THE EFFECTIVENESS OF A METRIC UNIT IN A SELECTED SECONDARY HOME ECONOMICS CLASS

By

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Among the ever-increasing changes in today's fast-moving world, the metric system of measurement is becoming more prominently used. This presents a challenge to educators to take responsibility in preparing students to deal with new terms and methods which at first are foreign to them. The author is grateful to the 28 students who participated in this study of the effectiveness of a metric unit in a selected secondary home economics class.

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CHAPTER I

INTRODUCTION

Each of our lives has been affected by measurement. Cooper, Magisos, Hauck, and Channell (1975) state:

> We are all clock-watchers, weight-watchers, and money-watchers. We are all conscious of the weather and of the speed at which we travel. . . . We measure our food and size our clothing . . . . The point is that none of us can escape measurement in some form or other. It is immediate and relevant to us all. . . .
>
> Our traditional system of measurement was developed over the years as a hodgepodge of weights and measures. . . . Although these units are standardized today, they are not related to each other in any systematic manner. . . .
>
> The metric system is a logically developed system with scientifically defined and controlled standards. . . . Because metric measurement is easier, fast to use, and more logical, consumers should welcome it (pp. 8-9).

After nearly 200 years of studies, reports, and debates, the United States of America has become committed to a program of predominant, though not exclusive, use of the metric system of measurement with the signing of the Metric Conversion Act of 1975 (1975).

As the result of a three-year study carried out by the National Bureau of Standards (1971), the following recommendations have been made:

> (1) That the United States change to the International Metric System deliberately and carefully; (2) that this be done through a coordinated national program; (3) that the Congress assign the responsibility for guiding the change, . . . to a central coordinating body responsive to all sectors of our society; (4) that within this guiding framework, detailed plans and timetables be worked out by these sectors themselves; (5) that early priority be given to educating every American schoolchild and the public at large to think in metric terms; . . . (6) that the Congress after deciding on a plan for the nation, establish a target date ten years ahead, by which time

> the U.S. will have become predominantly, though not exclusively metric; and (7) that there be a firm government commitment to this goal (p. iii).

Educators have realized the importance of teaching children the basics of the metric system in order to survive in the metric society. Tuttle, Director of Vocational and Technical Education in Oklahoma, has appointed a Metric Education Committee to coordinate the activities of vocational and technical education in the conversion to the Metric System. Among the goals and objectives adopted by the committee to guide its activities are the following (1977):

> (1) Compile for each division a bibliography of educational materials for teachers' use in metric education; (2) plan and coordinate a Metric Education Day during the August Conference; and (3) involve the vocational education student organizations in some special projects relative to the conversion program (p. 3).

Home economics teachers are among those who have realized their responsibility in launching extensive and intensive programs on metrication. As they consider the role education is expected to play in metric conversion, they see that a well-planned curriculum and adequate instructional materials are crucial to the success of the conversion. This researcher feels a need to implement into the home economics curriculum a unit of study of the metric system including a pretest, a concentrated study of six basic metric units with laboratory experiences involving the students, a posttest, and a follow-up through home experiences and student evaluations, to prepare students to understand and use metric measurement.

Purpose and Objectives

The purpose of this study is to determine whether treatment of an experimental group, involving a unit of study with classroom participation in specifically planned learning experiences, will bring about

increased knowledge, attitudinal changes, and changes in usage of metric measurement within the experimental group, and to compare any changes in knowledge, attitude, or metric usage with those of the control group to which no treatment has been given. The main objectives of this study are:

1. To determine the amount of knowledge gained by students in the experimental group who complete a unit of study of the metric system, as well as the amount of knowledge gained by students in the control group who have no unit of study.

2. To assess changes in students' attitudes toward the metric system as a result of classroom participation and to compare attitudinal changes with those of the control group.

3. To assess students' confidence in using metric measurement by determining the degree of surety with which they answer the metric pretest-posttest.

4. To make recommendations for further metric studies in home economics on the secondary school level.

Hypotheses

The following null hypotheses are basic to this study:

H_1: There will be no significant differences in acquired knowledge of the metric system between students completing a unit of metric instruction (Group I--Experimental Group) and students not receiving the same instruction (Group II--Control Group).

H_2: There will be no significant differences in attitudes toward the metric system between students completing a unit of metric

instruction (Group I--Experimental Group) and students not receiving the same instructions (Group II--Control Group).

H_3: There will be no significant differences in the degree of surety with which students answer the metric pretest-posttest between students completing a unit of metric instruction (Group I--Experimental Group) and students not receiving the same instruction (Group II--Control Group).

Assumptions

The following assumptions are that the:

1. Results of the pretest-posttest procedure will provide evidence of knowledge gained in relation to the metric system.

2. Students will follow instructions in completing the pretest and posttest.

3. Findings can serve as a basis for determining strategies for teaching metric information to secondary school students in other schools of a similar nature.

Limitations

1. The study is limited to 28 junior and senior girls, ages 16 and 17. One-half of the population (14 girls) are enrolled in Home Economics III, a comprehensive homemaking class in the vocational program at Fairview High School. These students comprise the experimental group. The other 14 are volunteers willing to participate in the control group.

2. A limited period of time makes it necessary to restrict the research problem to a four-week term growth measurement.

Definitions

The following definitions explain how certain terms are used in this study (DeSimone, 1971c):

Customary System: the system of measurement units (yard, pound, second, degree Fahrenheit, and units derived from these) most commonly used in the United States. Often referred to as the "English system" or the "U.S. system." Our customary system is derived from, but not identical to, the "Imperial system": the latter has been used in the United Kingdom and other English-speaking countries, but is being abandoned in favor of the metric system.

Degree of Surety: a division or unit of a scale for measurement of certainty. In the pretest and posttest used in this study, five degrees or units of certainty are described: (1) I'm not at all sure about this; (2) I'm fairly sure of my answer, but I wouldn't bet on it; (3) I'm somewhat sure; (4) I'm reasonably certain of the answer; (5) There is no doubt in my mind.

English Spelling of Metric Terms: the way in which meter and liter are spelled.

European Spelling of Metric Terms: the way in which metre and litre are spelled.

International System of Units (SI): popularly known as the modernized metric system, it is the coherent system of units based upon and including the meter (length), kilogram (mass), second (time), kelvin (temperature), amphere (electric current), and candela (luminous intensity), as established by the General Conference on Weights and Measures in 1960, under the Treaty of the Meter.

Metric System: the measurement system that commonly uses the meter for length, the kilogram for mass, the second for time, the degree Celsius (same as "Centrigrade") for temperature, and units derived from these. This system has evolved over the years and the modernized version today is identified as the "International System of Units," which is abbreviated "SI."

Metrication: any act tending to increase the use of the metric system (SI), whether it be increased use of metric units or of engineering standards that are based on such units.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

The studies which follow were chosen for inclusion in this chapter because of their close relationship to the problem. In order to establish relevance, the research was grouped into four categories:

1. History of measurement systems.
2. Five stages toward adoption.
3. Attitudes toward the metric system.
4. Implementation of the metric system in the home economics curriculum.

A computer search was done without success to locate meaningful studies. A hand search was also done and many sources were found. Sources included in this search were books, periodicals, journals, dissertations, pamphlets, and unpublished research reports.

