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Signature Susan D. Butler

Date July 14, 1980

AN ADULT EDUCATION LEARNING PACKAGE IN
CLOTHING CONSTRUCTION UTILIZING THE METRIC SYSTEM

by

SUSAN DUANY BUTLER

A professional paper submitted in partial fulfillment
of the requirements for the degree

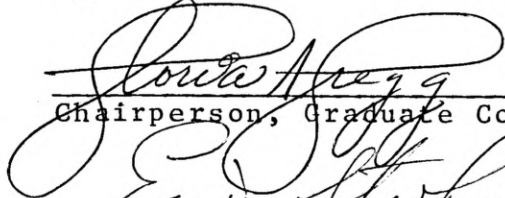
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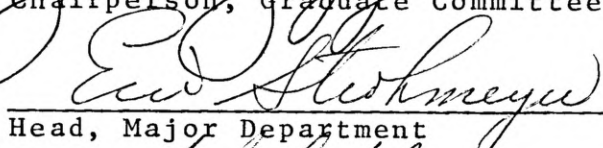
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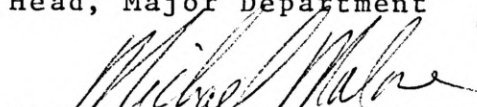
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ABSTRACT

Through an extensive review of the literature the current status of metrication in the United States was researched. Studies indicate that educating youth and re-educating the adult are the major transition links for consumer conversion to metrication. When the apparel industry converts to the metric system, industry will be able to better satisfy their consumers with standardized sizing, better fit, and labeling. Clothing construction is one of the broad areas of Home Economics which will undergo measurement changes. The major measurement change will involve linear measurements. Changes and modification of materials and teaching techniques will be necessary to help facilitate the transition to metrication.

The outcome of the investigation led to the development of a learning package based on teaching the adult the basic concepts of the metric system in the area of clothing construction. The learning package focuses on the home in context with the adult's past and present learning experiences. The "hands on" and "think metric" approaches to learning metrication were incorporated into the learning package. Metric learning activities were necessary for the acceptance and adoption of the metric system. The learning package contains two sections, one for the instructor and one for the student. The learning package includes an outline, pre-test, learning objectives, learning activities, materials needed, resource list, and a post-test which incorporates the following: general knowledge of the history and background for a metric America, metric awareness, volume, weight/mass and length measurements, and an in-depth training on metrics as it relates to clothing construction. The learning package is a guide for educator's implementing metric education programs in the area of clothing construction. The learning package follows the American Home Economics Association's outline for developing learning packages.

CHAPTER I

DESCRIPTION OF THE PROBLEM

Introduction

In 1975, Congress unanimously passed the Metric Conversion Act. With the passage of this act, the conversion to metrication became inevitable. At present, the utilization of the metric system in the U.S. is limited. DeSimone (publication no. 345-7, 1971) states that the reason why metrication has not gained acceptance in the U.S. is due to the psychological difficulty of adopting an unfamiliar and different concept.

In 1968, the National Education Association officially adopted a resolution committing the NEA to an active position in support of a planned metrication program. The Education Amendments of 1974 further commends the support of a planned metrication program by encouraging schools to integrate the metric system as a part of their regular education programs. In addition, this amendment of 1974 allocated \$100,000,000. in federal funds for subsidizing metric education needs.

The National Education Association is only one of the many associations that has recognized the need for metric education programs. Both the NEA and the National

Home Economics Association recommend and support the need for metric consumer education programs. In home economics the conversion to metrication would help consumers simplify measuring in the areas of clothing construction, baking, etc. In the area of clothing construction, the metric system would provide the consumer with improved fit, sizing, and labeling. Educating the consumer in metric measuring will be imperative in order to reduce the negative psychological implications of metric acceptance.

Statement of the Problem

The problem related to this project was that there was a limited amount of information and materials available on adult metric learning packages in the area of clothing construction. Due to this inadequate supply of information and materials, the intent of this project was to develop an adult education learning package which utilizes the metric system in clothing construction.

The Project

The objective of this project was threefold:

1. To trace the historical background and educational implications of metrics in the U.S.

2. To discuss how adults learn and utilize this information to develop effective metric teaching strategies for adult learners
3. To design a metric learning package in the area of clothing that focuses on the practical application of learning the metric system.

Research does suggest that metrics be taught through the practical application of the "hands on" approach related to the adult's past and current experiences (DeSimone, publication no. 345-6, 1971). Relevant metric activities in areas like baking and sewing are needed to teach the adult basic metric concepts. Research and development of instructional materials has been primarily based on teaching the elementary school student with little or no emphasis in regard to the adult's needs in coping with a metric world.

For educators to maximize the effectiveness of adult learning, teachers need to consider certain conditions of learning that are the most conducive for adult growth and development. It has been hypothesized that conducive learning takes place when the adult is ready to learn, is supported by the learning environment, perceives the goals of the learning experience as their goals, accepts a

responsibility in the planning process, learns by doing, learns through past and present experiences and senses progress towards the goal (Knowles, 1970).

In the long range plan for converting to the metric system, an adult education program should include: specific curricula relevant to the adult's needs and situation, suitable instructional materials, and trained teachers to design effective methods for teaching metrication (Cortright, 1971).

The purpose of this project was to design an adult metric learning package in the area of clothing construction that will focus on the practical application of learning the metric system in the home.

General Questions to be Answered

The following questions were answered in this project:

1. What is the current status of metrication in the U.S.?
2. What are the specific needs to be considered in designing an adult metric learning package in the area of clothing construction?
3. What resources are available for implementing an adult metric learning package in the area of clothing construction?

General Procedure

The researcher's intent was to design an adult metric learning package in the area of clothing construction to meet the adaptable needs of the adult's every day living experiences. The learning package was intended for use by educators teaching adult clothing classes. By reviewing the literature in the areas of metrics, educational implications, how the adult learns, metric education programs and learning packages, the researcher developed a metric learning package that has practical application in the home. Five experts in the field of metric education and clothing were identified to review and comment on the learning package and to make suggestions for improvement. The learning package was revised to accommodate those suggestions for improvement.

Limitations

Metric information in the area of clothing and adult metric education programs were extremely limited.

Delimitations

Due to the scope of the metric system, the adult learning package was restricted to the area of clothing construction.

Definitions

For the purpose of this project, the following definitions were used:

Metric system or metrics

The measurement system that commonly uses the meter for length, the kilogram for mass, the second for time, the degree Celsius (same as "Centigrade") for temperature, and units derived from these. This system has evolved over the years and the modernized version is identified as the "International System of Units" which is abbreviated "SI" (DeSimone, publication no. 345-6, 1971).

Customary system

The predominantly used measurement system in the U.S. It includes such commonly used units as inch, foot, yard, mile, pint, quart, gallon, bushel, ounce (fluid and avoirdupois), pound, degree Fahrenheit, and like metric, the ampere, the candela, and the second (DeSimone, publication no. 345-6, 1971).

Mettrication

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 (DeSimone, publication no. 345-6, 1971).

Learning package

An instructional learning program designed to teach the adult the basic concepts of metrication in the Home Economics related areas of clothing construction.

Learning

A change in an individual due to the interaction of that individual and his environment, which fills a need and makes him more capable of dealing adequately with his environment.

Hands on approach

The hands on approach is a phrase describing the process of learning to think metric meaningfully in terms of metric measurement.

Think metric

Think metric is a phrase describing the process of learning to think metric meaningfully in terms of metric measurement.

Practical application

Practical application allows the student to learn the metric system by applying the basic concepts of metrics to his everyday encounters with measurement.

Clothing

A term which refers to the area of clothing construction.

Summary

The purpose of this project was to design an adult metric learning package in the area of clothing construction that would focus on the practical application of learning the metric system. Educators are faced with the challenge of re-educating the consumer regarding the impending conversion to metrication. Educators need to consider the conditions for learning that are the most conducive for adult growth and development. In the past, metric education programs have been designed primarily for the elementary age child, with little or no regard to the adult. Adult education programs are also needed to help maximize the effectiveness of adults learning the metric system.

Through an extensive review of the literature in the areas of metrics and education, the researcher designed an adult metric learning package in the area of clothing construction. Once the package was developed, a total of five experts in the field of metric education and clothing were identified to review and comment on the learning package and asked to make suggestions for improvement.

CHAPTER II

Review of Literature

The purpose of this project was to design an adult metric learning package in the area of clothing construction which would focus on the practical application of learning the metric system in the home.

The review of literature for the proposed study covered the following areas: development of metrics in the U.S., the great metric controversy, going metric: what does it mean, consumer knowledge and attitudes, advantages of metrics as it relates to clothing construction, educational implications, principles of adult learning, and metrics as it relates to the adult.

Historical Development of Metrics in the United States

Our present day system of measurement is part of our cultural heritage from the days when the thirteen colonies were under British rule. It started as a hodge-podge of Anglo-Saxon, Roman, and Norman-French weights and measures. Since medieval times, commissions appointed by various English monarchs reduced the chaos of measurement by setting specific standards for some of the most important units. Early records indicate that an inch was defined as the length of three barleycorns, round and dry when laid

together; a pennyweight, or one-twentieth of a Tower ounce was equal to 32 wheatcorns from the midst of the ear (DeSimone, 1971).

Most colonies had standards for the basic measures. However, there was little uniformity among them, since they had been brought to America at different times and usually without regard to authenticity. A few may have been compared with official British standards but this was not always a guarantee of accuracy. Although some of the British standards were good, others were not very reliable.

In 1790, the framers of the United States Constitution recognized the need for a uniform national system of weights and measures. It was dictated that the creation and responsibility of a weights and measures system would be that of Congress. George Washington in his first inaugural address urged prompt action on this measure (Donovan, 1973).

In an attempt to establish order in the marketplace, the first United States Congress turned to Thomas Jefferson to define and render a uniform, stable system of measurement for the United States. Jefferson's first plan was to use a pendulum as a standard to define a system of weights and measures. His second plan was more promising. In

this plan, Jefferson wanted to establish a new system of weights and measures based on decimal ratios, which the United States had recently adopted for its coins. He suggested retaining some of the old names for frequently used units and felt that the sizes of the new units should be as close as possible to the size of the old ones. The new foot, based on the pendulum, would be nearly as long as an old foot, but it would be divided into ten inches (DeSimone, 1971).

Jefferson's report was accepted by Congress and discussed by certain select committees which after much deliberation reported the following conclusions to the United States Senate:

As a proposition has been made to the National Assembly of France for obtaining a standard of measure which shall be invariable, and communicable to all nations, and at all times; as a similar proposition has been submitted to the British Parliament, in their last session; as the avowed object of these is to introduce a uniformity in the measures and weights of the commercial nations; as a coincidence of regulation, by the Government of the United States, on so interesting a subject, would be desirable, your committee are of the opinion, that it would not be eligible, at present, to introduce any alteration in the measures and weights which are now used in the United States. (Donovan, 1973)

After Jefferson's early attempts, the United States showed little concern for standardizing measurement until 1816. Then, President James Madison reminded the Congress of the United States about the lack of a uniform system of weights and measures. In response to Madison's request, the Senate passed a resolution asking the Secretary of State to reinvestigate the matter of establishing a standard system of weights and measures. The result was John Quincy Adams' "Report Upon Weights and Measures", submitted four years later in 1821 (DeSimone, 1971). Adams' report recommended retention of the English customary system by the United States, but he proposed a program for achieving greater uniformity among the States. He also recommended that the President be authorized to negotiate with France, Spain, and Great Britain with a view toward achieving uniformity among all four nations (DeSimone, 1971).

Again, the members of Congress accepted Adams' report but did not respond to the report until 1830, when the legislature once again became concerned about the discrepancies of our system of weights and measures.

Then in 1863, the subject again came to task with President Lincoln forming the National Academy of Sciences to advise the government on all technical matters. A

committee led by Joseph Henry was appointed at the request of the Secretary of the Treasury to reconsider the system of weights, measures, and coinage. After two years of deliberation, the committee issued a report favorable to the adoption of the metric system. This met with the approval of Congressman John A. Kasson of Iowa, chairman of the newly appointed House Committee on Coinage, Weights, and Measures.

In 1866, the Kasson Committee reported favorably on three metric bills. The most important legalized the use of metric weights and measures, and it also specified English system equivalents of metric weights and measures. One of the other bills directed the Postmaster General to distribute metric postal scales to all post offices exchanging mail with foreign countries. The other directed the Secretary of the Treasury to furnish each state with one set of metric standards.

