrying
current
Installation of a flush switch.

The proposed list contains the forty-three items ranked
highest by the girls with the following eight exceptions:

Construction of an electric curling iron
Electrical toys
Construction of a percolator
Farm lighting system

- Construction of electric flatiron
- Installation of a flush switch
- Construction of an electric pad
- Construction of a simple telegraph system

It is difficult to explain why such items, as "Farm lighting system", and "Construction of a simple telegraph system", rank among the highest forty-three for girls, while they are not in this group for parents and boys. The other six items are ones with which girls would probably come in contact more frequently than boys or parents, of which only six were mothers.

The proposed list contains twenty-eight items common to parents, boys, and girls, thirty-five items common to parents and boys, thirty-three items common to boys and girls, and thirty items common to parents and girls. The following list contains the items which are common to parents, boys, and girls. It may probably be considered, safely, as the minimal essentials of a course in electricity.

- Use of fuses
- Dangers of electricity
- Making common wire splices
- Assembling electric iron, heater or toaster plug
- Use of switches
- Testing, finding and replacing fuses
- How to avoid dangers of electricity
- Soldering and taping splices
- Construction and use of spark plug
- Construction of common electrical household appliances
- Principles of connecting dry cells
- Cause and effect of short circuits
- Repairing light socket
- Reading an electric service meter
- Making simple repairs on household electrical appliances
- Materials that will conduct electricity
- Materials that will not conduct electricity
- Sources of electrical current
- Use of automobile storage battery
- Common house wiring and insulation

Testing for automobile battery troubles
Use of porcelain tubes, knobs, wiring-loom
Locating trouble in the automobile horn
Locating trouble in the automobile starter
Construction and installation of a drop-cord
Care of automobile storage-battery
Proper size of fuse to use in a circuit
Installation of a snap switch.

The other fifteen items of the proposed list, thirteen of which were found useful by boys, and seven by girls, are:

Operation of electric windshield wiper
Calculation of light bill from meter reading
Construction and wiring bell circuits
Structure of a push button
Meaning of the following terms: voltage, ampere, current, watt, kilowatt, kilowatt-hour, circuit, short-circuit, ground, and convenience outlet
Structure of an electric bell
Principles of the telephone
Structure of a dry cell
Connecting dry cells in series
Construction of an extension cord for 110 volts
Testing for trouble in the automobile lighting system
Construction of the automobile storage battery
Construction and use of ignition coil
Locating trouble in the automobile ignition system
Adjusting breaker points in automobile ignition system

The above fifteen items and the following fourteen, some of which appeared in the highest forty-three of each group, but not in the proposed list, may be used for the purpose of differentiation and individualization in the course.

Construction of a simple buzzer
Changing the charging rate of the automobile generator
Connecting dry cells in parallel
Construction of a simple lighting circuit with lamps in parallel
Construction of a simple lighting circuit with lamps in series
Capacity of light cords and fixture sockets for carrying current
Installation of a flush switch
Construction of an electric curling iron
Electrical toys
Construction of a percolator
Farm lighting system

Construction of an electric flatiron
Construction of an electric pad
Construction of a simple telegraph system

It is significant that the proposed list based on use, also contains twenty-nine of the forty-three items which rank highest in interest for the girls, and eleven of the forty-three items which rank highest in interest for the boys. It also contains the upper forty-three items which parents considered it valuable for boys and girls to study.

The items not included in the proposed list may be used to enrich and differentiate the curriculum for the pupils who have particular interest in the subject.

The relation between the items for minimal essentials, differentiation, and enrichment is shown graphically in the chart on page 68. The triangular area at the top of the diagram represents the core of the course, consisting of the twenty-eight items proposed as minimal essentials.

The branch on the left represents those items which may be used for differentiation between sexes. There are twenty-nine items in this group, fifteen of which appear among the forty-three ranked highest by girls and fifteen among the forty-three ranked highest by boys. Four items do not appear among the highest forty-three for either boys or girls, but do appear among the highest forty-three for parents, and for this reason they are included in this group.

The branch on the right represents the remaining twenty-three items which may be used for enrichment or special work.