History of Measurement Systems

Over 150 years ago, John Quincy Adams wrote for the Congress a report based on a four-year study dealing with the metric question and the modernization of the measurement system. Adams had given very serious attention to this first U.S. Metric Study. In his report he concluded as follows:

> Weights and measures may be ranked among the necessaries of life to every individual of human society. They enter into the economical arrangements and daily concerns of every family. They are necessary to every occupation of human industry; to the distribution and security of every species of property; to every transaction of trade and commerce; to the labors of the husbandman; to the ingenuity of the artificer; to the studies of the philosopher; to the researches of the antiquarian; to the navigation of the mariner, and the marches of the soldier; to all the exchanges of peace, and all the operations of war. The knowledge of them, as in established use, is among the first elements of education, and is often learned by those who learn nothing else, not even to read and write. This knowledge is riveted in the memory by the habitual application of it to the employments of men throughout life (DeSimone, 1971a, p. vi).

At that time Adams advised a two-stage approach. First, he suggested that the familiar English units be standardized, with the second stage being a negotiating with France, Britain, and Spain to establish a uniform international measurement system. Most of the trade had been with England using the customary system, and the metric system had not been firmly established with France, let alone the rest of the world. Therefore, he felt it would be better to wait until a uniform international measurement could be worked out before adopting it (DeSimone, 1971a).

According to the U.S. Metric Study Interim Report, two more historical strides were taken: "The creation of the metric system by France and the beginning of serious deliberations in the United States with regard to fixing a standard of weights and measures occurred in the same year--1790" (DeSimone, 1971b, p. 254).

By 1866, the use of the metric system in the United States was made legal by an act of Congress (DeSimone, 1971b), but it was not adopted as the system of measurement. About a century later, England began the conversion to the metric system.

Years of debate continued, and all the changes which led the United States closer to metric usage were noticed by the American Home Economics Association (AHEA). In 1967, AHEA decided to act by passing a resolution supporting the adoption of the metric system. Margaret Warning (1972) reported a subsequent event.

> Doris Hanson, executive director of AHEA, quoted this resolution at a hearing in March, 1972 before the Senate Commerce Committee on S. 2483, the Metric Conversion Act introduced by Senator Pell. She spoke for AHEA in support of passing the bill as rapidly as possible and agreed that conversion should be in general use in the United States within 10 years (p. 21).

Other progress was affected when, in 1968, the Metric Study Act authorized a three-year study which concluded that the United States should change to the predominant use of the metric system through a coordinated national program (DeSimone, 1971a). Finally, on December 23, 1975, President Gerald Ford signed the Metric Conversion Act of 1975, encouraging conversion to the predominant use of the metric system in 10 years.

Although educators have been aware of their responsibility in the success of the conversion to the metric system of measurement, some administrators, teachers and their students have had anxieties about the metric system. Such concern was addressed in this way:

> Metric is everybody's business. As a vocational educator you know that an important part of your subject matter deals with measurement and the proper use of measurement tools. Your students will need to know the metric system to use these tools for job entry. You are concerned with teaching the practical uses of tools. Who is better equipped than you are to teach the vocational applications of the metric system? The math teacher can do it, but he or she may not be able to apply the jobs for which your students are preparing. As educators, it is our job to prepare students for the world in which they are going to function as employees and consumers. It will be a metric world (Cooper et al., 1975, p. 8).

Five Stages Toward Adoption

In 1970, the Institute for Social Research at the University of Michigan conducted personal interviews with 1,400 family units and discovered that Americans actually knew very little about metric weights and measures. They also found that people advanced through five stages before they could use a new product (or system) with the ease of habit (Warning, 1972).

The first stage in learning to "think metric" began when people heard that there would be a change over to metrics. This was the "awareness stage" (Warning, 1972, p. 18). Many people did not realize that the United States was the only large country in the world that had not converted to the metric system.

An "information-gathering stage" (Warning, 1972, p. 18) followed awareness. The aware persons began to ask what the six metric units were, what the prefixes meant, and how they were used. They asked about the differences and similarities in the metric system and the present system. They acquired such small, fairly inexpensive tools and measuring devices as metric tape measures, rulers, metric sticks, a thermometer, a scale, and perhaps some handy conversion charts.

Third was the "application stage" (Warning, 1972, p. 19) in which they began to apply their knowledge by measuring height, weight, and circumference in metric dimensions and units. They consulted the thermometer to gauge the weather outside, with an eye for degrees Celsius. Gradually their practice led them to the next stage.

During the "trial stage" (Warning, 1972, p. 19), they used the metric

system more frequently. If they found the trial runs to be successful and pleasant, they almost forgot the old system.

Warning (1972) further stated the following:

> By the time he has reached the adoption stage, the learner . . . has begun to think in metric terms. He is convinced of the superiority of the new system, argues in its favor, and enjoys demonstrating its advantages.
>
> Implicit in each stage, of course, are the individual's eagerness to learn and willingness to practice, steadily and consistently (p. 19).

The homemaking classroom was an ideal place to introduce students to new ways of looking at measurements. Batcher and Young (1974) presented background information for the first three stages (awareness, information-gathering, and application) cited by Warning. They advocated that for the fourth stage, the teacher could easily provide frequent opportunities for students to use metric units and measuring equipment. They further stated that "By the time students reach the fifth or last stage (adoption), they have begun to think metrically" (p. 31).

Attitudes Toward the Metric System

The ideal reaction of people who are exposed to the modernized metric system was reflected in a limerick which was written by a first grade teacher at the close of a three-week workshop:

> There once was a student named Peter,
> Who asked, "Why use meter and liter?"
> But when he found out
> He let out a shout,
> "'Cause meter and liter are neater!"
> (Bright and Jones, 1973, p. 16)

Not all attitudes have been positive, however, and many times the attitudes of parents were parroted by students in class. The range of

reactions that parents have expressed were illustrated by two quotations given by Shumway and Sachs (1975):

> I have been sold on the metric system ever since I took eighth-grade mathematics in 1933. (A parent, 1973.) (p. 103)

> I urge opposition to this asinine . . . way of measurement. Are we, the great United States, no longer the leading country in the world? Must we change our very satisfactory way of measurement and weight to the backward systems of Europe? For the few companies trading with Europe, let them change. Why our whole country should be turned topsy-turvy for the European way is simply beyond me. . . . We should get together and bombard our congressmen with anti-metric system letters. (From a letter to the editor, Columbus Dispatch, 1973.) (p. 103)

Breaking down a negative attitude barrier has been one of the biggest challenges in education. In general, the more people are exposed to the metric system, the more willing they are to deal with it; likewise, the more they deal with it, the more they like it. Preparing the American consumer for the use of metric measurement is a slow process; patience and persistence must be employed in order to succeed.

Implementation of the Metric System in the Home Economics Curriculum

Getting off to a good start in teaching metrics is vital to its success. Such concern was expressed by Doherty (1976) in this way:

> It is essential that pupils understand measurement and be able to measure. It is especially essential that the schools prepare pupils to live in the world of the future where metric units will be universally used. It will not be easy to start teaching metric measurement meaningfully until teachers feel comfortable with the new metric concepts. It is absolutely essential, however, that teachers use and teach the vocabulary that conveys metric concepts, and that they select appropriate experiences that will enable individuals to grow in their abilities to use the metric system (p. 378).