Congressman Kasson made clear the intentions of his committee. The metric system was not to be made compulsory, but would be permissible to use in foreign trade. These bills remained in effect for several decades (DeSimone, 1971).

In 1875, an international treaty, the Treaty of the Metre, established well-defined metric standards for length and mass. It also instituted permanent machinery to recommend adoption of further refinements in the metric system. This treaty, known as the Metric Convention, was signed by 17 countries, including the United States.

As a result of the treaty, metric standards were constructed and distributed to each nation that ratified the Convention. Since 1893, the internationally agreed to metric standards have been the fundamental system of weights and measures for the United States (Feirer, 1977).

During the post-war, pre-depression years, only two Congressional hearings were held on the subject of metrics, although 40 bills were introduced to Congress. Then, with the onset of the depression, the metric question was conveniently shoved into the background. When times got better, the United States was still not ready to consider the change to metrics (DeSimone, 1971).

After a 25 year interruption, the question of the United States' acceptance of the metric system again became an active topic of discussion. During the latest period, which occurred between 1959 and 1968, the emphasis was placed on securing legislation to authorize a comprehensive investigation of the many facets of this question by the

Federal Government. In 1968, legislation directing the Secretary of Commerce to conduct such a study was enacted by Congress (DeSimone, publication no. 345-6, 1971).

In 1968, Congress asked for a three year investigation of the metric question because it sensed that the world trend toward metrics called for a new assessment. The investigation involved public hearings, supplemented by surveys on international trade, business, industry, education, and national security. The investigation consisted of a comprehensive report plus 12 sub-study reports covering all aspects of the study (Feirer, 1977).

Finally, in 1975, Congress unanimously passed the Metric Conversion Act. The act stated that the policy of the United States shall be to coordinate and plan the increasing use of the metric system in the United States and to establish a United States Metric Board to coordinate the voluntary conversion to the metric system (Odom, Barbrow, and Sokol, 1977).

According to Feirer (1977) the major provisions of the bill provide for:

- Adaptation of the metric system as the predominant system of measurement units
- No specific timetable
- Voluntary participation

- A Metric Board
- Costs of conversion
 - treat as other costs of doing business
 - no tax credits or subsidies
 - hardship cases to be reviewed by the board.

On the basis of the evidence marshalled in, the United States Metric Study, the report recommended that the United States change to the International Metric System through a coordinated national program over a period of 10 years. At the end of that time the nation would be predominantly metric (DeSimone, 1971).

The Great Metric Controversy

The debate over whether or not the United States should adopt the metric system is perhaps the world's longest nonstop argument. Marked by an occasional disruption, this debate has continued for over a century and a half. Since the United States has taken such an uncertain attitude toward the metric system, there is little concrete data on which to base specific answers to the questions of when the United States will be a total metric nation, how we can most effectively convert to the metric system and how much it will cost to convert to a new system of measurement. Only time and conversion can answer these debatable questions (Donovan, 1973).

Going Metric: What does it Mean?

Some people have assumed that the change to metric would be an abrupt and mandatory changeover and to some, it means a specific date in the near future where the inch and the pound would be outlawed. People at the other extreme have viewed it as a painless and casual drift toward the use of more metric measurements at little cost or inconvenience (DeSimone, 1971). The changeover to metrics would not be an abrupt and mandatory changeover. We can expect the drift to metrics to be without cost or inconvenience (Vogel, 1973).

Since Congress legalized the metric system in 1866, it would suggest that the nation would prefer to drift into metrics as opposed to a sudden changeover. Use of the metric system in the United States is increasing and by 1982, it is expected that the United States will be a metric nation (DeSimone, 1971).

Consumer Knowledge and Attitudes

The greatest problem is not in the metric system itself, but the psychological difficulty of adjusting to something unfamiliar and different. Adults do not like to change. Even though we recognize that our customary system is faulty, we are used to it, accept it, and are

content to go on in the same habitual manner (DeSimone, publication no. 345-7, 1971).

A study of public attitudes concerning a change from the customary measurement system to a new and unfamiliar system found that a program of planned metrication could be expected to encounter general opposition from the consumer. The survey confirmed that the vast majority of Americans have little knowledge of metric measures. Only 40 percent of the respondents were able to name even a single metric measure. Less than 20 percent were familiar with either the relationships within the metric system or the relationships of metric measures to the current system. Much resistance to conversion seems to stem from this lack of information. The objections to conversion mentioned most were inconvenience and confusion (DeSimone, publication no. 345-7, 1971).

A Gallup Poll, prepared in August 1971 and published in October of that year, found that only 44 percent of the adults in the United States knew what the metric system was. Of these, only 42 percent were in favor of adopting the metric system (Viets, 1973).

The poll confirms our own investigation which revealed that the more people know about metrication the more they favor its adoption. What

is now needed is intensive education of the public on the significant benefits to be derived from the system (Viets, 1973 quoting Gallup, 1971).

The evidence, therefore is clear, that adults are reluctant to convert to the metric system and that there is an immediate need for adult metric education.

Advantages of Metrics as it Relates to Clothing Construction

The apparel industry has an excellent opportunity to improve fit and better satisfy the consumer when they convert to the metric system. At present, there is no coordinated system to determine clothing sizes. Average body measurements of the population vary among countries and no size standards on which to base such a sizing system has ever been established for Americans (Odom, et al., 1977).

Current apparel standards are based on very old data and don't reflect the size of the current population. New standards are needed based on new data. When this data is available and the apparel industry is making the change, a change to the metric system would be the logical change to make (Gallup, 1978). Surveys have shown that the consumer would buy more clothing and would buy it more often, if fit were not such an aggravation (Gallup, 1978). With

modern data handled by computer, it is believed that it would be possible to fit an optimum number of people by using the metric system.

Through the years, the present system of measurement has evolved through the inconsistent practice of industry. Without a change to the metric system, it would be virtually impossible to change our present "faulty" methods of sizing and labeling (Odom et al., 1971).

A change to metrication would make possible sizing garments according to actual figure dimensions. Important fitting dimensions such as bust measurement, waist measurements, etc., would help the consumer get the best fit possible (Feirer, 1977).

Children's clothing sizes are the most confusing of all and will probably benefit the most by a specific and uniform system of sizing. The following reasons indicate the need for metric measurements:

1. Children's clothing is sized using ambiguous numbers which bare no relationship to age or build of the individual. The vast range in size, growth, and body configurations make the purchasing of children's clothing extremely difficult. Thus, selecting children's clothing is not easy when a size 12 months is not necessarily the same as a size one year (Feirer, 1977).
2. A higher percentage of clothing is purchased as gifts for infants and children than for

adults, therefore, there is more chance of costly errors in selecting the needed size (Odom et al., 1971).

3. Many articles of clothing for infants and children are prepackaged and purchased without trying on, again increasing the possibility of choosing the wrong size (DeSimone, publication no. 345-6, 1971).

A uniform sizing system would reduce the number of errors made and would result in direct savings in time and money as well as providing consumer satisfaction.

The present status of the consumer in purchasing men's clothing seems not to be threatened by customary units nor the international system of units. A survey of several men's wear shops revealed that domestic garments are labeled in customary sizes as defined by the National Bureau of Standards and imported garments are marked in a like manner (Odom et al., 1971).

Use of the metric system by the home sewer is another area of concern, since the home sewer is not accustomed to the metric system of measurement. The system of units presently used in home sewing are:

1. Patterns: inches are used to indicate body measurements for the various pattern sizes. The body measurements are then summarized into sizes. Widths of various parts of the garment, hem widths, width at the bottom of pants, etc., are expressed in terms of inches.

2. Fabric is produced in a variety of widths expressed in inches. Some of the widths most often used are 35-36", 44-45", 54-56". Fabric is purchased in lengths according to yards and eighths of yards.
3. Notions:
 - a. Thread is measured and labeled by yards but is purchased by the spool. The thread weight is also marked on the spool. The number used represents the numbers of yards of thread which is spun from a pound of cotton.
 - b. Seam tapes and bindings: The width is measured in inches and fractions of inches and when the width is labeled, it is labeled accordingly. These tapes are purchased in yards and eighths of yards. They are labeled in yards when prepackaged.
 - c. Zippers are measured and labeled in inches.
 - d. Buttons are classified by "lines". In the English System there are 40 lines to one inch. Buttons are often labeled in both lines and inches.
 - e. Buckles are measured by their widths, the part the belt slides through, in inches.
 - f. Trimmings include lace, ruffling, braid, embroidered trims, rick rack, novelty trims, edging. These trimmings are purchased by yards, and eighths of yards. When widths are labeled they are expressed in inches and fraction of inches.
 - g. Ribbon widths are designated in industry by width numbers, 1½, 2, 3, 5, 7, 9, 16, and 40. These numbers have their base in the French system of "lignes" which is believed based on the metric system. Ordinarily, ribbon is purchased in yards and eighths of yards. Prepackaged ribbon is labeled in either yards or feet.
 - h. Hooks and eyes, snaps: The traditional measurement system used for these items does not seem to be related to the English or the metric system. Snaps are available in the following sizes: 4/0, 3/0, 2/0, 0,

- 1, 2, 3, and 4. Hooks are sized: 0, 1, 2, and 3.
- i. Elastic widths are marked in inches and fractions, while lengths are marked in yards.
4. Measuring devices: Measuring tools used by the home sewer are marked according to the English System. The units most frequently marked are eighths of inches, inches, feet, and yards.
5. Sewing equipment:
 - a. Sewing machines have stitch length regulators and seam width guide lines. These markings are calibrated in inches. Stitch length is sometimes referred to by numbers indicating a progression from large to small stitches. Buttonhole templates are labeled in inches and fractions of inches.
 - b. Needles and pins: The needle number indicates diameter, but in general, the length and diameter are related. In sewing machine needles, the number refers to diameter. Pins are measured in sixteenths of an inch and the size number indicates the number of sixteenths. The diameter is referred to by the names of the pin: pleating, silk, dressmaker, and bank.
 - c. Scissors and shears are labeled by the length of the blade in inches (DeSimone, publication no. 345-6, 1971).

In regard to the above, the home sewer would only have to replace a minimum of equipment and tools with a conversion to metrication. The following are the basic measuring tools needed for metric measuring:

1. A one meter flexible measuring tape graduated in centimeters with millimeter divisions between the centimeter markings.
2. A seam gauge that is 15 centimeters long graduated in centimeters with millimeter divisions between each centimeter markings.

3. A hem marker which will use a one meter, meter stick for indicating the height of the hem (Feirer, 1977).

As a result of a change to metrication, the main disadvantages in the area of clothing would be economical and psychological. It is predicated that the greatest obstacle to overcome would be the resistance to change. Unlearning old habits and learning new ones, is a major undertaking and on a nationwide scale, it is predicated to be even more demanding.

The advantages of a change to the metric system of sizing appear to outweigh the disadvantages. Consumer resistance could be reduced to a minimum if the changeover at the retail level could be made in the shortest period of time, so that the confusion of having both systems in use concurrently would not be prolonged (DeSimone, publication no. 345-7, 1971). A common system of measurement would simplify world trade, sizing, and selection of garments. Changing to metrication would reduce the cost, efforts, and confusion of changing from one system of measurement to another (Odom et al., 1971).

Previous to the actual change an all out effort would be needed to educate and inform consumers as the industry retools and reeducates. An extensive educational

program and consumer campaign to think metric is imperative for a smooth transition into metrification (DeSimone, publication no. 345-6, 1971).

Educational Implications

In 1968, the National Education Association adopted for the first time a resolution committing the NEA officially to an active position in support of a planned metrification program. The resolution states:

The National Education Association recognizes the importance of the metric system of weights and measures in the contemporary world of commerce and technology. The Association believes that a carefully planned effort to convert to the metric system is essential to the future of American industrial and technological development and to the evolution of effective world communication. It supports federal legislation which would facilitate such a conversion. The Association believes it is imperative that those who teach and those who produce instructional materials begin now to prepare for this conversion by urging teachers to emphasize the rise of the metric system in regular classroom activities (National Education Association, 1968).

The Education Amendment of 1974 further commends the support of a planned metrification program by stating:

It is the policy of the United States to encourage educational agencies and institutions to prepare students to use the

metric system of measurement with ease and facility as a part of the regular education program (A Metric Reference, 1977).

The amendment further authorizes the United States Commissioner of Education to expend over \$100,000,000 in federal funds for metric education (Metric Education Program: Proposed Rules, 1975).

The Home Economics Education Association notes with special interest the need for a consumer education program in home economics classes as students begin to use metric units in cooking recipes and for garment sizes, fabrics, patterns, and other household measurements (DeSimone, publication no. 345-6, 1971).