The proposed list is by no means rigid. It may and

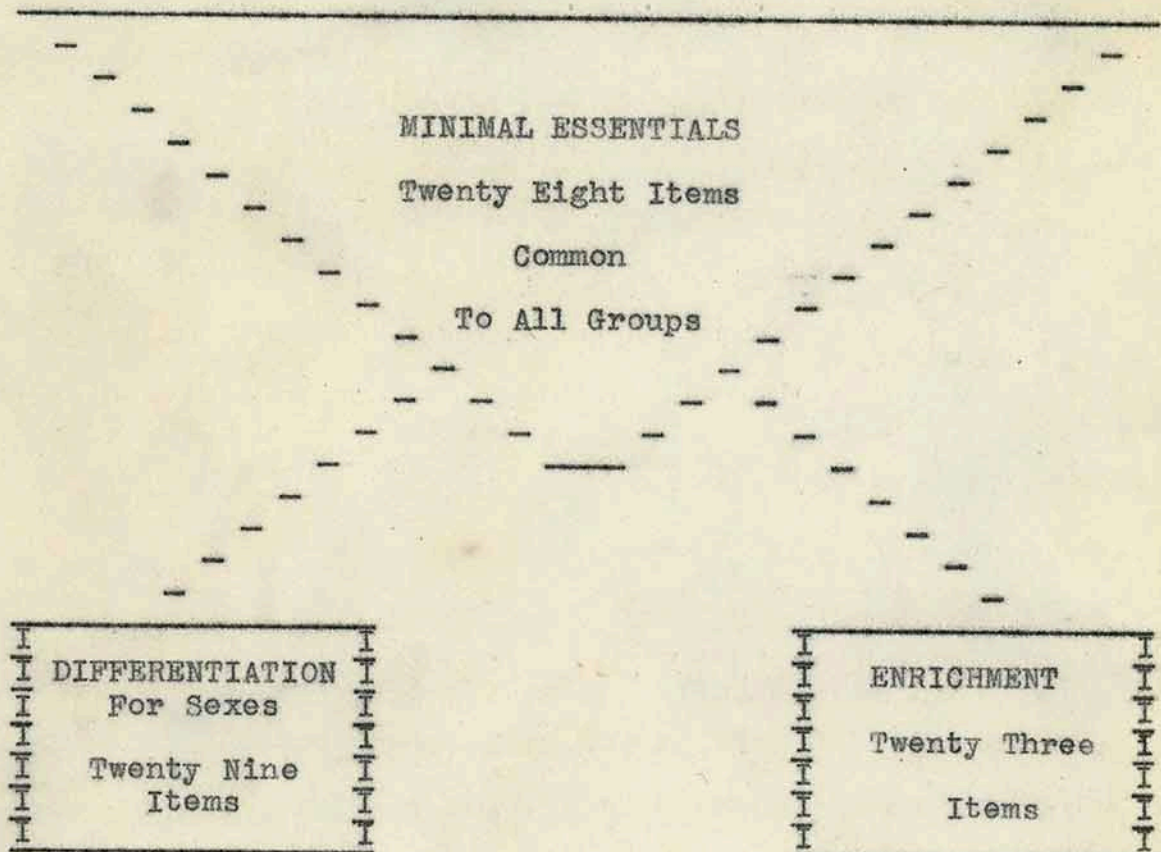
should be changed to fit different conditions. Some items receiving a low ranking in this study may have a greater value than the ranking indicates when actual conditions are encountered. Finally the teacher must use his own judgment in the matter of choosing what he will use to fit actual conditions and equipment.

It is hoped that the suggestions which this study sets forth will be of some value to those interested in curriculum construction and in teaching electricity.

DIAGRAM OF SUGGESTED ORGANIZATION

for a

COURSE IN ELECTRICITY



CHAPTER VI

SUMMARY AND CONCLUSIONS

Summary

Briefly, this study is a survey of domestic needs in electricity.

The purpose was to find out what information people had found useful, in order to select items as a basis for a practical course in electricity for high school pupils, preferably the ninth grade.