Students are usually favorably impressed with a teacher who acknowledges the shock of rapid change and tries to continue to learn in order to keep up with the times. The teacher who continues to discover and learn with the students can be an asset in the gaining of positive attitudes and a willingness on the part of the students to try things which at first are foreign to everyone.

Summary

The history of measurement systems and steps taken in adopting the new system have been presented in Chapter II. Also reported were attitudes of consumers and strategies for teaching metrics in the classroom as explored by various researchers. The review of studies confirmed the need for carefully designed and controlled units of study to be implemented in the curriculum of home economics.

CHAPTER III

RESEARCH PROCEDURES

Because of increased usage of the metric system of measurement due to the Metric Conversion Act of 1975, and the increasing necessity to implement metrication in the schools, the writer investigated research and related literature which pertained to the metric system and its impact on our society. This led further to the investigation of strategies for teaching metrics in the home economics classroom. The procedures and methods described in this chapter were followed to accomplish the objectives of this study.

The purpose of this study was to determine whether treatment of an experimental group, involving a unit of study with classroom participation in specifically planned learning experiences, would bring about increased knowledge, attitudinal changes, and behavioral changes within the experimental group, and to compare any changes in knowledge, attitude, or behavior with those of the control group to which no treatment was given. The main objectives of this study were:

1. To determine the amount of knowledge gained by students in the experimental group who completed a unit of study of the metric system, as well as the amount of knowledge gained by students in the control group who have no unit of study.

2. To assess changes in students' attitudes toward the metric

system as a result of classroom participation and to compare attitudinal changes with those of the control group.

3. To assess students' confidence in using metric measurement by determining the degree of surety with which they answer the metric pretest-posttest.

4. To make recommendations for further metric studies in home economics on the secondary school level.

Selection of the Sample

The subjects of this study consisted of 28 high school girls who were 16 or 17 years of age and were classified as juniors or seniors in high school. Since the total enrollment of junior and senior girls in high school was 49, the 28 subjects tested constituted 57 percent of the total number. Fairview High School was chosen because the researcher taught comprehensive Vocational Home Economics there and could use the students enrolled in the high school as part of the experiment.

Of the 28 students tested, 14 had enrolled by choice in Home Economics III, while the other 14 were not in any home economics class but volunteered to participate in the study as the control group. Those in the control group were chosen by the researcher because of ease in testing them through the English classes. All 28 subjects had completed Home Economics I and II.

Both the experimental group and the control group were given the pretest and posttest, both of which tested attitudes in Part I, and knowledge and degree of surety of answers in Part II. Only the experimental group received treatment by studying about the metric system in class and

applying metric measurement in the laboratory with selected experiments and other activities.

This sample of 28 is believed to be representative of a typical group of adolescent girls living in a rural community of approximately 3,000. The subjects' families were generally conservative in nature. Intelligence quotients (IQ's) of the students ranged from 89 to 134 in the experimental group and from 91 to 118 in the control group.

Research Design

The objectives guided the author in selecting the kind of research needed for the study. The researcher was interested in determining whether or not the knowledge of metrics gained in the classroom and practical application in the laboratory situation (independent variable) would affect the attitudes (dependent variable) of the students involved. This necessitated the experimental method, which provided for the experimenter's manipulation of certain influences or variables, and the observation (evaluation) of how the condition or behavior of the subjects was affected or changed.

In order to measure knowledge and attitudes, the researcher found the nonequivalent pretest-posttest control group design to be applicable. The design is adapted from the nonequivalent, pretest-posttest design which Best (1977, p. 104) describes and is diagrammed as follows:

$$O_1 \quad X \quad O_2$$

$$O_3 \qquad O_4$$

in which:

1. The treatment given only one group was indicated by the symbol X. The treatment was instructional materials and procedures which were compiled and tested by the researcher to meet the objectives of the program.

2. The experimental group was observed (evaluated) before and after the treatment, indicated as O_1 and O_2, while the control group was observed only and given no treatment. Pretests and posttests were used in observation (evaluation) and the experimental group was observed (evaluated) throughout the experimental time. The control group was indicated as O_3 and O_4.

3. The chi square was used to test for significant differences in knowledge, attitudes, and degree of surety of answers, using data from pretests and posttests in both the experimental and the control groups. Correct scores from pretests and posttests were used to compute knowledge gains within each group and to compare each group with the other. Mean scores of pretests and posttests were used to compare gains in attitudes in each group. Mean scores of surety of knowledge answers were also recorded, and gains were computed.

Instrumental Development

In developing a pretest and posttest which would include attitudes toward the metric system, knowledge of the metric system, a degree of surety of the answers, and the ownership of metric equipment, as well as the usage of metric equipment, the researcher reviewed literature and found several tests used by researchers and teachers. Permission was obtained from Gibbs (1978) to use parts of tests and teaching design

that she had used. Other sources provided ideas and methods which the researcher found applicable to the metric pretest-posttest.

The researcher then developed an instrument consisting of three parts (see Appendix). Part I was an attitude poll in which students responded to statements concerning the metric system by indicating how strongly they agreed or disagreed with the statements. Part II indicated what the subjects knew about the metric system by responses to 25 multiple choice statements. Subjects also recorded the degree of surety of their answers by placing a number from one (indicating doubt about the answer) to five (indicating no doubt about the answer) in the appropriate blank beside each statement. Part III recorded their ownership or access to metric equipment and their experience in using metric equipment.

In order to test members of the experimental group and the control group simultaneously, tests were given at the same time in the junior English class and the senior English class, as well as in the home economics class in the high school. Each teacher giving the tests read an introduction written by the researcher, and the students were given directions before the tests were administered. The tests were graded and recorded by the researcher (see Appendix B).

The experimental group was given four weeks of instruction and laboratory experience. This included activities which reinforced the information given in the unit of study. After the experimental group had been given the treatment, the posttest was given to the same control and experimental groups. The results were again graded and recorded.

Treatment of the Experimental Group

Treatment in the experimental group began with the showing of two

films from the Oklahoma State University library. The films, entitled "A Metric America" and "Metrics for Measure" showed advantages of metric measure in America, as well as in commercial dealing with other nations. Metric facts were presented in an entertaining manner, which encouraged positive attitudes toward the metric system.

Metrics curriculum developed by McNeary (1977) was used in the treatment of the experimental group during the four-week period of instruction. A description of the curriculum is given.

> The metrics curriculum consists of six units of instruction. Each instructional unit includes behavioral objectives, suggested activities for teacher and students, information sheets, assignment sheets, job sheets, visual aids, tests, and answers to the tests. Units are planned for more than one lesson or class period of instruction (p. ix).

In teaching each unit, the following general procedure was used: (1) discussion of objectives; (2) discussion of information and assignment sheets, as well as additional materials; (3) working of assignment sheets, job sheets, or additional assignments; and (4) testing. More than one lesson or class period will be taken to carry out the procedure.

Titles of units constituting the metric curriculum (McNeary, 1977) and their unit objectives are given in the following sequence (pp. 1-165). A sample of specific objectives and activities is located in Appendix C.

Unit I--INTRODUCTION TO METRICS: to match the base metric units, their prefixes, and symbols to their correct representation.