In the United States, the current usage of the metric system in education is limited and the American population is handicapped in learning the metric system since they are not living in a totally immersed metric environment (DeSimone, publication no. 345-6, 1971).

Until the conversion of metrification is in effect, the tasks of teachers in schools and those engaged in industrial training will be made easier when it is evident that the adoption of metric measurement is not a classroom discipline but a major change affecting every aspect of national life (Metrification Board, 1970).

The most effective teaching of metric measurement will come only when the metric system is adopted and incorporated

into the daily pattern of life. As long as it is a second system, the consumer will be hindered from thinking metric.

The adult will learn best if the metric system is not taught but experienced and used in context with the past and present experiences in which the adult is actively involved. The practical application of the "hands on" approach to learning is the most effective way to unlearn an old system and relearn a new one (DeSimone, publication no. 345-6, 1971).

It is for these reasons that the National Education Association states that a carefully planned effort to convert to the metric system needs to be put into effect as soon as possible, in order to make the conversion to metrification with relative ease. During the impending conversion to metrification, the educator can at least promote a "think metric" campaign by introducing the adult to the practical application of metrics in the home. By creating metric awareness, the adult can develop a positive attitude necessary for the acceptance and adoption of the metric system in the United States.

Principles of Adult Learning

Knowles formulates that there are certain conditions of learning that are more conducive to adult growth and

development than others. The conditions of learning that Knowles refers to are generated by practices which occur during the learning-teaching transaction. Knowles' conditions for learning and his principles of teaching are identified below:

Conditions of Learning

The learner feels a need to learn.

The learning environment is characterized by physical comfort, mutual trust, respect, mutual helpfulness, freedom of expression, and acceptance of differences.

Principles of Teaching

1. The teacher exposes students to new possibilities of self fulfillment.
2. The teacher helps each student clarify his own aspirations for improved behavior.
3. The teacher helps each student diagnose the gap between his aspiration and his present level of performance.
4. The teacher helps the students identify the life problems of the gaps in their personal equipment.
5. The teacher provides physical conditions that are comfortable (as to seating, smoking, temperature, ventilation, lighting, decoration) and conducive to interaction (preferably, no person sitting behind another person).
6. The teacher accepts each student as a person of worth and respects his feelings and ideas.
7. The teacher seeks to build relationships of mutual trust and helpfulness among the

students by encouraging co-operative activities and refraining from inducing competitiveness and judgement-
alness.

8. The teacher exposes his own feelings and contributes his resources as a co-learner in the spirit of mutual inquiry.

The learners perceive goals of a learning experience to be their goals.

9. The teacher involves the students in a mutual process of formulating learning objectives in which the needs of the students, of the institution, of the teacher, of the subject matter, and of the society are taken into account.

The learners accept a share of the responsibility for planning and operating a learning experience, and therefore have a feeling of commitment toward it.

10. The teacher shares his thinking about options available in the designing of learning experiences and the selection of materials and methods and involves the students in deciding among these options jointly.

The learners participate actively in the learning process.

11. The teacher helps the students to organize themselves to share responsibility in the process of mutual inquiry.

The learning process is related to and makes use of the experiences of the learners.

12. The teacher helps the students exploit their own experiences as resources for learning through the use of such techniques as discussion, etc.
13. The teacher gears the presentation of his own resources to the levels of experience of his particular students.

14. The teacher helps the students to apply new learning to experiences, and thus to make the learnings more meaningful and integrated.

The learners have a sense of progress toward their goals.

15. The teacher involves the students in developing mutually acceptable criteria and methods for measuring progress toward the learning objectives.
16. The teacher helps the students develop and apply procedures for self-evaluation according to these criteria.

The following discussions summarize some of the current attitudes regarding the special considerations required for administering effective adult education programs.

Bergevin (1967) indicated that:

1. The needs of the learner must be discovered, considered, and met.
2. The resources used for every program should be appropriate.
3. Problem-centered or situation-centered learning is meaningful to adults.
4. The programming of adult education activities should be a co-operative effort.
5. Most persons concerned with an educational program have certain expectations about it.
6. Programs of adult education must be in keeping with the environment in which they exist.

Morgan, Holmes, and Bundy (1976) stated:

1. The desire to learn is essential to effective learning.

2. The learner should have a clear understanding of what he should do to achieve the desired goal.
3. All learning is the result of activity on the part of the student.
4. Learning is influenced by whether it brings satisfaction or annoyance.
5. Learning by associating ideas or facts tends to produce more permanent learning than when these are learned singly.
6. Mere drill or repetition is relatively ineffective in teaching.
7. The student should have a "mind set" that is willing to accept new ideas and to treat them with a degree of hospitality even though he may not choose to adopt them.
8. A knowledge of his successes and failures should result in a challenge to the learner rather than in discouraging him.
9. The value of visual aids, when chosen wisely and used properly facilitates learning.

Tough (1971) employs the concept of a learning project consisting of a series of related episodes as his basic framework for program design. A program would consist of a number of simultaneous individual and group learning projects, each project having been collaboratively planned by learners and selected helpers and carried on at the learner's initiative.

Roger's (1969) hypothesized that:

1. We cannot teach another person directly; we can only facilitate his learning.
2. A person learns significantly only those things which he perceives as being involved

in the maintenance of, or enhancement of the structure of self.

3. Experience which, is assimilated, would involve a change in the organization of self trends to be resisted through denial or distortion of symbolization.
4. The structure and organization of self appear to become more rigid under threat; to relax its boundaries when completely free from threat. Experience which is perceived as inconsistent with the self can only be assimilated if the current organization of self is relaxed and expanded to include it.
5. The educational situation which most effectively promotes significant learning is the one in which threat to the self of the learner is reduced to a minimum and differentiated perception of the field is facilitated.

Aaron Fairclough (1971) believes that the active learning situation is the most desirable for adults. Fairclough also believes that cues and responses become more meaningful when the adult student is actively involved in the learning process as opposed to inactivity.

Thus, the principles of learning cited above can be thought of as guides to help facilitate adult learning in the most effective manner possible. When the following teaching conditions exist, the climate for learning will be the most conducive: the adult is ready to learn; is supported by the learning environment; perceives the goals of the learning experience as his goals; accepts a

responsibility in the planning process; learns by doing; learns through past and present experiences; and senses progress towards the goal. Research indicates that it is imperative that educators consider the principles of learning to maximize the effectiveness of adult learning.

Metrics as it Relates to the Adult

The National Education Association recognizes the need for effective adult education programs on the practical application of the metric system (Cortright, 1971). The development of a satisfactory adult education program is dependent upon the pragmatic usage of the metric system in one's everyday life.

The objective for an adult clothing metric education program is to familiarize and teach the adult the basic concepts of measurement through the practical application of measurement in the area of clothing construction (Odom et al., 1977). By creating a metric awareness that relates to the adult's past and present experiences, the adult will have an easier time relating to a new system of measurement. Until the adult has had the opportunity to experience measurement in concrete, comparative terms, metric terminology, will be virtually meaningless to him (DeSimone, publication no. 345-6, 1971).

Measurement should not and really cannot be taught through a series of planned lessons. Learning metric measures should be taught as a gradual process related to the adult's experiences. Until the adult has had the opportunity to experience metric terms, the gram, kilogram, centimeter or meter will be virtually meaningless (DeSimone, publication no. 345-6, 1971).

One of the most effective ways to learn the metric system is to use it in meaningful, everyday oral expressions. As with the metric language, adults will learn best if it is not taught but experienced and used in some activity in context with situations in which the adult is actively involved, i.e., sewing, cooking, etc. (Putz, 1973).

Through the experience of others who have had experience teaching metric programs, the following observations and suggestions have been recommended:

1. The system should be introduced into the practices of daily living.
2. To teach a new system in terms of its relationship to an existing system is the wrong approach. Instruction must be in the use of the new system.
3. A major problem in conversion is logistics. If a manufacturer adopts the metric system and his suppliers do not, he is in trouble. The same will hold in education.

4. Instruction must be geared to the adult, as well as the equipment and materials.
5. Instruction in metrics should be limited to the requirements of the adult's job needs and daily living. This means thorough instruction in the basic metric units but selective teaching of refined and derived units with limited or special application.
6. Linear units of measurement are the easiest to apply and comprehend. These concepts should be taught first.
7. Establishing a "think metric" campaign is the most effective and successful means of educating.
8. The use of mass media is another means of teaching metrics by providing the viewer with the opportunity to "see" how it works.
9. Learn by doing. It is possible to learn metric units by studying it, but the familiarity that is needed can only come with actually measuring and verbalizing the new language in meaningful everyday expressions.
10. Teach students to "think metric". Nothing will turn a student off more than requiring memorization of a series of lengthy conversion factors.

One important factor that will help facilitate learning a new system of measurement will be time and not a one-shot concentrated effort. Like learning a new language, it will be important that the adult be given every opportunity to use the new metric language in their everyday experiences, both personal and vicarious (T.V., news media, etc.). If they are exposed to the new system often enough, and if they realize the benefits of the

new system and if a need to use the new system is established, then they will gradually develop an increasing familiarity with the metric system without special intensive training (DeSimone, publication no. 345-6, 1971).

Adeline Naiman (1971) recommends that in order to get the adult to learn a new system of measurement and to "think metric" is to provide materials that are stimulating to the participants and gives them something to take home and use. Learning by doing is the precept. No amount of lecturing will make the use of a new language instinctive. For adults to learn a new measurement language there must be considerable time and opportunity to use that language in real activities, without pressure. A measurement curriculum built around actual clothing activities will stimulate the adult more than lectures.

A "think metric" campaign should include random experiential learning. This term includes the unorganized learning experiences to which each of us is continually exposed. Television, newspapers, conversations, reading, and entertainment all have some effect on us if continually exposed to it (Bergevin, 1967).

The more metric involvement and awareness there is the easier it will be for the adult to make the transition

to metrification. Exposure and the opportunity to use and see metric terminology in one's everyday experiences will facilitate the learning process. In essence advocating the "think metric" campaign will subliminally teach the adult metrification.

In administering a "think metric" campaign the following materials are needed to teach metric measurement effectively:

1. Meter sticks and metric rulers
2. Cubes, squares, strips, and rods calibrated in metric units
3. The meter board, with grid lines dividing it into squares
4. Scales and balances calibrated in grams and kilograms
5. Cylinders and beakers graduated in metric terms
6. Celsius thermometers (DeSimone, publication no. 345-6, 1971).

In order for metric instruction to be effective, there needs to be a relationship between the learning activities, the home, and the community (Bright, 1973). Therefore, a "think metric" campaign needs the support and involvement of the community to facilitate learning. Through continual reinforcement and use of the metric system, the transition to metrification will be subliminal.

Summary

Our present day system of measurement is part of our cultural heritage that developed out of a haphazard process of tradition and folklore. An inch was first standardized in English cultures long ago as three grains of barley laid end to end. A yard was the distance from the tip of the nose to the tip of the middle finger on the outstretched arm of a king.

Since 1790, the need for a uniform system of measurement has been recognized, acknowledged, negotiated, acted upon, accepted, ignored, and reconsidered. In 1866, the metric system became the lawful system of weights and measures, but only within the last decade has the United States begun the transition to metrification.

Recommendations from the United States Metric Study reports that the United States will change to the International Metric System through a coordinated national program over a ten-year period. The change to metrification will be viewed as a drift to a new system of measurement as opposed to an abrupt, mandatory changeover.

A study of public attitudes regarding the change from the customary system of measurement to a new and

unfamiliar system is expected to encounter opposition. Resistance to conversion stems from lack of information, inconvenience, and confusion. Gallup's 1971 poll confirms the more people know about the metric system the more they favor its adoption.

The apparel industry has an excellent opportunity to improve fit and better satisfy the consumer when it converts to the metric system. Presently, the United States has no coordinated system for sizing clothes. A common system of measurement would simplify world trade, sizing, and selection of garments. Changing to metrication would reduce the costs, efforts, and confusion involved when converting from one system of measurement to another.

The Education Amendment of 1974 supports the conversion of a planned metrication program, relying primarily on the educator to re-educate the public. The task of re-educating the public regarding the metric system lies primarily on the shoulders of the educator.

The National Education Association states that a carefully planned educational effort to convert to the metric system needs to be put into effect immediately in order to facilitate the transition to metrics.

Adult education programs are needed to familiarize and teach the adult the pragmatic usage of the metric system. The intent of such a program is to teach the adult the basic concepts of measuring through the practical application of measurement in the area of clothing construction.

