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ABSTRACT

This guide was written to aid home economics teachers in developing a greater understanding and use of basic skills in the home economics curriculum. The objectives of this guide are (1) to expand the awareness of underlying mathematics and science principles in the consumer and vocational home economics curriculum and (2) to provide a bank of resources to give teachers a practical and useful base from which to launch their own basic skills instruction. The curriculum guide, structured around the Montana Scope and Sequence, is divided into the curriculum areas of child development, family life, clothing and textiles, foods and nutrition, consumer education, and housing and home furnishings. Objectives and page numbers corresponding to the Scope and Sequence are noted on the top of each page. Science and mathematics concepts, competencies, learning activities, and instructional resources are numbered under each objective. (KC)

SCIENCE AND MATH ACTIVITIES AND RESOURCES

FOR TEACHING HOME ECONOMICS

(S. M. A. R. T.)

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SCIENCE AND MATH ACTIVITIES AND RESOURCES FOR TEACHING HOME ECONOMICS

The roots of home economics have long been interwoven with scientific or mathematic principles. At its very conception, home economics was described by Ellen Richards to be "the utilization of resources of modern science to improve the home life." Catherine Beecher, too, stressed that the application of science was essential to good teaching in the field of home economics. Now, the recent "Back to Basics" movement has brought renewed interest in fostering math and science learning through practical application in home economics classes.

The Vocational Home Economics Education Coalition Statement "A Quest for Quality: Consumer and Homemaking Education in the 80's" stated that although consumer and homemaking classes do not teach singly all basic skills, the "programs do serve as a vital segment of the whole education system in bringing basic skills, principles, and theories to life for students in their quest for independence."[1] These basic skills become critical as our society becomes increasingly more complex. Home Economics classes can give practical meaning to the basic skills movement. Math or science can come alive when students perceive them to be useful skills for everyday living. As Moxley (1984) stated, "One gains both greater understanding and utilization of the basic disciplines when they are applied with one's own life."[2]

SMART Home Economics (Science and Math Activities and Resources for Teaching Home Economics) was written to aid teachers in developing a greater understanding and utilization of the basic disciplines. The objectives of this curriculum guide are to a) expand the awareness of underlying math and science principles in the consumer and vocational home economics curriculum and b) provide a bank of resources to give teachers a practical and useful base from which to launch their own basic skills instruction.

SMART, structured around the Montana Scope and Sequence, is divided into the curriculum areas of Child Development, Family Life, Clothing and Textiles, Foods and Nutrition, Consumer Education, and Housing and Home Furnishings. Objectives and page numbers corresponding to the Scope and Sequence are noted on the top of each page. Science and math concepts, competencies, learning activities, and instructional resources are numbered under each objective so Concept 1. relates to Competency 1., Learning Activity 1. and Instructional Resource 1.

[1]The Vocational Home Economics Education Coalition (1985). A Quest for Quality: Consumer and Homemaking Education in the 80's. Home Economics Education Association, Washington, D.C.

[2]Moxley, V.M. (1984). Home economics at risk. Illinois Teacher of Home Economics, 28, 46-48.

The learning activities and resources presented are by no means the only ones which should be taught. Indeed, you will have fun discovering many more as you develop your own units! The science and math principles that are commonly integrated into most home economics curriculums (ie. consumer problems dealing with interest rates and mortgages, sexual education and physical development) have not been expanded upon in this guide due to the ease of finding information in textbooks and other resources.

The learning experiences are not designed to stand alone, but rather are to be incorporated into a unit or lesson plan which would provide background information via lecture, readings, audio-visuals, discussion, etc. Due to space limitations and copyright laws, only a concise description of most activities was possible. A reference has been listed to give you more detailed directions. Several worksheets, indicated by an * in the Instructional Resources section, have been included in the appendix to get you started. A short reference list of other easily obtained resources may be found at the end of the guide.

And now, do something smart for yourself and your students:

a) Incorporate some of the activities of SMART into your curriculum,
b) Inform your principal, school board, and parents on what a smart curriculum you are teaching (some schools even give math and science credit for home economics classes!) and
c) Provide us feedback on how you used SMART in your classroom by completing the evaluation form enclosed. If you have any "smart" ideas of your own that you would like to share, please send those as well!

Child Development

Child Development
Level I (S.S. 1)

Objective I. B. Identify developmental stages of early childhood.

Math Concepts: Solve real world problems involving averages of whole numbers.

Math Competencies: Determines averages related to characteristics of the newborn baby.

Learning Activities:

1. Complete the Pretest.
   a. Observe a teacher demonstration on how to add and average heights and weights of a sample group of ten newborn babies.
   b. Bring into class individual birth weight and height to write on a class chart.
   c. Find average class birth weight and height.
   d. Find the average heights and weights of girls and the boys in the class.
   e. Obtain a list of birth weight/heights of newborn babies born during the last several months at a local hospital. Make comparisons with the class averages.
   f. Complete the Post-test.

Instructional Resources

*1.-7. Height and Weight Activity. Pretest/Posttest from Crabtree, Myrna, Teacher's Guide for Home Economics Curriculum Competency Based Modules for Integrating Basic Skills in Reading, Writing and Mathematics, Florida State University.

Child Development
Level 1 (S.S. p. 1)

Objective II. C. Explore Job Procurement Skills

Math Concepts:
1. Mean, median, range
2. Solve real world money problems using multiplication and division.

Math Competencies: The student will
1. Find the mean, median and range of current wage for babysitting in the community.
2. Determine number of hours of babysitting wages needed to purchase desired money goal.

Learning Activities:

1. Survey community and find out current wage rate for babysitting. Identify mean, median and range of babysitting wages for community.

2. Set personal money goal (item to save money for) and compute # of hours of babysitting needed to satisfy goal.

Child Development
Level II (S.S. p. 2)

Objective I. A. Identify personal development characteristics.

Math Concepts: Solve measurement problems.

Math Competencies: The student will determine elapsed time between birth and specific development tasks.

Learning Activities:

1. Complete the Pretest.

2. Use Instruction Aid, The Baby Book, to make your own baby book. Fill out the baby book forms with the average ages of developmental tasks (physical, social and intellectual). Reproduce the baby book pages. Note that this exercise in physical development will to provide the student with practice in the mathematical skill of determining elapsed time between events. Each page can be folded in half and put together to form a booklet. The blank sides of the page can be filled in by the students to include a cover, baby pictures, family pictures or other information which normally makes up a baby book. Footprints can be made by pressing the side of your fist into a stamp pad and then onto the page. Toes are made with fingertips held tightly together. Additional pages can also be added to supplement other concepts being taught in this unit on Child Development, including immunizations, diseases, social development and intellectual development.

3. If possible, bring in personal baby book or one of a family member. Otherwise, work with a classmate who brings in a baby book. On a sheet of paper, note the dates recorded in the book and note the significance of each date. Then compute the elapsed time between each date and the date of birth.

4. Complete the Post-test.

5. Play game "Ages & Stages" to identify the stages of development.

Instructional Resources:

1.-5. Instructional Aids from Teacher's Guide for Home Economics Curriculum Competency Based Modules for Integrating Basic Skills in Reading, Writing and Mathematics, Crabtree, Myrna, Florida State Department of Vocational Education

6. Ages & Stages, Forecast for Home Economics, December 1981, p. 38-40.

Child Development
Level II (S.S. p. 2)

Objective I. B. Determine economic considerations important to parenting readiness.

Math Skill: Solve real-world problems involving addition and subtraction.

Math Competencies: The student will compute the costs of having a baby.

Learning Activities:

1. Research the costs of raising a child. Using national cost figures for food, housing, and other budget items, figure out what salary you would like to earn to comfortably afford having a child.

2. Assign different students to research the costs of child care such as food, clothing, schooling, insurance, health care.

3. Complete a Diapering Cost Comparison Project.

Instructional Resources:

3. Proctor and Gamble. Diapering Cost Comparison Project. Cincinnati, Ohio: Proctor and Gamble Co., P.O. Box 14009, 1978.

Child Development
Level III (S.S. p. 4)

Objective III. B. Investigate costs and financial obligations related to childbirth.

Math Concepts: Solve real-world problems using addition; graphs

Math Competencies: The student will compute the costs and financial obligations related to childbirth.

1. a. Compute the minimum costs of having a first baby and caring for it for the first year. Have students complete "Cost of Raising a Child".
   b. Research the costs of having a baby including doctor, check-ups, hospitals, equipment, insurance, etc. Compute percentages and make graphs for exhibit.

2. Assign different students to research the costs of child care such as food, clothing, schooling, insurance, health care.

3. Prepare a bulletin board "The Bird with the Biggest Bill" to exhibit costs of having children.

Instructional Resource

*1. "Cost of Raising a Child", Teaching Strategies in Reading, Writing, and Mathematics for Home Economics Education, Dept. of Vocational-Technical Education, Oregon State University, Corvallis, OR

3. "Bulletin Board Ideas", Forecast, March 1984

Child Development
Level III (S.S. p. 5)

Objective III. E. Identify related decisions in preparation for childbirth.

Math Concepts: Solve real-world problems using addition, multiplication, comparisons, and graphing.

Math Competencies: The student will compute the cost of different feeding formulas for the first year of life and make a graphic exhibit.

Learning Activities:

1. Find the approximate amounts of different foods needed by an infant to meet his/her nutritional needs. Then compute the cost to feed a child for one year.

2. Research the costs of various types of feeding formulas for babies. Compare the costs and nutrients and make a graph of the findings.

Instructional Resources

1. "Take a Close Look at Baby Foods", Professional Communications Dept, Gerber Products Company, Fremont, Michigan 49412.

   "Infant Feeding: Nutrition for Healthy Babies", Cooperative Extension, Montana State University, Oct. 1981, Circular 1219.

Child Development
Level III (S.S. p. 8)

Objective XI. B. Conduct an effective child care program.

Math Concepts: Demonstrate utilization of math concepts to others.

Math Competencies: Teach beginning math concepts to preschool children.

Learning Activities:

1. Develop math activities for preschool children. Use activities in child care program.

Instructional Resources:

1. Beasley, Georgia Blair, An Activities Handbook for Child Care Math, Research & Curriculum Unit for Vocational-Technical Education, Mississippi State, (ERIC ED 189392)

   Other materials are available from the Math-Science Teacher Resource Center, 126 Reid Hall, Montana State University, Bozeman, MT 59717.

Objective II. C. Identify hereditary and environmental influences on the unborn child.

Science Concepts: Genetics: Dominant and Recessive Genes, Sex-linked traits.

Science Competencies: The student will identify dominant and recessive genes and sex-linked traits in their families.

Learning Activities:

1. Draw family pedigrees to show inheritance of a trait caused by a dominant gene.

   Draw a family pedigree to show how sex-linked traits are inherited.

Instructional Resources:

Other related materials may be obtained from your local chapter of the March of Dimes and Healthy Mothers, Healthy Babies.

Child Development
Level II (S.S p. 2)

Objective III. A. Define characteristics of physical growth and motor development at each stage.

Science Concepts: Vaccines and immunizations

Science Competencies: The student will understand how vaccines work to produce immunity.

Learning Activities:

1. Complete a unit on immunization to learn what kinds of immunizations are necessary, appropriate age for immunization, how they work, and what risks are involved.

Instructional Resources:

1. Immunization: The Need for Action, P.O. Box 1400K, Dayton, Ohio. Cost: $3.00. (includes duplicating masters, filmstrip, and game).

Clothing and Textiles

Clothing and Textiles
Level II (S.S. p. 11)

Objective I. A. Describe the ways in which fibers, yarns and fabrics are constructed.

Math Concepts: Measuring, Counting, Comparison Problems,

Math Competencies: The student will perform thread counts on various fabrics.

Learning Activities:

1. Measure and mark off 1" squares of different fabrics. Use a magnifiying glass and count threads in each direction. Compare the characteristics and appearance of the fabric with different thread counts. How does thread count affect appearance, durability, and cleaning?

Clothing and Textiles
Level I (S.S. p. 10)

Objective II. C. Adapt construction techniques to project.

Math Concepts: 1. Concurve and Concave Curves, Costs & Savings Problems
2. Geometric Figures
3. Parallel and perpendicular lines
4. Measuring Techniques, Right angles
5. Using a ruler

Math Competencies: The student will:
1. Understand convex and concave by using both types of curves in a sewing project.
2. Identify the geometric shapes used in a sewing project.
3. Use parallel and perpendicular lines in layout procedures.
4. Utilize measuring techniques to make a pattern for a sewing project.
5. Accurately measure using a ruler.

Learning Activities:

1. Construct stuffed animals (such as frogs) which utilize both concave and convex curves. Demonstrate techniques of fitting curves and sewing curves. Calculate your costs in making the toy and compare this cost with what it would cost to buy the toy.

2. Trim t-shirts using appliques of different geometric shapes. For instance, design a disco shirt using a circular record with grooves. Use a compass to draw a perfect circle. Meaure the diameter to calculate how large a fabric scrap is needed.

3. Demonstrate the use of parallel and perpendicular lines in pattern layout.

4. Construct a pattern for a sewing project using a diagram or written instructions instead of a commercial pattern Examples of some possible projects include:
   a) Fabric wallets (How to books available in fabric stores)
   b) Wind Socks

Instructional Resources:

1. "Great Projects--Be a Toymaker", Forecast.

2. "Make a Hit" How To's, Coed, Feb 1984, p. 47.

3. Wind Sock, Direction sheet adapted from Lou Stockwell.

4. Ruler Exercise created by Margaret Johnson, Lewis and Clark Junior High, Billings, MT 59102.

Clothing and Textiles
Level II (S.S. p. 11)

Objective II. C. Plan wardrobe through needs assessment and garment coordination.

Math Concept: Drawing circles and measuring diameter; Probability

Math Competencies:
1. The student will make a wardrobe wheel by drawing different size circles and rectangles.
2. The student will figure out how many different combinations are possible from his/her wardrobe wheel.

Learning Activities:

1. Make a Wardrobe Wheel: Cut out different size circles (7", 17", 26" diameter) from cardboard. Fasten the circles together having the smallest circle on top with a paper fastener. Place a picture of an article of clothing in the center. Arrange other pictures of garments that coordinate with the first picture on the surrounding circles. For example, on the center circle place a pictures of a top (blouse, jacket, shirt, dress). The next circle could show bottoms (skirt, pants, shorts) and the next layer accessories. By turning the circle wheels, you will find how many different combinations can be made around the center garment.

2. Compute how many combinations are possible from the wardrobe wheel. List the possible combinations.

Instructional Resources:

1. Clothing: Image and Impact, Palo Alto: Southwestern Publishing Company, 1983.

Clothing and Textiles
Level II (S.S. p. 12)

Objective III. A. Select a pattern for individual type and size.

Math Concepts: Metric Measurements

Math Competencies: The student will take body measurements in metric.

Learning Activities:

1. Use metric units to find body measurements. Record measurements on a sheet which compares metric to English measurements. Read pattern envelope which gives both metric and English measurements.

Clothing and Textiles
Level II (S.S. p. 11)

Objective I. A. Describe the ways in which fibers, yarns and fabrics are constructed.
B. Coordinate fabric with design and function

Science Concepts: 1. Fiber Identification--natural vs. synthetic

Science Competencies:
1. The student will be able to identify different fibers by using burning, chemical and microscopic analysis techniques.
2. The student will identify important properties of different fibers and fabrics, and finishes.
3. The student will apply fabric knowledge in a fabric swatch game.
4. The student will research specialty fibers and fabrics and their production, use and care.

Learning Activities:

1. Demonstrate how to identify natural from synthetic fibers. American Wool Council has information on wool fibers and fabrics. Use a textile laboratory manual to identify specific tests for fabrics.

   Have students test various fabric swatches by
   a. burning
   b. applying chemicals (i.e. acetone to test acetate)
   c. using a microscope

   Research the manufacturing processes. Information may be obtained from the American Textile Manufacturers Institute.

   Have the chemistry instructor demonstrate how synthetic fibers are made. Rayon and nylon can be made in the chemistry lab. (See The Chemical World, p. 41, Chemistry of Common Substances or other chemistry text for instructions.)

2. Have students design experiments to test the durability, absorbancy, resiliency, wrinkle-resistance and other properties of fabrics.

   Test tensile strength of thread using the directions on p. 283, The Chemical World. A bucket suspended on the thread is attached to a ring stand. Weights are added to the bucket until the thread breaks. The mass of the weights will indicate the strength of the threads. Compare the strength of wet threads with dry threads. Devise an experiment to test the tensile strength of fabric samples.

Test absorbancy, wrinkling, construction, and colorfastness by
a) soaking 6" fabric squares for 3 minutes in baby jars filled with water. Time how long it takes to dry the samples with a hair dryer.
b) Wadding sample in hand for 1 minute. Record the appearance on your chart.
c) Try to remove a thread. Does it ravel?
d) Tear the samples Record how the fabric reacts.
e) Cut 2" square. Place in baby food jar and cover with bleach. Let set overnight. Rinse and dry the samples. Compare with the unbleached fabric sample. Record the changes.

Research the processes for making fabric stain-resistant and flame-retardant. Test different fabrics for these properties. Where is each finish needed?

3. Play the Swatch Shop Game to understand factors to consider in choosing fabric and notions for a project.
4. Examine specialty clothing such as lycra sports tights to see how technological advances in textiles can affect everyday life. How has space research affected fabrics? Have students research fibers such as Armalon, Beta, Fyrel, Kapton, Mylar, and Teflon.

Read "Why Olympic Clothes Can Be the Secret to Olympic Success". How can clothing affect physical performance? What advances have there been in ski and outdoor clothing (thinsulate and insulation, silver linings, goretex, etc.)? Discuss how these speciality fabrics are produced, (origin, process, how they function, etc.)

Instructional Resources:

1. Darlington, C. LeRoy & Neal D. Eigenfeld, The Chemical World, Houghton-Mifflin Company, 1977. Available on loan from the Math-Science Teacher Resource Center, 126 Reid Hall, Montana State University, Bozeman, MT 59717.

"Made in U.S.A.: The Story of How Textiles are Crafted With Pride in the U.S.A." and other materials, American Textile Manufacturers Institute, Inc, 1101 Connecticut Avenue, N.W., Suite 300, Washington, D.C. 20036.

Wool Education Center, American Wool Council, 200 Clayton Street, Denver, CO 80206.

3. Swatch Swap, Forecast, p. 37, Sept 1984.
4. "Why Olympic Clothes Can Be the Secret to Olympic Success", Coed, May 1984, p. 38-41.

Check sports magazines such as Bicycling, Skiing, and running magazines for speciality ski clothing, cycling clothing, rainy weather clothing, etc. Catalogs from REI, P.O. Box C-88125, Seattle, WA 98188-0125 and Early Winters, 110 Prefontaine Place South, Seattle, WA 98104 often have descriptions of specialty fabrics and construction features.

Clothing and Textiles
Level II (S.S. p. 12)

Objective I. B. Coordinate fabric with design and function.

Science Concepts
1. Color and its effect on light, warmth, mood
2. The effect of fibers and fabrics on heat

Science Competencies:
1. The student will understand what makes color and the effects of color on light reflection and absorption, warmth, and mood.

2. The student will be able to relate what makes fibers and fabrics warm or cool.

Learning Activities:

1. Have students learn the origin of colors. Have students mix colors with water color paints to show how colors are produced. Discuss the color wheel.

   Experiment with the light absorbency and reflective qualities of color. How can this be applied to their use?

   Research how color affects mood.

2. Relate texture and fabrics to warmth and coolness. How can fabrics and fibers be used to trap heat? Discuss layering, reflective fabrics, loft, moisture absorbency and other factors related to keeping warm.

Clothing and Textiles
Level II (S.S. p. 12)

Objective IV. A. Apply maintenance techniques to problem situations.

Science Concept:
1. Solvents and solutes
2. Effect of cleansing agents on fibers, dyes, and finishes.
3. The chemistry of soaps and detergents; effect of hard water

Science Competencies:
1. The student will understand the use of various solvents in stain removal and cleaning techniques.
2. The student will understand why different fiber, dyes and finishes require different care techniques.
3. The student will discover how soap and detergent are made, how the cleaning action takes place, and how it is affected by hard water.

Learning Activities:

1. Fabric Sleuth. Have students play detectives to find out how to best remove stains of a variety of sources on different types of fabrics. Divide class into groups and give each group different fabric swatches with various types of stains (fruit, blood, ink, egg, alcohol, lipstick, etc.) Have them identify the stain and find the best method for its removal without affecting the fabric. Have students show and report the results to the class.
   Have students devise experiments for the following:
   Experiment with the effect of hot and cold water on stains. Then make a chart to classify which stains should be removed with hot water and cold water.
   Take a field trip to a "dry cleaning" shop. Find out the chemical process of dry cleaning. What chemicals are used? What fabrics can be drycleaned? What fabrics should not be drycleaned? Why?
   What is the difference between chlorine and oxygen bleaches? Have students experiment to find out on what fabrics would you use each type.
2. What is the rationale behind care labels in terms of chemical composition of fibers, dyes, finish, and cleansing agents? Students can devise experiments to test washing/cleaning effects on fibers, dyes, and special finishes. For example, they may investigate what happens to wool when washed in hot water, goretex when washed with detergent, down when drycleaned, flame retardancy after many launderings, etc.