Unit II--SI METRIC PRACTICES: to punctuate and space numbers using SI practices and correctly select the plurals of SI unit names and symbols.

Unit III--BASE UNIT METRE: to calculate metric problems of length, area, and volume.

Unit IV--WEIGHT-MASS: to calculate problems of weight using kilogram and its prefixes.

Unit V--TEMPERATURE: to match temperature on the Celsius scale to selected temperature ranges.

Unit VI--CUSTOMARY UNIT CONVERSION FACTORS: to convert units of length, area, volume, weight-mass, temperature, and speed from the customary system to the SI metric system.

Scoring the Metric Pretest-Posttest

Scores obtained from the metric pretests and posttests were examined. Analysis of the data was presented to show relationships and to point out general tendencies of the students in both the experimental and the control groups.

Attitudinal responses to each statement in Part I were analyzed by figuring mean scores in the pretests and posttests of both the experimental and the control groups. Responses to attitude statements were given number values of strongly agree, 5; agree, 4; undecided, 3; disagree, 2; strongly disagree, 1.

Knowledge scores in Part II were taken from pretests and posttests of both the experimental and the control groups. A gain or loss in scores was calculated.

Ownership and/or access to metric tools and equipment, as well as the usage of such equipment were tabulated. Tables were comprised in order to show any differences in attitudes, knowledge, and usage of metric equipment between the experimental group and the control groups, as well as the differences between the pretests and posttests of each group. They also conveyed messages to the instructor concerning what items were best understood and answered, and what items needed more emphasis through the laboratory learning processes.

CHAPTER IV

ANALYSIS OF DATA

Introduction

The overall purpose of this study was to determine whether treatment of an experimental group, involving a unit of study with classroom participation in specifically planned learning experiences, would bring about increased knowledge, attitudinal changes, and changes in usage of metric measurement within the experimental group, and to compare any changes in knowledge, attitude, or metric usage with those in the control group to which no treatment was given.

Objectives of this study were:

1. To determine the amount of knowledge gained by students in the experimental group who complete a unit of study of the metric system, as well as the amount of knowledge gained by students in the control group who have no unit of study.

2. To assess changes in students' attitudes toward the metric system as a result of classroom participation and to compare attitudinal changes with those of the control group.

3. To assess students' confidence in using metric measurement by determining the degree of surety with which they answer the metric pretest-posttest.

4. To make recommendations for further metric studies in home economics on the secondary school level.

The following null hypotheses were basic to this study:

H_1: There will be no significant differences in acquired knowledge of the metric system between students completing a unit of metric instruction (Group I--Experimental Group) and students not receiving the instruction (Group II--Control Group).

H_2: There will be no significant differences in attitudes toward the metric system between students completing a unit of metric instruction (Group I--Experimental Group) and students not receiving the instruction (Group II--Control Group).

H_3: There will be no significant differences in the degree of surety with which students answer the metric pretest-posttest between students completing a unit of metric instruction (Group I--Experimental Group) and students not receiving the instruction (Group II--Control Group).

The sample for this study consisted of 28 girls classified as juniors or seniors in high school. Fourteen of the subjects were enrolled in the home economics program (the experimental group) and fourteen were not enrolled in home economics but participated voluntarily as the control group.

Test of Hypotheses

Three null hypotheses were formulated in relation to the objectives. These hypotheses pertained to the affects of a unit of study in metric measurement upon attitudes toward the metric system, knowledge gained from the study, and confidence in answering metric questions by recording the degree of surety of the answers.

Table I records that the posttest scores in the experimental group showed a gain of from 6 to 14 points, while posttest scores in the control group showed a maximum gain of 6 points and no gain or a loss of 1 point in some instances. The chi square was used to indicate if there was a significant difference in knowledge gain between the experimental group and the control group. Table II shows a significant difference in knowledge gain at the .005 level. The results were interpreted to mean that because of a higher increase in score points, the subjects in the experimental group learned more during the four-week period between pretests and posttests than did those in the control group who did not receive any further instruction about metrics. Therefore, Null Hypothesis I, that there will be no significant differences in acquired knowledge of the metric system between students completing a unit of metric instruction (Group I--Experimental Group) and students not receiving the instruction (Group II--Control Group), was not accepted.

Null Hypothesis II was tested by analyzing the results of the Likert-type attitude rating scale for the responses of students in relation to each of 17 items. The respondents were asked to indicate their attitudes toward statements concerning the metric system.

On the basis of scores obtained from the pretests and posttests, data in Table III showed a gain of from 0.4 to 1.6 in mean attitude scores in the experimental group, with one exception. Item four showed no gain in attitude; that item stated: "It will be easier for the grade school children to learn the metric system than it will be for junior high or high school students and adults to learn. Posttest scores of the control group showed a loss in attitudes of minus 0.2 to a gain in attitudes up to 1.0. Results of the chi square test showed no

TABLE I

CORRECT SCORES FOR EXPERIMENTAL GROUP AND CONTROL GROUP ON METRICS PRETEST AND POSTTEST, PART II

Group	Student	Pretest Score	Posttest Score	Score Gain or Loss
Experimental	1	12	22	+10
N = 14	2	10	24	+14
	3	14	25*	+11
	4	14	25*	+11
	5	13	23	+10
	6	10	23	+13
	7	14	23	+ 9
	8	10	23	+13
	9	14	23	+ 9
	10	13	23	+10
	11	7	15	+ 8
	12	15	21	+ 6
	13	19	25*	+ 6
	14	10	21	+11
Control	15	9	15	+ 6
N = 14	16	14	16	+ 2
	17	9	8	- 1
	18	14	15	+ 1
	19	7	7	0
	20	10	12	+ 2
	21	11	14	+ 3
	22	7	11	+ 4
	23	9	13	+ 4
	24	11	12	+ 1
	25	14	13	- 1
	26	11	10	- 1
	27	14	15	+ 1
	28	13	15	+ 2

*Indicates a perfect score.

TABLE II

CHI SQUARE TEST FOR EXPERIMENTAL GROUP AND CONTROL GROUP ON KNOWLEDGE GAIN IN METRIC STUDY

Groups	Pretest	Posttest	Sum of Rows
Experimental	175	316	491
Control	153	176	329
Sum of Columns	328	492	820

$$X^2 = \Sigma \frac{(fo - fe)^2}{fe}$$

$X^2 = 9.88$, $df = (r - 1)(k - 1) = 1$.

$p < .005$ significance level.

TABLE III

MEAN SCORES FOR EXPERIMENTAL GROUP AND CONTROL GROUP ON ATTITUDES TOWARD THE METRIC SYSTEM, PART I

Statement Number	Experimental Group			Control Group		
	Pretest Mean Scores	Posttest Mean Scores		Pretest Mean Scores	Posttest Mean Scores	
1	2.9	4.2	+1.4*	2.9	3.1	+0.2*
2	3.5	4.5	+1.0	3.0	3.6	+0.6
3	3.0	4.6	+1.6	2.9	3.0	+0.1
4	4.6	4.6	0	4.5	4.6	+0.1
5	3.7	4.3	+0.6	3.4	3.6	+0.2
6	2.4	2.8	+0.4	2.4	2.2	-0.2
7	3.6	4.5	+0.9	3.4	3.2	-0.2
8	3.9	4.6	+0.7	4.1	4.0	-0.1
9	4.0	4.6	+0.6	3.6	3.9	+0.3
10	3.9	4.6	+0.7	3.6	4.0	+0.4
11	4.0	4.4	+0.4	4.0	3.9	-0.1
12	3.8	4.4	+0.6	3.4	4.0	+0.6
13	4.0	4.6	+0.6	4.2	3.7	-0.5
14	4.0	4.6	+0.6	4.5	4.4	-0.1
15	3.8	4.6	+0.8	3.9	4.0	+0.1
16	3.9	4.4	+0.5	3.6	3.7	+0.1
17	2.9	4.0	+1.1	1.6	2.6	+1.0

Highest possible score is 5.