For educators to maximize the effectiveness of adult learning, teachers need to consider certain conditions of learning that are the most conducive for adult growth and development.

Learning, unlearning, and relearning a new system of measurement is an enormous chore for the consumer. Previous to changing to metrication, an extensive education program is needed to re-educate the consumer.

CHAPTER III

PROCEDURES

Introduction

The purpose of this project was to design an adult education learning package which uses the metric system in clothing construction. The learning package focuses on the practical application of learning the metric system in the home.

The procedure was two-fold:

1. Review of literature to design the learning package
2. Critique of the learning package by five experts in the field of metric education and clothing

The outcome is a learning package which can be utilized by teachers in the field of clothing construction and adult education. The package will help adults understand and utilize the metric system in the home.

Methods of Collecting Information

This project was conducted in a non-experimental framework. To complete this project, the investigator did an extensive review of the literature and contacted professionals in the fields of clothing, metrics, and industry for information on metrification and for assistance in developing the learning package.

To achieve the goals of the project, the following categories were investigated through the literature:

1. Historical Development of Metrics in the United States
2. The Great Metric Controversy
3. Going Metric: What Does it Mean?
4. Consumer Knowledge and Attitudes
5. Advantages of Metrics as it Relates to Clothing Construction
6. Educational Implications
7. Principles of Adult Learning
8. Metrics as it Relates to the Adult

Once information from the literature was obtained, categorized, and organized, the researcher utilized this information to design an adult education learning package utilizing metrics in clothing construction.

A total of five organizations and businesses interested in the fields of metrication, education, and clothing were identified through clothing textbooks, magazines, journals, periodicals, and professionals in the field as sources of expertise to review, comment, and make suggestions for improving the learning package. The organizations and businesses contacted were: McCall Pattern Company, The American Home Economics Association, The American National Metric Council, Butterick Pattern Company, and the United States Metric Association, Inc. According to those recommendations received, the metric learning package

as developed from the literature was revised to accommodate those suggestions.

Method of Organizing Information

As a result of searching the literature and obtaining input from experts, a metric learning package in the area of clothing construction was developed. The learning package was designed to be utilized by adult education teachers who are teaching clothing construction.

The learning package includes the following components:

- Content outline
- Pre-test
- Learning objectives
- Metric clothing lessons
- Metric learning activities
- Materials needed
- Resource list
- Post-test
- Evaluation of the learning package.

The learning package was presented in the format designed by the American Home Economics Association.

Summary

The purpose of this project was to design an adult education learning package which utilizes the metric system in clothing construction. The learning package focuses on the practical application of learning the metric system.

The information was collected through a review of the literature and critiqued by a total of five experts in the field of metric education and clothing. The product resulting from these procedures was an adult education learning package which could be considered a guide for integrating metric education into clothing construction courses.

CHAPTER IV

THE LEARNING PACKAGE

This learning package was developed by the writer to be used to teach adults metrics as they relate to clothing construction. The learning package was designed to introduce metrics to the novice at the secondary, post-secondary, and adult learning levels. The learning package can be utilized on a self taught or instructor basis. The learning package encompasses these areas of the metric system: volume, weight/mass, and temperature with special attention to length as it relates to clothing construction. The learning activities are designed to provide the student with a "hands on" approach to learning the metric system. Diversified activities allow the student to become familiar with metric terminology, prefixes, approximate unit size, abbreviations, measurement activities, and values. Included are three evaluation tools: the pre-test, post-test, and self-test.

The format for developing the learning package was outlined by the American Home Economics Association. The learning package included the following information: content outline, pre-test, learning objectives, metric clothing lessons, metric learning activities, materials

needed, resource list, and a post-test. The first lesson provides the student with the general knowledge of the history and background for a metric America. The second lesson is an awareness of the impending change to metrication and how it relates to one's everyday life. Lesson three provides the student with the following general knowledge on volume, weight/mass, temperature, length, terminology, prefixes, unit size, abbreviations, metric activities, and values. Lesson four provides in-depth training and "hands on" learning experiences relating to clothing construction. Objectives from the affective, cognitive, psychomotor, and comprehensive levels were selected to convey the expected performance of the desired behavioral outcomes. A post-test, self-tests, and pre-test are included to help the learner assess his learning outcome.

TITLE: It's Neater by the Meter!

SUBJECT: Clothing and Textiles: Clothing
Construction Using the Metric
System

PERFORMANCE LEVEL: Maturity level: Secondary, Post-
Secondary, Adult
Complexity level: Beginning
Taxonomic level: Cognitive
Affective
Psychomotor
Comprehension

PURPOSE: This package is designed to intro-
duce the student to the practical
application of the metric system in
the area of clothing construction.

PRODUCED: September 1979

by

Susan Duany Butler
515 Logan
Helena, Montana
59601

GENERALIZATIONS TO BE LEARNED

The change to metrication is inevitable and consumers need to be aware and informed of this new system of measurement. In the area of clothing construction, the transition to metrication involves a change in measuring length and width from inches, feet, and yards to millimeters, centimeters, and meters. Although the length and width of an item will not change, the terminology and tools used for measuring that item will change. Consumer re-education is imperative for a smooth transition into the metric system.

COMPONENT IDEAS

1. General knowledge of the history and background for a "Metric America"
2. Awareness of the impending change to metrication and how it relates to one's everyday life
3. Receive general knowledge of the following metric measures: volume, weight/mass, temperature, and length. General knowledge will include terminology, prefixes, approximate size of unit, abbreviations, measurement activities, and values
4. Provide in-depth training and "hands on" learning experiences relating to clothing construction

INSTRUCTIONAL OBJECTIVES

1. Given the history and background of the U.S.'s impending change to metrication, the student will be able to list several reasons why the U.S. is converting to the metric system and be able to summarize the historical events which have led the U.S. to a metric conversion.
2. Given an introduction and background to the metric system, the student will identify 10 items in the marketplace that have changed or are using dual measurement designations.
3. Given the general knowledge of the following metric measures: volume, weight/mass, temperature, and length the student will be able to score 90% on an exam which will test terminology, prefixes, approximate unit size, abbreviations, and values.
4. Given in-depth training and "hands on" learning experiences relating to clothing construction, the student

will be able to construct a satisfactory garment which utilizes only the metric system of measurement.

INSTRUCTIONAL APPROACH

In the lessons presented the student will learn the metric system as it relates to the practical application of clothing construction. The lessons emphasize the "hands on" approach to learning.

IDENTIFICATION OF THE LEARNERS

This learning package is designed for secondary, post-secondary, and adult learners and is intended to be used in the area of clothing construction.

SPECIAL INSTRUCTIONS

Equipment Needed

- Bulletin Board
- Overhead Transparency Projector
- Filmstrip Projector
- Film Projector

Materials Needed

- Books
 - Thinking Metric, Gilbert, T.F. and Gilbert, M.B. New York: John Wiley and Sons, Inc., 1973.
 - Meet the Meters, Leslie, G.F. Dr. and Gold, M.I. New York: Ballantine Books, 1976.
 - A Metric Workbook for Teachers of Consumer and Homemaking Education, Orange County Department of Education, Santa Ana, California, 1976.(\$1.50)
- Pamphlets
 - "Metric Education Guide," Co-operative Extension Services of the Northeast States.
 - "Guidelines for Metrication," American Home Sewing Association, Inc., New York, New York, 1979.
 - "Educators Guide to Metric for Clothing Construction," Coats and Clark, Inc., Stamford, Connecticut, 1976.

Media Needed

- Filmstrips
 - "Measuring Metric in Fashion Sewing," The McCall

Pattern Co., Education Department, P.O. Box 9119,
Manhattan, Kansas, 66502, 1976.

Filmstrip with cassette illustrates how the
metric system can be applied to day-to-day
living with special emphasis on the sewing
classroom.

"Metric or English? That is the Question," Singer
Education Division, Society for Visual Education,
Inc., 1345 Diversey Parkway, Chicago, Ill., 60614,
1973.

This series of four filmstrips includes:

History of the English System

History of the Metric System

Characteristics of the Metric System

Why Go Metric?

Films

"A Metric America," Alms Instructional Media Services,
Box 1010, Hollywood, CA., 90028, 1974.

Animated film tells why America is going metric
and teaches basic metric weights and measures.

"Meters, Liters, and Kilograms," Metrication Institute
of America, 1825 Willow Road, P.O. Box 236, Northfield,
Illinois, 60093, 1974.

This film teaches the metric system through visual
relationships.

Overhead Transparency Projector

A Metric Workbook for Teachers of Consumer and Home-
making Education, Orange County Department of
Education, Santa Ana, California, 1976. (\$1.50)

Bulletin Board

Bulletin boards to be made by instructor and students
reflecting metric measurement.

Wall Charts

Ford Posters, Ford Metric Materials, P.O. Box 5337,
Detroit, Michigan, 48221. (\$2.00)

Activity Worksheets

Activity worksheets included.

Metric Equipment

Ideal School Supply Co., 11000 South Laverne Ave.,
Oaklawn, Ill. 60453.

Length- meter sticks, metric rulers, and tape
measures

Weight- bathroom scale, spring scale balance or
platform scale

Volume- liquid, dry, and small measures
Temperature- Celsius thermometer

Other Materials Needed

Appliques	Patterns
Patches	Pins
Belting	Scissors
Buckles	Sewing Machine
Buttons	Snaps
Elastic	Tapes and Braids
Fabric	Thread
Hooks and Eyes	Trimming
Needles	Zippers

Facilities Needed

Tables for learning activities
Sewing machines

Teacher Resources

American National Metric Council
1625 Massachusetts Avenue, N.W.
Washington, DC 20036

U.S. Department of Commerce
National Bureau of Standards
Washington, DC 20036

Sears, Roebuck and Co., Inc.
Sears Tower BSC, 40-22
Consumer Information Services, D/703
Chicago, IL 60684

J.C. Penney Co., Inc.
Educational Relations
1301 Avenue of the Americas
New York, NY 10029

Special Requirements

See the following pages for additional metric
reference sheets and materials.

MOST COMMONLY USED METRIC AND CUSTOMARY UNITS

Most Commonly Used Units	Metric Unit	Abbrevi- ations	Reference Points
Length	millimeter	mm	diameter of a paper clip wire
	centimeter	cm	a little more than the width of a paper clip
	meter	m	a little longer than a yard
	kilometer	km	somewhat further than a $\frac{1}{2}$ mile
Weight (mass)	gram	g	a little more than the weight of a paper clip
	kilogram	kg	a little more than 2 pounds
	metric ton		a little more than a short ton
Volume	milliliter	mL	five of them make a teaspoon
	liter	L	a little larger than a quart
Temperature	degree	$^{\circ}\text{C}$	100 $^{\circ}\text{C}$ water boils 37 $^{\circ}\text{C}$ normal body 20 $^{\circ}\text{C}$ room temp. 0 $^{\circ}$ water freezes

MOST COMMONLY USED PREFIXES

Prefix	Symbol	Meaning	Example
kilo	k	1000	kilogram (kg), 1000 grams kilometer (km) 1000 meters
centi	c	1/100, .01	centimeter (cm) .01 meter
milli	m	1/1000, .001	millimeter (mm) .001 meter milliliter (mL) .001 liter milligram (mg) .0001 gram

LONG DISTANCES MEASURED IN KILOMETERS

	Atlanta	Boston	Chicago	Dallas	Los Angeles	Mexico City	Miami	Montreal	New Orleans	New York	Seattle	Washington
Atlanta		1718	1174	1295	3534	2896	1070	1979	793	1376	4434	1014
Boston	1718		1569	2927	4911	4669	2481	531	2471	348	4885	703
Chicago	1174	1569		1506	3371	3332	2188	1364	1519	1187	3319	1146
Dallas	1295	2927	1506		2257	1849	2106	2837	801	2576	3398	2208
Los Angeles	3534	4911	3371	2257		3245	4364	4698	3059	4690	1974	4254
Mexico City	2896	4669	3332	1849	3245		3543	4579	2164	4219	4743	3855
Miami	1070	2481	2188	2106	4364	3543		2743	1409	2140	5504	1778
Montreal	1979	531	1364	2837	4698	4579	2743		2639	624	4340	965
New Orleans	793	2471	1519	801	3049	2164	1409	2639		2132	4200	1768
New York	1376	348	1187	2576	4690	4219	2140	624	2132		4672	368
Seattle	4434	4885	3319	3398	1974	4743	5504	4340	4200	4672		4422
Washington	1014	703	1146	2208	4254	3855	1778	965	1768	368	4422	