   Experiment with effect of heat or ironing on different fabrics.

   Discuss "static electricity" and how can it be controlled. Identify fabrics which are more apt to have static cling? Demonstrate how fabric softeners can prevent static

electricity.

3. Show how soaps and detergents make water wetter or reduce surface tension enabling it to penetrate fabric faster and more thoroughly.

   Have chemistry class prepare soaps and detergents.

Instructional Resources:

1. Stain Removal Guide and The Latest in Laundry, Maytag Company, Newton, Iowa 50208. Also available is "Laundry Problems of the 80's" for $5.00.

3. "Making Soap" and "Making Detergent", Experiment 55-56, p. 113-115, and "Hard and Soft Water", Experiment 25, p. 49-50. Chemistry of Common Substances, Morristown, N.J.: Silver Burdett, 1979.

   Lots about Laundering, Proctor and Gamble, P.O. Box 14009, Cincinnati, Ohio 45214.

Consumer Education

Consumer Education
Level I (S.S. p. 16)

Objective II. A. Determine quality for cost when selecting fast foods.

Math Concept:
1. Problem solving using addition, multiplication
2. Using a Computer
3. Statistics--Probability

Math Competencies:
1. The student will calculate the cost of making "fast foods" at home and plan a fast food menu to meet their caloric needs.
2. The student will use a computer program to determine number of calories in fast foods and % of certain nutrients.
3. The student will use the probability formula to calculate number of different hamburger combinations available.

Learning Activities:

1. Read "Restaurant Rating."
   a. Have students compute cost of making their favorite fast foods (see page 40 for example). How much more does it cost to eat out?
   b. Have students estimate how many calories they need per day (Weight in pounds X 19 for males or Weight in pounds X 17 for females). Portion the calories into number of meals eaten per day. Then examine the number of calories eaten in the student's favorite fast food meal. (Use the computer program Fast Food or a Calorie Chart of Fast Foods.) If the meal exceeds their allotted number of calories for the meal have them plan a menu of fast foods which would meet their needs.

2. Evaluate fast food meals for calories, Vitamin C, iron, calcium, B vitamins, sodium, and fat. Find out percentages of the Recommended Daily Allowances.

*3. Complete the "Hamburger Mathematics" Exercise to see how many possible combinations are possible from 8 condiments.

Instructional Resources:

1. "Restaurant Rating", CO-ED, March 1984, p. 38-41.

2. Fast Food Micro-Guide, The Learning Seed, 21250 N. Andover, Kildeer, IL 60047

*3. Leyden, Michael, "Hamburger Mathematics", Science Activities, Nov/Dec 1980, p. 6.

Consumer Education
Level I (S.S. p. 16)

Objective: Use labels and unit pricing as guides when shopping.

Math Concept: Problem solving using unit conversion, division

Math Competencies: The student will be able to compute unit pricing in a comparison of stores and container size.

Learning Activity:

1. Complete "Comparative Shopping Craze" a comparative shopping exercise to compare prices of different size containers at different stores.

Instructional Resource:

1. Forecast, Oct. 1984, p. 38.

Consumer Education
Level (S.S. p. 16)

Objective II. C. Select Clothing to Meet Personal Needs

Math Concept: 1. Computers, Budgeting
2. Problem solving using fractions, decimals

Math Competencies: The student will:
1. Use a computer program in learning how to budget his/her clothing budget.
2. Find costs of clothing purchased after discounts.

Learning Activities:

1. Play the "Comparative Shopping Game" to simulate a clothing shopping spree. The game lets you practice smart shopping skills. Directions for inputting the game into the computer are found in the article.

2. Give students sample problems on purchasing clothing and have them calculate discounts and sales tax on purchases.

Instructional Resources:

1. "Comparative Shopping Game," CO-ED, Sept 1984, p. 75-78. Directions are for Apple IIe computer.

2. Crabtree, Myrna, Teacher's Guide for Home Economics Curriculum Competency Based Modules for Integrating Basic Skills in Reading, Writing and Mathematics, p. 141-144, Florida State Department of Vocational Education.

Consumer Education
Level II (S.S. p. 18)

Objective I. B. Demonstrate comparative shopping techniques.

Math Concept:
1. Problem solving using division of decimals, percentage
2. Charts, percentage, problem solving using subtraction of decimals.

Math Competencies:
1. The student will calculate sales tax and unit prices.
2. The student will compare mail order prices to store prices and figure total costs by computing shipping costs and taxes.

Learning Activities:

1. Duplicate master for finding the best buy for personal care products from 3 different types of stores (drug, supermarket and special), Students will also compare size and find cost/oz.

2. Mail-order catalogs. Have students do a comparison project to find out the savings, if any, from mail-ordering. Find the total cost for items which includes shipping charges and sales tax, if applicable.

Instructional Resources:

1. "What's the Best Buy" Forecast, Nov. 1980, p. 4.

2. Various mail-order catalogs.

Consumer Education
Level II (S.S. p. 18)

Objective I. C. Develop a spending and savings plan.

Math Concept: 1.-2. Problem solving using subtraction, addition
3. Computer

Math Competencies:
1. The student will be able to balance a checkbook.
2. The student will record savings and purchases in a shopping spree game.
3. The student will use a computer to balance a checkbook.

Learning Activity:

1. Complete "The Great Balancing Act", an exercise on checkbook balancing.

   Play "Harder Checkbook Game". Students keep a checkbook balance sheet as they move around a game board with different transactions pictured (i.e. Pay rent $150, Supermarket $51.25, etc.). Player with the largest balance at the end of the game wins. The other players total the pay and earn columns and check the balance. If the balance doesn't check, the self-declared winner loses!

2. "Shopping Spree--A Decision Game". Players proceed around a game board making purchases and earning an allowance. Players can deposit money with "Mom" and earn 6% interest. At the end of the game players complete record sheet and report balance. Highest Balance is the winner!

3. Personal Checking Computer program. A FACTS monthly newsletter/problem sheet is free with the computer program purchase.

Instructional Resources:

1. "The Great Balancing Act", Forecast, Oct. 1984, p. 37.

   "Harder Checkbook Game", A Real Math Game Mat, Open Court Pub. Company, 1981.

   Griswold, Billye, "Shopping Spree--A Decision Game", in Teaching Aids for Consumer and Homemaker Programs (Hazel Taylor Spitze, ed.), University of Illinois, Urbana, Champaign, 1972.

3. "Personal Checking," C.W. Public, 1313 5th Ave., Sterling, IL 61081, $45.00

Consumer Education
Level III (S.S. p. 20)

Objective II. B. Analyze factors which affect transportation

Math Concept:
1. Problem solving using division, decimals
2. Percentage, simple interest problems
3. Problem solving ratio, map drawing, decimal problems.

Math Competencies:
1. The student will compute miles per gallon and gasoline costs/year for their "dream machine."
2. The student will compute discounts, sales tax and simple interest rates for financing a car, car parts, and repairs.
3. The student will compute miles/gallon, cost/trip, cost/person and map out common transportation routes.

Learning Activities:

1. Complete "Feeding Your Dream Machine". Obtain the latest gasoline usage ratings from the Environmental Protection Agency. Have students select a car and compute gasoline costs for one year. Use 12,000 miles per year as an average for miles driven. Find how many gallons of gasoline would be consumed in one year. Using the current cost of gasoline per gallon, compute the annual cost of "feeding" your "Dream Machine". Recompute the annual gasoline cost when gasoline prices are raised $.20/gallon.

   Pretest, worksheets, and post-test are available in Teacher's Guide for Home Economics Curriculum Competency Based Modules for Integrating Basic Skills in Reading, Writing and Mathematics to find sales tax, simple interest, and discounted prices on cars and auto parts.

3. "Streamline Your Transportation". Complete the worksheet on transportation energy to find out how to cut gasoline costs. Compute miles per gallon, map out trips, compute cost/trip and cost/person. Analyze the trips to see where savings can be made.

Instructional Resources:

1. "Transportation and the City", National Science Teacher's Assoc., PEEC, 1976, pp. 3, 17.

2. Crabtree, Myrna, Teacher's Guide for Home Economics Curriculum Competency Based Modules for Integrating Basic Skills in Reading, Writing and Mathematics, p. 307-317, Florida State Department of Vocational Education.

*3. "Transportation Energy", Tips and Topics, Vol XXIV, No. 2, Winter 1983, p. 2.

Consumer Economics
Level III (S.S. 21)

Objective II. C. Analyze factors affecting selection of financial services.

Math Concept: Problem solving using %, subtraction, multiplication and division of decimal numbers.

Math Competencies: The student will compute interest rates.

Learning Activities:

1. "What Happens to Those Savings $?" Have students survey the financial institutions in the community for interest rates on various types of loans and savings accounts. Have them calculate the opportunity costs and find out the different methods used to calculate interest rates at each institution.

Instructional Resources

1. "Your Savings Options" and "How to Buy Insurance Consumer Card", Consumer Affairs Office, 19th floor, American Express, American Express Plaza, New York, 10004.

   Consumer Education and Consumer Math books available from the Math Science Teacher Resource Center, 126 Reid Hall, Montana State University, Bozeman, MT 59717.

Consumer Economics
Level III (S.S. p. 22)

Objective II. D. Analyze factors affecting credit selection.

Math Skills: 1. Problem solving using percent

Math Competencies:
1. The student will calculate the opportunity costs of credit and compare interest rates on various savings and loans.

Learning Activities :

1. Distribute ads for expensive items that students would be interested in buying--stereo, C-B radio, ski equipment, etc. Have students visit 3 different credit suppliers (banks, credit company, retail stores) to find out down payment, amount of finance charge, total number of payments and duration of loan.

   Play "The Credit Game" to provide a simulated experience in the use of credit and the opportunity to learn the differences in some of the common credit sources.

   Play "Borrowers' Dilemma" to help students gain a "feel" for a lending agency and also for the borrower. The student will gain knowledge of procedures for securing loans, rates of interest, etc.

Instructional Resources:

1. Caragher, Kay, "The Credit Game", and DeWitt, Nancy, "Borrowers Dilemma" in Teaching Aids for Consumer Homemaker Programs (Hazel Taylor Spitze, ed.), University of Illinois, Urbana, Champaign, 1972 or in Illinois Teacher, Sept/Oct. 1971.

Consumer Education
Level III (S.S. p. 22)

Objective II. E. Prepare a budget.

Math Concepts: Problem solving involving addition, subtraction, percentage

Math Competencies: The student will solve money management problems related to income and budgeting.

Learning Activities:

1. Have students follow the directions in "Setting Yourself Up After High School".

   Students are instructed to write the job they want to have for their career--the gross income, the size of their family, etc.
   Then compute (using tax tables) their net monthly income and from that figure (again stating famiy size) project a realistic budget for food, clothing, housing, utilities, auto, and recreation.

   Pretest, Case Studies and Budget Worksheets, and Post tests in Teacher's Guide for Home Economics Curriculum Competency Based Modules for Integrating Basic Skills in Reading, Writing and Mathematics, p. 307-317. Have students calculate total income for month/year, regular monthly expenses, flexible and unexpected expenses, and remaining savings for different accounts.

   Complete "Dollar Wise" to practice planning use of discretionary income to meet family needs.

Instructional Materials:

*1. "Setting Yourself Up After High School". Webb, Farren, Teaching Consumer Skills and How to Survive in America, Denver University, Colorado Center for Teaching International Relations.

   Science and Education Administration, A Guide to Budget for the Young Couple, USDA, Home and Garden Bulletin 98, July 1977. Available from Montana Cooperative Extension Service, Montana State University, Bozeman, MT 59717.

2. Crabtree, Myrna, Teacher's Guide for Home Economics Curriculum Competency Based Modules for Integrating Basic Skills in Reading, Writing and Mathematics, p. 307-317, Florida State Department of Vocational Education.

3. "Dollar Wise", Forecast, Dec. 1974, F-36.

Consumer Education
Level 1 (S. S. p. 16)

Objective II. A. Determine quality for cost when selecting fast foods.

Science Concept: Nutrients required by the body, evaluation techniques.

Science Competencies: The student will analyze fast foods for nutritional quality and will conduct product testing panels.

Learning Activities:

1. Discuss "Anatomy of a Hero" a poster illustrating the nutrients found in an hero sandwich. Then have students analyze the nutrients found in their favorite fast food. (May use computer program Fast Food). Discuss which fast food selections are most nutritious. What nutrients are often lacking?

2. For Pizza Lovers Only - Have students run taste panels on different kinds of pizza--may include carry-out, home-made, mix, frozen, or bake-it-at-home. Evaluations should inlcude cost, nutrients, quality, taste, and appearane.

Instructional Resources:

1. Anatomy of a Hero, Poster from the National Dairy Council. Also found on p. 16-17 in "You--A Guide to Food, Exercise, and Nutrition."

Consumer Education
Level II, p. 18

Objective I. B. Demonstrate comparative shopping techniques

Science Concept:
1. Tests for sugars and artificial sweeteners, chemical reactions of common household items and humectants help retain moisture.
2. Toxic elements, effects of cigarettes on lungs, biodegradability, effects of caffeine on body, quality testing of foods, pH of medicine.

Science Competencies:
1. The student will evaluate various products by utilizing chemical experiments.
2. The student will explore the safety of items by designing scientific experiments to test products.

Learning Activities:
These exercises are great for interdisciplinary projects for chemistry and consumer classes or extra credit projects:

1. Perform Consumer Chemistry Experiments to help evaluate products to determine "best buys".
   a. Testing for Sugars
   b. Testing for Artificial Sweeteners
   c. Successful Soap Making
   d. Make Your Own Toothpaste
   e. Making Hand Lotion, Experiment 38, p. 76-77, Chemistry of Common Substances.

Other comparative tests may be devised by students such as a test to evaluate the pH of shampoos.

2. Use science principles to explore the safety of products:
   a. analyze chemical make-up of products (i.e. find the lead content of paint)
   b. evaluate cigarettes by using an aspirator.
   c. test the biodegradability of detergents
   d. find the effect of caffeine on pulse rate
   e. do quality testing of meat and eggs
   f. test the acidity of aspirin.

Instructional Resources:

1. "Consumer Chemistry for Middle/Jr. High Students", Science Scope, November 1984, p. 6-8.

   Summerlin, Lee, Chemistry of Common Substances, Morristown, New Jersey: Silver Burdett, 1979, p. 76-77.

Family Life

Family Life
Level I (S.S. p. 25)

Objective IV. D. Describe factors affecting the relationship with parents.

Math Concepts:
1. Time Skills, Charting and Graphing, Parallel Lines
2. Sets and Subsets
3. Symbols and Configurations

Math Competencies:
1. The student will make a life-line using parallel lines to graph time events of a family.
2. The student will use the concept of sets and subsets to diagram family relationships and responsibilities.
3. Use symbols and configurations to depict 3-4 family generations.

Learning Activities:

1. Student will diagram a family lifeline by drawing parallel lines to depict the life line of each family member against a line representing calendar years. Chart the progression of significant events such as promotions, retirements, graduation, etc. on the lifeline. See "The Family Lifeline" for an example.

2. Complete a family paper sculpture to examine the boundaries and subsystems of your family. Use "A Bird's Eye View of the Family: A Class Project for instructions on how to diagram the sets and subsets of the relationships of your family. This exercise is a useful technique for understanding the "family systems' theory. This theory suggests that a family is more than just a sum of individual family members. The family paper sculpture increases understanding the complex interactions that create the family by diagraming members, boundaries, spatial arrangementvs and connecting lines.

3. Genotypes. Make a graphic design to show birth, death, marriage, adoption, etpc. of 3-4 generations of your family. Use symbols and configurations to show the significant dynamics of your family.

Instructional Resources:

1. Weis, Susan, "The Family Lifeline--An Aid for Family Life Planning". Illinois Teacher , Sept/Oct 1982, p. 29-30.

2. Wedemeyer, Nancy, "A Bird's Eye View of the Family: A Class Project", Tips and Topics in Home Economics, Vol XXII, No. 1, Fall 1981, p. 4-5.

3. Eggeman, Ken. ILLINOIS TEACHER, Dec. 1984, p. 71-73, Vol XXVIII, No. 2.

Family Living
Level II (S.S. p. 28)

Objective VI. Investigate careers opportunities.

Math Concepts: Surveys, Charts and Graphs

Math Competencies: The student will survey the community for job opportunities in family life.

Learning Activity:

1. Have students survey the community for job opportunities in family life. Have them present the materials to class by making charts/graphs showing job skills needed and estimated salary.

   A possible approach could be to look through the telephone book and list agencies and people that are associated with family life careers such as adoption agencies, counselling services, group homes, etc. Students can then survey professionals for salary range, skills required, education needed, and advantages and disadvantages of a career in family life. The results can be presented on a graph or chart.

Family Life
Level III (S.S. p. 31)

Objective VII. B. Identify life style changes and concerns of the aged.

Math Concepts: Charts/Graphs, Percentages, Budgeting

Math Competencies: The student will examine various charts and graphs to research information on aging and use this information to prepare budgets, find percentages, compute social security benefits and make comparisons.

Learning Activities:

1. Have Social Security representative talk on benefits of Social Security. Have students figure out sample problems on how much of a paycheck would go towards Social Security benefits.

2. Examine RDA charts to see how nutritional needs change with age. Discuss how eating habits should change to accommodate changing nutrient needs.

3. Examine national population surveys and predict percent of population that will be over 65 in the year 2000. What percent will be in the work force? Discuss what affects this will have on society.

4. Research the increasing costs of health care for the aged. Find out what medical costs Medicare and Medicaid will cover. Read and compare budget graphs of different aged couples. What percent of income goes for health care in the over 65 group? How does this differ from other age groups?

5. Develop a Guided Design on budget problems. Divide class into groups and assign each group to prepare a budget for one of the following: diabetic 84-year old woman surviving on Social Security check alone, elderly couple supported by railroad pension living with single son, elderly couple beseiged with medical bills for husband's second heart operation.

6. Read charts on population statistics. Find out what the average life span is for males and females. Make a pie chart showing major causes of death for different ages and sex. Discuss changes that have occurred in the last 20 years. How has science influenced these changes? What do you predict for the future?

7. Have financial consultant talk on ways to financially plan for growing old. Have students make a "Financial Timeline" depicting what they hope to realistically have for financial assets at different periods of their life. (i.e. when to buy a house, kinds of insurance coverage, when to make other investments, retirement plans, etc.)

Instructional Materials:

5. For information on developing a Guided Design write: Design Network, Freshman Engineering, West Virginia University Morgantown, WV 26506

6. U.S. Dept of Commerce, Bureau of the Census, Projections of the Population of the U.S. 1982-2050, Washington, D.C. U.S. Gov. Printing Office, 1982.

Family Life
Level II (S.S. p. 28)

Objective III. A. Examine pressures imposed by self and family.

Science Concepts: The body requires adequate calories and nutrients to maintain optimal growth and function.

Science Competencies: The student will recognize symptoms of anorexia and bulimia and learn healthful ways to maintain ideal body weight.

Learning Activities:

1. Unhealthy Choices: Anorexia-Bulimia. Read articles on anorexia and bulimia and show audiovisuals.

   Have a counselor and dietitian speak on anorexia and bulimia. Additional readings, newsletters, and help organizations are listed in the articles.

2. Have students complete the exercises in "You--A Guide to Food, Exercise and Nutrition."
   a. It's Time You Faced the Fats--Take measurements to estimate body composition
   b. It's a Matter of Balance--Compute caloric needs for maintaining, losing or gaining weight.
   c. Use the Basic Four Food Guide to plan a week's menu which will meet caloric and nutritional needs.

Instructional Resources

1. Unhealthy Choices: Anorexia - Bulimia, Packet which includes, "Not Just a Skinny Kid", Teachers Guide, and "You --A Guide to Food, Exercise, and Nutrition",
   Filmstrip: "Dangerous Dieting: The Wrong Way to Lose Weight" is available free on loan from the Washington State Dairy Council (206-575-1575).

   Other articles:
   Mead, Cheryl and Bob Allers, "Why Some Teens are Starving Themselves to Death," CO-ED, January 1985, p. 30-33.

   Sweeten, Mary, Anorexia and Bulimia: A Research Review, Illinois Teacher, p. 19-22.

   Lawrence, Robert, How to Help a Loved-One Overcome Anorexia Nervosa and Bulimarexia, National Dairy Council , 12450 Washington, Thornton, CO 80233-0120.

Family Life
Level II (S.S. p. 28)

Objective III. B. Examine Social Pressures.

Science Concept: Effects of Chemical Abuse

Science Competencies: The student will examine the physiological and psychological influences of alcohol.

Learning Activities:

1. Have a MADD speaker talk on the problems of alcoholism.

   Lecture on the impact of alcohol on nutritional status. Read charts on the nutritional quality and metabolism of alcohol. See "Alcohol vs. Nutritional Status" for background information and references.

2. Mouse Maze. Conduct experiment on the effects of alcohol by running a mouse through a maze and chart running times. Inject alcohol (.5 cc or 40% ethyl alcohol) into the mouse and observe and record the effects. This is an excellent exercise to integrate with science classes.