In the opinion of authorities, electrical service has become an important factor in raising the "Nation's standard of living"; therefore, it should have a place as a subject in the high school curriculum.

Two similar studies were reviewed. One was the report of the American Vocational Association Committee, on Standards of Attainment in Industrial-Arts, presented at the meeting of the Industrial-Arts sections, American Vocational Association, New Orleans, Louisiana, December 7, 1929. It contained a number of tables summarizing the replies to questionnaires sent to forty cities. The purpose was to determine what a boy should know and be able to do in a number of different subjects by the close of the junior high school period. The table summarizing the replies on "What a boy should know and be able to do in Electrical Construction by the close of the Junior High School Period", was used as a partial basis for the construction of the check list used in this study.

The other was a thesis, entitled, "A Basis of Selecting Curriculum Material for a High School Course in Electricity", submitted in partial fulfillment of the requirements for the M. A. Degree by D. C. Ellinger, University of Pittsburgh, Pittsburgh, Pennsylvania. This thesis was based on a questionnaire study of the needs and interests of 397 high school boys beginning the electrical course in Schenley High School, Pittsburgh, Pennsylvania, during the four years previous to June 1924. None of the material in this thesis was used in the present study.

The check list technique was used to obtain the information.

The check lists were marked by 178 parents, 147 boys, and 164 girls, a total of 489 individuals.

Because of a lack of similar material upon which the writer could draw, the first check list was based on personal opinion. It was later revised, partially, on the basis of the report of the American Vocational Association Committee on Standards of Attainment in Industrial-Arts.

This study was carried on in Crawford County, Kansas, with the aid of the junior high schools, Senior High School and College High School of Pittsburg, and the senior high schools of Girard and Cherokee.

The findings are given in a number of tables containing information concerning eighty items, which are summarized in the following facts:

(1) Some parents, boys, and girls find a knowledge of

each item useful.

- (2) Parents consider the items of which they have little if any knowledge valuable for their sons and daughters to study.
- (3) Boys have found use for more knowledge of electricity than either parents or girls.
- (4) Boys are interested in nearly everything concerning electricity, particularly the items of which they have little knowledge.
- (5) Girls are interested in many items of which they have little knowledge.
- (6) One half the boys found a knowledge of thirty-one items useful, one-half the parents found a knowledge of six items useful, while one-half the girls found a knowledge of only one item useful.
- (7) The knowledge found useful by the three groups is similar, even though there is considerable difference in the ranking of some items.
- (8) People who do not have a knowledge of many of the items listed are, nevertheless, interested in, and would like to know more about them.
- (9) There is a significant relationship between the numbers of parents, boys, and girls finding a knowledge of the different items useful as indicated by the following correlations:

Parents and boys	+ .759 ± .032
Parents and girls	+ .556 ± .052
Boys and girls	+ .505 ± .056.
- (10) There is a significant relationship between the percentage of pupils expressing an interest in the items and the percentage of parents who considered the items valuable for study as indicated by the correlation + .609 ± .047.

Conclusions

From the data obtained in this study the following conclusions may be drawn:

- First, since a knowledge of electricity has been found useful by four hundred, eighty-nine unselected individuals,

in Crawford County, Kansas, a similar knowledge of electricity may probably be found useful by everyone.

Second, since boys and girls are interested in electricity and many of them find a knowledge of it useful, it is a subject that should be included in the curriculum.

Third, this list of items, which is similar to that submitted by the American Vocational Association Committee on "Standards of Attainment in Industrial-Arts Teaching", should be helpful in the construction of a course in electricity for junior or senior high school.

Fourth, since twenty-eight items of the proposed list are common to parents, boys, and girls, they may be considered as minimal essentials in a course in electricity.

Fifth, since electricity plays an important part in the home, some instruction for this phase of homemaking should be given in the school.

Sixth, since boys and girls find a knowledge of different items useful, there would probably need to be considerable differentiation in the course to provide for the needs of the two sexes.