*These columns indicate score gain or loss.

significant gain in attitudinal scores (Table IV). Therefore, Null Hypothesis II, that there will be no significant differences in attitudes toward the metric system between students completing a unit of metric instruction (Group I--Experimental Group) and students not receiving the instruction (Group II--Control Group), was accepted. The fact that students of the control group who were in the senior English class had access to the films used in introducing the metric unit to the experimental group may have affected the findings.

TABLE IV

CHI SQUARE TEST FOR EXPERIMENTAL GROUP AND CONTROL GROUP ON ATTITUDES TOWARD THE METRIC SYSTEM

Groups	Pretest	Posttest	Sum of Rows
Experimental	61.9	74.4	136.3
Control	59.0	61.5	120.5
Sum of Columns	120.9	135.9	256.8

$$X^2 = \Sigma \frac{(fo - fe)^2}{fe}$$

$X^2 = 0.31$, not significant.

Mean scores in Table V indicate that the increase in the degree of surety in answering the items was greater in the experimental group than in the control group.

TABLE V

MEAN SCORES OF SURETY OF KNOWLEDGE ANSWERS, PART II

Item Number	Experimental Group Pretest Mean Score	Experimental Group Posttest Mean Score		Control Group Pretest Mean Score	Control Group Posttest Mean Score	
1	1.3	3.8	+1.5*	1.7	1.9	+0.2*
2	3.0	4.7	+1.7	3.6	4.0	+0.4
3	2.2	4.6	+2.4	2.5	2.4	-0.1
4	2.6	4.4	+1.8	3.2	3.3	+0.1
5	3.3	4.5	+1.2	3.4	3.5	-0.1
6	2.6	4.4	+1.8	2.3	2.8	+0.5
7	1.9	4.0	+2.1	1.8	2.0	+0.2
8	1.8	4.3	+2.5	2.0	2.3	+0.3
9	2.0	4.5	+2.5	2.6	2.2	-0.4
10	1.8	4.5	+2.7	1.4	1.9	+0.5
11	1.7	4.3	+2.6	1.8	1.8	0
12	1.9	4.7	+2.8	1.9	2.2	+0.3
13	1.6	4.4	+2.8	1.7	2.2	+0.5
14	1.0	3.4	+2.4	1.4	1.6	+0.2
15	1.2	3.9	+2.7	1.4	1.6	+0.2
16	1.1	3.8	+2.7	1.3	1.5	+0.2
17	1.5	4.8	+3.3	1.3	1.7	+0.4
18	1.4	4.6	+3.2	1.2	1.5	+0.3
19	2.5	4.6	+2.1	2.8	3.2	+0.4
20	1.4	3.8	+2.4	1.4	2.0	+0.6
21	2.2	4.6	+2.4	2.3	2.5	+0.2
22	3.4	4.7	+1.3	3.0	3.2	+0.2
23	3.5	4.6	+1.1	2.4	3.0	+0.6
24	3.0	4.4	+1.4	1.6	2.0	+0.4
25	1.6	4.5	+2.9	1.8	1.8	0

Highest possible score is 5.

*These columns indicate score gain or loss.

On the basis of scores obtained from the pretests and posttests, data in Table V showed a gain in mean scores of surety of knowledge answers in the experimental group ranging from 1.1 to 3.3, while the control group scores showed a loss of minus 0.4 to a gain of 0.7. In Table VI results of the chi square test showed a significant difference in surety of answers gain at the .05 level. Therefore, Null Hypothesis III, that there will be no significant differences in the degree of surety with which students answer the metric pretest-posttest between students completing a unit of metric instruction (Group I--Experimental Group) and students not receiving the instruction (Group II--Control Group), was not accepted.

TABLE VI

CHI SQUARE TEST FOR EXPERIMENTAL GROUP AND CONTROL GROUP ON SURETY OF ANSWERS IN METRIC STUDY

Groups	Pretest	Posttest	Sum of Rows
Experimental	51.5	108.8	160.3
Control	51.8	58.1	109.9
Sum of Columns	103.3	166.9	270.2

$$X^2 = \Sigma \frac{(fo - fe)^2}{fe}$$

$X^2 = 6.19$, $df = (r - 1)(k - 1) = 1$.

$p < .05$ significance level.

In assessing the number of students who owned or had access to metric equipment at the time of the pretest and again at the time of the posttest, Table VI indicates that those in the experimental group bought or used metric items in the classroom during the experimental period, while the others did not. The usage of metric items increased in the experimental group, so that all 14 students in the experimental group used the metric items which were in the classroom during the experimental time. Articles which were not available in the classroom were used somewhat by both groups, independent of the study.

During the treatment procedures in the classroom, some students asked to order metric dry measures, oven temperature converter charts, and recipes. They borrowed cookbooks and other printed recipes from the department, as well as dry measures and thermometers for projects using metric measurement. In conjunction with an English assignment, they used metric curriculum and other articles as resources for the projects. Two students asked to make a bulletin board with metric terms and equipment.

After posttests were administered, students further responded to the unit of metric study by writing evaluations of the course. They responded in the following ways:

> I feel as if I know more about metrics now than when I first began. I think I made metrics hard to learn, not because I didn't have the right attitude--I just figured it would take me a while to catch on.
>
> I believe that the unit on metrics is very important to know. When we will change to the metric system I'll at least know or be able to recall it, and it won't be so hard to learn. Next year I think you should teach it to the sophomore classes; they would benefit from it.
>
> I feel this unit really helped me. I think it should be taught every year. We need more done on weight, because this is the hardest part.

TABLE VII

ACCESSIBLE METRIC EQUIPMENT AND USAGE OF METRIC EQUIPMENT

	Experimental Group		Control Group*	
	Pretest	Posttest	Pretest	Posttest
	Number of Responses		Number of Responses	
Item Ownership or Accessibility				
1. Meter Stick	10	14	7	7
2. Tape Measure	7	14	8	8
3. Large Dry Measures	4	11	6	6
4. Small Dry Measures	3	10	2	2
5. Liquid Measures	6	14	8	8
6. Scales	2	7	3	3
7. Thermometer	1	9	3	3
8. Mechanic's Tools	2	9	6	7
9. Camera	3	5	5	5
10. Snow Skis	0	1	1	1
11. Car Speedometer	2	5	6	6
12. Oven Temperature Converter Chart	0	8	0	0
Usage of Items				
1. Meter Stick	8	14	8	13
2. Tape Measure	2	14	9	11
3. Large Dry Measures	2	14	6	7
4. Small Dry Measures	2	14	3	3
5. Liquid Measures	5	14	8	9
6. Scales	5	14	5	5
7. Thermometer	2	14	5	8
8. Mechanic's Tools†	1	1	4	8
9. Camera†	1	5	5	5
10. Snow Skis†	1	1	1	2
11. Car Speedometer†	4	6	6	6
12. Oven Temperature Converter Chart	0	14	0	0

*Control group did not use items as did experimental group.