3. Hold a Mocktail Party. Have students concoct non-alcoholic drinks and have a tasting party. Have students analyze the drinks for nutritional quality and hold a "Drink-off" for the most nutritious drink.

4. Have students gather state statistics on drinking and driving and prepare some charts/graphs to display around the school.

Instructional Resources:

1. Smith, Anna, "Alcohol vs. Nutritional Status", Forecast, Nov/Dec 1985, p. 43-47.

2. Mouse Maze, Tips and Topics, Vol XXII, No. 2, Winter 1981, p 4.

Family Life
Level III (S.S. p. 30)

Objective III. D. Explore the responsibility for decisions regarding parenthood.

Science Concept: Basic needs of plants and/or animals

Science Competency: The student will understand the basic needs or plants and/or animals by completing a parenting exercise.

Learning Activities:

1. Have students adopt a goldfish for a week. Obtain care instructions from a pet store and develop a list of responsibilities for fish-parents. The fish-child must be supervised at all times. Student-parent must arrange (pay or barter) for fish-sitting if he/she cannot be present. Have students keep a diary and cost analysis of experiences. Daily reports will be given each day at the beginning of class on parenting experiences. A paper will be written at the end of the week on how student will apply what he/she learned through the fish adoption for later Family Life.

2. "Nurturing Plants and Friends" Activity. This plant/relationship analogy helps establish healthy components for a relationship while students learn basic care principles for ferns and spider plants.

Instructional Resources:

2. Alexander, Elaine, "Nurturing Plants and Friends", Forecast, Sept. 1985, p. 55-57.

Family Life
Level III (S.S. p. 31)

Objective VI. B. Identify life style changes and concerns for the aged.

Science Concept: The Physiological Effects of Aging

Science Competency: The student will:
1. Identify physiological changes of aging by participating in simulation exercises, interacting with senior citizens, researching topics, and other related activities.

Learning Activities:

1. Aging Simulation: Provide students with an experience of what it is like to grow old. Think up ways to simulate the effects of aging on the body. Activities might include taping fingers and trying to pick up a small object to simulate arthritis, applying vasoline to glasses or wrapping with plastic wrap and trying to find a phone number, plugging ears with cotton and trying to carry on a conversation, wearing plastic gloves or mittens and trying to pick up a pin or reach into a box of objects, holding a "tasteless foods" party (leaving out salt, sugar, flavoring) to simulate loss of taste/smell.

2. Gray Panthers: Write the Gray Panthers for ideas on how to get students involved with projects for the elderly.

3. Make an "Aging Board--You Choose the Speed." Have students cut out pictures of factors which increase speed of aging (junk food, alcohol, cigarettes, suntanning, etc.) and ways to slow down aging (good diet, regular check-ups, exercise, sun protection, etc.)

4. Have physician speak on medical problems aging. Include information on the medication problems of the elderly.

5. Have students research one of the medical problems discussed above--hypertension, heart disease, Alzheimer's disease, arthritis, etc. Reports may be given in class or other presentations (talks, posters) may be arranged to be given in senior citizen centers. For instance, student may present diet intervention tips for reducing hypertension or modifying diet for heart disease.

6. Lecture on Osteoporosis using "Calcium and Your Health" transparency lessons and other materials from National Dairy Council.

7. Filmstrips and other activities that are found in Intergenerations, Penny's Forum.

8. Osteoporosis experiment: Soak some chicken bones in vinegar (acid) for several days. Have students hypothesis on what causes the bones to soften and become flexible. What material has dissolved? What substance remains? How does this relate to bones and aging? How can this be prevented?

Instructional Resources:

2. Gray Panthers, 3635 Chestnut St., Philadelphia, PA 19104.

6. Resource packet on Osteoporosis, $3.00 from Nutrition Education Services, Washington State Dairy Council, 3830 Stone Way North, Seattle, WA 98103. The packet includes:
   Are You at Risk for Bone Disease?

   Are You Calcium Deficient?

   Osteoporosis

   Calcium, You Never Outgrow Your Need for It

   The All-American Guide to Calcium Rich Foods

   And other teacher information sheets on calcium. A filmstrip "Osteoporosis--Are You at Risk for Bone disease? is available free on loan (206-575-1575)

7. "Interdependent Generations, J.C. Penney Company, 1301 Avenue of the Americas, New York, N.Y. 10019, 1983 (has excellent resource list of audiovisuals and curriculum materials.

Foods and Nutrition

Foods and Nutrition
Level I (S.S. p. 33)

Objective I. D. Measure dry and liquid ingredients accurately using proper measuring tools.

Math Concepts:
1. Metric System
2. Mass vs. volume
3. Importance of accurate measurements
4. Fractions and Equivalents

Math Competencies: The student will
1. Become familiar with the metric system through practical exercises.

2. Determine the accuracy of measuring techniques using mass and volume.

3. Learn the importance of standardized measuring techniques by preparing a recipe using a non-specific directions.

4. Find the most efficient way to make exact measurements.

Learning Activities:

1. Complete lessons on metric system from "Going Metric Without Going Mad".

   Complete "By Jove! I Think I've Got It!", a worksheet that matches items to a length, mass or volume measurement. This worksheet is a real challenge as it makes you THINK METRIC! Advanced students may convert the metric units to the English units.

   Construct a balance scale to measure gram masses. Balance a ruler over a wire supported by clothes pins attached to a coffee can or milk carton. Drill holes on ends of ruler and attach a paper clip. Attach paper cups to the paper clip which will hold the substance to be measured. Specific directions may be found in "Metric Survival Kit".

   Construct a large cardboard thermometer with Farenheit temperatures marked. Have students find the comparable Celsius temperatures by taking actual thermometer readings and mark them on the drawing. Have them find the Celsius temperature for freezing point, boiling point, normal body temperature, room temperature, oven temperatures, cold winter temperatures, etc. An example is on p. 13, "Metric Survival Kit".

   Complete the metric maze "Metric Madness".

2. Measure different types of flour (cake, all purpose, whole wheat, sifted, and unsifted) in a one cup measuring cup. Take the measured cup of flour and weigh it. How does mass compare with volume? Measure other ingredients (brown sugar, packed and unpacked; shortening, etc.) and weigh them. Are the class measurements alike? What is the difference between the measurements? What method is more accurate?

   What different methods can be used to measure fats? Demonstrate the water displacement method. Are there other ingredients which can be measured in this manner?

3. Prepare "Gobbly Gooks," a confectionary concoction that is made with globs, blubs, blobs, and dribbles and compare it to a standardized "No Bake Cookie" recipe to demonstrate first hand the importance of accurate measuring techniques and following directions. Kitchens may be divided up so half will use the Gobbly Gook recipe and half will use the No Bake Cookie recipe.

4. Complete the individualized learning system units, "Save Time Number of Measurements" and "From Measure to Measure" which includes drills on efficient measuring.

Instructional Resources:

1. "Going Metric without Going Mad", Montana Cooperative Extension, Montana State University, Bozeman, MT 59715 (Also available for loan from Math/Science Teachers Resource Center, 126 Reid Hall, Montana State University)

   *"By Jove! I Think I've Got It", Unknown source.

   "Metric Madness", COED, Sept 1984, p. 47.

   "Metric Survival Kit", In-service Guide", Enrich, Inc. Sunnyvale, CA 94086.

   Other metric resources are available from the Math/Science Teachers Resource Center, 126 Reid Hall, Montana State University, Bozeman, MT 59717.

   An excellent bibliography of metric resources is printed in Adams, Constance, Adoption of the Metric System by Consumers: A Program for New York State Cooperative Extension, Masters Thesis, June 1975. (ERIC ED 107533)

3. *Neff, Kathy, "Gobbly Gooks" Recipe Sheet and "No Bake Cookies" Recipe Sheet, Forecast, October 1985, p. 9.

4. "Save Time Number of Measurements" and "From Measure to Measure", Individualized Learning Systems, Continuing Education Publications, Extension Hall Annex, Corvallis, Oregon 97331, 1973. (Note: there is a series of individualized lessons available on a variety of food preparation topics.)

Foods and Nutrition
Level I (S.S. p. 33)

Objective I. E. Compute measuring equivalents.

Math Concepts: Conversion of measuring units, fractions

Math Competencies: The student will be able to convert measuring units.

Learning Activities:

1. After completing practice exercises on measurements and equivalents, play "Equals" a card game based on Concentration. Make 4 x 4" cards from heavy paper. On each card write a measurement and on another a measurement that is equal to it. Mix the cards up and turn them upside down on the table. Each player in turn picks up 2 cards. If they are equal it is a match. If the cards do not match they are turned upside down again. Game continues until all cards are picked up and matched. Winner is the player with the most cards correctly matched.

2. Classroom Potpourri I. Use a computer program to convert recipes.

3. Play the Equivalents Game "Who Has?" Students each have a card(s) with a measurement and a question such as "I have 6 ounces. Who has 6 teaspoons?" The student with the answer (in equivalents) responds by reading his/her card aloud. Play continues until all the cards are read. The game may be timed to see how quickly the equivalents can be identified.

Instructional Resources:

1. "Equals", Blankenship, Martha, BASE Home Economics Curriculum. Grades 5-8 Area 3.0 Foods/Nutrition, Home Economics Education, West Virginia, Oct. 1981, BANK I, I-fn-39. ERIC Ed 222646.

2. Classroom Potpourri I, Clo's Line, Volberg, MT, 1985. For Apple Computer, $30.00. Disk includes cooking terms, abbreviations, nutritional snacks, candy bar, and miscellaneous other programs.

*3. "Who Has", Teaching Strategies in Reading, Writing and Mathematics for Home Economics Education, Dept of Vocatonal--Technical Education, Oregon State University, Corvallis, OR 97331.

Food and Nutrition
Level I (S.S. p. 33)

Objective I. H. Demonstrate correct use of recipe.

Math Concept: 1. Fractions
2. Computer

Math Competencies: The student will multiply and divide fractions when adjusting recipes and use a computer program to do same functions.

Learning Activities:

1. Complete "Halve? Double? Triple a Recipe?" or other worksheets on recipe adjustment.

   Have class do a Quantity Foods Project adjusting recipes to accommodate a large number of guests.

   Have class bring in a favorite recipe and adjust it to fit the needs of a) single person, b) married couple, and c) family of 6.

2. Use "Recipe Juggle", a computer program to adjust recipes.

Instructional Resources:

1. "Halve? Double? Triple a Recipe?", Individualized Learning System, Continuing Education Publications, Extension Hall Annex, Corvallis, Oregon 97331.

   Other worksheets may be found in food service or consumer math workbooks.
   1983.

2. "Recipe Juggle," Clo's Line, Volberg, MT 59351.

Food and Nutrition
Level I (S.S. p. 33)

Objective II. A. Identify the basic concepts of nutrition.

Math Concept:
1. Percentages
2. Graphs
3. Problem Solving Using Addition
4. Graphs to Make Comparisons
5. Graphs, Finding the Mean, Range, and Medium
6. Percent, Diagrams

Math Competencies:
1. The student will be able to compute percent of RDA for foods from each of the four food groups.
2. The student will graph percentages of the RDA for several different foods on game cards in preparation of playing "Oh Fudge."
3. The student will problem solve to find the least possible calories to obtain his/her basic four requirements.
4. The student will make graphs to compare nutrient and fiber densities of various forms of foods.
5. The student will prepare a graph indicating nutrient value of "hidden nutrition" recipe and will find the mean, medium, and range of the results from a taste panel evaluation of the product.
6. The student will illustrate nutritional quality of foods by drawing a geometric diagram showing nutrient percentage of RDA.

Learning Activities:
1. Play "100% Relay" to teach nutrient content of various foods. Players draw a card from a pile of Comparison Cards (National Dairy Council) which show % RDA of 50 foods. Students keep track of % of RDA of the foods they draw by charting on a relay track. The first student to reach 100% wins.

   Use "Computing Your Way to Better Nutrition" a computer program, to analyze nutrition. Contains exercises on cereals/refined sugar, chemicals in food, fast foods, RDA bar graphs, and vitamins.

2. Have students prepare game cards for "Oh Fudge" by drawing graphs of the nutrient values of different foods on cards (similar to National Dairy Council Comparison Cards). The cards are then used to play "Oh Fudge" which teaches nutrient content of foods. Players are dealt 8 cards and bid 0-8 points on how many tricks they can take. The first player plays a card and calls out a nutrient. Other players must play a card with that nutrient. The person whose food card has the greatest % of the nutrient receives the trick and leads the next play. The object is to take the **exact** number of tricks bid. Players who win the <u>exact</u> number of tricks receive a score to match his bid. Others receive 0

points. The game time may be set for a given amount of time, number of hands (8 or so), or set score (50 or so).

3. Have students who want to lose (or gain) weight play "Map a Calorie Route." The object is to obtain foods which meet the requirements of the Basic Four Food Groups with the least possible number of calories. Players throw dice and proceed the designated number of spaces on a game board which contains squares of foods from all of the food groups. Players may move in all directions but cannot land where someone else has landed. Students record the calorie value of the foods they land on on a record sheet which breaks down the foods by category. Players must have the record sheet completed with foods from all food groups to be eligible to win. The player with the lowest number of calories wins.

4. Compare different forms of foods for nutrient and fiber density. Create bar graphs to illustrate the % of recommended amounts of each nutrient. For example, compare an apple and apple pie or orange juice and an orange to indicate which form of a food is more nutritious, has more calories, or contains higher fiber.

5. Compute the % RDA of two foods or 2 meals. Use geometric diagrams to illustrate the differences in nutritional quality. These graphic models can be prepared ahead of time by the teacher and then interpreted by the students.

Instructional Resources:

1. "100 Relay", Illinois Teacher, Vol. XIII, No. 5 (May-June 1970), pp. 248-249.

   "Computing Your Way to Better Nutrition," available from Minnesota Educational Computing Consortium, 1984.

2. "Oh Fudge!", created by Sister Jance Greenwood, Illinois Teacher, Vol XVI, No. 1, Sept/Oct. 1972, p. 42-43.

3. "Map a Calorie Route", Greenman, Jo Ann, Illinois Teacher, Sept/Oct. 1971.

5. Varo, Pertti, "Nutrient Diagrams--A Way to Illustrate Nutritional Quality", Journal of Nutrition Education, Vol 17, No. 2, 1985, p. 39-40.

Food and Nutrition
Level II (S.S. p. 35)

Objective I. B. Demonstrate conservation of resources in kitchen.

Math Concepts: Problem solving using estimation, addition and subtraction of decimal numbers

Math Competencies: The student will discover the energy cost of foods and compute savings possible from selection of low energy foods.

Learning Activities:

1. Have students complete the activity "What's For Dinner".
   a) Have students review the items offered in the "Menu" and select first preferences based strictly on likes and dislikes. Place checks beside those items in Column 1.
   b) Make selections from the menu on the basis of least energy consumption and make a check in Column 2. The energy cost of a food includes fertilizers, insecticides, equipment, transportation, processing, packaging, and preparation.
   c) Find the energy price for each item you chose from the Energy Price List and compute your energy bill.
   d) Discover how you might have saved energy by finding the differences between the individual items in the two columns and enter these in column 3.

2. Complete "What's in the Package?" to find the percent of total energy in an item that is food energy.

Instructional Materials:

*1. "What's For Dinner" adapted from Energy Conservation in the Home, U.S. Department of Energy, 1977, pp. 211-213.

*2. Reese, Chris, "What's In a Package", Counting on Energy, Project 3E, Montgomery County, Blue Bell, PA, p. 31. ERIC ED 207 824

Food and Nutrition
Level II (S.S. p. 36)

Objective II. A.

Math Concept:
1. Addition, percentage, bar graphs, computer
2. Problem solving using addition
3. Problem solving using multiplication and division
4. Measuring, reading a chart, using a formula

Math Competencies:
1. The student will complete a food record and compute the total calories and nutrients consumed for one day, finding the % of RDA.
2. The student will construct diet plans to add up to various calorie levels.
3. The student will compute the length of time it takes to burn off calories through various forms of exercise.
4. The student will take measurements and calculate their percentage of body fat.

Learning Activities:

1. Have students keep food records for 1-3 days. Find the amount of calories and other key nutrients in the portions of food eaten utilizing USDA Food Composition Tables. Total the amounts obtained for the whole day and compare it with the percent of the RDA for the appropriate age and sex. Construct a bar graph to illustrate %RDA from a meal/day. See "Breakfast Bonanza" for an example.

   Using "Calorie Study Program" students will make a quick guestimate of their calorie intake and use the computer to computer calorie expenditure.

2. Working in teams, construct a food mobile or poster to show foods for a day that would equal the following: 2000 calories, 800 calories, 2400 calories. Show the number of servings of each food. For example, if the diet includes 3 glasses of milk, use 3 pictures or write the information on 1 glass.

3. Discuss the difference in fuel consumption of car that travels 25-55-75 miles per hour. How does the example relate to how fast you burn the fuel you get from fuel? Develop a bulletin board showing how long it takes to burn off different foods when doing various exercises.

   Have students do the "Carrot Burn". Have students compute how long it would take to burn off a carrot stick with various activities (reading, walking, running, standing, lifting, etc.). Then have students perform the activities for the time it takes to burn the calories. For instance, if a 143 pound guy ate a 5" carrot he would have to lie down for

15 minutes, study for 11, bicycle for 5, walk for 4, or run for 2 minutes to burn the 21 calories.
Have students look up the number of calories in their favorite food. Then have them find foods from the Basic Four Food groups that are equal in calories to their favorite food. For instance, a 12 oz soda has 150 calories. Have them find how much of a food from each of the four food groups could be eaten for the same caloric value. Then have them find 5 exercises and the amount of time it would take to burn up the designated calories.

4. "Find Your Fat Test". Have students measure their right upper arm, right forearm, and waist. Then read the "Constant" Chart and use the constants found for the appropriate measurements in the formula. Constant chart and formula can be found in Exercise Physiology or You--A Guide to Food, Exercise and Nutrition.

Instructional Resources:

1. Breakfast Bonanza, Activity #8, Food...Your Choice, National Dairy Council, Rosemount, ILL, 1980.

   "Calorie Study Program", Computer Program available from Clo's Line, Volberg, MT, 1984, $29.95.

3. Konishi, Frank. Exercise Equivalents of Foods: A Practical Guide for the Overweight. Carbondale, ILL: Southern Illinois University Press, 1973.

4. McArdle, William, and Frank and Victor Katch, Exercice Physiology, Philadelphia: Lea and Febiger, 1981. An adapted exercise is in A Guide to Food Exercise and Nutrition, National Dairy Council publication.

Food and Nutrition
Level II (S.S. p. 36)

Objective II. C. Determine the effects of food and life styles on nutrition and health.

Math Concept:
1. Conversion of units, taking measurements, multiplication
2. Constructing a model to scale
3. Problem solving using metric conversion, addition, multiplication and division of decimals
4. Circle graphs, percentage
5. Reading bar graphs

Math Competencies: The student will:
1. measure pulse rate and convert to beats per minute.
2. use a scale of 1 ft = 1000 ft to construct a replicate of the capillary system.
3. calculate his/her energy based on weight and activity needs.
4. construct a circle graph to illustrate his/her meal pattern.
5. read bar graphs to find major nutrient contributions of each food group.

Learning Activities:

1. "Pumping Iron (Hemoglobin style). Have students take their pulse (amounts of beats in 10 seconds) and convert it to beats per minute (X 6). Pulse may be taken on various occasions: after activities such as walking, running, standing, eating, talking, falling asleep, awakening, or when angry, upset, sad, or happy. Have students find the differences between the various activities. For example, how much more would your heart have to beat if you were running for an hour versus sleeping for an hour.

   Find your target heart rate by using this formula:
   220 - age - Resting heart rate X % of intensity (.6, .7 or .8) + Resting heart rate = Target Heart Rate.
   220-age = assumed maximum heart rate;
   Resting pulse rate is the pulse rate taken before getting out of bed in the morning (may be taken when resting quietly);
   % of intensity = .60 if little no daily exercise, .70 if moderate daily exercise, and .80 if considerable daily exercise.

   The cardiovascular system is improved when target heart rate is maintained for 20 minutes during exercise. Exercising like this three times a week is recommended.

Have students calculate how many more times per month an unfit person's heart beats than a more fit person's heart. Use 80 beats/minute as the resting heart rate for the unfit heart and 50 beats/minute as the resting heart rate for the fit person's heart.

2. "Give Your Heart A Break". Have students construct a model of the capillary system to illustrate the length of capillaries in 10 versus 25 pounds of flesh. A pound of flesh contains 3 miles of capillaries. Using a scale of 1 foot = 1000 feet, measure off 400 feet of red string to represent the capillaries in 25 pounds of flesh. Have students calculate the length of string needed to represent capillaries in 10 pounds of flesh. This exercise provides a visual illustration of the work that can be saved the heart by reducing weight.
3. Calculate Basal Metabolism energy needs, activity needs and specific dynamic action of food needs to compute caloric needs for a day. Use worksheet "Human Energy Needs" for formulas.