REFERENCES FOR SPEED

Speed (km/h)	Activity	% of Speed Limit
5	Walking at a moderate pace	5%
10	Jogging	10%
25	Driving in a school zone, first or second gear	25%
50	City driving, light traffic	50%
75	Driving on a 2-lane road, approaching the city	75%
100	Thruway driving	100%
125	Speeding on the thruway	125%
150	High-speed train	150%

Memory
device

(Gilbert, 1973)

TEMPERATURE °CELSIUS

Ambient Temperature

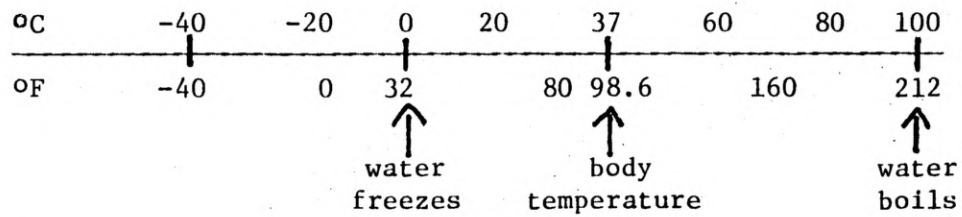
Temperature (°C)	Memory Aid	Reference Point
100	<u>F</u> orty, <u>F</u> iery <u>T</u> hirty, <u>T</u> hirsty	Boiling
40		A hot, fiery day in summer in Arizona
30		A thirsty, hot day in summer in New York
20		Room temperature
10	<u>T</u> en, <u>T</u> epid <u>F</u> orty, <u>F</u> rigid	A tepid day in autumn or in spring
0		Freezing
-20		A bitter cold day in winter
-40		About as frigid as it ever gets in the United States

Body Temperature

Temperature (°F)	Temperature (°C)	Body Condition
98.6	37	Normal
99.5	37.5	Slight cold
100.5	38	Low-grade fever
102	39	Flu
104	40	Quite sick
105	40.5	Alarm
106	41	Convulsion

(Gilbert, 1973)

TEMPERATURE °CELSIUS
-continued-



Temperature (°C)	Heat Condition
150	For baking cake
125	For warming bread
100	For boiling water

Industrial and Kitchen Temperatures

Temperature (°C)	Heat Condition
3000	Melts iron
1000	Melts gold
250	For broiling steak
215	For roasting beef
200	For baking potatoes
175	For baking cookies
160	For baking fish

(Gilbert, 1973)

CLOTHING CONSTRUCTION
PRODUCT SPECIFICATIONS GUIDELINES

APPLIQUES AND PATCHES	-- State size in one-millimeter increments.
BUCKLES	-- See appliques and patches.
BUTTONS	-- Discontinue use of ligne measurement on packaging. Measure and state size (diameter) in one-millimeter increments.
ELASTIC, BY THE YARD	-- See fabric.
FABRIC	-- Put up in one-meter increments. State widths below 450 mm (trimming) in one-millimeter increments. State widths above 45 cm in one-centimeter lengths.
HOOKS AND EYES	-- The current size delineation (0-4) will continue.
MEASURING AIDS	-- Mark in .5 centimeter increments. Mark at least the first centimeter in millimeters. A one-meter stick will replace the customary yardstick. A 1.5 meter tape will replace the 60 inch tape.
NEEDLES, HAND SEWING	-- The current size delineation will continue.
MACHINE	-- Diameter will be in .05 millimeter increments.
PATTERNS	-- Current soft conversion of sizing will continue temporarily. Pattern fabric and notion requirements will reflect the American Home Sewing Associations guidelines.
PINS	-- State length in one-millimeter increments.
SCISSORS	-- State length in one-centimeter increments.
SEWING MACHINES	-- Throat plates will be available with .5 centimeter markings. Calibrate and state stitch length in millimeters (0-4).
SNAPS	-- The current delineation (5/0-5) will continue.

PRODUCT SPECIFICATIONS
-continued-

- TAPES AND BRAIDS -- Put up in .1 meter increments.
Widths see fabric.
- THREAD -- Put up below 20 m in one-meter increments. Put up above 20 m in 5 meter increments.
- TRIMMING (by the yard) -- See fabric.
- WEIGHT, ITEMS SOLD BY -- Solids state weight in one gram increments.
Liquids (e.g. sewing machine oil) state volume in one-milliliter increments.
- ZIPPERS -- Lengths below 30 cm will be available in one-centimeter increments. Lengths above 30 cm will be available in 5 centimeter increments. (exception 68 cm slip-cover zipper).

(American Home Sewing Association, 1979)

APPLIQUES, BUCKLES, AND PATCHES

Common Widths	New Metric Size	Common Widths	New Metric Size
1/4 in.	7 mm	1-1/4 in.	32 mm
1/2 in.	13 mm	1-1/2 in.	38 mm
5/8 in.	16 mm	1-3/4 in.	44 mm
3/4 in.	19 mm	2 in.	51 mm
7/8 in.	22 mm	2-1/4 in.	57 mm
1 in.	25 mm	2-1/2 in.	63 mm

BUTTONS

Ligne Measurement	New Metric Size	Customary Equivalent
10 12	7 mm	1/4 in.
14 16	9 mm	3/8 in.
18	11 mm	7/16 in.
20 22	13 mm	1/2 in.
24	16 mm	5/8 in.
28 30	19 mm	3/4 in.
34 36	22 mm	7/8 in.
40	25 mm	1 in.

FABRIC, BELTING, ELASTIC, TAPES, AND BRAIDS

<u>Metric Widths</u>	<u>Customary Equivalent</u>	<u>Metric Widths</u>	<u>Customary Equivalent</u>
46 cm	18 in.	122 cm	48 in.
54 cm	21 in.	127 cm	50 in.
64 cm	25 in.	140 cm	54-56 in.
70 cm	27 in.	150 cm	58-60 in.
90 cm	35-36 in.	175 cm	68-70 in.
100 cm	39 in.	180 cm	72 in.
107 cm.	42 in.	275 cm	108 in.
115 cm	44-45 in.		

NARROW FABRIC WIDTHS

<u>Customary Width</u>	<u>New Metric Width</u>	<u>Customary Width</u>	<u>New Metric Width</u>
1/8 in.	3 mm	11/16 in.	17 mm
3/16 in.	5 mm	3/4 in.	19 mm
1/4 in.	6 mm	13/16 in.	21 mm
5/16 in.	8 mm	7/8 in.	22 mm
3/8 in.	10 mm	15/16 in.	24 mm
7/16 in.	11 mm	1 in.	25 mm
1/2 in.	13 mm	1-1/8 in.	29 mm
9/16 in.	14 mm	1-1/4 in.	32 mm
5/8 in.	16 mm	1-3/8 in.	35 mm

NARROW FABRIC WIDTHS

Customary Width	New Metric Width	Customary Width	New Metric Width
1-1/2 in.	38 mm	2 in.	51 mm
1-5/8 in.	41 mm	2-1/8 in.	54 mm
1-3/4 in.	44 mm	2-1/4 in.	57 mm
1-7/8 in.	48 mm	2-3/8 in.	60 mm

SEWING MACHINE NEEDLES

Common Size	New Metric Size	Common Size	New Metric Size
5	50	20	125
6	55	21	130
7	60	22	140
9	65	23	160
10	70	24	180
11	75	25	200
12	80	26	230
13	85	27	250
14	90	28	280
16	100	29	300
18	110	30	330
19	120	31	350

PATTERN SIZING

HOW TO SELECT SIZE

Pattern sizes are based on body measurements. To determine what pattern size you need, take your body measurements and compare them with the listed body measurements on the chart.

Take your body measurements snugly but not too tightly in the undergarments that you would normally wear.

Buy coat and suit patterns the same size as dress pattern. Do NOT purchase a larger size.

Buy maternity patterns in the same size you used before pregnancy.

BABIES

Babies sizes are for infants who are not yet walking.

Age	Newborn (1-3 months)	6 months
Weight	3-6 kg	6-8 kg
Height	43-61 cm	61-67 cm

TODDLERS

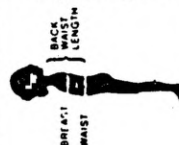
Toddler patterns are designed for a figure between that of a baby and a child. Toddlers' pants have a diaper allowance; dresses are shorter than the similar Child's size.

Size	1/2	1	2	3	4
Breast or Chest	48	51	53	56	58
Waist	48	50	51	52	53
Finished Dress Length	35.5	38	40.5	43	46
Approx. Height	71	79	87	94	102



CHILDREN

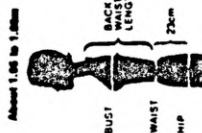
Size	2	3	4	5	6	8x
Breast or Chest	53	56	58	61	64	65
Waist	51	52	53	55	56	57
Hip	—	—	61	64	66	67
Back Waist Length	22	23	24	25.5	27	27.5
Finished Dress Length	46	48	51	56	61	64
Approx. Height	89	97	104	112	119	122



MISSSES

Misses patterns are designed for a well proportioned, developed figure; about 1.65m to 1.68m without shoes.

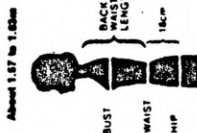
Size	6	8	10	12	14	16	18	20
Bust	78	80	83	87	92	97	102	107
Waist	58	61	64	67	71	76	81	87
Hip	83	85	88	92	97	102	107	112
Back Waist Length	39.5	40	40.5	41.5	42	42.5	43	44



MISS PETITE

This size range is designed for the shorter Miss figure; about 1.57m to 1.63m without shoes.

Size	6mp	8mp	10mp	12mp	14mp	16mp
Bust	78	80	83	87	92	97
Waist	60	62	65	69	73	78
Hip	83	85	88	92	97	102
Back Waist Length	37	37.5	38	39	39.5	40



JUNIOR

Junior patterns are designed for a well proportioned, shorter waisted figure; about 1.63m to 1.65m without shoes.

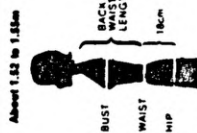
Size	5	7	9	11	13	15
Bust	76	79	81	85	89	94
Waist	57	60	62	65	69	74
Hip	81	84	87	90	94	99
Back Waist Length	38	39	39.5	40	40.5	41.5



JUNIOR PETITE

Junior Petite patterns are designed for a well proportioned petite figure; about 1.52m to 1.55m without shoes.

Size	3jp	5jp	7jp	9jp	11jp	13jp
Bust	76	79	81	84	87	89
Waist	56	58	61	64	66	69
Hip	79	81	84	87	89	92
Back Waist Length	35.5	36	37	37.5	38	39



(American Home Sewing Association, 1979)

PATTERN SIZING -continued-

GIRLS

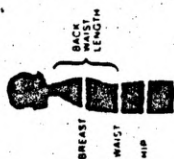
Girls' patterns are designed for the girl who has not yet begun to mature. See below for approximate heights without shoes.



Size	7	8	10	12	14
Bust	66	69	73	76	81
Waist	58	60	62	65	67
Hip	68	71	76	81	87
Back Waist Length	29.5	31	32.5	34.5	36
Approx. Height	127	132	142	149	155

CHUBBIE

Chubbie patterns are designed for the growing girl who is over the average weight for her age and height. See below for approximate heights without shoes.



Size	8½c	10½c	12½c	14½c
Bust	76	80	84	88
Waist	71	74	76	79
Hip	84	88	92	96
Back Waist Length	32	34	35.5	37.5
Approx. Height	132	142	149	155

BOYS AND TEEN-BOYS

These size ranges are for growing boys and young men who have not yet reached full adult stature.

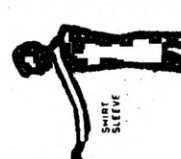


Size	BOYS					TEEN-BOYS				
	7	8	10	12	14	16	18	20		
Chest	66	69	71	76	81	85	89	93	cm	
Waist	58	61	64	66	69	71	74	76	cm	
Hip (seat)	69	71	75	79	83	87	90	94	cm	
Neck or										
Neckband*	30	31	32	33	34.5	35.5	37	38	cm	
Height	122	127	137	147	155	163	168	173	cm	
Shirt Sleeve	57	59	64	68	74	76	79	81	cm	

NOTE: For Toddlers' and Little Boys' (½ to 6) — See Toddlers' and Children's charts.

MEN

Men's patterns are sized for men of average build about 1.78m without shoes.



Size	34	36	38	40	42	44	46	48
Chest	87	92	97	102	107	112	117	122
Waist	71	76	81	87	92	99	107	112
Hip (seat)	89	94	99	104	109	114	119	124
Neck or								
Neckband*	35.5	37	38	39.5	40.5	42	43	44.5
Shirt Sleeve	81	81	84	84	87	87	89	89

*This is a ready-to-wear measurement, not a pattern "body" measurement. Buy shirt pattern by this measurement.