†Not used in class.

I think you did a good job teaching us. Next year, teach them like you taught us. You might take more time explaining.

I think it will help us when we are older and they enforce it more. The more we use metrics, the more we will learn. We covered the main ways we will be using metrics, and it was a good course.

I think it was a great idea, and I think it will prove useful later on in the future. I also learned a lot from putting what we learned into effect. It's not as hard as I first thought and it was different. I think the whole school should have a course in metrics.

My attitude has changed tremendously. I really like metrics now. Parts of this unit were boring, but I think we all learned a lot from it. I'm anxious to do my home experience using metrics. You did a good job teaching us. Keep on teaching this.

I thought the course in metrics was important to learn. I enjoyed the exercises we did. This unit has helped me in my understanding of metrics as well as my attitude toward metrics.

I think that learning the metric system in home economics will help us in the future when the U.S. changes over. I understand why we should change. I think it's a lot easier than the system we're using now.

I think that learning the metric system was very good. It was a lot easier than I thought it would be, and I really enjoyed it. I didn't look forward to it at first, but now I am glad that I know it and am ahead of the majority of people when it comes time to use it. I think it will be easier to use rather than the present system. I am glad that we studied it and I finally understand it.

I feel this unit was certainly worthwhile. I was not sure at first whether we really needed to use another system. However, I can see a need for universality in communication, traveling, and trade. The practical assignments made it very interesting. More students need to have instruction on metrics.

This unit has really taught me a lot. At first I was a little hesitant about metrics; I really thought it would be hard to learn, but it isn't. I hope everybody gets to have the chance to take a unit like this.

I feel this was a very good subject to study. I think you did a good job teaching it, because I understood it while

> we were doing it and I understand it now. I feel I know quite a bit, even enough to write a paper about it in English. I think you should teach it every two years.
>
> I've learned a great deal in this unit. My whole attitude has changed toward the metric system. I'm not afraid to use it any more; as a matter of fact, I'm looking forward to the change. Overall, I think we covered it pretty well; I do think more practical experience in measuring to get a better concept of the sizes of weight and mass measures would help. I enjoyed it more than anything I've done in home economics during the last four years!

Other comments were made during the course of the four-week study. Some were quoted here.

> I'm really getting excited about metrics!
>
> My sister doesn't understand it in freshmen math. I wish she could see the things you have to make it easier to see.
>
> Since other countries learn the language we use, we should be willing to change to the metric system that they use.

Students who had younger brothers or sisters who watched cartoons on television reported having seen cartoons with metric characters in them. Others became aware of metric facts presented in cartoon form in a Sunday newspaper. They were eager to share in class anything they learned and heard about metrics outside the classroom.

The experimental group carried out further use of metric measuring in required home experiences which were turned in two months after the unit of study. Some of the articles completed by the students include placemats, coasters, and napkin rings, a latch-hook rug, pillows, a lined jacket, a wool suit, yeast bread, a dinner, five kinds of desserts, a laundering experiment, measuring in degrees Celsius and charting the weather, and a birthday party for a younger sister. All students reported using metric measuring in the home experiences.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The present study was concerned with the presentation of a study of the metric system to a group of adolescent high school girls enrolled in Vocational Home Economics III in a rural community high school.

The purpose of the study was to determine whether treatment of an experimental group, involving a unit of study with classroom participation in specifically planned learning experiences, would bring about increased knowledge, attitudinal changes, and changes in usage of metric measurement within the experimental group, and to compare any changes in knowledge, attitude, or metric usage with those of the control group to which no treatment was given.

The main objectives of the study were:

1. To determine the amount of knowledge gained by students in the experimental group who complete a unit of study of the metric system, as well as the amount of knowledge gained by students in the control group who have no unit of study;

2. To assess changes in students' attitudes toward the metric system as a result of classroom participation and to compare attitudinal changes with those of the control group;

3. To assess students' confidence in using metric measurement by

determining the degree of surety with which they answer the metric pretest-posttest.

4. To make recommendations for further metric studies in home economics on the secondary school level.

The following null hypotheses were basic to this study:

H_1: There will be no significant differences in acquired knowledge of the metric system between students completing a unit of metric instruction (Group I--Experimental Group) and students not receiving the instruction (Group II--Control Group).

H_2: There will be no significant differences in attitudes toward the metric system between students completing a unit of metric instruction (Group I--Experimental Group) and students not receiving the instruction (Group II--Control Group).

H_3: There will be no significant differences in the degree of surety with which students answer the metric pretest-posttest between students completing a unit of metric instruction (Group I--Experimental Group) and students not receiving the instruction (Group II--Control Group).

Findings indicated that there was a significant difference in gains in knowledge in the experimental group as compared to the control group; there was no significant difference between mean attitude scores; there was a significant difference between the degree of surety of answers in the experimental group and in the control group.

The sample for this study consisted of 28 girls 16 or 17 years of age who classified as juniors or seniors in high school. Fourteen students (one-half of the sample) were enrolled in Home Economics III and

served as the experimental group, while 14 others volunteered to be part of the control group, being accessible through the English departments.

Pretests and posttests were administered to both the experimental group and the control group, and the experimental group participated in a four-week study of the metric system during the interim of the pretest and the posttest.

Scores were recorded and analyzed by frequency and percentage. The Chi Square test was used in testing for significance in the findings.

Test scoring results of the knowledge test showed that the students in the experimental group made a greater gain in knowledge than the control group. The experimental group measured length, area, volume, as they would measure carpeting, drapes, and wall area in home furnishings. They weighed food and used metric recipes in the foods laboratory. Celsius temperature was used in baking and in measuring temperature of water and the atmosphere. Students took their own measurements and figured amounts of material needed to sew a garment; they also weighed themselves as they studied weight control. They learned to convert from the customary to the metric system by using charts, and they converted recipes. All these experiences enabled the students to work with the metric system of measurement and an increase in knowledge was affected.

In reviewing responses given by students during the four-week study, the author concluded that even though no significant change in attitude was shown, some change in attitude had taken place. The willingness to purchase new equipment indicated that the students planned to continue the application of metric measuring, and evaluations given by students orally and in writing showed definite positive attitudes toward the metric system.

The students became more confident as they gained experience in using the metric system of measurement. They were able to answer questions more quickly and correctly as they developed the ability to "think metric."

During the four-week period of study, the students became aware of the metric system and its importance in trade between the United States and other countries. They learned that it is not a difficult system to learn. They gathered information through the curriculum guide and other sources persented to them. They applied it in the laboratory situation, as they would in their own surroundings in the future; they used the metric system frequently in class and found the experiences to be interesting and successful. They became convinced that the metric system is superior to the customary system, and they conveyed that attitude to parents and other students.