   "Cutting Down Calories" is a worksheet that estimates the number of calories needed to maintain weight and the caloric deficit to achieve the rate of weight loss desired.
4. Make a food wheel following instructions in "Food Wheel". Students make a circle graph of their typical meal pattern.
5. "Let's Hear It for Rutabagos." Have students read bar graphs which show the major nutrients con/tributed by basic four food groups. Give students a list of foods, all from the same food group, and a list of major nutrients. The number of foods in which a specific nutrient bar is greater than the calorie bar is tallied on the nutrient list. If 1/2 or more of the foods have a nutrient bar taller than the calorie bar, the food group is considered a major contributor of that nutrient.

Instructional Resources:

*3. "Human Energy Needs" Worksheet, Counting On Energy, Project 3E, Montgomery County, Intermediate Unit, Blue Bell, PA, 1980, (ERIC ED 207 824).

Weight Management: A New Look at an Old Problem, Learning Packet ($3.00) from Washington State Dairy Council, 3830 Stone Way North, Seattle, WA 98103. This packet contains: "Cutting Down Calories", Weighing thef Facts about weight control, Be Sizewise, What to Know about a Weight Control Diet Before Yo. Eat One, and other articles on weight reduction.

4. "Food Wheel", Activity #2A, Food...Your Choice, National Dairy Council, Rosemount, ILL, 1980.

5. "Let's Hear It For Rutabagos", Activity #3B, Food...Your Choice, National Dairy Council, Rosemount, ILL, 1980.

Food and Nutrition
Level II (S.S. p. 35)

Objective II. D. State influence of planning.

Math Concept: Timetables

Math Competencies: The student will complete a timetable for meal preparation by computing total cooking and preparation times and the time to begin preparation of each food.

Learning Activities:

1. Give students a menu for one meal. Students will look up the preparation and cooking times and complete a "Meal Preparation Timetable." This exercise will require them to figure out the total time needed for food preparation and the time preparation should be started.

Objective II. E. Explain basic shopping skills to assist in consumer choices.

Math Concepts:

1. Problem solving using addition of decimals, percentage
2. Problem solving using addition of decimals
3. Problem solving using estimation, addition of decimals
4. Problem solving using unit conversion, decimals
5. Problem solving using division of decimal numbers, changing units
6. Division of decimals, averaging, measuring, percentage

Math Competency: The student will:

1. compute cost of food and sales tax from restaurant menus.
2. add food costs and calories and percent of nutrients when playing a nutrition game.
3. use estimation and addition skills to play marketing game.
4. compute servings per package and cost per serving of different protein foods.
5. use measuring, averaging, percentage skills to evaluate chocolate chip cookies.

Learning Activities:

1. Obtain menus from local restaurants. Give students a monetary range of spending money and have them make selections staying within the budget. Find the total cost of a meal using the restaurant menus. Compute sales tax and tip.

2. Play "Thrifty Nutrition" to relate nutrient values to food costs. Teams take turns choosing a food model and record the cost, number of calories, and percent of nutrients for each model they choose. The winner is the team that has spent the least money when 100% of all 8 nutrients is achieved.

3. Marketing Game. Have students bring empty clean containers for food, cosmetics, drugs, cleaning agents, etc. Divide the class into 2 teams and give each team a set amount of play money. A team member is asked by opposite members to spend a set amount of money. If he/she spends wisely by selecting items that do not go over the set amount, he/she can retain the money. If he/she overspends, they must pay the other team the set amount of money.

4. "A Chicken in Every Pot". Divide the class into groups and have each group devise a cost comparison sheet on poultry comparing one of the following:
   a) the cost/serving of poultry with 2 cuts of beef, lamb, pork, veal and seafood,

b) comparing cost per oz of 5 kinds of poultry (turkey, chicken, goose, duck, Cornish hen, capon),
c) comparing cost/oz or gram of different forms (frozen, fresh, barbequed, frozen, ready-to-eat, canned, etc.),
d) finding the unit cost of family pack vs. thigh, drumsticks, breasts, and wings.

Prepare graphs to contrast the costs and nutrients of dark and white, young and old, homemade chicken soup and canned soup, fresh turkey, goose, duck and chicken.

5. "Protein Worth Beans--Comparing Meat and Meat Alternatives." Devise a list of protein foods which includes vegetable protein sources. Rank the list by cost, having high cost items at the top. Research the cost and amount of servings per package of the items. Compute the cost per serving of the different protein sources, then re-rank the protein sources according to your new information.

6. The Great American Chocolate Chip Cookie Taste Test. Divide the class into 8 groups. Have each group purchase a different brand name chocolate chip cookie, a store brand and a no-name brand of cookie. Each group will analyze their cookies on the basis of unit price per pound, package cost, number of cookies per pound, average number of chips per cookie, cookie size, ingredients (artificial flavors, colors or preservatives), and nutritional information. Have each group assemble the information in a report along with a consecutive listing of the first five ingredients on the cookie package. Students can also conduct The Great American Chocolate Chip Taste Test finding the class' favorite cookie (keep the brand name concealed). Cookies made from scratch or from a mix can also be evaluated against the purchased the cookies for cost, flavor and appearance, and nutritional quality.

7. Play "Bargain Hunt--Supermarket Shopping". The student is given a list of foods with the instructions to find the least expensive item for each of the categories. They can use coupons, double coupons, different stores, generic brands, sales items, etc. "Bargain Hunt II" has students select the best buy per unit for a list of items.

Instructional Resources:

1. Ready made worksheets may be found in consumer math workbooks such as those published by J. Weston Walch, Portland, Maine, 1983.
2. Skaggs, Elizabeth, "Thrifty Nutrition" Game, Illinois Teacher, Vol XVI, No., Sept/Oct. 1972, p. 44-45.
6. "The Great American Chocolate Chip Taste Test", Forecast, Sept 1983, p. 51-52, and COED, p. 73.
*7. "Bargain Hunt I and II", Teaching Strategies in Reading, Writing, and Mathematics for Home Economics Education, Dept. of Vocational-Technical Education, Oregon State University, Corvallis, OR 97331.

Math Concepts: Arithmetic operations, fractional operations, decimal operations, percentages, making change.

Math Competencies: Given basic math problems commonly encountered in food service, the student will correctly solve 90% of the problems.

Learning Activities:

1. Complete Food Service Worker, Module 2: Basic Math Concepts.

Instructional Materials

1. **Food Service Worker,** Dept. of Vocational-Technical Education, Tennessee University, Knoxville, June 1981. ERIC ED 229521.

Food and Nutrition
Level III (S.S. p. 38)

Objective I. B. Compare cost of menu choices.

Math Concepts:
1. Problem solving using division, decimals, ratios.
2. Percents, ratios
3. Problem solving using addition, multiplication, division, decimals

Math Competencies:
1. The student will compute nutrient cost ratios.
2. The student will determine nutrient density by computing % standard for cost nutrient/cost ratio.
3. The student will compute costs of food and best buys for different situations.

Learning Activities:

1. Utilize the nutrient/cost ratio (method by Schaus and Briggs) to identify good nutritional buys. The nutrient/cost ratio is the number of nutrients greater than 50% of the USRDA purchased for one dollar divided by the kilocalories available for one dollar. Have each student select a food and calculate the following:
   a) amount of food that can be purchased for $1.00
   b) number of kcal for $1.00
   c) serving size
   d) approximate # of servings for $1.00
   e) number of nutrients greater than 100% USRDA per $1.00
   f) number of nutrients greater than 50% USRDA per $1.00
   g) nutrient Cost Ratio ("f"/"b")
   h) highest nutrients per $1.00 (Nutrients greater than 100% USRDA and nutrients greater than 50% USRDA)

2. Compute the nutrient density of foods by the following steps:
   1) Determine the % RDA of a nutrient (per serving) for the food being explored,
   2) Determine the % standard for cost of a serving of the food (Cost per serving divided by Estimated cost of food for day), and
   3) calculate the nutrient/cost ratio by dividing the % nutrient (Step 1) by the % standard for cost (Step 2).

3. "Fill the Market Basket". Have students compute food costs for some practical situations---the best dessert to serve the class on a limited budget and the cost of groceries for a camping trip, etc.

Instructional Materials:

1. Schaus, Ellen E., and George M. Briggs, "Nutritionally Economic Foods", Journal of Nutrition Education, Vol 15, No. 4, p. 130-131.

Cost of Food at Home Estimated for Food Plans at 4 Cost Levels, October 1983, U.S. Average," Family Economic Review, No. 1, (1984), 31.

2. Jackson, Carolyn, "All Foods are not Created Equal", Illinois Teacher, Nov/Dec, 1984, p. 62-63.

3. "Fill the Market Basket", BASE Home Economics Curriculum. Grades 5-8, Area 3.0 Foods/Nutrition. Home Economics Education, West Virginia, BANK I, p. I-fn-45. ERIC ED 222646.

Foods and Nutrition
Level III (S.S. p. 38)

Objective II. A. Consider the influences on food supply.

Math Concepts:
1. Percentages
2. Read tables and graphs, problem solving using addition, division, decimals

Math Competencies:
1. The student will compute the cost of inflation from a survey of food prices.
2. The student will interpret graphs and complete problems related to food economics.

Learning Activities:

1. Give students a list of products such as flour, sirloin steak, chicken, shampoo, etc. and have them fill in their own favorate brand names and sizes for each product. Over a period of 7 months, they are to go to the same store, looking for the same products and write the price changes over a period of a month. Using this information have them compute the cost of inflation.

   Complete exercises in "How to Use the Consumer Price Index". Students will figure price changes and calculate the decrease in purchasing power.

2. Complete activities "From the earth to you table" to learn about the economics of food. This includes units on Who shares in the money you spend for food? Why do food costs change? How do production costs affect the cost of food? How does processing affect the cost of food? How does the retailer affect the cost of food? The student will read circle graphs, compute how many hours of work are required to buy a certain amount of food, compute preparation and total food costs compare processing costs of food, and estimate monthly net profit of retailers.

Instructional Resources:

1. J.C. Penneys, Forum Plus: How to Use the Consumer Price Index, N.Y.: 1979.

2. "From the Earth To Your Table", Office of Communication, United States Department of Agriculture, Washington D.C. 20250

Foods and Nutrition
Level III (S.S. 38)

Objective II. D. State influences on menu planning.

Math Concept: Problem solving using addition, multiplication, division of fractions and decimals, unit conversion

Math Competencies: The student will use math skills in recipe adjustments, market orders, and computing selling price for quantity foods marketing project.

Learning Activities:

1. Plan a quantity foods production activity. Ideas for the project include:

   MARKETING COOKIES (See worksheets)

   GRAB A NAB (Nutritious Appetizing Breakfast) Sell exciting and nutritious breakfast foods to students/faculty/staff

   CATERING SERVICE--develop a catering service to serve luncheons at faculty and organization meetings

   GOOD FOOD FACTORY--Market convenience food items for the community (ready to heat casseroles, etc.)

   INTERNATIONAL LUNCHEON--Plan an international luncheon to raise money for the foreign student fund.

   VISITING STUDENTS DINNER--Serve a meal to athletic or other teams from out of town

Instructional Resources:

*1. "Marketing", Teaching Strategies in Reading, Writing, and Mathematics for Home Economics Education, Dept. of Vocational and Technical Education, Oregon State University, Corvallis, OR 97331.

Foods and Nutrition
Level 1 (S.S. p. 33)

Objective I. A. Incorporate safety techniques in the kitchen.

Science Concepts: Principles behind fire and safety rules

Science Competencies: The student will understand oxidation and will know the proper procedure for putting out different types of fires.

Learning Activities:

1. Demonstrate how to put out different types of fires: chemical, electrical, etc. Learn the three types of fire extinguishers and how to use them. Find out what kitchen ingredients/equipment may be effective in putting out fires.

   Send for an Arm and Hammer Fire Pail Kit for the classroom.

Instructional Resources:

1. Arm and Hammer Division, Church & Dwight Co., Inc., P.O. Box 7648, Princeton, NJ 08540

Foods and Nutrition
Level I (S.S. p. 33)

Objective I. B. Use sanitation principles for preparation labs.

Science Concepts: Why sanitation of food is important,
Microorganisms

Science Competencies: The student will discover the needs of microorganisms and how to control them through proper sanitation methods.

Learning Activities:

1. "Hello Jello." Prepare culture dishes using jello as medium. Contaminate the jello with the following: a hair from your head, saliva, coughing, fingerprint, etc. Use "Hello Jello" worksheet for directions.

2. "Will It Spoil?" Conduct an experiment to discover what foods spoil. Observe for five days and record your findings. Discuss why some foods spoil more quickly than others.

* 3. Discuss temperatures which are safe for foods. Use "Safe Temperature" handout for information sheet. By removing the temperatures from the left hand side you may use the same worksheet as a post-test. Have volunteer students test temperatures of food served in the cafeteria using a food quality thermometer.

4. "Subsurface Mold Growth on Foods." Observe aerial and submerged mold on bread, apple, and cheese. What does this experiment tell us about the safety of cutting off the top mold and using the rest of the food?

5. Discover how to properly handle food by doing the experiments in the Food Handling Detective Story.

6. Read The Safe Food Book. Discuss types of food poisoning and foods what are most often the culprits. Plan a picnic using "safe" foods.

Instructional Resources:

*1. Hello Jello
2. Will It Spoil? FOOD....Your CHOICE, Level 3. National Dairy Council, Rosemount, IL., 1980. Unit Two, Activity 7A.
4. "Subsurface mold growth on foods", Experiments in Food Science, The Institute of Food Technology, 221 N. LaSalle, Chicago, ILL 60601, p. 7-10.
5. Food Handling Detective Story. FOOD....YOUR CHOICE, Level 3. National Dairy Council, Rosemount, IL, 1980, Unit Two, Activity 7B.
6. USDA, The Safe Food Book, Food Safety and Inspection Service, Dec. 1984. Available through Consumer Information Center, Pueblo, CO, Homes and Gardens Bulletin 24.

Food and Nutrition
Level I (S.S. p. 33)

Objective I. H. Demonstrate correct use of recipes.

Science Concept:
1. Formation of carbon dioxide gas with leavening agents
2. Functional characteristics of ingredients
3. Use of heat, water, and air for leavening
4. Caramelization of Sugar
5. Scientific design, How cells incorporate air

Science Competencies:
1. The student will understand the chemistry of leavening agents
2. The student will understand the function of baking ingredients.
3. The student will understand how heat, water and air combine to cause products to rise.
4. The student will demonstrate how sugar decomposes into caramel.
5. The student will set up an experimental design to find the best method for air incorporation in egg whites.

Learning Activities:

1. Make Lemon Fizz, p. 73, Science Experiments You Can Eat, to demonstrate how baking soda and acid work. Observe what happens when baking soda is added to water and when lemon juice is added. Test pH of both solutions. Repeat experiment with hot and cold water.

   Complete "How Cakes Rise", p. 74-79, Science Experiments You Can Eat, an experiment with cream of tartar and baking soda.

   Make Wheat Germ Pancakes with baking powder and yeast, p. 39-41, The Science Cookbook to demonstrate different leavening reactions.

   Balloon Experiment: Place baking powder and water, baking soda and vinegar, baking soda and water, yeast and water, and water (control) in separate pop bottles. Place a balloon on each pop bottle . On which bottles does the balloon inflate?

2. Discuss the overheads "Functions of Ingredients" and "What Happens during Baking".

   Investigate how chemistry is used in cakemaking. Read "The Chemistry of a Cake: or Eating Metric." Bake a cake to demonstrate gas expansion and protein coagulation.

3. Discover the action of steam and air in making products rise. Search through cookbooks to find recipes that incorporate air or steam instead of leavening agents. Prepare various products which use this type of leavening such as Apple Puffs, (The Science Cookbook), Pop Overs, Angel Food Cake and Chocolate Souffle.

   Make Dutch Babies-- pancakes that puff up like magic. Experiment with different mixing methods to find the best method of incorporating air when making Dutch Babies. (i.e. electric mixer vs. whip vs. fork; eggs, then liquid, then flour vs. all ingredients together.)

   Make Pita Bread to demonstrate how steam causes bread to expand.

4. Demonstrate how sugar decomposes into caramel, p. 80-81, The Science Cookbook. May also prepare a cookie recipe or ice cream sauce that uses this principle.

5. Experiment with different mixing methods of incorporating air into egg whites. Use egg whites in meringue tortes when experiment completed. Make a chart of the results.

   Greased vs. ungreased bowl
   Cold vs. room temperature bowl
   Fork vs. electric beater
   Pure vs with speck of egg yolk
   Small deep bowl vs. shallow wide bowl
   Sugar added at beginning, middle and end

Instructional Resources:

1. Cobb, Vicki, Science Experiments You Can Eat, J.B. Lippincott, 1972.

   Waxter, Julia, The Science Cookbook, Belmont, CA: David S. Lake Pub., 1981.

2. "Which Cake Shall I Serve?", Topic #3 Function of Ingredients. Proctor and Gamble, P.O. Box 14009, Cincinnati, OH 45214.

   Marino, Constance and Joseph Schmuckler, "The Chemistry of a Cake: or Eating Metric", Science Activities, Nov/Dec. 1980, p. 31-3.

*3. Dutch Babies Recipe, Family German Pancake Recipe. Pita Recipe

4. Waxter, Julia, The Science Cookbook, B lmont, CA: David S. Lake Pub., 1981.

Food and Nutrition
Level I (S.S. p. 33)

Objective II. A. Identify the basic concepts of nutrition.

Science Concepts:
1. How nutrients are used by the body
2-3. Nutrients in Food
4. Chemical analysis of nutrients
5. How food gives energy

Science Competencies: The student will:
1. understand the function of different nutrients in the body.
2. be able to identify sources of different nutrients in foods.
3. make wise food decisions based on his/her individual nutritional needs.
4. use chemical tests to analyze foods for several different nutrients.
5. make a calorimeter to understand how food energy is measured.

Learning Activities:

1. Use a "Nutrients and Body Function Board" to increase understanding of the specific body functions each of the 12 nutrients serves, show interaction between nutrients, and motivate interest in nutrition. The board lists the body functions of the nutrients. Students match up cards printed with the nutrient names with the correct function in a game setting.

2. Identify foods rich in certain nutrients in "Nutrition Match-Up" exercise. Name the major nutrient contributed by the group of foods listed.

   Play "Got It", a card game where the object is to get the recommended daily diet allowance of the nutrient being played for. Students find thir RDA for their age and sex. Students are dealt 5 cards from a deck of 52 cards which have pictures of different foods with their nutrient content (students may make cards or can use National Dairy Council Food Composition Cards). Players decide on a nutrient to play for. The first player draws a card from the deck and may keep it or discard it. Players must keep 5 cards in their hand at all times. The next player can pick up the discarded card or draw from the pile. The game continues until a player gets enough of the nutrient to meet his/her RDA.

   "Anatomy of a Milkshake," Activity #5. Examine what is a fattening food by analyzing the nutrient content of a milkshake.

3. Use "Snack In-Basket" to make decisions on good snacking.

4. Chemically test different foods for nutrient content:

   a. Sugar - Benedict's Solution or Molisch test. (see Experiment #57, Chemistry of Common Substances or p. 243-244, The Chemical World).
   b. Starch - Iodine Test (See p. 244, The Chemical World).
   c. Protein - Burn test. Burn different foods. Protein foods smell like burning hair.
   d. Fat - Brown paper. Check if food leaves a grease spot on brown paper. See also Experiment 60-63, Chemistry of Common Substances for finding the fat content of french fries using freon, and methods for finding the fat content of milk and ground beef.
   e. Vitamin C - Iodine Method. See p. 266-267, The Chemical World or Experiment #50, p. 101-102, Chemistry of Common Substances.
   f. Iron - mix various fruit juices with tea and check for precipitate indicating iron present or do Experiment 23, p. 45-46, Chemistry of Common Substances. (This experiment also teaches dilutions and use of a standard.)
   g. Potassium - Experiment 24, p. 47-48, Chemistry of Common Substances.

5. "Coffee Can Calorimeter". Assemble a calorimeter to demonstrate how food produces energy and how energy can be measured. Students should understand what a kilocalorie is after this exercise.

Instructional Resources:

1. Smith, Carolyn, "Nutrients and Body Functions: A Teaching Technique", Illinois Teacher, Jan/Feb. 1980, p. 133-136.

2. "Nutrition Match-Up", Forecast for Home Economics.

   "Got It," Illinois Teacher, Vol. XIII, No. 5, May-June 1970, p. 248-249.

   Anatomy of a Milkshake, Food...Your CHoice, National Dairy Council, Rosemount, ILL, 1980.

*3. Blankenship, Martha, "Snack In-Basket", BASE Home Economics Curriculum. Grades 5-8 Area 3.0 Foods/Nutrition, Home Economics Education, West Virginia, Oct. 1981, p. II-fn-67.

4. These books are available for loan from Math Science Teacher Resource Center, 126 Reid Hall, Montana State University, Bozeman, MT 59717:

   Summerlin, Lee, Chemistry of Common Substances, Morristown, N.Y.: Silver Burdett, 1979.

   Darlington, C. LeRoy & Eigenfeld, Neal, The Chemical World, Houghton Mifflin Company, 1977.