About 1.58 to 1.60m



YOUNG JUNIOR/TEEN

This size range is designed for the developing pre-teen and teen figures, about 1.55m to 1.60m without shoes.

Size	5/6	7/8	9/10	11/12	13/14	15/16
Bust	71	74	78	81	85	89
Waist	56	58	61	64	66	69
Hip	79	81	85	89	93	97
Back Waist Length	34.5	35.5	37	38	39	40

About 1.63 to 1.64m



WOMEN

Women's patterns are designed for the larger, more fully mature figure, about 1.65m to 1.68m without shoes.

Size	38	40	42	44	46	48	50
Bust	107	112	117	122	127	132	137
Waist*	89	94	99	105	112	118	124
Hip	112	117	122	127	132	137	142
Back Waist Length	44	44	44.5	45	45.5	46	cm

About 1.67 to 1.68m



HALF-SIZE

Half-size patterns are for a fully developed figure with a short back waist length, about 1.57m to 1.60m without shoes.

Size	10½	12½	14½	16½	18½	20½	22½	24½
Bust	84	89	94	99	104	109	114	119
Waist	69	74	79	84	89	96	102	108
Hip	89	94	99	104	109	116	122	128
Back Waist Length	38	39	39.5	40	40.5	40.5	41	41.5

SKIRTS, SLACKS & SHORTS:

Select by waist measurement. For hip-hugger patterns OR if hips are two sizes larger in proportion to waist, select size by hip measurement.

	Misses			Miss Petite			Junior Petite			Young Junior/Teen		
	Waist	Hip	Waist	Hip	Waist	Hip	Waist	Hip	Waist	Hip	Waist	Hip
Misses	58 61 64 67 71 76 81 87 cm	83 85 88 92 97 102 107 112 cm	58 61 64 67 71 76 81 87 cm	60 62 65 69 73 78 cm	63 65 68 72 76 cm	63 65 68 72 76 cm	55 58 61 64 66 69 cm	58 61 64 66 69 cm	55 58 61 64 66 69 cm	58 61 64 66 69 cm	55 58 61 64 66 69 cm	58 61 64 66 69 cm
Junior	57 60 62 65 69 74 cm	81 84 87 90 94 99 cm	57 60 62 65 69 74 cm	55 58 61 64 66 69 cm	58 61 64 66 69 cm	55 58 61 64 66 69 cm	55 58 61 64 66 69 cm	58 61 64 66 69 cm	55 58 61 64 66 69 cm	58 61 64 66 69 cm	55 58 61 64 66 69 cm	58 61 64 66 69 cm
Women	89 94 99 105 112 118 124 cm	112 117 122 127 132 137 142 cm	89 94 99 105 112 118 124 cm	55 58 61 64 66 69 cm	58 61 64 66 69 cm	55 58 61 64 66 69 cm	55 58 61 64 66 69 cm	58 61 64 66 69 cm	55 58 61 64 66 69 cm	58 61 64 66 69 cm	55 58 61 64 66 69 cm	58 61 64 66 69 cm

(American Home Sewing Association,
1979)

METRIC CHART
CONVERTING INCHES AND YARDS TO CENTIMETRES AND METRES

Extra fabric is needed to match plaids, stripes, one-way designs.					SIMPLICITY 5574		
STANDARD	Bust	83	86	92	97	102	cm
BODY	Waist	61	65	69	74	79	cm
MEASURE-	Hip - 23 cm below waist	88	91	97	102	107	cm
MENTS	Back-neck to waist	40.5	41	42	42.5	43	cm

Fabric required	Sizes	10	12	14	16	18
-----------------	-------	----	----	----	----	----

Front Wrap-Top						
90 cm without nap		2.90	2.90	2.90	2.90	3.00 m
115 cm "	"	2.10	2.40	2.55	2.65	2.75 m
140 cm "	"	1.50	1.60	1.85	1.95	2.20 m
150 cm "	"	1.40	1.50	1.60	1.75	1.85 m

63

Pants						
115 cm, 140 cm without nap		2.40	2.40	2.40	2.40	2.55 m
150 cm without nap		2.10	2.20	2.40	2.40	2.55 m
Elastic - 2 cm wide		0.70	0.80	0.80	0.95	0.95 m

Garment Measurements						
Finished back length of front-wrap top	57.8	58.4	59	59.7	61	cm
Finished length at side seam from waistline marking of pants	104.1	104.7	105.3	105.9	106.7	cm
Bottom width of pants leg	87	89.5	92.7	95.8	99	cm

Sewing notions: Thread, seam binding or stretch lace.
(American Home Sewing Association, 1979)

PINS

<u>Common Lengths</u>	<u>New Metric Size</u>	<u>Common Lengths</u>	<u>New Metric Size</u>
1/4 in.	7 mm	1-1/2 in.	38 mm
1/2 in.	13 mm	1-3/4 in.	44 mm
5/8 in.	16 mm	2 in.	51 mm
3/4 in.	19 mm	2-1/4 in.	57 mm
7/8 in.	22 mm	2-1/2 in.	63 mm
1 in.	25 mm	3 in.	76 mm
1-1/4 in.	32 mm		

SCISSORS

<u>Common Lengths</u>	<u>New Metric Size</u>	<u>Common Lengths</u>	<u>New Metric Size</u>
1/2 in.	1 cm	3-1/2 in.	9 cm
1 in.	2 cm	4 in.	10 cm
1-1/2 in.	3 cm	4-1/2 in.	11 cm
2 in.	5 cm	5 in.	13 cm
2-1/2 in.	6 cm	5-1/2 in.	14 cm
3 in.	7 cm	6 in.	15 cm

THREAD

Common Yardage Put-ups	New Metric Put-ups	Common Yardage Put-ups	New Metric Put-ups
10 yd.	9 m	225 yd.	200 m
50 yd.	45 m	250 yd.	225 m
70 yd.	60 m or 65 m	275 yd.	250 m
75 yd.	65 m or 70 m	300 yd.	270 m or
80 yd.	70 m or 75 m	325 yd.	295 m or
100 yd.	90 m	400 yd.	365 m
125 yd.	100 m or 115 m	425 yd.	385 m or 390 m
150 yd.	135 m or 140 m	475 yd.	430 m or 435 m
200 yd.	180 m or 185 m	500 yd.	450 m or 455 m

ZIPPERS

Common Zipper Lengths	New Metric Length	Common Zipper Lengths	New Metric Length
4 in.	10 cm	18 in.	45 cm
5 in.	12 cm	20 in.	50 cm
6 in.	15 cm	22 in.	55 cm
7 in.	18 cm	24 in.	60 cm
9 in.	23 cm	26 in.	65 cm
10 in.	25 cm	27 in.	68 cm
11 in.	28 cm	28 in.	70 cm
12 in.	30 cm	30 in.	75 cm
14 in.	35 cm	34 in.	85 cm
16 in.	40 cm	36 in.	90 cm

GENERAL GUIDELINES FOR TEACHING
THE METRIC SYSTEM

1. Teach students to "Think Metric" rather than teaching students to convert.
2. Be positive in your teaching approach.
3. Keep metrics simple--concentrate on the basic units: length, volume, mass, and temperature.
4. Show specific examples and applications of units that relate to the students' daily life. Example, 55 mph. is about equal to 90 km/h.
5. Convert the customary system to the metric system only when necessary and then round off conversions to units or tenths.
6. Do not introduce units that have little or no meaning to the student. Example, cardela.
7. Adapt your metric presentation to fit the audience. Example, do not spend a lot of time teaching a nutrition class about how the meter is used in clothing construction.
8. Use "hands on" teaching and learning experiences.
9. Relate the metric system to our monetary system in terms of cent, (centi), mill, (milli).

10. Emphasize approximations. Example, the meter is a little longer than a yard.

11. Emphasize measurement with reasonable units. Example, you would not measure a football field in centimeters nor your waist in meters.

12. Illustrate with actual size visual aids, both in terms and actual measuring.

13. Mention things that will not change during conversion.

14. Teach the content in stages, not all at once.

15. Get the student involved.

16. Use the metric system at every opportunity.

RULES FOR WRITING METRICS

1. At this point, the correct way to refer to the metric system is International System of Units, System International, or SI - Metric.

2. Pluralization of symbols should not be used.

Example, 3 mm not 3 mms

6 kg not 6 kgs

4 g never 4 gms

3. Never use a prefix without a unit either in speech or writing. Example: kilogram or kilometer not kilo

milliliter or millimeter not milli

4. Use a zero before decimal quantity less than a unit. Example: 0.531 mg not .531 mg

0.8 cm not .8 cm

5. Never put a full stop (period) after a symbol except at the end of a sentence. Example: 33 cm not 33 cm.

6. To avoid confusion, the correct expression of the symbols for SI units is of extreme importance. Use the correct capital and lower case letters for unit and multiple unit symbols.

7. Unit names are not capitalized even though some of their symbols are, except the degree Celsius ($^{\circ}\text{C}$).

8. Commas are not to be used as a thousands marker.
Use a space instead. Example: 739 610 736 not 739,610,736
9. Velocity is kilometers per hour (k/h) not K.P.H.
10. Terms and symbols are usually written in lower case letters unless otherwise designated. Once exception is the liter (L) to avoid confusing it with the number 1.
Example: The seam allowance is 1.5 cm not 1.5 CM
11. Use the American "er" spelling of names rather than the British "re" spelling. Example: meter not metre
12. Use the name of the unit, not the symbol, when no number is involved. Example: The meter is a unit
not
The m is a unit
13. Use the symbol with a number when expressing quantity. Example: 18 cm long not 18 centimeters long
14. Leave a space between the number and the symbol.
Example: 2.5 m of fabric not 2.5m of fabric
15. The temperature scale is now called "degree Celsius" ($^{\circ}\text{C}$) not Centigrade.
16. Don't use fractions, i.e., $\frac{1}{2}$ liter, except when developing specific quantitative concepts.

EVALUATION INSTRUCTIONS

A. Special Requirements

The Pre-Test Key, Post-Test Key, and Post-Test are found in the following section. The Pre-Test, which can be found in the student section is a test to determine the students acquired knowledge of the metric system. A Pre-Test allows the instructor and student to determine the level of metric attainment he or she has procured. The Post-Test requires the completion of a garment plus a written test involving the practical application of metric "hands on" activities.

B. Test Key

Pre-Test Key - Part I

1. a. customary b. metric
2. SI
3. a. meter c. liter
b. gram d. degree Celsius
4. a. milli = one thousandth of
b. centi = one hundredth of
c. kilo = 1000 times
5. a. inch, foot, yard, mile
b. grain, dram, ounce, pound, ton
c. teaspoon, tablespoon, fluid ounce, cup, pint, quart, gallon
6. a. m c. L
b. g d. °C
7. a. kilogram b. milliliter
8. 1.5 cm
9. meter

Part II

- | | | | |
|------|------|------|------|
| 1. T | 3. T | 5. T | 7. F |
| 2. T | 4. T | 6. F | 8. T |

Part III

1. road signs, patterns, food labels, measuring tools for baking, sewing, cars, track and field measures, temperature and maps

C. Post-Test Key - Part I

- | | | |
|-------------|-------------|-------------|
| 1. unlikely | 3. unlikely | 5. likely |
| 2. unlikely | 4. likely | 6. unlikely |

Part II

Answers will be determined when the student used for the measurement exercise is identified.

Part III

- | | |
|---|-----------------------------|
| 1. 150°C | 10. 5 mL |
| 2. 37°C | 11. 250 mL |
| 3. 0° C | 12. a. length=1 c. height=1 |
| 4. 20°C | b. width =1 d. volume=1 |
| 5. 1 kg | 13. 2.4 m |
| 6. 1 g | 14. skirt |
| 7. approximately 82 kg | 15. 61 cm |
| 8. 2.5 kg | 16. 90 cm, 115 cm, 150 cm |
| 9. 2500 g | 17. 3.5 hours |
| | 18. 25 km/h |
| 19. a. milli- | |
| b. centi- | |
| c. deca- | |
| d. deci- | |
| e. hecto- | |
| f. kilo- | |
| 20. Check answers against a metric ruler. | |

Part IV

The instructor will grade on the basis of the students factual support of the question.

Part V

Selected criteria for evaluating the garment will be dependent upon the item constructed.

POST-TEST

The purpose of the following activity is to challenge your ability to "Think Metric" in your everyday life and in clothing construction.