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APPENDIX

CHECK LISTS USED
IN MAKING
THE
STUDY

CHECK LIST GIVEN TO STUDENTS

Classification _____ Sex _____ Age _____

The purpose of this check list is to help determine the things that should be included in a course in high school electricity.

Mark with (1) the items, a knowledge of which has been useful to you.

Mark with (2) any other items in which you are interested.

Add any items that you think should be included.

- () Sources of electrical current
- () Principles of connecting dry cells
- () Connecting dry cells in series
- () Connecting dry cells in parallel
- () Construction of an electromagnet
- () Making common wire splices
- () Soldering and taping splices
- () Constructing and wiring bell circuits
- () Constructing a bell circuit using one button for two bells
- () Constructing a bell circuit using two buttons either of which will operate a single bell
- () Construction of an extension cord for 110 volts
- () Detection and removal of trouble in a bell circuit
- () Assembling electric iron, heater or toaster plug
- () Wiring miniature battery lamps
- () Construction of a simple lighting-circuit with lamps in parallel

- () Construction of a simple lighting-circuit with lamps in series
- () Construction of a simple buzzer
- () Construction and installation of a drop-cord
- () Construction of a simple telegraph system
- () Use of switches
- () Installation of a flush switch
- () Installation of a snap switch
- () Installation of a flush receptacle
- () Construction of a simple electric motor
- () Connection of a transformer to 110-volt line
- () Construction of a small transformer
- () Use of fuses
- () Testing, finding and replacing fuses
- () Proper size of fuse to use in a circuit
- () Cause and effect of short circuits
- () Reading an electric service meter
- () Calculation of light bill from meter reading
- () Action and principles of an electric motor and generator
- () Principles of electromagnetism
- () Structure of a push button
- () Structure of an electric bell
- () Structure of a dry cell
- () Common house wiring and insulation
- () Use of porcelain tubes, knobs, wiring-loom
- () Dangers of electricity
- () How to avoid dangers of electricity
- () Construction of electric flatiron

- () Construction of lighting-circuit using three-way switches
- () Repairing light socket
- () Farm lighting system
- () Code rules for wiring
- () Construction of an electric pad
- () Construction of an electric curling iron
- () Construction of a percolator
- () Electrical toys
- () Construction of weatherproof outdoor circuits
- () Use and construction of a rheostat
- () Use and construction of a thermostat
- () Construction of common electrical household appliances
- () Making simple repairs on household electrical appliances
- () Principles involved in selecting electrically-driven machinery for home and office use
- () Principles of the common incandescent lamp
- () Electroplating
- () Construction of a commutator
- () Magnetic compass
- () Materials that will conduct electricity
- () Materials that will not conduct electricity
- ✓ () Care of volt meters and ammeters
- () Use of pyrometer
- () Principles of the telephone
- () Use of automobile storage-battery
- () Construction of automobile storage-battery
- () Care of automobile storage-battery
- () Testing for automobile battery troubles

- () Locating trouble in the automobile horn
- () Locating trouble in the automobile starter
- () Operation of electric windshield wiper
- () Testing for trouble in the automobile lighting system
- () Locating trouble in the ignition system
- () Adjusting breaker points in automobile ignition system
- () Changing the charging rate of the automobile generator
- () Construction and use of spark plug
- () Construction and use of ignition coil
- () Capacity of light cords and fixture sockets for carrying current
- () Meaning of the following terms: voltage, ampere, current, watt, kilowatt, kilowatt-hour, circuit, short-circuit, ground and convenience outlet

CHECK LIST SENT TO PARENTS

TO THE PARENTS

Occupation of Father _____

Occupation of Mother _____

The purpose of this check list is to help determine the things that should be taught in a course in high school electricity. You can aid very much in making this a course of practical value to high school pupils by marking this list according to the following directions.

Mark with (1) the items, a knowledge of which has been useful to you.

Mark with (2) the other items that you think would be of practical value for your son or daughter to study.

Add any items not listed here, that you feel should be included in the course.