*5. Counting on Energy, Project 3E, Montgomery County, Bluebell, PA.

Food and Nutrition
Level I (S.S. p. 33)

Objective II. B. Prepare a variety of foods using basic techniques

Science Concepts: 1. Getting food out of tissues through osmosis

Science Competencies:
1. The student will do experiments to discover the principles of osmosis and will incorporate these principles into cooking methods.

Learning Activities:

1. Sprinkle sugar on grapefruit. After a half hour, check the amount of juice on top. Discuss what is happening.

   "Osmosis in Eggs." Place an egg in a wide-mouth jar. Cover with vinegar and cap jar. Observe after 2 hours. Observe after 2 days. (Egg should swell to 2x size). Pour off vinegar. Wash egg several times. Add clear syrup to cover egg. Observe after several days. Have students explain what is happening.

   Complete the osmosis experiment from Learning Science through Cooking, p. 16-17. This experiment uses potato cubes to demonstrate the principles of osmosis.

   Brainstorm ways osmosis can be used to an advantage in cooking, ie., crisping lettuce, making soups, meat cookery, freezing fruits.

   Participate in a foods lab on preparing relishes such as radish roses, carrot curls, celery ringlets, etc. Observations can be made on the effect of salt and different water temperatures. See Science Experiments You Can Eat, p. 89, for ideas.

Instructional Resources

1. Davis, Barbara. Learning Science Through Cooking, New York: Sterling Publishing Co, Inc., 1964

   Cobb, Vicki. Science Experiments You Can Eat, New York: J.B. Lippincott Company, 1972

Foods and Nutrition
Level I (S.S. p. 33)

Objective II. B. Prepare a variety of foods using basic techniques.

Science Principles:
1. Solutions and Suspensions (solute, solvent, diffusion, homogeneous, supersaturation, serial dilutions, decanting, Tyndall effect, colloids)
2. Boiling and freezing points and how they are affected by solutes

Science Competencies: The student will:
1. discover factors which affect the rate of dissolving, tell the difference, between solutions and suspensions, and identify colloid mixtures.
2. identify boiling and freezing points and the effect of solutes on them.

Learning Activities:

1. Make instant fruit drink using ice water, room temperature water, and boiling water. Make observations on the rate of diffusion. See p. 5-8, The Science Cookbook for experiment on how temperature affects dissolving rate in honey lemonade.

   Complete the experiment "Sour-ball Ade" on page 24, [illegible] Experiments You Can Eat, which demonstrates the effect of surface area on dissolving rate.

   Have students plan their own experiment like the one on page 29, Science Experiments You Can Eat. Filter a sweetened puree such as borscht or applesauce to demonstrate how particle size affects solutions. Examine the filtered liquid and have students arrive at definitions for solution and suspension.

   Identify colloids. Demonstrate the Tyndall effect by shining a flashlight through a glass of water and then through cranberry juice. Have students classify different liquids as being colloid or solution or suspension.

2. Perform an experiment to discover what the boiling point is at your altitude. How will this affecting cooking and baking? Experiment with covering and uncovering foods and pressure cooking to demonstrate temperature changes while cooking. Add a solute (salt or sugar) to the water and find the new boiling point.

   Boil water in a paper cup (Experiment #21, p. 42, Chemistry of Common Substances to show how different materials absorb heat at different rates.

Complete the experiment on page 12-17, The Science Cookbook to see how evaporation and absorption affects foods. Make stewed tomatoes or catsup to demonstrate how evaporation can aid food preparation. Taste test reconstituted dried foods to demonstrate absorption principles.

Complete the experiment "Ice Pops and the Freezing Point of Solutions" on p. 20, Science Experiments You Can Eat.

"Tin Can Ice Cream". Find the melting point of ice. Find the melting point of ice when salt is added. What happens to the freezing point? Examine the ingredients, nutrient composition and quality (flavor, texture, color) of homemade, commercial, and gourmet ice creams. Read "The Scoop on Ice Cream."

Instructional Resources:

1. Cobb, Vicki, Science Experiments You Can Eat, J.B. Lippincott, 1972.

Wexter, Julia, The Science Cookbook, Belmont, CA: David S. Lake Pub., 1981.

Summerlin, Lee, Chemistry of Common Substances. Morristown, N.Y.: Silver Burdett, 1979.

*Thomas, Dian, "Tin Can Ice Cream", Tucson, AZ: H-P Books (ISBN: 0-89586-167-4), p. 46.

"The Scoop on Ice Cream". COED, June 1984.

Food and Nutrition
Level II (S.S. p. 35)

Objective I. B. Demonstrate conservation of resources in the kitchen.

Science Concepts: 1. Processing and packaging consume energy.
2-3. Energy costs of food production
4-5. Alternate energy sources--solar
6-8. Conservation of energy

Science Competency: The student will:
1-3. understand the energy costs involved in the production, processing and packaging of food.
4-5. use solar power to cook and dehydrate food.
6-8. be able to apply conservation techniques for home use.

Learning Activities:

1. Use Pie-In-The-Sky for background reading on food and energy and activities to teach energy costs of processing and packaging.

2. Complete "Ag, Energy and Society," 12 lessons on food production prepared by the National Science Teachers Association to examine present day agricultural methods, impact on resources, and food production in other cultures.

   Show the film "Toast" (12 minutes) to give an overview of energy consumption in the food industry.

4. Use the Sunspot Solar Oven to harness the sun to cook.

5. Loan the "Energy Box", a trunk filled with energy devices, books, and activity guides to give students experience recycling, solar food drying and solar cooking.

6. Teacher displays picture of kitchen with abundance of electrical appliances and gadgets. A caption comes from the television: "The President announces - "all households must cut back on energy expenditures." A couple thinks, "How could we possibly help." Have students calculate the amount of energy used by each appliance. Then have the students brainstorm how energy might be conserved (i.e. have them group appliances by similar jobs accomplished and compare the energy used by each).

7. Assign each student an appliance. Make 2 identical cards stating or picturing a tip for wise use of that appliance to conserve energy. Divide class into group of four. Have one student in each group draw a picture of an energy wasting monster. Play the game like "Old Maid."

8. Conduct an experiment comparing different food preparation techniques. Plan, prepare and compare an oven meal, a pressure cooker meal, and a small appliance meal.

Instructional Resources:

1. - 4. Available from Montana Power Company Consumer Education Services, 40 E. Broadway, Butte, MT 59701.

5. Energy Box, Loaned for 1 1/2 week period for $60 shipping fee from AERO, 324 Fuller, Helena, MT 59601 (Call 443-7272)

Food and Nutrition
Level II (S.S. p. 35)

Objective II. B. Identify food additives.

Science Concepts: 1. Chemicals in our Food
2. Function and safety of Chemical Additives

ScienceCompetencies:
1. The student will understand the chemical nature of the foods he/she eats.
2. The student will recognize some common food additives and understand why they are needed.

Learning Activities:

1. Have students read a breakfast, lunch and dinner menu as seen by a chemist. Discuss the chemicals present in all foods. Help the students identify the chemical names for sugars, proteins, and fats.

2. "Additives--Do They Add or Subtract," Activity #21. Examine the purpose of additives. Make muffins with and without additives.

   Have students bring in bread wrappers and various labels from cereal and baked products. Make a list of the additives found on the labels. Have students research the function of each additive. Read "You should know . . . about Bakery Products. Discuss what additives are really needed and which are just cosmetic. Read the rest of "You should know" series to find out about food colors, preservatives, sweeteners, caffeine, sodium, nutrients, etc.

   Make "Chemical Apple Pie," Experiment 4, p. 7, Chemistry of Common Substances. This experiment demonstrates what is possible with chemistry--apple pie without apples!

   Have students research what changes are being made in labeling laws to better identify food additives.

   Perform experiments to demonstrate the purpose of additives. Prepare foods with and without additives and record the differences. See "Science Experiments with Food Preservatives" for some ideas. Experiment 10 and 45 in Chemistry of Common Substances tests foods for the additives borax and calcium propionate.

   "The Great Sodium Shakeup" in The Case of the Hidden Sodium. Identify sodium content in foods. This activity explains some of the sodium compounds that may be added to foods (sodium glutamate, sodium propionate, etc.) and contains some low-sodium recipes for students to taste test.

3. "Are All Sugars Sweet?" Experiment 3, p. 6, Chemistry of

Common Substances. Rank sweeteners on their sweetening power. (Sucrose - 100, Lactose 16, Galactose 32, Glucose 72, Fructose 173, Cyclamates 3,000 and Saccharin 45,000).

Examine products the students use that contain artificial sweeteners. After background information has been presented, assign students to research the wide range of products where artificial sweeteners are used. Run a taste panel using lemonade sweetened with sugar, saccharin, cyclamates, and aspartame. Poll students on their favorite.

Sample baked products using the artificial sweeteners. What problems are encountered in baking with the artifical sweeteners?

Instructional Resources:

1. "Your Breakfast Chemicals," "Your Dinner Chemicals" and "Your Lunch As Seen By A Chemist," Consumer Information, Manufacturing Chemists Association, 2501 M St, N.W., Washington, D.C. 20037. "Food Additives Who Needs Them" is also available.

   "Additives--Do They Add or Subtract?", Activity 21, Food...Your Choice, National Dairy Council, Rosemount, ILL, 1980.

2. Consumer Guide to Food Additives, Consumer Guide/BM, Box 3660, Kankakee, IL 60902

   "You Should Know", DNS 22-32, Cornell District Center, 7-U Research Park, Ithaca, New York 14850.

   "Additives and our Food Heritage", Consumer Relations Dept, Kraft, Chicago, ILL

   "Science Experiments with Food Preservatives", Public Relations, Dept. 133, Monsanto Industrial Chemicals Co., 800 N. Lindbergh Blvd, St. Louis, Missouri 63166

   Lehmann, P., "More Than You Wanted to Know About Additives", FDA Consumer, April-June 1979.

   "The Case of the Hidden Sodium", Quaker Oats Company, Merchandise Mart Plaza, Chicago, ILL 60654.

3. "Are All Sugars Sweet?", Chemistry of Common Substances. Morristown, New Jersey: Silver Burdett Company, 1979, p. 6.

   Free samples available of Nutrasweet form Searle Food Resources, Inc., P.O. Box 1174, Glenview, IL 670025.

Food and Nutrition
Level II, (S.S. p. 35)

Objective II. C. Determine the effects of food and life styles on nutrition and health.

Science Concepts:
1. Scientific methods and nutrient needs of body
2. Effect of nutrition on health, risk factors of heart disease
3. Plant fibers and their physiologic effect on body
5. Simple vs. complex carbohydrates
6. The function of enzymes
7. Relationship between Nutrition and Physical Peformance

Science Competencies: The student will:
1. understand the scientific method by conducting an animal study to find the effect of nutrient deficiencies.
2. modify recipes and diets for optimum health.
3. understand the effects of fiber in the diet and become familiar with various fiber components and sources of plants.
5. understand the difference in simple and complex carbohydrates and how they affect the body.
6. understand how enzymes help breakdown food particles by experimenting on carbohydrates and proteins.
7. understand how nutrition affects physical performance and how to obtain optimal energy for sports

Learning Activities:

1. Conduct an animal feeding study to analyze effect of diet on health. See "Learning Nutrition Via Animal Feeding Experiments for procedures and ideas.

   "Trapped." Students find what nutrients are deficient in fast foods by "rescuing" someone trapped in a fast food joint. They decide what foods would provide him/her with a balanced diet and also examine how deficiencies of each nutrient would affect the body.

2. Conduct a unit on "Heart Healthy Cooking". Study the U.S. States Dietary Guidelines and information from the American Heart Association. Have students determine what risk factors they have for heart disease. Have nurse take blood pressures of students and help with pulse rates of students. Discuss what relationship the guidelines have to health of the individual. Have students research latest research reports on effects of fats and fiber on cholesterol, sodium, calcium, fiber, and other nutritional factors on hypertension, caffeine, alcohol, and other topics related to the recommendations.

   Read the "Facts about Blood Cholesterol" and information booklets from Mazola Nutrition/Health Information including "A Guide to Fats and Oils" to help understand the U.S. Dietary Guideline of increasing the polyunsaturated to saturated fat

ratio.

Plan a week's menus around heart healthy food which meets the new U.S. Dietary Guidelines.

Modify favorite recipes to reduce sodium, sugar, cholesterol, saturated fat, and calories. See "Hearts", p. 24-29, Forecast for ideas. Test the recipes and run taste panels to evaluate the changes in flavor, texture, color, and overall quality. Develop a class recipe book with the modified recipes and the resulting changes in calories and key nutrients. Present demonstrations on how to modify recipes at the next PTA meeting!

Hold a "Fight Anemia Cookie Contest." Students create recipes to incorporate more iron into snacks.

Prepare "Hidden Nutrition Cakes" (Chocolate Kraut Cake, Tomato Cake, Sweet Potato Cake, and Chocolate Dot Pumpkin Cake. Design comparision cards of the nutrient values of these fortified cakes and regular cakes.

Run a simulation of a food technology lab having students create a recipe with "hidden nutrition." Since the nutrients most often short in American diets are iron, calcium, vitamin A and Vitamin C, have students pay special attention to adding these. Have students run a taste panel to evaluate appearance, flavor, texture, and other characteristics of their new foods. Nutrient information should be presented on a chart indicating % of the USRDA, caloric value and how the new food is different from the nutritive value of the usual recipe.

Survey the local restaurants for the availability of heart healthy foods on their menus. Contact The American Heart Association for their guidelines as some restaurants have indicated that certain menu items have been approved by the American Heart Association. Other projects might be surveying restaurants for the type of fat (saturated vs. polyunsaturated) used in deep-fat frying foods, the options in low calorie or low-fat salad dressings, vegetarian dishes on the menu, or amount of sodium used in food preparation.

3. Show the film "Science and Superstition." (10 minutes) Play "The Mythbusters". Have students take the true and false test on "Food Facts or Fallacies" or "Quiz on Food Fads". Have them investigate one myth that they find fascinating. Have students give a short report on the supporting information they discover. Discuss how to evaluate information for creditability.

4. Have chemistry teacher demonstrate or describe the procedure for analyzing fiber in the laboratory. Have students research fiber and arrive at a class definition for fiber. What parts of the plant does fiber come from. What are

different components of fiber? What happens to fiber in the digestive tract? How does fiber aid digestion, prevent constipation? Demonstrate how fiber assists peristalsis by filling a sock with different items showing how difficult it is to move a flat object (sheet of paper) versus something that touches the sides of the stocking. Read recent publications on fiber to discover other healthful contributions, ie. cancer, hypocholesterolemia, diverticulosis, etc. How much fiber should be included in the diet? How can this be achieved? What different contributions do the various fiber components (pectin vs. cellulose) make?

Play "Betting on Bulk", a card game utilizing the Incredible Bulk to indicate fiber-dense foods and the Taste Bud to recognize the importance of taste in foods and symbols to point out nutrient content of foods.

Create a smorgasbord of high fiber breads that can be displayed in the school cafeteria with fiber and nutrient information. Students can develop their own recipes. (See "Add-A-Grain Bread" for ideas).

Investigate the use of a variety of high-fiber grains in a variety of foods. See "New Ways with Barley" for recipes using Montana barley.

Write companies for the actual fiber content of products advertised as being whole wheat. Whole wheat crackers, for instance, might be a good product to investigate. How truthful is "whole wheat" advertising?

3. Discuss simple and complex carbohydrates. Design a comparison project to examine the carbohydrate contents of various foods. Examples might be identifying "hidden sugar" in foods to aid diabetics, comparing sugar content of cereals to help parents of young children, or identifying foods high or low in fiber content. Projects might consist of designing posters for display at school, stores, and medical offices, or presenting talks to classes, parent groups, or senior citizen and other organizations.

6. Demonstrate the breakdown of starch to sugar by enzymes. Have students chew a soda cracker and hold it in their mouths for 5 minutes. Is there a taste change? What causes the change? What does starch convert to? OR Have two test tubes containing a small amount of starch. Add water to one and a small amount of saliva to the other. Test both test tubes with a few drops of iodine. Which one contained the most starch? What happened to the starch in the saliva tube?

Demonstrate protein enzymes by seeing what happens to jello when a protein enzyme is added (meat tenderizer). Make gelatin and add meat tenderizer to a) hot gelatin and b) cold set gelatin. Observe. Why was the gelatin not

affected by the enzymes when added to the hot gelatin? Discuss how enzymes may be used in food preparation. Make junket, p. 117-118, and complete the meat tenderness experiment on p. 119-126, Science Experiments You Can Eat. Have students make a gelatin salad with fresh pineapple and canned pineapple. (Place a slice of fresh pineapple and a slice of canned pineapple on gelatin.) Why is fresh pineapple not used in gelatin salads?

Demonstrate how enzymes aid digestion by showing how bile salts affect cooking oil. Do an experiment with the effects of water, pepsin, hydrochloric acid, and hydrochloric aid and pepsin on egg white.

7. Nutrition and Physical Performance. Discuss topics such as weight gain/weight loss, optimum calorie levels for physical performance and the best foods to obtain, glycogen loading, pregame meals, water and mineral needs and how to replace.

Instructional Resources:

1. Harden, Margarette, "Learning Nutrition Via Animal Feeding Experiments", Texas Tech. Vol XIX, #2, Winter, 1979, p. 6-8.

   "Trapped", Activity 4A. Food...Your Choice. National Dairy Council. Rosemount, ILL, 1980.

2. "Hearts", Forecast for Home Economics, Oct. 1985, p. 24-29. Adapted from Culinary Heart Kitchen Course, a $95 kit available from your local chapter of the American Heart Association.

   The American Heart Association Cookbook, Fourth Ed., New York: David McKay Co., Inc., 1984.

   Various information brochures from your local The American Heart Association are available on heart healthy foods.

   "Facts about Cholesterol." NIH Publication 852696, U.S. Gov. Printing Office, Jan. 1985.

   Mazola Nutrition/Health Information Service, Box 307, Coventry, CT 06238.

   Patton, Carol, "Hidden Nutrition Cakes". Illinois Teacher, Jan/Feb 1984, p. 90-91. For recipes write to author at Tuscola High School, Tuscola, ILL.

   Spitze, Hazel, "Hidden Nutrition: A Concept and a Teaching Technique," Illinois Teacher, Jan/Feb. 1980, p. 130-132.

3. "Food Facts or Fallacies" Pre-test. The Body Revolution, Utah State Board for Vocational Education, Utah Supt. of Education, Sept. 1981.

"Nutrition Nonsense", Learning Packet, $3.00, Washington State Dairy Council, 3830 Stone Way North, Seattle, WA 98103. Packet contains: Quiz on Food Fads, Eating for the Health of It, Vitamin Facts, Guide to Wise Food Choices, Coping with Food Faddism, The Confusing World of Health Foods, and other articles on nutrition misinformation.

4. Cooking With Whole Grains, Better Homes and Gardens, 1983.

Newman, Rosemary, New Ways with Barley, Department of Home Economics, Montana State University, Bozeman, MT 59717.

The Fiberfactor (Newsletter) and Food, Fiber, and Fitness (recipe booklet) are available from Consumer Relations Dept, The Quaker Oats Company, Merchandise Mart Plaza, Chicago, IL 60654.

"Dietary Fiber: A Healthy Story Continued", Kellogg Co., MP and S Dept, 235 Porter St, P.O. Box 3423, Battle Creek, MI 49016

"Fiber: A New Look at Dietary Fiber", Nutrition Today, Sept/Oct, 1984, Vol 19, #5, p. 6-11.

"Betting on Bulk", card game available from Eunice Bassler, The ABC's of Nutrition Education, Dept of Home Foods and Nutrition, Kansas State University, Manhattan, KS 66506. Article in Illinois Teacher, Nov/Dec. 1984, p. 60-61.

6. Cobb, Vicki, Science Experiments You Can Eat, New York: Lippincott, 1972.

An Intermediate Science Unit, Portland MA: Weston Walch.

7. Nutrition and Physical Performance, resource packet ($3.00) from the Washington State Dairy Council, 3830 Stone Way North, Seattle, WA 98103 which contains: Nutrition, Health and Athletic Performance, Eat to Compete, Food in Training and Energy for Sport (General Mills), Quiz, Vitamin Facts, Guide to Good Eating, Teachers Guide, and several articles on Nutrition and Physical Performance.

Objective II. D. State influences on menu planning.

Science Concepts:

1. The effects of pressure on cooking time
2. Sensory perception

Science Competency:

1. The student will understand the principles of pressure cooking.
2. The student will understand the sensory perception sights on the tongue and use all senses to taste herbs and evaluate foods.

Learning Activities:

1. Obtain a "Pressure Can It Kit" from Presto.

   Place 2 whole medium sized potatoes in ordinary saucepan and 2 of the same size potatoes in a pressure saucepan. Add 1 cup of water to each. Cook both for 15 minutes. Use 15 pounds of pressure for the pressure saucepan. Compare doneness and amount of liquid remaining for each.

* 2. Map out the perception sights on the tongue for saltiness, bitterness, sweetness, sourness. Complete "Tongue Teasers" and "More Than Meets the Eye" exercises to better understand sensory perception as related to foods.