Directions:

- Read each item carefully and answer the questions correctly.

Part I: Answer each question likely or unlikely.

1. A basketball player is 3 meters tall _____
2. The temperature was 20°C and it began to snow _____

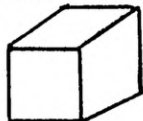
3. A piece of paper weighs 100 grams _____
4. The beauty contestant measured 83-61-88 _____
5. It is approximately 703 kilometers from Washington, D.C. to Boston _____
6. The recipe called for 1 L of vanilla flavoring _____

Part II

Your body measurements measured metrically.

Part III

1. At what temperature would you bake a cake _____
2. Normal body temperature is _____
3. Water freezes at _____
4. A comfortable room temperature would be _____
5. A liter of milk weighs _____ g
6. A millimeter of water weighs _____ g
7. Approximately how much would an average 6 foot man weigh _____
8. How much would a 6 pack of soda weigh _____ kg
9. How much would a 6 pack of soda weigh in grams _____
10. A teaspoon of water is _____
11. The volume of an average coffee cup is _____
12. With a 30 cm ruler, determine the volume, in cm^3 , of the cubic container. Volume = length x width x height



length = _____ cm height = _____ cm
width = _____ cm volume = _____ cm^3

13. Approximately how much fabric is needed to make a size 10 pair of pants. Fabric width is 115 cm.
14. A zipper length of 18 cm could be used to make _____
15. For a size 10 skirt you would need _____ of 2 cm wide elastic
16. The standard fabric widths on the market are: _____, _____, and _____
17. How long would it take to drive on the thruway to a city 350 km away? _____ hours
18. How fast would you drive through a school zone _____
19. Write the prefixes for the following multiples:

a. 0.001 _____	d. 0.1 _____
b. 0.01 _____	e. 100 _____
c. 10 _____	f. 1000 _____

20. Draw the approximate length of these lines:
- a. 5 cm
 - b. 80 cm
 - c. 35 cm

Part IV: Discussion Questions

Select one of the following questions and support that statement.

- 1. The U.S. is slowly changing to the metric system of measurement and the use of this system has become evident in the marketplace.
- 2. The transition to metrification has been historical and lengthy.

Part V: Clothing Construction (to be completed at another time)

Student will complete a garment of their selection and will construct the garment using the metric system of measurement.

Student Section

"It's Neater by the Meter"

This learning package is designed to introduce you, the student to the practical application of the metric system in the area of clothing construction.

INTRODUCTION

The metric system is here to stay so let's begin using the metric system by learning to "Think Metric"! Now is the time to learn, understand and use the International System of Units (SI) or better known as the modern metric system. The metric system is simple, practical and easy to learn. Incorporating the metric system into your daily life simplifies the transition to metrication. "Think Metric", and utilize the metric system at home by creating a metrical salad or designing a "meter-made" skirt! Just remember the metric system is going to be "Neater by the Meter"!

The following lessons and activities have been designed to introduce you, the student, to the practical application of the metric system. It is the instructor's goal to introduce, familiarize, and teach you to "Think Metric".

This learning package will introduce you to all aspects of metric measurement with special attention on length, as it relates to clothing construction.

LEARNING OBJECTIVES

Upon completion of this learning package you should be able

to accomplish the following objectives:

1. Given the history and background of the U.S.'s impending change to metrication, you will be able to list several reasons why the U.S. is converting to the metric system and be able to summarize the historical events which have led the U.S. to a metric conversion.
2. Given an introduction and the background to the metric system, you will identify 10 items in the marketplace that have changed or are using dual measurement designations.
3. Given the general knowledge of the following metric measures: volume, weight, temperature, and length, you will be able to score 90% on an exam which will test terminology, prefixes, approximate size of unit, abbreviations, measurement exercises, and values.
4. Given in-depth training and "hands on" learning experiences relating length to clothing construction, you will be able to construct a satisfactory garment which utilizes only the metric system of measurement.

PRE-TEST

The use of metrication is increasing rapidly. Consumers' need to be aware and informed of this new system of measurement, which will eventually affect their lives daily. The following test is designed to help you assess the extent to which you now understand the metric system of measurement. This assessment will also indicate areas in which you need further study. If you are already proficient in certain areas of the metric system, you will not be required to complete that portion of the learning package.

Directions

- Read the questions carefully
- When you have completed the test obtain the key from the instructor and check your answers
- Take your scored answer sheet to the instructor so that you may discuss with her areas for further study

Part I: Answer each question by filling in the blank with the correct answer.

1. The system of weights and measures traditionally used in this country is now called the _____ system. The system of weights and measurements we are slowly changing to is the _____.

2. The abbreviation for the International System of Units is _____.
3. The most commonly used metric units are:
 - a. _____ for length
 - b. _____ for weight/mass
 - c. _____ for volume
 - d. _____ for temperature
4. Name the 3 most commonly used metric prefixes and their values: _____
5.
 - a. The meter replaces the _____ for length
 - b. The gram replaces the _____ for weight/mass
 - c. The liter replaces the _____ for volume
6. The symbols used to indicate meter, gram, liter and degree Celsius are: _____
7.
 - a. kg is used to indicate _____
 - b. mL is used to indicate _____
8. The seam allowance on a pattern is _____ cm
9. In the metric system, fabric is measured by the _____.

Part II: Answer the following correctly by circling either true or false.

10. Measurements for a size 12 pattern would be bust 86, waist 65, hip 91
T or F
11. A millimeter is about the width of a dime
T or F
12. A centimeter is about _____

the width of your pinky
fingernail T or F

13. A meter is a little longer than a yard
T or F
14. A kilometer is about $2\frac{1}{2}$ times around a running track T or F
15. A 103 lb. woman would weigh 206 kg T or F
16. The U.S. expects to be a total metric nation by 1980 T or F

Part III: List 5 items that you have seen in the marketplace or have experienced in everyday life that have changed to metrication.

LESSON I

The U.S. is actively involved in a metric conversion. Consumers, industry, government, etc., hold and display many different attitudes and concerns regarding the transition to the metric system. These attitudes, whether they are negative or positive, affect the utilization and acceptance of the metric system. The activities suggested for this lesson are designed to help you understand the reasons why and the need for a metric America.

Component Idea

General knowledge of the history and background for a metric America.

Objective

Given the history and background of the U.S.'s impending change to metrication, you will be able to list several reasons why the U.S. is converting to the metric system and be able to summarize the events which have led the U.S. to a metric conversion.

Instructions

Complete activities 1 and 2 and as many additional readings as necessary for you to comprehend the reasons why and the historical events which have led the U.S. to a metric conversion.

Learning Activities

1. Teacher presentation of the metric system's history in the U.S.
 2. View and discuss the filmstrips "History of the English System" and "History of the Metric System".
- Discussion Questions:
- a. Summarize the historical events that have led the U.S. to a metric conversion.
 - b. Discuss the advantages of the metric system in regard to: world trade, uniform system, decimal system, easier to multiply and divide, consistent vocabulary.

- c. Determine which system of measurement is more advantageous to the U.S. and explain why.
 - d. Discuss how and why an improved system of measurement would be more beneficial.
3. Additional readings as deemed necessary to comprehend the U.S. move to metrication.

Self-Test

If you can answer the above questions confidently and without looking back at references or notes you are ready for Lesson II.

LESSON II: Metric Awareness

The metric system is here to stay and is becoming increasingly evident in the marketplace. Consumer awareness of a metric transition will provide the consumer with an added incentive to accept and learn the metric system.

Component Idea

Awareness of the impending change to metrication and how it relates to one's everyday way of life.

Objective

Given an introduction and background to the metric system you will identify 10

items in the marketplace that have changed or are using dual measurement designations.

Instructions

Complete activities 1,2,3, 4,5,6, and as many additional activities necessary for you to become aware of the U.S.'s impending change to metrication.

Learning Activities

1. View and discuss the film-strip "Measuring Metric in Fashion Merchandising".
2. Show examples of products currently in the marketplace using metric units. Compare those products against similar items measured in customary units, determine any differences in the product.
3. Have a store representative speak on incorporating metrics into their business structure and how metrics has affected their business.
4. Take a field trip to a place having large quantities of metric materials available.
5. Visit a grocery and a clothing store and see how many different metric units are used.
6. Design a bulletin board or a metric awareness corner and display metric products, articles, tools.

7. Make a collage illustrating Celsius temperature, length, volume and mass/weight.
8. Create a metric display at the library, a clothing or grocery store.
9. Find a food ad and change the ad to metrics.
10. Design your own metric windshield flyer, bumper sticker, door knob flyer, etc., for distribution.
11. Design a metric fact button.

Self-Test

Identify 10 items in the marketplace that have changed or are using dual metric measurement designations.

LESSON III: Metric Measuring

The metric system of measurement is a simple system to use. It is an easier system to use than our customary system of inches, feet and yards. Learning the metric system will not be as difficult as you think. By learning only 10 words you can use metric units well enough for routine activities.

Component Idea

Receive general knowledge of the following metric measures: volume, weight/mass, temperature and length. General knowledge will include terminology, prefixes, approximate

size of unit, abbreviations, measurement activities, and values.

Objective

Given the general knowledge of the following metric measures: volume, weight/mass, and temperature you will be able to score 90% on an exam which will test terminology, prefixes, approximate unit size, abbreviations, measurement activities, and values.

Instructions

Complete the following activities and consult your instructor regarding any additional activities and readings as necessary for you to comprehend metric measuring. The books Thinking Metric and Meet the Meters will provide you with additional readings and learning activities.

Learning Activities

Part I: Background Information

1. View and discuss the film "A Metric America".
2. View and discuss the film "Meters, Liters, and Kilograms".
3. Teacher presentation on: common metric units, terminology, prefixes, symbols, meanings and values, the decimal

system relationship, relationship of metric units to customary units, comparison of metric measuring tools to customary measuring tools, and the difference between soft and hard conversions.

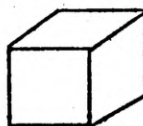
Part II: Volume

The liter is the basic unit of measure for volume. One liter is 1 quart plus a bit leftover for kitty to have a saucer of milk. The liter is used to measure liquid.

1. Compare a liter of water with a quart of water.
2. Fill a soda can with water. Pour into a beaker. How many millimeters is it?
3. Pour what you believe is 1, 2, 5, 15, and 25 mL of salt. Measure for accuracy using metric measuring spoons. Compare amounts to customary measuring tools.
4. Pour what you believe is 50, 125, and 250 mL of salt. Measure for accuracy using metric measuring cups. Compare amounts to customary measuring cups. Make the same comparison using 25, 100, and 200 mL.
5. Measure the following volumes: a glass of water, a cup of coffee, a pint of milk, a quart of juice, a gallon of milk, a teaspoon of vanilla, and a tablespoon of baking powder.

6. With a 30 cm ruler, determine the volume, in cm^3 , of the cubic container. Volume = length x width x height.

length = _____ cm
width = _____ cm
height = _____ cm
volume = _____ cm^3



7. Prepare a simple recipe using metric measures and measuring tools.
8. Create a volume bulletin board using examples of the metric measure, the liter.
9. Suggest something that you can associate each of the following volumes to: 1000 mL, 15 mL, 500 mL, 1 L, 4 L, 250 mL, 1 mL, 0.25 L, and 0.5 L.

Part III: Mass/Weight

The basic metric unit for mass is the gram. A gram is about the weight of a large paper clip. The gram replaces the ounce and the pound. A kilogram weighs a little more than 2 pounds.

1. Weigh yourself on a metric scale.
2. Form a mass of clay into a ball and guesstimate 1 kg. Weigh the mass and restructure the clay to weigh 1 kg. Do this

activity again, using 4 and 7 kg masses.

3. Guesstimate and then weigh the following items: bag of onions, bunch of bananas, box of nails, potatoes, handful of peaches.
4. Match the correct answer: a 6 pack of soda, heavy weight wrestler, an average woman, a turkey, and a liter of milk.
125 kg, 9 kg, 60 kg, 2.5 kg, 1000 kg, 200 kg, and 1 kg.
5. Fill in the blank by determining the following weights in grams: 250 mL of water, 1000 mL of water, 250 mL of dry beans, 125 mL of sugar, 5 mL of rice, and 15 mL of flour.

Part IV: Temperature

Celsius is the basic unit for measuring temperature. Water boils at 100°C and freezes at 0°C . Normal body temperature is 37°C .

1. Determine the following metric measurements: coldest temperature last winter____, room temperature____, normal body temperature____, today's outdoor temperature____, water boils at____, temperature for baking a cake is____, temperature for warming food is____.
2. Fill in the blank by suggesting a description for each temperature:

0°C , -40°C , 20°C , 100°C ,
 150°C , 40°C , 10°C .