Conclusions

Therefore, the author feels that learning experiences developed to increase the metric skills of students in the experimental sample did have some effect on increasing scores on the posttests. On the basis of generalizations and written evaluations of students, as well as verbal comments during the four-week experimental treatment, the writer concludes that students in the experimental group did gain knowledge and skills in using metrics, and this gain did bring about a more positive attitude toward metrics, as well as other changes as shown in home experiences completed by the students.

Recommendations for Metric Education in the Home Economics Curriculum

On the basis of the findings in this study, the writer makes the following recommendations:

1. Home economics teachers should make a concentrated effort to receive instruction in the metric system of measurement.

2. All home economics should include the metric system as part of the curriculum.

3. Adult education should include the teaching of metrics in the curriculum.

4. It should be mandatory for Oklahoma schools to teach the metric system of measurement throughout grade school, junior high school, and high school.

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APPENDIX A

CORRESPONDENCE

724 East Broadway
Fairview, Oklahoma

June 4, 1979

Mrs. Shirley Gibbs
Route 7, Box 47
Bowling Green, Kentucky

Dear Mrs. Gibbs:

As a graduate student in the area of Home Economics Education at Oklahoma State University, I am writing in regard to your dissertation on Instructing Dietitians in the Metric System of Measurement.

I am working to complete my Master's degree and have chosen as my thesis problem The Instruction of Metrics in Secondary Home Economics. It is my purpose to measure knowledge of the metric system and attitudes toward metrics before and after learning experiences are carried out.

Upon reviewing the literature, I found several questionnaires and pretests which can be adapted to my needs. Some of the statements in the instrument which you developed would be particularly useful to me. With the counsel of my thesis adviser, Dr. Elaine Jorgenson, I am writing to ask if you will give me permission to use the Metric Skills I and Metric Skills II in developing my tests. If permitted to use your tests, full credit would be given.

I would appreciate any suggestions you might give in relation to the metric system and its application in Home Economics at the high school level. I appreciate the help given by the reading of your dissertation; it has encouraged me in my project.

Yours truly,

Jane Lee

Jane Lee
Vocational Home Economics Instructor
Fairview High School
Fairview, Oklahoma

JL/cf

WESTERN KENTUCKY UNIVERSITY

BOWLING GREEN, KENTUCKY

Department of Home Economics
and Family Living

June 13, 1979

Jana Lee
Vocational Home Economics Instructor
Fairview High School
Fairview, OK

Dear Ms. Lee,

It is rewarding to know that my dissertation has been of help to you in your academic endeavors. You have my permission to use Metric Skills I and Metric Skills II to develop the tests for your thesis. I would appreciate a copy of your abstract as I am interested in research that involves the metric system.

Sincerely,

Shirley Gibbs

Shirley Gibbs
Coordinator Foods, Nutrition,
and Institution Administration
WESTERN KENTUCKY UNIVERSITY
Bowling Green, KY 42101

SG:net

724 East Broadway
Fairview, Oklahoma

June 19, 1979

Mr. Paul McNeary
1513 London Drive
Murray, Kentucky

Dear Mr. McNeary:

As a graduate student in the area of Home Economics Education at Oklahoma State University, I am writing in regard to your dissertation on The Identification of Problems in Implementing Metrics in Oklahoma's Area Vocational-Technical Schools and the curriculum which you wrote and used in teaching an extension course in Fairview, Oklahoma, September 14 to October 3, 1977. After taking the course on metrics, I decided to use it in my local high school vocational home economics program.

I am working to complete my Master's degree and I have chosen as my thesis problem The Implementation of the Metric System in the Secondary School Home Economics Curriculum. It is my purpose to measure knowledge of the metric system and attitudes toward metrics before and after learning experiences are carried out.

In describing my work in the thesis, I find it necessary to use the metrics curriculum objectives and other information, and I am writing to ask your permission to quote some of your work. If permitted to use your curriculum as a source of my information, I would be sure to give full credit to you.

I would appreciate any suggestions you might give in relation to the metric system and its application in Home Economics at the high school level. I appreciate the help given by the extension course you taught in Fairview; it has encouraged me in my project.

If you have any questions concerning my request, you may reach me by phone collect (405/227-3881). I shall be eager to hear from you so I may continue in my thesis writing.

Yours truly,

Jane Lee

Jane Lee
Vocational Home Economics Instructor
Fairview High School
Fairview, Oklahoma

JL/cf

Murray State University

College of Industry and Technology
Department of Industrial Education
Murray, Kentucky 42071 (502) 762-3392

July 2, 1979

Mrs. Jane Lee
724 East Broadway
Fairview, Oklahoma 73737

Dear Mrs. Lee:

I'm sorry it has taken so long for me to respond to your letter; it arrived while I was on vacation.

You have my permission to use any of my work pertaining to metrics, in any form you decide is most appropriate for inclusion in your thesis.

You may wish to contact Mr. Harold Winburn, State Supervisor of Industrial Arts, for additional information about the Current State of Metrics in Oklahoma. He is the chairman of the Metrics Conversion Committee of the Department of Vocational-Technical Education.

If it is convenient I would appreciate a copy of your conclusions and recommendations when your study is completed.

If I can help in any way please contact me. Best of luck on your thesis.

Sincerely,

Paul McNeary

Paul McNeary, Assistant Professor
Dept. of Industrial Education

APPENDIX B

PRETEST-POSTTEST INSTRUMENT WITH INTRODUCTION

Introduction to the Metric Questionnaire

Each of our lives has been affected by measurement. We are all clock-watchers, weight-watchers, and money-watchers. We are all conscious of the weather and of the speed at which we travel. We measure our food and size our clothing. None of us can escape measurement in some form or other. It is immediate and relevant to us all.

Metric measurement is being evidenced increasingly in our daily lives. Prescriptions of medicine have been measured in metrics for many years, and photographers have been adjusting cameras to "X" number of millimeters for a perfect picture. We continue to use metrics in these areas as we do in the Olympic sports events such as the 500 meter dash and the 100 meter swimming event. We buy grams of food and liters of soft drinks such as Coke. Mechanics need metric tools to fix cars which are increasingly equipped with speedometers recording miles per kilometer. A winter sport involves snow skis measured in metrics, and we hear weather reports given in degrees Celsius.

As we consider the consistent use of the metric system in our daily lives, it is to our advantage to become knowledgeable of its practical usage. In order to determine students' knowledge and ability to deal with the metric system, a questionnaire has been developed. The purpose of this questionnaire is three-fold: to determine how you feel about the metric system, what you know about it, and whether or not you use it.

Information gained from this survey will be used to develop a follow-up unit of study. The purpose of this study is to enable students to gain knowledge and practical experience with metric usage so they will feel confident in dealing with it in the future.

Name _____ Date _____

Part I

How Do You Feel About the Metric System?

Directions: The following are opinion items. To indicate your opinion, place an X in one of the columns at the left of each statement by using the following code:

SD - Strongly Disagree
D - Disagree
U - Undecided
A - Agree
SA - Strongly Agree

SD	D	U	A	SA	
					1. It is a good idea for the United States to change to the metric system of measure.
					2. The United States needs to make the change because the rest of the major countries in the world use the metric system.
					3. Since the metric system is based on tens, it will be easier than our present system to learn.
					4. It will be easier for the grade school children to learn the metric system than it will be for junior high or high school students and adults to learn.
					5. The change to the metric system will help the United States in its export system which is needed for the economic program.
					6. The American people as a whole will easily adjust to having the temperature reported as zero degrees Celsius instead of 32 degrees Fahrenheight.
					7. Shopping and price comparisons will be easier because the metric system can be divided or multiplied by 10.
					8. It will be to our advantage in the future to have a workable knowledge of the metric system.
					9. Having a workable knowledge of the metric system would build confidence in applying it in everyday living situations.
					10. The more students work with the metric system in a laboratory situation, the more competent they will feel in applying it elsewhere.