   Research how extracts are obtained.

   "Artificial Flavors", Experiment 54, p. 110-112, Chemistry of Common Substances. Students make esters and gain an understanding how different artificial flavorings may be produced chemically.

   Have students make pudding and vary the time when flavoring is added. What happens to the alcohol when flavoring is added at the beginning of the cooking time?

   Mix various herbs and spices with cream cheese and have students sample them and suggest dishes where the spice would be appropriate. Identify the part of the plant where the spice originated i.e. (flower, seed, stem, bulb).

   Start an herb garden instructing students on how to care for the plants, how to harvest the herb, and appropriate storage methods.

   "Cheese Tom Ditty", p. 44-46, The Science Cookbook. Make this recipe to discover the process of sensory perception and desensitization.

Instructional Resources:

1. Experiment from Teaching Principles of Science in Homemaking, Home Economics National Education Association, 12001 16th St., N.W., Washington 6, D.C., April 1960.

The Pressure Can It Kit, National Presto Industries, Inc., Eau Claire, WI 54701.

*2. Blankenship, Martha, BASE Home Economics Curriculum. Grades 5-8 Area 3.0 Foods/Nutrition, Home Economics Education, West Virginia, Oct. 1981.

"Herbs That May Be Grown in Montana", Montana Cooperative Extension Service, Bozeman, MT 59717, Circular 11783, March 1985.

Waxter, Julie, The Science Cookbook, Belmont, CA: David S. Lake Pub., 1981.

Summerlin, Lee, "Artificial Flavors", Experiment 54, Chemistry of Common Substances, Morristown, New Jersey: Silver Burdett, 1979.

Food and Nutrition
Level II, (S.S. p. 36)

Objective III. A. Use standard food preparation techniques to prepare food.

Science Concepts: CARBOHYDRATES
1. Elements & compounds of carbohydrates, oxidation
2. Saturation and supersaturation, crystallization
3. Effect of heat and water on carbohydrates

Science Competencies: The student will:
1. know what elements comprise carbohydrates by observing models and learn what element is left after oxidation.
2. understand saturation and supersaturation of sugar solutions.
3-5. perform lab exercises to learn the effect of water and heat on carbohydrates.
6. identify parts of kernal of grain and understand germination and the milling process.
7. understand the Maillard reaction.

Learning Activities: Carbohydrates

1. Invite the chemistry instructor to bring his element chart and models to explain elements and how they are combined to form compounds. Carbohydrates or "watered carbons" are made up of the elements carbon and hydrogen. Have students make their own models out of toothpicks and painted styrofoam balls (black - carbon, red oxygen, and white - hydrogen).

   Burn different foods on aluminum foil in the oven to illustrate the carbon remaining after oxidation.

2. Complete food laboratories on the crystallization properties of sugar. See p. 42-46, Science Experiments You Can Eat for experiments on syrup and hyroscopic cookies.

3. Complete food experiments to demonstrate how cooking affects starch breakdown. What happens to starch when water is added? Have the students make Tapioca page 47-48 in Science Experiments You Can Eat or the Swiss dish Muesli, page 21, Learning Science through Cooking or Twice Baked Potatoes in The Science Cookbook. What happens to starch when a combination of water and heat are applied? Prepare risotta, page 22, Learning Science through Cooking or Polenta, p. 26-29 The Science Cookbook and/or design experiments of your own with puddings, vegetable cookery, and sauces.

4. Have students devise an experiment to compare tapioca, flour and cornstarch as thickeners. Have them find the best mixing method from the following: add starch to 1 T. water, add starch to 1 c. water, heat liquid and add starch, and mix starch with melted fat and add to liquid. What happens to

the starch molecule? What technique produces the smoothest product? Is the same technique equally effective for all kinds of thickeners?

Make pies utilizing cornstarch, flour, and tapioca as thickeners. Devise a rating scale to evaluate the products.

Make puddings using different thickening agents and compare flavor, appearance, cost, and textures. Summarize the principles of starch cooking.

Experiment with methods to produce the best gravy. Have students summarize results by composing a short paragraph on "Fail-proof Gravy Making."

5. Examine a kernel of grain and identity the components: germ, endosperm, aleurone, pericarp. View pieces under a microscope. What is the purpose and composition of each part? Sprout wheat or other seeds to demonstrate germination. Visit a mill or bakery to learn about the milling processes. Have a agricultural expert talk on the variety of grains grown in Montana and different uses for them.
7. Demonstrate the Maillard Reaction by toasting bread and having students identify the flavor and color changes. Explain that the Maillard reaction is a reaction between protein (amines) and sugars (reducing sugars). Have students complete the experiment "The Effect of Refrigeration Storage on Color Form in Potato Chips and French Fries.

Instructional Resources:

4. Cobb, Vicki, Science Experiments You Can Eat, New York: Lippincott, 1978.

   Waxter, Julia, The Science Cookbook, Belmont, CA: David S. Lake, Pub., 1981.

5. Green, Kinsey, The World of Food Teachers Guide. Lexington, Mass.: Ginn & Co., 1977.

6. Blankenship, Martha, BASE Home Economics Curriculum. Grades 5-8 AREA 3.0 Foods/Nutrition, Home Economics Education, West Virginia, Oct. 1981, BANK III, p. III-fn-9.

7. "The Effect of Refrigeration Storage on Color Form in Potato Chips and French Fries", Experiments in Food Science. The Institute of Food Technologists, 221 N. LaSalle St., Chicago, IL 60601, p. 29-30.

Food and Nutrition
Level II (S.S. p. 36)

Objective III. A. Use of standard food preparation techniques to prepare foods.

Science Concepts: PROTEINS
1. Denaturation
2. Coagulation
3. Effect of acid
4. Collagen tissue and the effect of heat and moisture

Science Competencies:
1. The student will perform different food experiments to see how protein is affected by heat, moisture, acid, temperature, enzymes, etc.

Learning Activities:

1. Beat egg whites into meringue to show how protein is denatured and its shape changes, p. 58, Science Experiments You Can Eat and p. 32, The Science Cookbook. Demonstrate the effects of beating, acid, temperature and sugar on the protein.

2. Perform various experiments to demonstrate coagulation.

   Fry an egg at high and low temperatures.

   "Chemistry of a Fried Egg," Experiment 59, p. 121, Chemistry of Common Substances. "Fry" an egg without heat. Explore ways to coagulate protein using heat, alcohol, tannic acid, and salts of heavy metals.

   Make Custard, p. 62, Science Experiments You Can Eat to show the change to a solid state.

   What is the scum that forms on scalded milk? Make hot chocolate to compare high and low cooking temperature, stirring versus beating, covered versus uncovered.

   "Calcium and Coagulation of Milk," Experiment 26, p. 51-52. Chemistry of Common Substances.

   Make cheese and identify the protein portion of milk and by-products by "Making Cheddar Cheese at Home" and "Making Cottage Cheese at Home".

   Prepare Sour Milk Biscuits demonstrating how to sour milk. This will demonstrate how solid particles of protein form when acid is added.

Study curdling of tomato soup. Find the best method from the following: tomato juice added to white sauce, thickened juice added to milk, hot tomato juice to hot milk, cold tomato juice added to cold milk, hot tomato juice added to cold milk, cold milk added to hot tomato juice.

4. Collagen study: Discover where gelatin comes from. Prepare gelatin from veal bones by boiling bones for an hour in water and straining. Complete gelatin experiments on p. 65-66, Science Experiments You Can Eat.
How can you apply this knowledge to meat cookery?

5. Discover the difference in flour types by preparing gluten balls from all-purpose flour, pastry flour, cake flour, and bread flour. See the "Directions for Making Gluten Balls." Discuss uses for each flour type.

   Make and evaluate muffins from cake flour and all-purpose flour.

   Using handcraft books, make playdough paste and glue for paper mache. What determines the characteristics? What makes the dough malleable? How can you relate this to breads?

6. What is needed to produce the structure of bread? Experiment with kneading biscuits for 2, 5, and 15 minutes and baking after the first, second and third rolling.

   Investigate the effect of the following ingredients on bread: a) butter, margarine or oil, b) sugar, honey, sugar substitute, brown sugar, or molasses, c) various flours, and d) eggs and no eggs.

7. Discuss complete and incomplete proteins. Demonstrate how vegetarians can combine proteins to obtain all the essential amino acids needed. What are other benefits obtained from eating vegetable proteins? What deficiencies might result from eating only vegetables?

   Investigate the technology in developing soy protein products. List all the products you can think of produced from soy--everything from oil, extruded protein products, dog food, meat extenders, margarines, "ice creams", flour and baked products, milk and baby formulas, etc. Have students make Tofu (soybean curd) and develop recipes with it.

Instructional Resources:

1, 2, 4. Cobb, Vicki, Science Experiments You Can Eat, New York: Lippincott, 1972.

Waxter, Julia, The Science Cookbook, Belmont, CA: David S. Lake Pub., 1981.

2. Summerlin, Lee, Chemistry of Common Substances, Morristown, N.J.: Silver Burdett, 1979, p. 121-122, 51-52.

Pagenkoph, Andrea, "Making Cheddar Cheese at Home" and "Making Cottage Cheese at Home", Montana Cooperative Extension, Bozeman, MT 59717.

3. Ada Campbell et al., The Experimental Study of Food, Boston: Houghton-Mifflin, 1979.

7. U.S.D.A., Soybeans in family meals, Home and Garden Bulletin #208.

Food and Nutrition
Level II (S.S. p. 36)

Objective III. A. Use standard food preparation techniques to prepare foods.

Science Concepts: Fatty Acids
1. Sources of fat, saturated, polyunsaturated
2. Coalescence and Emulsions of fat molecules
3. Smoking point and solidfying points of fats
4. Oxidation and rancidity
5. Relation of fat to health

Science Competencies: The student will:
1. obtain oils from plant sources and will be able to identify saturated and polyunsaturated fats.
2. make butter to understand coalescence of fat molecules and other products to study emulsions.
3. identify smoke points and solidifying points of various fats.
4. discover the best storage method for fats which will prevent rancidity or off-flavors from occurring.
5. understand the importance of fat and the type of fat to the diet.

Learning Activities:

1. Have the chemistry instructor explain the difference between saturated and polyunsaturated fats. Explore the types of fats available on the market. Discuss animal and plant sources of fat and their relationship to the U.S. Dietary Guidelines.

   Demonstrate how plant oils are obtained. Press oil from nuts to make nut butter, p. 52, Science Experiments You Can Eat.
2. Make butter by shaking cream a covered jar. Show how the fat molecules coalesce or clump together.

   Make whipped cream, p. 33, The Science Cookbook. Compare artificial whipped toppings with real whipped cream. Evaluate product quality, nutritional quality, calories, ingredients, and cost.

   Prepare French dressing and observe how long it takes the oil to separate from the vinegar after shaking it 10 times, 20 times, and beating with an electric mixer 4 minutes. Hypothesize what is happening to the size of the droplets.

   Prepare mayonnaise with and without the egg. Identify the emulsifying agent in mayonnaise.

   Plan experiments to test the effects of temperature (cold or warm oil, or cold or warm egg yolks) on emulsions.

Complete the frozen emulsion experiment on page 38, Science Experiments You Can Eat. Make strawberry bombe with gelatin and without gelatin as the control. Which dessert has the smoother texture?

Test the effect of paprika, vinegar, gelatin, egg yolk, cornstarch and egg white on an emulsion, p. 108, The World of Food Teachers Guide .

3. Do an experiment to discover the smoke points and solidfying points of various plant and animal fats.

Fry foods at recommended temperature, then 50 degrees higher and lower than the recommended temperature.
Compare the amount of oil used and the doneness of the food.

Make pie crust using butter, lard, vegetable shortening, and oil. Evaluate the products for flavor, tenderness and appearance, and ease of preparation.

Complete "The Effect of Emulsifiers on Process Cheese, p. 11-13, Experiments in Food Science to investigate the use of emulsifiers and their effect on melting point.

4. Experiment with the "Effect of roasting upon color, flavor, and texture of peanut butter" on page 11-13, Experiments in Food Science. Make peanut butter from peanuts roasted 20, 30, and 40 minutes and then evaluate homemade peanut butter for color, flavor and percentage of fat.

Demonstrate the off-flavors in fat caused by oxidative rancidity by comparing potato chips stored in clear jars versus aluminum foil covered jars, p. 21-22, Experiments in Food Science.

5. Discuss essential fatty acids and the fat soluble vitamins as well as the U.S. Dietary Guidelines to reduce the total amount of fat and increase the proportion of polyunsaturated fats. Demonstrate no or low-fat cookery methods (Use of non-stick sprays, American Heart Association recipe modifications, no-fat salad dressings using pectin or cornstarch). Discuss what vitamins must be considered if fat in the diet is reduced.

Instructional Resources:

1. Cobb, Vicki, Science Experiments You Can Eat, New York: Lippincott, 1978.
2. Green, Kinsey, The World of Food, Ginn & Company, 1977.

Waxter, Julie, The Science Cookbook, Belmont, CA: David S> Lake Pub, 1981.

3-4. Experiments in Food Science, Institute of Food Technology, 221 N. LaSalle St., Chicago Illinois 60601

5. Recipe pamphlets from local American Heart Association.

Food and Nutrition
Level II (S.S. p. 36)

Objective III. A. Use standard food preparation techniques to prepare foods

Science Concepts: Acids and Bases

Science Competencies: The student will test foods for being acidic or basic and be able to apply this knowledge in food preparation techniques.

Learning Activities:

1. Test foods with litmus paper and classify as being alkaline or acidic. Some examples of food to test might be: soda, water, salt, tomato juice, baking powder, vinegar, sour milk, cream of tartar, molasses, lemon juice, buttermilk, melted chocolate, brown sugar, ammonia, chlorine bleach.

   Experiment with familiar combinations of the above to show what happens when an acid and alkali are combined. Explain the hydrogen and hydroxyl ion and neutralization.

   Discuss other common chemical reactions: antacids taken for heartburn, baking soda applied for bee sting, aluminum darkening, and silver polishing.

2. Experiment with the effect of heat and pH on the color and texture of vegetables, p. 1-5, Experiments in Food Science. or "The Effects of Ingredients and Cooking on Vegetables."

3. Make a fruit salad to demonstrate how to prevent oxidative browning, p. 82-83, Science Experiments You Can Eat.

   Demonstrate the effect of vitamin C in prevention of browning when preparing Slim Slice Potato Cake, p. 9-11, The Science Cookbook.

   Note browning changes in food when using ascorbic acid, citric acid, acetic acid, and water as treatments. Experiments in Food Science, p. 23-25.

Instructional Resources:

2-3. Experiments in Food Science, Institute of Food Technologists, 221 N. LaSalle Street, Chicago, ILL 60601

*Northway, Martha, "The Effects of Ingredients and Cooking on Vegetables", Ennis High School, Ennis, MT, 1985.

Cobb, Vicki, Science Experiments You Can Eat, New York: Lippincott, 1978.

Waxter, Julia, The Science Cookbook, Belmont, CA: David Lake Publ, 1981.

Food and Nutrition
Level II (S.S. p. 36)

Objective III. B. Demonstrate food preservation techniques.

Science Concepts:
1. Sugar and Pectin in Preservation of food
2. Microorganisms--Needs, Uses
3-4. Ways to preserve foods and control microorganisms

Science Competencies:
1. The student will test fruit juice for amount of pectin and discover the function of sugar and pectin in jellymaking.
2. The student will discover the good uses of microorganisms.
3. The student will use a variety of techniques to preserve foods.

Learning Activities:

1. Make grape jelly using "Jelly Jiving" or p. 49, Science Experiments You Can Eat.

   Test fruit juice for pectin: Combine 1 T. cooled fruit juice and 1 T. ethyl alcohol and let stand 30 seconds. If a thick gelatinous mass like thick egg white forms, the juice is high in pectin and indicates 1 cup of sugar per cup of juice will make good jelly. A less firm precipitate that breaks up in the fingers will indicate less sugar per juice is needed, i.e. 1/2-3/4 cup per cup of juice. If there is little precipitate, a commercial pectin should be used.

   Test fruit using a jell-meter.
   What is the purpose of sugar in jellymaking?

2. Study yeast, bread mold, and blue cheese under a microscope. Relate to food spoilage. Are microorganisms always bad?

   Make Sally Lunn Bread, p. 106-109 and Pretzels, p. 110-112, Science Experiments You Can Eat, to learn the requirements of yeast to grow.

   Make sauerkraut, yogurt, and sourdough bread to demonstrate food uses of microorganisms. Discuss other uses in foods: beer and wine making, cheeses, sausages, etc.

   Make sauerkraut to show how enzymes act as catalysts, osmosis, and that lactic acid bacteria convert sugar in cabbage to lactic acid. A comparison of homemade sauerkraut and commercial sauerkraut also shows the effect of bleaching. Use Experiment 29, p. 58-59, Chemistry of Common Substances for specific directions.

Discuss "A Microbiological Approach to Nutrition", an article on current research being done to improve protein quality of cereal grains by fermenting them with special strains of bacteria or fungi that produce high levels of essential amino acids.

3. Design experiments to show the effect of various preservation methods on bacteria, molds, and yeasts.

   Make pickles to demonstrate the use of additives (salt), acid (vinegar) and heat in preservation of foods.

   Make jerky to demonstrate the use of preservatives and drying in preservation of foods.

   Make "Fruit Leather" to demonstrate drying techniques.

   Make "Soup Can Sausage" to demonstrate the effect of additives in preserving meats. Have students research the safety issue of nitrates/nitrites.

   Complete "The Effect of Curing in Meat Color", p. 27-28, Experiments in Food Science to find the effect of $NaNO_3$ on fresh meat before and after cooking.

   Dry various fruits, computing the amount of water loss in dehydration. Experiment with the effect of ascorbic acid, salt water, and bisulfate on browning.

   "Making Raisins", Experiment #4, p. 86-87, Chemistry of Common Substances.

4. Play "Stockpile" to review basic concepts of food spoilage and various methods of preservation.

Instructional Resources:

1. "Jelly Jiving", Ball Corporation, 1979.

   Cobb, Vicki, Science Experiments You Can Eat, New York: Lippincott, 1972.

2. Summerlin, Lee, Chemistry of Common Substances, Morristown, N.Y.: Silver Burdett, 1979. ISBN 0-382-04572-6.

   Newman, Rosemary, et. al, "A Microbiological Approach to Nutrition", Journal of the American Dietetic Association, July 1984, p. 820--821.

   "Make Your Own Sauerkraut", Cooperative Extension Programs, University of WI, May 1972.

   Pagenkopf, Andrea, "Making Yogurt, Buttermilk, and Sour Cream at Home, Montana Cooperative Extension, Bozeman, MT 59717, #: MT 8429

3. "Making Pickles", Science and Children, Sept. 1977, p. 19-20.

*"Soup Can Sausage Recipe"

Waxter, Julia, The Science Cookbook, Belmont, CA: David S. Lake Pub., 1981.

Experiments in Food Science, Institute of Food Technology, 221, N. LaSalle Street, Chicago, IL 60601.

Johnson, Mae Martha, "Fruit Leather", Cooperative Extension Service, Montana State University, Bozeman, MT 59717.

"Home Drying of Foods", Montana Cooperative Extension, Bozeman, MT 59717, Bul. 1293 ($.35), June 1983.

4. "Stockpile", The Food Preservation Game, Forecast, Dec. 1980, p. 38-39.

Food and Nutrition
Level III (S.S. p. 37)

Objective I. A. Apply nutrition principles when planning for special needs.

Science Concepts: Improving nutritional quality of foods

Science Competencies: The student will understand nutrient density and learn how to improve the nutritional quality of their favorite recipes.

Learning Activities:

1. Hold a nutrition recipe contest for students that promotes the U.S. Dietary Guidelines. See "Nutrition Recipe Contest for Seniors" for details on how to hold the cook-off and hints to improve the nutritional quality of favorite recipes.

   Complete "Who's Who", Activity 10A and "The A, B, B_2, C's of Menu Planning" to compare the nutritional needs and activities through the life cycle.

   Roleplay different family lifestyles and learn what factors influence food decisions by using Food for Today's Lifestyles. This unit covers nutrition of individual family members, economy, time and organization.

Instructional Resources:

1. Balsam, Alan, "Nutrition Recipe Contest for Seniors", Journal of Nutrition Education, 16:136B, 1984.

   American Heart Association pamphlets available from your local association.

   "Who's Who", 10A and "The A, B, B_2, C's of Menu Planning", Food...Your Choice, National Dairy Council, Rosemount, ILL.

   Food for Today's Lifestyles, Proctor Gamble, Box 90-541, Minneapolis, MN 55460, Cost is $5.00.

Foods and Nutrition
Level III (S.S. p. 38)

Objective II. A. Consider the influences on food supply.

Science Concepts: The food supply in relation to sources, food forms and processing

Science Competencies: The student will learn the effect of scientific advances on the food supply.

Learning Activities :

1. Use a "Scientific Wheel" to help students think out a problem. Place a topic in the center of the wheel and have students expand this topic by having ideas branch off from the center topic. Having students work in groups of 4 or 5, have them brainstorm the results of scientific advances that affect food supply. Subjects that can be used are: fertilizers, pesticides, pasteurization, refrigeration, etc.