- () Sources of electrical current
- () Principles of connecting dry cells
- () Connecting dry cells in series
- () Connecting dry cells in parallel
- () Construction of an electromagnet
- () Making common wire splices
- () Soldering and taping splices
- () Constructing and wiring bell circuits
- () Constructing a bell circuit using one button for two bells
- () Constructing a bell circuit using two buttons either of which will operate a single bell
- () Construction of an extension cord for 110 volts
- () Detection and removal of trouble in a bell circuit

- () Wiring miniature battery lamps
- () Construction of a simple lighting-circuit with lamps in parallel
- () Construction of a simple lighting-circuit with lamps in series
- () Construction of a simple buzzer
- () Construction and installation of a drop-cord
- () Construction of a simple telegraph system
- () Use of switches
- () Installation of a flush switch
- () Installation of a snap switch
- () Installation of a flush receptacle
- () Construction of a simple electric motor
- () Connection of a transformer to 110-volt line
- () Construction of a small transformer
- () Use of fuses
- () Testing, finding and replacing fuses
- () Proper size of fuse to use in a circuit
- () Cause and effect of short circuits
- () Reading an electric service meter
- () Calculation of light bill from meter reading
- () Action and principles of an electric motor and generator
- () Principles of electromagnetism
- () Structure of a push button
- () Structure of an electric bell
- () Structure of a dry cell
- () Common house wiring and insulation
- () Use of porcelain tubes, knobs, wiring-loom

- () Dangers of electricity
- () How to avoid dangers of electricity
- () Construction of electric flatiron
- () Construction of lighting-circuit using three-way switches
- () Repairing light socket
- () Farm lighting system
- () Code rules for wiring
- () Construction of an electric pad
- () Construction of an electric curling iron
- () Construction of a percolator
- () Electrical toys
- () Construction of weatherproof outdoor circuits
- () Use and construction of a rheostat
- () Use and construction of a thermostat
- () Construction of common electrical household appliances
- () Making simple repairs on household electrical appliances
- () Principles involved in selecting electrically-driven machinery for home and office use
- () Principles of the common incandescent lamp
- () Electroplating
- () Construction of a commutator
- () Magnetic compass
- () Materials that will conduct electricity
- () Materials that will not conduct electricity
- () Care of volt meters and ammeters
- () Use of pyrometer
- () Principles of the telephone
- () Use of automobile storage-battery

- () Construction of automobile storage-battery
- () Care of automobile storage-battery
- () Testing for automobile battery troubles
- () Locating trouble in the automobile horn
- () Locating trouble in the automobile starter
- () Operation of electric windshield wiper
- () Testing for trouble in the automobile lighting system
- () Locating trouble in the ignition system
- () Adjusting breaker points in automobile ignition system
- () Changing the charging rate of the automobile generator
- () Construction and use of spark plug
- () Construction and use of ignition coil
- () Capacity of light cords and fixture sockets for carrying current
- () Meaning of the following terms: voltage, ampere, current, watt, kilowatt, kilowatt-hour, circuit, short-circuit, ground and convenience outlet

ABSTRACT

SURVEY OF DOMESTIC NEEDS IN ELECTRICITY

What items should be included in a course in practical electricity for junior or senior high school? A survey of domestic needs in electricity was made in an attempt to answer this question.

This study was carried on in Crawford County, Kansas, with the aid of the junior high schools, Senior High School, and College High School of Pittsburg, and the senior high schools of Girard and Cherokee.

The check list technique was used to obtain the information. Because of a lack of similar material upon which the writer could draw, the first check list was based on personal opinion. It was later revised, partially, on the basis of the report of the American Vocational Association Committee on Standards of Attainment in Industrial-Arts. The final check list contained eighty items. Fifty-two are those a knowledge of which would generally be found useful about the home. Fourteen concern the electrical system of the automobile. The remaining fourteen are names of specialized appliances, such as the commutator, an electrical device for making an alternating current direct or continuous, and the pyrometer, an instrument for measuring degrees of heat higher than those recorded by a mercurial thermometer.

Copies of the check list were given to both parents and pupils. The parents receiving the check lists were requested

to mark with (1) the items a knowledge of which they had found useful, and with (2) any other items which they thought it would be valuable for their sons or daughters to study. The pupils receiving the check lists were requested to mark with (1) the items, a knowledge of which they had found useful, and to mark with (2) any other items in which they were interested.