SD	D	U	A	SA

11. I am willing to listen to some facts about the metric system.

12. I want to see for myself just what is involved in the metric system.

13. I want to decide for myself whether it is easy or difficult.

14. I would want to have knowledge of the metric system if it would help me get a better job.

15. I would like to be able to communicate in metric terms in the United States as well as in a foreign country should the opportunity arise.

16. I will accept the challenge to "Think Metric."

17. I can help educate others who have not learned about the metric system.

Part II

What Do You Know About the Metric System?

Directions: The following are multiple choice items. Choose the best answer. Write the letter of your response in the blank to the right of each number.

In the blank to the left of the number, write another number (1-5) to indicate the certainty of your answer by using the following code:

1. I'm not at all sure about this.
2. I'm fairly sure of my answer, but I wouldn't bet on it.
3. I'm somewhat sure.
4. I'm reasonably certain of the answer.
5. There is no doubt in my mind.

____ 1. ____ History of the metric system reveals that:

A. The metric system was first used in Mexico.
B. The metric system has been used for more than 1000 years.
C. In 1866, the use of the metric system in the United States was made legal, but not compulsory.
D. In 1950, the United States Secretary of Commerce recommended that the United States change to complete use of the metric system.

____ 2. ____ The metric unit used to measure length is the:

A. ampere
B. liter
C. kilogram
D. meter

____ 3. ____ The prefix "centi" means

A. one hundredth of (1/100 or 0.01)
B. one hundred times (x 100)
C. ten times (x 10)
D. one tenth (1/10 or 0.1)

____ 4. ____ The correct symbol for centimeter is:

A. Cm
B. Cm.
C. cm
D. cm.

____ 5. ____ Eleven and thirteen hundredths is written:

A. 11,013
B. 11.13
C. 11,13
D. 11.013

____ 6. ____ A meter is about the height of:

A. a door
B. a table
C. a chair seat
D. a foot stool

____ 7. ____ A tall man is about:

A. 2 centimeters high
B. 20 centimeters high
C. 200 centimeters high
D. 2000 centimeters high

____ 8. ____ Normal body temperature is about:

A. 25°C
B. 37°C
C. 65°C
D. 98°C

____ 9. ____ There are about 10 meters in one:

A. millimeter
B. centimeter
C. dekameter
D. kilometer

____ 10. ____ The length of a car is approximately:

A. 1 centimeter
B. 4 meters
C. 14 dekameters
D. 26 mectameters

____ 11. ____ The width of an average fingernail is about:

A. 1 centimeter
B. 1 meter
C. 1 decimeter
D. 1 millimeter

____ 12. ____ 31.6 km x 10 km = :

A. 3160 km^2
B. 3.16 km
C. 316 km^2
D. 31.6 km

____ 13. ____ 16 cm x 4 cm x 0.3 cm = :

A. 0.192 cm^2
B. 1920 cm^2
C. 1.92 cm^3
D. 19.2 cm^3

____ 14. ____ A measuring cup would hold about:

A. 2 milliliters
B. 20 milliliters
C. 200 milliliters
D. 2000 milliliters

____ 15. ____ A new born baby weighs:

A. 3 kilograms
B. 30 kilograms
C. 300 kilograms
D. 3000 kilograms

____ 16. ____ A liter of water weighs about:

A. 10 kilograms
B. 1 kilogram
C. 0.01 kilogram
D. 0.001 kilogram

____ 17. ____ A professional football player weighs about:

A. 15 kilograms
B. 45 grams
C. 115 kilograms
D. 250 grams

____ 18. ____ 3000 meters = :

A. 0.03 kilometer
B. 0.3 kilometer
C. 3 kilometers
D. 30 kilometers

____ 19. ____ A liter of water could best be held in a:

A. bathtub
B. swimming pool
C. thimble
D. pitcher

____ 20. ____ If your car is low on oil, the gas station attendant would add:

A. 2 milliliters
B. 1 liter
C. 20 liters
D. 10 milliliters

____ 21. ____ Water freezes and boils at:

A. 100°C and 212°C
B. 25°C and 165°C
C. 16°C and 140°C
D. 0°C and 100°C

____ 22. ____ When you add 256.01, 1.0003, and 73.73, the total is:

A. 772.904
B. 330.7403
C. 1093.340
D. 77.2904

____ 23. ____ Subtract .0009 from 7.35 and the answer is:

A. 7.3491
B. 7.2600
C. 0.7341
D. 734.91

____ 24. ____ Divide 7.4148 by 50.1 and the answer is:

A. 1.48
B. 0.0148
C. 0.148
D. 0.00148

____ 25. ____ To change milliliters to liters, move the decimal point:

A. one place to the left
B. one place to the right
C. three places to the left
D. three places to the right

Part III

What Is Your Experience In Using the Metric System?

Directions: The following are items concerning your experience in using the metric system. Indicate your response by placing an X in one of the columns at the left of each item using the following code:

Y - Yes
U - Uncertain
N - No

Y	U	N	
			1. I own or have access to metric equipment such as these:
			meter stick
			tape measure
			dry measuring cups
			liquid measuring cups
			measuring spoons
			scales
			thermometer
			mechanic's tools
			camera
			snow skis
			car speedometer
			other _____
			2. I have already used metric equipment such as these:
			meter stick
			tape measure
			dry measuring cups
			liquid measuring cups
			measuring cups
			scales
			thermometer
			mechanic's tools
			camera
			snow skis
			car speedometer
			other _____

APPENDIX C

SAMPLE OF SPECIFIC OBJECTIVES AND ACTIVITIES

UNIT I: INTRODUCTION TO METRICS

Specific Objectives

After completion of this unit, the student should be able to:

1. Select from a list correct statements about the history of measurement.

2. List important reasons the United States should adopt the metric system.

3. Match the commonly used basic metric units and their symbols to the measurements they represent.

4. Match the commonly used metric prefixes, the less commonly used metric prefixes, and their symbols to the correct values.

5. Name the supplementary metric units.

6. Define derived metric units.

Activities

1. Show "A Metric America" film from the Oklahoma State University library.

2. Show "Metrics for Measure" film from the Oklahoma State University library.

3. Give a mini-pretest "Are You Ready for Metrics?" (A Metric Workbook for Teachers of Consumer and Homemaking Education, 1977, p. 10).

4. Make transparencies and present Think Metric by Mil Metric (Blackwell, 1974) using overhead projector.

5. Assign assignment sheets No. 1 and No. 2, which are provided in the curriculum.

6. Give tests to see if objectives were met.

VITA[2]

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Candidate for the Degree of

Master of Science

Thesis: THE IMPLEMENTATION OF THE METRIC SYSTEM IN THE SECONDARY SCHOOL HOME ECONOMICS CURRICULUM

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