2. Read "A Look at Food and Eating in the Years Ahead."

   What advances in food technology have resulted from the space program? Have students taste different dehydrated products, freeze-dried products, and vacuum packed products.

   Plan a trip for backpacking utilizing lightweight forms of foods. Also consider cost, nutrition, preparation, and cooking method besides weight.

Instructional Resources:

1. "Scientific Wheel", BASE Home Economics Curriculum. Grades 5-8 Area 3.0 Foods/Nutrition, Home Economics Education, West Virginia, Oct. 1981, BANK III, p. III-fn-6.

2. USDA, What's to Eat?, 1979, pp. 123-131.

   "Space Foods", Coed, Jan. 1984 .

Food and Nutrition
Level III (S.S. p. 39)

Objective III. C. Evaluate the purchase of kitchen equipment.

Science Concepts:
1. Conduction and absorption properties of different materials: aluminum, stainless steel, iron, glass.

2. The effect of acid and salt on cooking equipment.

3. Why does silverware tarnish?

4. Microwave Principles

Science Competencies: The student will:
1. test different baking and cooking equipment for heat conduction and absorption.

2. demonstrate the effect of acid and salt on cooking equipment.

3. understand what causes silverware to tarnish and the chemical reactions involved in removing tarnish.
4. understand the principles of electromagnetic energy.

Learning Activities:

1. Complete the laboratory experiments on cookware from the Mirro Aluminum Company.
   a. Brown Flour Test
   b. Baking Chocolate Test
   c. "Waterless Cooking Test"
   d. Preheat Tests
   e. Interior Finish Test
   f. Exterior Finish Test
   g. Pressure/Temperature Relationship Test

   Bake cookies on light, shiny cookie sheet and a dull, dark cookie sheet. Compare results.

   Compare cakes baked in aluminum, stainless steel, tin, and glass pans. How should the temperature be modified for the glass pan? How does this experiment demonstrate the heat absorbant qualities of the glass pan?

   Test different types of saucepans for the time it takes to boil water. What metal is the best conductor.

2. Have students examine old aluminum pans for evidence of pitting caused by salt. What is happening?

   Have students cook an acid food in darkened pans to observe the chemical change. (Try applesauce or tomato juice, cream of tartar.) Can you write the chemical equation?

Demonstrate how to clean calcium and lime deposits out of an iron or teakettle by using an acid (vinegar).

3. Complete an experiment on why silverware tarnishes and how to remove tarnish chemically using baking soda, Experiment 18-10, p. 38, Chemistry of Common Substances. Tarnish silverware or silverplate by making contact with egg yolk then chemically remove the tarnish using aluminum foil or aluminum pie plates and a baking soda solution.

4. Complete the exercises in "Master Microwaving."

Instructional Resources

*1. "Aluminum Cookware and Bakeware", Mirro Aluminum Company, Manitowoc, WI 54220

3. Summerlin, Lee. Chemistry of Common Substances, Morristown, N.Y.: Silver Burdett. ISBN 0-382-04572-6. Available from the Math-Science Teacher Center, 126 Reid Hall, Montana State University, Bozeman, MT 59717.

4. "Master Microwaving", Montana Cooperative Extension Service, Bozeman, MT 59717, 2P008, June 1983 ($2.50).

Housing and Home Furnishings
Level I (S.S. p. 40)

Objective II. A. Relate living space to use of furnishings, accessories, and low cost decorating ideas.

Math Concepts: Problem solving using addition, budgeting skills

Math Competencies: The student will utilize problem solving by constructing a master purchase plan for home furnishings.

Learning Activities:

1. Have students calculate cost for furnishing one room of house and outline a purchase plan using real or imaginary assets.

Instructional Resources:

1. Home Furnishings and Equipment, Money Managament Institute, 1985, p. 5. ($1.00) Household International, 2700 Sanders Road, Prospect Heights, IL 60070.

Housing and Home Furnishings
Level II (S.S. p. 41)

Objective I. G. Identify financial influences related to housing.

Math Concepts:
1. Computers and Problem Solving
2. Tables, Problem Solving using Percent, Addition and Multiplication
3. Problem solving, Reading a Table
4. Meter reading, Problem solving,

Math Competencies:
1. The student will use computers to learn about electric bills.
2. The student will use information from tables to calculate gallons of hot water/year, amount of energy consumed and cost per year.
3. The student will keep a record of water usage for day or week and using a table calculate total water consumed and cost.
4. The student will be able to set up an experiment to solve an energy consumption problem utilizing a meter reading activity.

Learning Activities:

1. Use computer program, "Electric Bill" to learn about computation of electric bill. "Ever Wonder How to Figure Your Energy Bill? shows an easy step-by-step way to check your energy bill and "How to Understand Your Utility Bill" gives a more in depth look at utility costs.
2. Complete "Luke Warm" activity sheet to calculate hot water usage.
3. Estimate the amount of water student and families use each day by recording the number of times each activity listed in the water consumption table occurs. A tally sheet in the kitchen, utility area and bedroom can be used. Multiply the number of times the activity occurred by the average number of gallons used per single activity. Add up the water used by all activities.

b. Determine how much water costs the family per day. Divide the monthly water bill by the number of days in the month.

c. What steps could reduce water use? What factors may influence availability and cost of water in your community? How would scarcity affect your water supply?

4. Teach students to read utility meters (check with your utility for information pamphlets). Have them complete the following activities for rough estimates of energy consumption by their family.

a. Estimate the amount of gas or electricity used by heating system by taking a reading after the family goes to bed and before the family gets up in the morning. Subtract the p.m. reading from the a.m. reading and divide by the number of hours. Multiply this figure by the cost per unit to obtain the cost of heating.
b. Assign experiments to check energy consumption of other appliances, such as an air conditioner.
c. Read the meter daily and graph energy usage for a week or month. Before starting the meter reading have students hypothesize what factors would cause changes in the energy usage--change in temperature, more people in the household on weekends, laundry days use more energy, etc. Have them plot energy usage against one of the factors.

"Kill A Watt". Complete the exercises on meter reading.

Instructional Resources:

1. Electric Bill, National Science Teachers Association. Available through Montana Power Company, 40 E. Broadway, Butte, MT 59701.

"Ever Wonder How to Figure Your Energy Bill???" , Montana Power Company, 40 E. Broadway, Butte, MT 59701.

"How to Understand Your Utility Bill", U.S. Dept of Energy, Office of Public Affairs, Washington, D.C. 20585

*2. "Lukewarm", Energy Activities for the Classroom, ERIC Center for Science, Mathematics and Environmental Education, College of Education, The Ohio State University, 1976.

3. "Water, Water Everywhere", Tips and Topics, Vol XXIV, No. 2, Winter 1983.

4. "How to Read Your Electric and Gas Meter," Tips and Topics, Vol XXIV, No. 2, Winter 1983, p. 3.

"Kill A Watt", Award Winning Energy Education Activities for Elementary and High School Teachers, National Science Teachers Association, (ERHQ-011), 1977. Available for loan from Math-Science Teacher Resource Center, 126 Reid Hall, Montana State University, Bozeman MT 59717.

Housing and Home Furnishings
Level II (S.S. p. 42)

Objective II. B. Draw a floor plan.

Math Concepts: Measurement, Drawing to Scale Skills

Math Competencies: The student will use measurement and scale drawing techniques to design a kitchen floor plan.

Learning Activities:

1. Design a kitchen floor plan using worksheet "Design Your Dream Kitchen!

Instructional Resources:

1. "Design Your Dream Kitchen!", Forecast, Oct 1984, p. 34-35.

   Kitchens For Today's Living, Maytag Company, Dept. 209YG-NY, Newton, IA 50208 ($1.00)

   "Kitchen Planning," Kansas State Cooperative Extension, June 1978. Available from Montana Cooperative Extension, Montana State University, Bozeman MT 59717.

Housing and Home Furnishings
Level II (S.S. p. 42)

Objective II. D. Explore background treatment for home furnishings.

Math Concepts: Problem Solving using measurement, finding area, multiplication, division

Math Competencies: The student will calculate window area and possible cost savings from energy efficient window treatment.

Learning Activities:

1. Calculate the energy lost through windows. Use "Residential Window Treatments" for calculation directions.

   Compute the cost effectiveness of energy efficient window treatments. Calculate the payback period using the formula

   $$\frac{\text{Initial cost}}{\text{Yearly Energy Savings}} = \text{Payback Period}$$

2. Make Roman shades or variations using instructions from Montana Cooperative Extension Service.

Instructional Resources:

1. Peters, Norm, "Window Treatment Effect on Energy Cost", Tips & Topic, Spring 1983, Vol XXIII, No. 3, p. 3-4.

   Vogel, Michael, "Residential Window Treatments", MT 8408, Montana Cooperative Extension Service, Montana State University, Bozeman, MT 59717.

2. Thompson, Carol Jo, "How to Make Insulated Roman Shades" (MT 8316) and "How to Make Variations of Roman Shades, Austrian Curtains, and Balloon Shades" (MT 8317), Montana Cooperative Extension Service, Montana State University, Bozeman, MT 59717.

Housing and Home Furnishings
Level II (S.S. p. 42)

Objective III. E. Analyse lighting in the home.

Math Concepts: Measuring light intensity in footcandles

Math Competencies: The student will learn to use a light meter to find out correct lighting for different areas of the house.

Learning Activities:

1. "Dim It". Students analyse lighting in their homes by learning to use a light meter. Compare the findings with the recommended light levels on the worksheet, "Dim It."

Instructional Materials:

*1. "Dim it," Counting on Energy, Project 3E, Montgomery County, Blue Bell, PA, p. 313. ERIC Ed 207 874.

Housing and Home Furnishings
Level II (S.S. p. 42)

Objective III. G. Analyze household equipment.

Math Concepts:
1. Percentage
2. Mill, Histogram
3. Stopwatch,problemsolving using multiplication, time interval
4. Problem solving using multiplication, decimals
5. Problem solving using multipliction
6. Ratio
7. Draw floor plan to scale
8. Graphing
9. Problem solving using conversion of units, measurement of heat, multiplication & division, and ratio.

Math Competencies:
1. The student will be able to compute percentages of usage difference over 2 generations.
2. The student will understand the concept of mill (.001 of a dollar) and plot a histogram of cost per hour for 10 appliances.
3. The student will be able to demonstrate the energy consumption differences of conventional and microwave ovens after complete an experiment using a stop watch to determine operation time.
4. The student will compute life-time operating costs for appliances.
5. The student will compute wattages for electrical appliances.
6. The student will survey the school for electrical appliances and compute their efficiency.
7. The student will create a floor plan for a home of the future showing possible appliances that will still be in use.
8. The students will complete a graph to show the results of an appliance survey.
9. The student will calculate a ratio of efficiency for an appliance.

Learning Activities:

*1. Complete activity "Electricity: Our Energy Slave" which compares electricity usage over 2 generations.
*2. Complete "Which Costs The Most?" activity to compare electricity costs of appliances.
*3. Complete "Oven Use and Energy Consumption" to compare differences in energy consumption of microwave and regular ovens.
4. Assign student to visit a major appliance store to read Energy Guide labels of different major applicances. Have them figure out initial costs (including taxes, discounts, installation) and operating costs. Calculate the cost to operate appliance for lifetime. Discuss whether paying a higher initial cost is justified by operating cost savings.

5. Complete an activity, "So You're Moving to a New Earth" where students are "transported" to a new earth and must choose which appliances to take with them. Wattage and how much wattage various appliances require are concepts which are covered.
6. Hold a scavenger hunt in school to find electrical appliances. Guess which appliance uses the most energy. Compute efficiency using the ratio of useful work that is derived from the energy inputted.

$$\frac{\text{Energy Output}}{\text{Energy Input}} \times 100 = \text{Efficiency}$$

Complete the worksheet "Evaluating The Energy Efficiency Rating of an Appliance."

7. Create a floor plan for the home of the future. In each room list the appliances you predict you will own 25 years from now. Do you notice any changes?

*8. "Home Appliance Use". Complete a survey on home appliances to find out what appliances were used when parents were young and what appliances students have now. Make a graph to represent results.

*9. "Wasting Away". Follow the steps in the worksheet "Wasting Away" to find the efficiency of a coffee pot. This exercise will involve finding the wattage rating, measuring water temperature to calculate energy transferred to the water in BTU's, and calculating the total energy consumed.

Instructional Materials:

*1-3. Worksheet from "Lessons from an Energy Curriculum for the Senior High Grades, Indiana State, p 48-49, 73-75, 34-39. (ERIC files ED219217)

4. "Home Furnishings and Equipment, p. 7, Money Management Institute, Household International, 2700 Sanders Road, Prospect Heights, IL 600706

5. So You're Moving to A New Eartn, Montana Power Company Consumer Education Services, 40 E. Broadway, Butte, MT 59701.

*6. Evaluating the Energy Efficiency Rating of an Appliance More information may be obtained from: AHAM, 20th N. Wacker Dr, Chicago, IL 60606

*7-8. Phase II, Final Report, New Mexico Energy Education, New Mexico. Highland University, Las Vegas, Dec. 1982.

*9. "Wasting Away," Counting on Energy, Project 3E, Montgomery County, Blue Bell, PA, p. 313. ERIC Ed 207874.

Housing and Home Furnishings
Level I (S.S. p. 40)

Objective I. D. Relate values, interest and economics to life style and housing.

Science Concept: Energy Conservation

Science Competency: The student will discover how he/she can conserve energy by application of a computer program.

Learning Activities:

1. Use "Energy Conservation," a program with graphics and timed quiz to find out what how your family can conserve energy.

Instructional Resources:

1. Energy Conservation Computer Program, Alabama Dept. of Economic and Community Affairs. Available through Montana Power Company, 40 E. Broadway, Butte, MT 59701.

Housing and Home Furnishings
Level III (S.S. p. 44)

Objective II. A. Identify the characteristics of various housing types.

Science Concept: Adaptation of Housing to Environment

Science Competencies: The student will investigate alternate forms of housing.

Learning Activities:

1. Research alternate housing forms including solar, dome, zome, foam, earth sheltered, and mobile to find out what type of housing saves energy. Give reports stating advantages and disadvantages of each form and their relationship to the environment.

   Arrange a field trip with a local builder or home owner to see energy-saving features of home or alternate forms of housing.

2. View films on solar and alternate housing forms.

3. Conduct experiments on solar radiation and the effects of different insulating materials, colors, etc on energy using a model sunpower house.

Instructional Resources:

1. Impson, June, "Earth Sheltered Housing: A Curriculum Update," Tips and Topics, Vol XXIII, No. 3, Spring 1983. p. 1-3.

   "Passive Design Ideas for the Energy Conscious," National Solar Heating and Cooling Information Center, P.O. Box 1607, Rockville, MD 20850.

2. "Passive Solar Homes Conserve Energy," 12 minute film, Allegro Film Production, Inc., 1980, available through Montana Power Company, 40 E. Broadway, Butte, MT 59701

   "Solar Energy Options," 13 1/2 minutes, Allegro Film Productions, Inc., 1980, available through Montana Power Company, 40 E. Broadway, Butte, MT 59701.

3. "Sunpower House," Crystal Production, available through Montana Power Company, 40 E. Broadway Butte, MT 59701.

Housing and Home Furnishings
Level III (S.S. p. 44)

Objective II. B. Compare financial aspects and limitations of renting and owning a home.

Math Concepts:
1. Tables, Problem Solving using average, %
2. Computers
3. Tables, Problem solving using %

Math Competencies: The student will:
1. Be able to calculate possible savings from lowering the the thermostat.
2. Use a computer program to discover the costs of home maintenance.
3. Estimate costs of his/her dream house and calculate down payment, mortgage payments, closing costs, insurance costs for his/her estimated income.

Learning Activities:

1. Complete the worksheet "Raise It 'n' Lower It".
2. Operate the computer program "A-1 Handy Home Hints" to examine the cost of home maintenance.
3. Have students complete a Guided Design Project. Read recent housing literature to find out how much home you can afford for your anticipated income.

- Have a realator talk about housing costs in your area. Have students make a list of their housing requirements for their dream home and help them estimate the cost.
- Have a banker describe types of home financing is available. Have students research what would be the best financial arrangement for buying their dream house. Call various lending institutes for current rates and investigate FHA, VA, and other types of loans.

Instructional Resources:

*1. Raise It 'n' Lower It Activity Sheet from Lessons from an Energy Curriculum for the Senior High Grades, Indiana State, p. 63-64, Jan. 1982.
2. A-1 Handy Home Hints, Modtec Publisher, $13.83. Requires Radio Shack I or III, 16K Computer
3. The Househunter's Guide and The Househunter's Scorecard, Family Housing Bureau of Chicago Title Insurance, 111 W. Washington St., Chicago, ILL 60602.

"Selecting and Financing a Home", USDA Homes and Gardens Bul. 182, August 1979. Available from Montana Cooperative Extension Service, Montana State University, Bozeman, MT 59717.

Guthrie, Lou, "Teaching Students to Make Housing Decisions," Tips and Topics, Vol XXIII, No. 3, Spring 1983, p. 6-7. (article on using Guided Design approach to teaching housing)

Housing and Home Furnishings
Level III (S.S. p. 45)

Objective IV. A. Compare the quality and insulating properties of building materials.

Math Concepts: Computer Application

Math Competencies: The student will be able to predict possible energy savings with home improvements by using a computer program.

Learning Activity:

1. Use a computer program "Energy Miser" to analyze your home heating and cooling system. The program will also predict annual savings of utility bills with improvements and modifications and calculation of energy tax credit.

Instructional Resources:

1. Energy Miser, for Apple II available from Hayden Book Co., Inc. for $29.95.

Housing and Home Furnishings
Level I (S. S. p. 40)

Objective I. A. Explore the historical influence on housing.

Science Concept: Environmental influences on housing

Science Competency: The student will use present housing knowledge to predict housing of future.

Learning Activities:

1. Identify housing trends using the discussion topics listed in "Housing in the Future".

   Divide class into groups to develop sketches and descriptions of housing in the 21st Century based on changes presently occurring in family, energy, and environment. Consider possibility of living under water, underground, or in outer space. Have each group of students present their projects to class and put up displays around school.

Instructional Resources:

1. "Housing in the Future", Tips and Topics, XXIII, No. 3, Spring, 1983, p. 2-3.

2. "Take a Look Into the House of the Future", Forecast, April 1984, p. 41-43.

Housing and Home Furnishings
Level III (S.S. p. 44)

Objective II. B. Compare financial aspects and limitations of renting and owning a home.

Science Concepts: 1-2. Energy Conservation

Science Competencies: 1-2. The student will be able to demonstrate the principles of energy conservation in game playing.

Learning Activities:

1. Complete the "Energy Maze", a quiz on energy conservation. Then have students divide up into 9 teams to research one of the clues in the maze to find out "Amazing Facts About Energy."

2. Play the "Home Energy Game." to test knowledge of energy conservation.

3. View film on energy conservation.

Instructional Materials:

1. "Energy Maze," CO-ED, January 1984, p. 20-21.

*2. "Home Energy Game," Lessons from an Energy Curriculum for the Senior High Grades, Indiana State, January 1982, p. 7-12. (ERIC ED 219271).

4. "Energy Management in the Home Saves Money," 12 min., Allegro Film Productions, 1979, and "Pigopolis," Industry Media Inc., 12 min. are available through Montana Power Company, 40 E. Broadway, Butte, MT 59701.

Housing and Home Furnishings
Level II (S. S. p. 42)

Objective III. G. Analyze household equipment.

Science Concept:
1. Electromagnetic Energy
2. Energy Conservation, experimental design, principles of microwaves, evaluation techniques, radiant energy principles and safety
3. Energy saving principles

Science Competencies:
1. The student will gain an understanding of electromagnetic energy.
2. The student will understand advantages and disadvantages of microwave cooking by designing experiment for product evaluation.
3. The student will learn energy saving tips for various appliances.

Learning Activities:

1. Compete the experiments in "Master Microwaving" and read "Microwave Cooking Appliances" to gain an understanding of electromagnetic energy and how to use it wisely in cooking.

2. Complete the "Microwave Comparison Project."

3. Have each student research an appliance to find energy saving tips and report the findings to class.

Instructional Materials:

1. Thompson, Carol Jo, "Microwave Cooking Appliances", Bulletin 1199, Jan 1982 and "Master Microwaving" ($2.50) are available from Montana Cooperative Extension Service, Montana State University, Bozeman, MT 59717.

2. Lesson Plans from "Microwave Comparison Project", Forecast, Oct 1985, p. 41-45.

3. "Saving Energy With You . . ." and "Facts on Major Home Appliance Energy Conservation and Efficiency Trends", AHAM, 20 N Wacker Dr, Suite 1500, Chicago, IL 60606.

Housing and Home Furnishings
Level III (S.S. p. 45)

Objective IV. A. Compare the quality of insulating properties of building materials.

Science Concepts: Experimental Design to learn insulation principles.

Science Competencies: The student will design an experiment using a "warm box" to test insulation materials.