Part V: Length

The metric unit for length or distance is the meter. A meter is a little longer than a yard, approximately $3\frac{1}{2}$ inches longer. Most door knobs are 1 meter high.

1. Determine your height in ____ cm and ____ m.
2. Measure the following items: length of a piece of typing paper, a pen, length of your pace, width of a fingernail.
3. Measure the dimensions of the floor by measuring with a 50 m tape measure.
____ m x ____ m
4. Guesstimate then measure the following: height of a door, height of ceiling, width of door, height of chair, length and width of a table.
5. Determine the distances between cities. (scale map attached) Boston to Chicago, New York to Seattle, Los Angeles to Boston, Dallas to Chicago.

Self-Test

Complete the attached worksheet "A Metric Search". If you can complete the puzzle confidently go on to Lesson IV.

C E N T I G R A D E Q U S L I O B
 K E T R A D E L V F I L M S N O T
 T J N S R E T E M O L I K T D I R
 R P S T G C U S T O M A R Y C L A
 A P U C I I T W L P S I T W M P U
 C E I B D M O R E D E C I M A L Q
 K L S E Z E E R F I R S A O I D L
 G S L P U T H T F B S R E T E M B
 T N E Q S E S S E X I F E R P J O
 H E C T A R E S M R F R A N C E G
 O V M A E S O A V N S G R A M L K

1. The system of weights and measurements traditionally used in this country is now called the _____ system. (9)
2. The metric system is based on the _____ system, or units of 10. (7)
3. The country in which the metric system was developed during the second half of the 18th century. (6)
4. The abbreviation for International System of Units which is used to differentiate between modern and obsolete forms of the metric system. (2)
5. Probably the first sport in this country that will go completely metric will be _____ and field. (5)
6. The main reason we are converting to metric in this country is to help our nation's export and import business and our balance of _____. (5)
7. In the metric system, _____, such as kilo, deci, milli, and centi, are used to designate multiples and submultiples of the basic units. (8)
8. For years we have been using metrics for familiar items, such as milligrams (mg) for vitamins and millimeters (mm) for _____. (4)
9. Instead of measuring fabric length in yards, we'll measure it in _____. (6)
10. Soon 1.5 cm will replace 5/8 inch for _____ allowances in sewing. (4)
11. Instead of miles per hour, speeds will be measured in _____ per hour. (10)
12. One meter equals 10 _____. (10)
13. Instead of measuring fabric width in inches, you'll be measuring it in _____. (11)
14. _____ will be used in land measurement instead of acres. (8)
15. The basic metric measurement for volume is the _____. (5)
16. A metric _____ will hold 250 milliliters. (3)
17. A liter is a little more than a _____. (5)
18. The basic metric measurement for mass or weight is the _____. (4)
19. Heavy weights are measured in the metric _____, which is equal to 1000 kg. (3)
20. A kilogram is slightly more than _____ pounds.
21. Temperature will not be recorded in Fahrenheit but in degrees _____. (7)
22. Normal _____ temperature is 37°C. (4)
23. Water _____ at 100°C. (5)
24. Water _____ at 0°C. (7)
25. _____ is a metric term that is being changed to Celsius to honor the inventor, Anders Celsius. (10)

LESSON IV: Metrics in Clothing Construction

The apparel industry has an excellent opportunity to improve fit and better satisfy the consumer when it converts to the metric system. Current apparel standards are based on very old data and do not reflect the size of the current population. A change to the metric system will improve garment fit. A consumer education program is imperative to help the consumer overcome the resistance to change.

Component Idea

Provide an in-depth training and "hands on" learning experiences relating length to clothing construction.

Objective

Given an in-depth training and "hands on" learning experiences relating length to clothing construction you will be able to construct a satisfactory garment which utilizes only the metric system of measurement.

Instructions

Complete the following activities and consult your instructor regarding any additional activities and readings as deemed necessary for you to compre-

hend metric measuring in the area of clothing construction.

Learning Activities

1. Teacher presentation and discussion on clothing construction metric reference sheets.
2. Research how clothing is sized in other metricated countries.
3. Take a field trip to a clothing and sewing store and determine the amount of metrication that has taken place. Record your findings.
4. Shop for wearing apparel or sewing items which carry labels or descriptions in metric terms. Report findings.
5. Collect objects commonly used for sewing and measure those items with metric measuring tools.
6. Determine whether or not any sewing tools or machine parts will be obsolete for sewing in metric. If yes, what items will change?
7. Take your metric measurements: height, weight, foot size, head circumference, bust or chest, waist, hips, backwaist length, neck, inseam, sleeve.

8. Determine your pattern size.
9. Select a pattern, material and supplies and compute fabric requirements in either meters or centimeters.
10. Determine what notions are needed to complete the garment. Compute in metric measurements.
11. Construct a metric garment using only metric measurements. Record as you go what and how you metrically measured.
12. Organize a metric fashion show with completed garments.
13. Create a metric "Neater by the Meter" bulletin board for the classroom.
14. Display metric signs and labels in the classroom, measuring the height of the door, table width, etc.
15. Create a metric "Neater by the Meter" poster or display for a fabric store.
16. Determine and list what metric materials and tools you'll need to continue sewing metrically.

Self-Test

If you can successfully achieve the above learning activities you have accomplished the goal of learning how to apply the metric system to clothing construction.

POST-TEST

When you feel you have attained the objective of all the lessons ask your teacher for the post-test. When you have completed the test return it to your teacher so that she may review it with you.

Quest

If you are interested in further study of the metric system, explore one or more of the following activities. If you'd like to pursue an activity not listed here consult your teacher.

1. Apply metrication to other areas of daily measurement. For instance, baking, computing distances, temperature conversion, and weighing objects.
2. Develop a metric resource center and develop a list of available metric supplies.
3. Promote a "Think Metric" campaign by encouraging metric awareness. Ideas: displays, newspaper, T.V.
4. Declare a "Metric Day", do everything metrically.
5. Encourage radio, news, T.V., etc., to use metrics in weather data, etc.

LESSON KEYS

Lesson III - Part II

1. liter
2. 500 mL
5. a. 250 mL or 0.25 L
b. 250 mL or 0.25 L
c. 500 mL or 0.50 L
d. 1000 mL or 1 L
e. 4 L
f. 5mL
g. 15 mL
6. a. length = 1 cm
b. width = 1 cm
c. height = 1 cm
d. volume = 1 cm³
9. a. 1 quart
b. 1 tablespoon
c. 1 pint
d. 1 quart
e. 1 gallon
f. 1 cup
g. tip of smallest finger
h. half-pint or 1 cup
i. 1 pint

Part III

4. a. 2.5 kg d. 9 kg
b. 125 kg e. 1 kg
c. 60 kg

Part IV

1. a. 0°C d. 100°C
b. 20°C e. 150°C
c. 37°C f. 125°C
2. a. freezing
b. a very cold day
c. room temperature
d. boiling point for water
e. cooking temperature
f. a very hot day
g. a cool day

Part IV

2. a. 28 cm
b. approximately 13 cm
d. 1 cm
5. a. 1569 km c. 4911 km
b. 4672 km d. 1506 km

Self-Test Key- Lesson III

1. customary
2. decimal
3. France
4. SI
5. track
6. trade
7. prefixes
8. film
9. meters
10. seam
11. kilometers
12. centimeters
13. meters
14. hectare
15. liter
16. cup
17. quart
18. gram
19. kg
20. two
21. Celsius
22. body
23. boils
24. freezes
25. Centigrade

Summary

The procedure presented in the learning package was for the purpose of teaching the adult learner the basic concepts of the metric system in the area of clothing construction. The design of the learning package focused on learning the metric system in context with the past and present experiences in which the adult was actively involved. The "hands on" and think metric approach to learning metrification was incorporated into the learning package. Metric learning activities were designed to develop and reflect the positive attitude necessary for the acceptance and adoption of the metric system.

The format for developing the learning package was outlined by the American Home Economics Association. The learning package included the following information: content outline, pre-test, learning objectives, metric clothing lessons, metric learning activities, materials needed, resource list, and a post-test. The first lesson provides the student with the general knowledge of the history and background for a metric America. The second lesson is an awareness of the impending change to metrification and how it relates to one's everyday life. Lesson

three provides the student with the following general knowledge on volume, weight/mass, temperature, length, terminology, prefixes, unit size, abbreviations, metric activities, and values. Lesson four provides an in-depth training and "hands on" learning experiences relating to clothing construction. Objectives from the affective, cognitive, psychomotor, and comprehensive levels were selected to convey the expected performance of the desired behavioral outcomes. A post-test, self-tests, and pre-test are included to help the learner assess their learning outcome.

CHAPTER V

SUMMARY

Metrication became inevitable in 1975 when Congress unanimously passed the Metric Conversion Act. The major provisions of the bill provided no specific timetables for conversion, voluntary participation, a Metric Board, conversion costs, and adaptation of the metric system as the predominant system of measurement units. The metric report further recommended that the United States change to the international metric system through a coordinated national program over a ten-year period. By the end of that time, the United States would be predominantly a metric nation.

Studies indicate that the greatest transition problem to metrication would be the psychological difficulty of adjusting to something unfamiliar and different. Much of the resistance to conversion stems from a lack of information and education regarding metrication. The more people know about metrication, the more people are in favor of its adoption. Education of youth and re-education of adults is needed to make the transition to metrication with relative ease.

When the apparel industry converts to the metric system, this industry will be better able to satisfy

their consumers with standardized sizing, better fit, and labeling. At present, clothing standards are based on very old data that does not reflect the size of the current population. When new data standards are available and as industry is changing, a change to metrication would be a logical and beneficial change for consumers.

In the United States, the current use of the metric system in education is limited and will be until the American population is totally immersed in a metric environment. Until then, the American population will be handicapped in learning the metric system. The most effective teaching of metric measurement will only be when the metric system is adopted and incorporated into the daily pattern of life.

Adult education programs are needed to familiarize and teach the adult the pragmatic use of the metric system. The intent of such a program should be to teach adults the basic concepts of the metric system by using a practical, "hands on" approach. For educators to maximize the effectiveness of adult learning, teachers need to consider the following conditions for learning:

1. The learner feels a need to learn.
2. The learner is supported by the learning environment.

3. The learner perceives the goals of the learning experience as his goal.
4. The learner accepts a responsibility in the planning process.
5. The learner learns by doing.
6. The learner learns through past and present experiences.
7. The learner senses progress toward the goal.

Learning, unlearning, and relearning a new system of measurement is an enormous chore for the consumer. Previous to a change to metrication, an extensive education program is needed to re-educate the consumer.

The purpose of this project was to design an adult learning package using metrics in the area of clothing construction. The information to design the learning package was collected through a review of the literature and from critiques by a total of five experts in the field of metrics, education, and clothing. The literature was reviewed in these areas: historical development of metrics in the United States, the great metric controversy: what does it mean?, consumer knowledge and attitudes, advantages of metrics as it relates to clothing, educational implications, principles of adult learning, and metrics as it relates to the adult. The organizations and businesses contacted were: McCall Pattern Company, The American Home Economics Association, The American

National Metric Council, Butterick Pattern Company, and the United States Metric Association, Inc.

The format for developing the learning package was outlined by the American Home Economics Association. The learning package includes the following information: content outline, pre-test, learning objectives, metric clothing lessons, metric learning activities, materials needed, resource list and a post-test. The first lesson provides the student with the general knowledge of the history and background for a metric America. The second lesson is an awareness of the impending change to metrification and how it relates to one's everyday life. Lesson three provides the student with the following general knowledge on volume, weight/mass, temperature, length, terminology, prefixes, unit size, abbreviations, metric activities, and values. Lesson four provides an in-depth training and "hands on" learning experiences relating to clothing construction. Objectives from the affective, cognitive, psychomotor, and comprehensive levels were selected to convey the expected performance of the desired behavioral outcomes. A post-test, self-tests, and pre-test are included to help the learner assess their learning outcome.

Suggestions and Recommendations

Based on the experience of designing this learning package, the following suggestions and recommendations were made:

1. There is a lack of written subject matter information, resources, and media available in the area of metrication. This indicates a need to develop additional learning packages that can be used in courses other than clothing construction such as nutrition, housing, etc.

2. Instructors of metrication need in-service training in order to successfully plan, implement, and evaluate relevant adult metric education programs.

3. In light of the fact that students learn best through the "hands on" approach teachers need to utilize this approach when working with adults.

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