The check lists for parents were placed in the hands of junior high school pupils by the home room teachers in the Lakeside and Roosevelt Junior High Schools, Pittsburg, Kansas. The pupils took the check lists home to be checked according to directions and, later, brought them back to the teachers. Four hundred, twenty-five check lists were sent out in this way. Two hundred, five were returned. Of this number, one hundred, seventy-eight which were marked according to directions, were used in the final tabulations. The remaining twenty-seven were discarded because they were returned without any markings.

The check lists were sent to the parents of junior high school pupils, on the assumption that they would probably be more interested in marking them because their children have several years yet to remain in school. These check lists were marked almost entirely by fathers, i.e. by one hundred, seventy-two, representing fifty-three occupations, while only six check lists were marked by mothers from five occupations. For this reason, the data given for parents must be considered as representing almost entirely the opinions and interests of

men. This fact limits the study in that the knowledge found useful by girls cannot be compared in any worth while way, with that found useful by the mothers.

Senior high school students were asked to mark the check lists, because they are more mature and, probably, have had more experience with the items than have the junior high school pupils. Three hundred, eleven lists were distributed by the teachers, one hundred, forty-seven to boys and one hundred, sixty-four to girls. All were marked, immediately, and returned.

The findings of the study, which are given in a number of tables, indicate that boys and parents, ninety-six per cent of whom are men, find a knowledge of many of the same things useful. The girls, probably because of lack of interest as well as lack of knowledge of the items, did not mark the list as fully as did either of the other groups.

The range in percentage of parents marking each item varies from sixty-four and six-tenths in the case of one, down to five per cent. Fifty per cent found a knowledge of six items useful, while twenty-five per cent found use for a knowledge of forty-six items.

The range in percentage of boys marking each item varies from seventy-six and one-tenth in the case of one, down to six and one-tenth per cent. Fifty per cent found a knowledge of thirty-one items useful, while twenty-five per cent found use for a knowledge of seventy-two items, i.e. all but eight.

A study of the data for girls shows quite different

results. The range in percentage of girls marking each item varies from fifty-four and two-tenths in the case of one, down to six-tenths of one per cent. Fifty per cent found a knowledge of only one item useful, while twenty-five per cent found use for a knowledge of nine items.

The number of items found useful by seventy-five, fifty, and twenty-five per cent of each group is shown in the following table.

Per Cent	Group	No of Items
75	Parents	
	Boys	1
	Girls	
50	Parents	6
	Boys	31
	Girls	1
25	Parents	46
	Boys	72
	Girls	9

A study of the data regarding interests shows that, in general, boys and girls manifest an interest in the items of which they have no knowledge. Sixty-two and five-tenths per cent is the greatest number of boys interested in any item of which they have no knowledge, while seventeen and six-tenths per cent is the least number interested in any item. Forty-five and one-tenth per cent is the greatest number of girls interested in any item of which they have no knowledge, and thirteen and four-tenths per cent is the least number interested in any item.

The parents considered a number of items of which they have no knowledge valuable for their sons and daughters to study. Fifty-four and two-tenths per cent of parents is the highest number that considered any item valuable for study, while sixteen and two-tenths per cent is the least number considering any item valuable for study.

Since the results of this study show, (1) that a knowledge of electricity has been found useful by four hundred, eighty-nine unselected individuals, (2) that boys and girls are interested in many of the items of which they have no knowledge, and (3) that parents wish their sons and daughters to be better informed regarding electricity, some form of instruction should be given in junior or senior high school on this subject.

Such a course should consist of material for (1) minimal essentials, (2) differentiation, and (3) enrichment. The twenty-eight items, common to each group, which are also among the forty-three checked by at least twenty-five per cent of the four hundred, eighty-nine individuals could be considered as the minimal essentials. The twenty-nine items which are not common to each group, but which rank high, could be used for differentiation. The remaining twenty-three which were checked less frequently could be used for enriching the course for pupils particularly interested in the subject.