Learning Actitivies:

1. Construct and test a "Warm Box". Collect 2 cardboard boxes large enough to handle interior insulation equal to R-25. Line the interior of one box with insulation (2 layers of glass fiber or foam board insulation). Make a peep hole in one side of the box. Suspend a thermometer inside and seal the cracks with tape. Use the other box as a "control" box. Seal all the cracks. Add a peep hole and thermometer but do not add insulation to the control. Observe temperature changes in different weather conditions.

ADDITIONAL RESOURCES:

Bolster, L. Carey, H. Woodburn, and Joella Gipson. Consumer and Career Mathematics, 2nd edition, Scott Foresman and Co. 1983.

*Cobb, Vicki. More Science Experiments You Can Eat. New York: J.B. Lippincott. 1978.

Dwyer, Kathleen, Consumer Chemistry, Seattle: United Graphics, Inc., 1977.

Fairbank, Roswell and Robert Schultheis, Consumer Math, Palo Alto, CA: South-Western Publishing Company, 1983.

Food and Drug Administration, "Mini Lessons," (lessons on nutrition, food safety and drug safety), Superintendent of Documents, Gov. Printing Office, Washington, D.C. 20402.

Kitchen Science: A Compendium of Essential Information for Every Cook, Houghton Mifflin, 1983, Paperback $6.98.

Kowalski, Stephen, Consumer Science, Kendall Hunt Publishing Co., 2460 Kerper Blvd, Dubuque, IO 52001, 1974.

*Lankford, Francis and Willian Goe. Consumer Activities Book, Harcourt, Brace Jovanovich, 1974.

*Newton, David, E. Math in Everyday Life, Portland, Maine: J. Weston Walch, 1976.

Nutrition Education and Training Program, Nutrition and Fitness Materials, USDA, 1985. Listing of curriculum guides, nutrition and sports nutrition, weight control, computer programs, and audio-visual aids for loan from the Food and Nutrition Information Center.

*Pascaris, Peter. A Guidebook for Teaching Consumer Math, Boston: Allyn and Bacon, Inc., 1982.

*Palakovich, Julie, Montana Energy Resource Guide, Montana Dept of Natural Resources, 23 S. Ewing, Helena, MT 59620. (This is an excellent directory of energy education resources available in the state of Montana.)

Resource Units in Science Principles, Home Economics Education, University of Missouri, Columbia, MI, 1961

*William, Gerard, et al., Essentials of Math. Harcourt Brace Jovanovich, Pub., 1983.

*These resources are available on a 2 week loan from the Math-Science Teacher Resource Center, 126 Reid Hall, Montana State University, Bozeman, MT 59717 The only cost is return shipping. Many other resources on the metric system and energy conservation are available from the Math-Science Teacher Resource Center. A list of holdings is available upon request.

Appendix of Worksheets

INDEX TO LEARNING EXPERIENCE WORKSHEETS

INDEX TO LEARNING ACTIVITY WORKSHEETS
CONTINUED

HEIGHT AND WEIGHT ACTIVITY

Pretest/Post-test

DIRECTIONS: Using the information given below, answer the following multiple choice questions by writing the letter of correct response in the space provided.

BIRTHS FOR JULY 14, 1981

	Weight	Sex	Height
Mary Jones	7 lbs. 9 oz	F	19"
Kerry Anne Thomas	8 lbs. 2 oz	F	19-3/4"
Joe Smith	10 lbs. 1 oz	M	22-1/2"
Maria Garcia	6 lbs. 5 oz	F	18"
Tamara Clark	5 lbs. 7 oz	F	18-1/4"
Jack Stephens	7 lbs. 5 oz	M	20-1/4"
Mark Walker	8 lbs. 8 oz	M	21"

_____1. What is the average weight of the female births for July 14, 1981?

a. 5 lbs. 6 oz. c. 6 lbs. 7 oz.
b. 6 lbs. 5 oz. d. 7 lbs. 6 oz.

_____2. What is the average weight of the male births for July 14, 1981?

a. 8 lbs. 4 oz. c. 7 lbs. 9 oz.
b. 8 lbs. 2 oz. d. 7 lbs. 8 oz.

_____3. What is the average height of the female born on July 14, 1981.

a. 18-1/2" c. 18"
b. 18-3/4" d. 19"

_____4. What is the average height of the males born on July 14, 1981?

a. 20-3/4" c. 21-1/4"
b. 20-1/4" d. 21-3/4"

_____5. During July the following births per week were recorded:

1st week 27
2nd week 59
3rd week 33
4th week 29

What is the average weekly birth rate?

a. 27 c. 36
b. 37 d. 31

Adapted from Crabtree, Myrna, Teacher's Guide for Home Economics Curriculum Competency Based Modules for Integrating Basic Skills in Reading, Writing, and Mathematics, Florida State University.

DEVELOPMENTAL STAGES

Pretest/Post-test

DIRECTIONS: Answer the following multiple choice questions by writing the letter of the correct response in the space provided.

_____1. Tommy White was born July 15, 1980. He cut his first tooth on December 27, 1980. How old was Tommy when he cut his first tooth?

a. 4 months 5 days
b. 6 months 13 days
c. 5 months 15 days
d. 5 months 12 days

_____2. On January 18, 1980, he sat up for the first time. How old was he?

a. 6 months 3 days
b. 3 months 16 days
c. 5 months 20 days
d. 7 months 2 days

_____3. On September 5, 1980, he ate baby food for the first time. How old was he?

a. 2 months
b. 1 month 20 days
c. 1 month 2 days
d. 1 month 20 days

_____4. On February 15, 1981, Tommy crawled for the first time. How old was he?

a. 5 months 15 days
b. 6 months 20 days
c. 5 months
d. 7 months

_____5. On June 24, 1981, Tommy walked for the first time. How old was he?

a. 11 months 9 days
b. 9 months 11 days
c. 12 months 1 day
d. 11 months 19 days

From: Crabtree, Myrna, Teacher's Guide for Home Economics Curriculum Competency Based Modules for Integrating Basic Skills in Reading, Writing and Mathematics, Florida State University.

BABY BOOK
Page Format

Baby's Name_____

Date of Birth_____

Place of Birth_____

Weight_____

Height_____

Color of Eyes_____

Color of Hair_____

Distinguishing Characteristics_____

_____

_____

_____

_____

FAMILY TREE

_____ _____ _____ _____
Grandmother Grandfather Grandmother Grandfather

_____ _____
Mother's Name Father's Name

_____
Baby's Name

(This pagecan be folded. Cover can be drawn by student on outside front. Family pictures can be drawn or glued on back.)

PHYSICAL DEVELOPMENT OF BABY

Baby Rolled Over on _____
Date

Baby's Age When First Rolled Over _____

Baby Sat Alone On _____
date

Baby's Age When Sitting Alone_____
Age

Baby Crawled_____
Date

Baby's Age_____
Age

Baby Took First Steps_____
Date

Baby's Age_____
Age

Baby Ate Solid Foods on_____
Date

Baby's Age_____
Age

Baby Drank from a Cup On_____
Date

Baby's Age_____
Age

Baby Slept All Night On _____
Date

Baby's Age_____
Age

Baby Cut First Tooth On_____
Date

Baby's Age_____
Age

(Fold to make book. Pictures showing physical development can be drawn or glued on blank sides.)

Adapted from Crabtree, Myrna, Teacher's Guide for Home Economics Curriculum Competency Based Modules for Intevgrating Basic Skills in Reading, Writing, and Mathematics, Florida State University.

COST OF RAISING A CHILD

Compute the minimum costs of having a first baby and caring for it the first year.

Directions:

Secure information from a new mother, doctor, or hospital. Further information concerning expenses may be found in catalogs, classified ads, newspaper ads, garage sales, and shopping at a department store.

PURCHASE DESCRIPTION		NEW OR USED COST
Medical Expenses		
Midwife fee or obstetrician's fee		
Pediatrician's fee		
Hospital or Birthing Center (delivery room, nursery, lab, medical supplies, etc.)		
Medical Insurance		
Visits to the doctor		
	A - Sub Total	
Maternity Clothes		
5 slacks (or skirts), 5 tops		
foundations		
3 dresses		
	B - Sub Total	
Nursery Furniture		
Crib / Mattress		
Bathing / Dressing Table		
Dresser / Chest or Drawers		
Stroller		
High Chair		
Bassinette		
	C - Sub Total	
Nursery Items		
1 lamp		
1 mattress cover / pad		
diaper pail		
diaper holder		
	D - Sub Total	

Layette

4 blankets
2 sheets
4 washcloths
2 towels
Sleepwear
2 play suits
2 bibs
4 pairs of booties

E - Sub Total _____

Miscellaneous

Thermometer
Pictures from hospital
Diaper liners
Diaper pads
1 fork and 2 spoons
1 mobile
Comb and brush
Baby oil, soap, pins, etc.
Formula
Bottle sterilizer
1 diaper bag
Baby book
Swing
Car seat
Infant seat
Walker
Bumper pads
Play pen
Car bed

F - Sub Total _____

SUMMARY

To find the total cost of having a baby and caring for it the first year, total the sub totals from the previous pages.

Medical Expenses	A - Sub Total	_____
Maternity Clothes	B - Sub Total	_____
Nursery Furniture	C - Sub Total	_____
Nursery Items	D - Sub Total	_____
Layette	E - Sub Total	_____
Miscellaneous	F - Sub Total	_____
	TOTAL EXPENSES	_____

Additional Expenses to be Considered for the First Year Are:

Baby food _____ Baby sitter _____ Additional clothing _____

Follow-up:

1. Discussion on what expenses could be eliminated or reduced.
2. Research and estimate further costs of raising a child to 18 years or through college.

ROUND WINDSOCK (adapted from Lori Stockwell)

Materials Needed:

Lightweight nylon fabric; 44-45" width, 1/2 yard of four different colors
10" of 44-45" width fabric for accent color (contrasting to other four)
8" ring
3 grommets
1 swivel
1 spool thread
48" fish line or string

Cutting Out: See illustrations.

Tail pieces: #1 — Cut four pieces, one of each color 13" x 44". To form tail pieces, fold each in half, measure up 6" from end, mark a diagonal line to fold, cut.

Accent color: #2 — Cut four strips 2 1/2" X 44". Fold in half lengthwise, cut one end at a 45° angle, same as for tail pieces.

Top Part: #3 — Using different colors for each: Cut one strip 4 1/2" x 25" for top row. Cut three strips 4" x 25" for next three layers.

Construction

Top: #3 — Using 1/4" seams, sew the 25" length pieces together as shown. (The 4 1/2" x 25" piece is for the top.) Put lettering or any additional designs, if desired, on at this time.

Bottom: #2 — Fold tail pieces in half lengthwise, mark a line on your fabric 3 3/8" from the fold that begins 12 1/2" from the top and extends to the slanted end of tail piece. Stitch 1/4" around, finish all seams with a zig-zag stitch. Cut between rows of stitching in center of tail piece.

Accents: #5 — Fold strips in half lengthwise, stitch 1/4" seam around, finish seams, turn. Press.

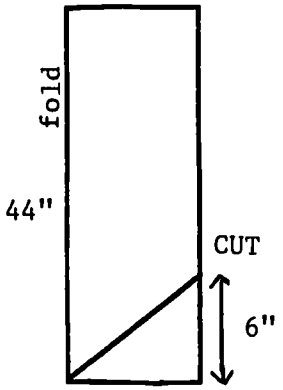
#6: Pin accent color to the edge of tail piece overlapping 1". Topstitch down 12 1/2". Repeat this step with each color until all accent and tail pieces are joined. (The last one will join with the first to make it round.)

Right sides together; stitch top to bottom. Finish seam. Fold over 3/4" at top. Press. Slip ring inside fold. Stitch close to ring with zipper foot. Stitch again 1/4" away from first stitching. Apply three grommets evenly spaced. To apply grommets: clip small hole at grommet placement. Force grommet shaft through opening. Using bolt with round head (larger than size grommet), place bolt head on grommet and hammer until shaft rolls over and secures fabric.

String cords (fishline) through swizzle hanger, keeping the ends even. Tie a knot just below hanger. Attach each cord end to a grommet using a square knot.

ILLUSTRATIONS FOR WIND SOCK PROJECT

#1



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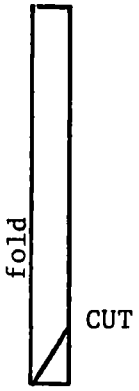
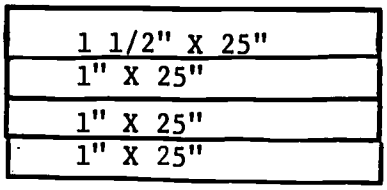
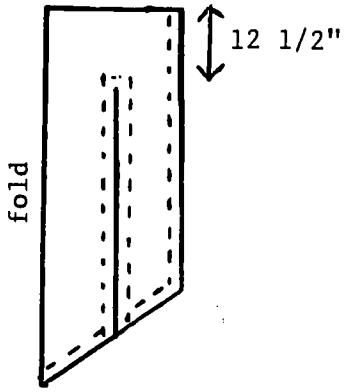


#3

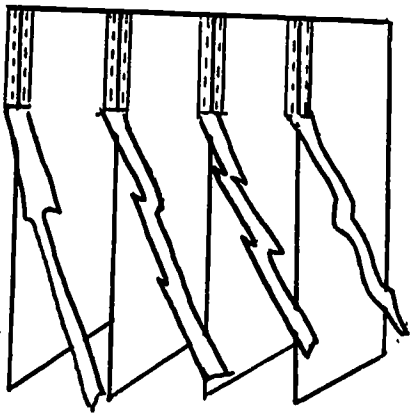


#4



#5

#6



FROM: Margaret Johnson, Billings

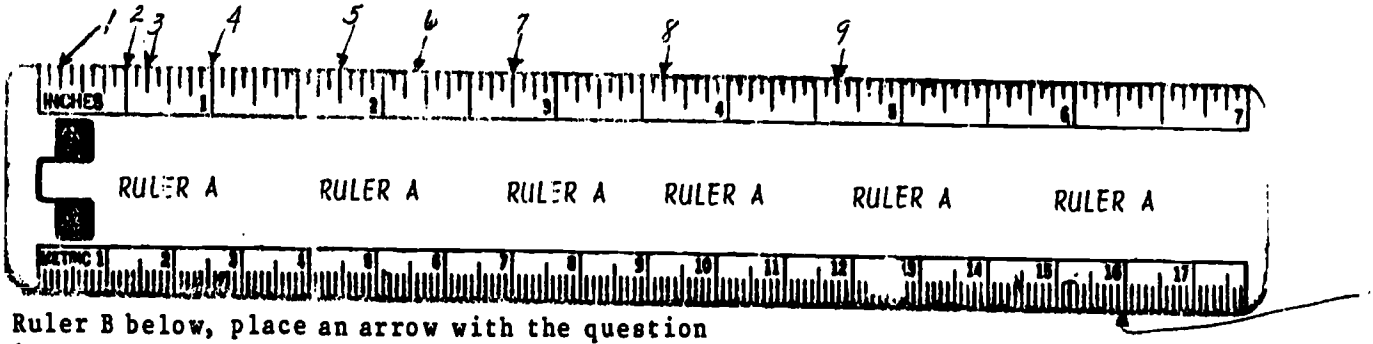
RULER READING ASSIGNMENT

Part A: On ruler A below, identity the numbered markings. Please reduce fractions to the smallest number (example: 1/2 inch instead of 4/8 inch). Please note that metric is at the lower part of the ruler!

1. _____ 3. _____ 5. _____ 7._____ 9._____

2._____ 4. _____ 6. _____ 8._____ 10._____

RULER A:



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Part B: On Ruler B below, place an arrow with the question number on line where it should be in order to answer the question correctly.

11. What is a standard seam allowance (in inches)? Please mark _____.

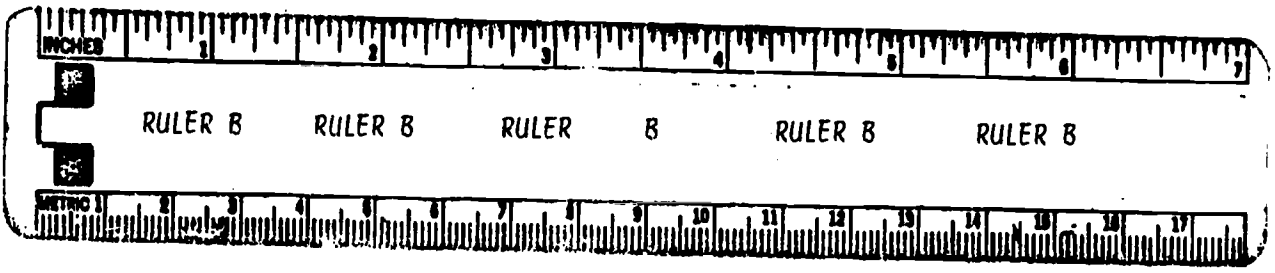
12. A clean finish is truned under _____ inch and stitched. Please mark _____.

13. Stay-stitching is done how far from the curved edge of the single layer of fabric? _____.

14. Please mark where 3 5/16 is on Ruler B.

15. Please mark with an arrow where 6 mm is on Ruler B. Thank you!

RULER B:



35

HAMBURGER MATHEMATICS

A Hamburger Stand in Chicago boasts it has 256 varieties of hamburgers on the menu. This is an unique number: 256. It is divisible by many other numbers. It can also be expressed as a $(2)^8$ or $(4)^4$ or $(16)^2$. It is interesting that such a number should represent the limit of hamburger choices.

This restaurant offers eight condiments: catsup, onion, mustard, pickle, lettuce, tomato, mayonnaise, and relish.

How many different combinations for burgers can you come up with? Instead of writing out the list of condiments, you may substitute numbers to represent the garnishes. The first two are filled in for you.

NUMBER OF CONDIMENTS	POSSIBLE COMBINATIONS
0	(1) a plain burger
8	(1) a super burger
1	(8) 1/2/3/4/5/6/7/8
———	---- 12/13/14/15/16/1//18 23/24/, etc.

Use the back side of this paper to list more possible combinations.

Listing the number of possibilities by trial and error is a concrete operation. It is good, old-fashioned messing about. There is a more sophisticated method for determining combinations. Use the following equation:

$$nCr = \frac{n!}{(n-r)!\ r!}$$

From the possible eight condiments, how many burgers could you prepare using combinations of any three?

$$n = 8; \quad r = 3$$

$$_8C_3 = \frac{(8x7x6x5x4x3x2x1)}{(5x4x3x2x1)\ (3x2x1)}$$

$$_8C_3 = \frac{(8x7x6)}{(3x2x1)}$$

$$_8C_3 = 56$$

(Adapted from Science Activities, p. 14, Nov/Dec, 1980).

STREAMLINE YOUR TRANSPORTATION

1. Keep a record for one week or one tank of gas the number of miles driven and gallons of gas used.

$$\frac{\text{miles}}{\text{gallon}} = \text{miles per gallon (mpg)}$$

2. Using a map of the area your family drives the most. Record each trip taken for a week using a different colored pencil to draw each travel route.

What was the shortest trip? _____

What was the longest trip? _____

What was the most frequent trip? _____

3. Keep a record of purpose, date, number people, beginning and ending odometer readings and number of miles traveled. Using the mpg for the automobile used and price per gallon of gas. Determine cost/person for each trip.

$$\frac{\text{miles traveled}}{\text{mpg}} = \text{gallons of gas used} \times \$/\text{gallon} = \$/\text{trip}$$

$$\frac{\text{Cost/trip}}{\text{\# people}} = \text{Cost/person}$$

4. Using the above records, make an X besides trips that could have been eliminated, an W if you could have walked, and a B if a bicycle could have been used.

What trips could have been combined?

What other ways could costs have been reduced?

List 5 ways to reduce your routine transportation costs.

"Transportation Energy", Tips and Topics, Vol XXIV, No. 2, Winter 1983, p. 2.

SETTING YOURSELF UP AFTER HIGH SCHOOL

Imagine that you have just graduated from high school and are going to try to make it on your own. Complete the following worksheet. You must document each item (for example, you must have a newspaper ad or a note from a used car dealer to establish the price of your car).

1. Where will you work and how much will you make per month?

2. Calculate the deductions you will have per month for federal taxes, state taxes, and F.I.C.A.

3. What car will you buy? If you buy the car on time how much will your monthly payments be?

4. Where will you live? How much is the monthly rent?

5. How much will your monthly payment be for car insurance?

6. List all your meals and their cost for one week. Then multiply the cost per week by four to get a monthly food bill.

7. Estimate the amount you will spend for gasoline per month if you drive the American average of 1,200 miles per month (m.p.g. for your car ÷ 1,200 miles x current cost of gas per gallon).

8. List the things you will do for entertainment for the month and their approximate cost.

9. Estimate your utility (gas, electric, and phone bills) for the month.

10. List and estimate the cost for the toilet items you will need a month (soap, shampoo, razors, shaving cream, perfume, after shave, and othe miscellaneous items)

11. Subtract the total you have for monthly expenses from the total you have for take-home pay.

12. Do you think you can live comfortably on your own with the salary you have?

13. How long can you be happy with this type lifestyle?

14. What can you do to get more money?

Adapted from Webb, Farren, Teaching Consumer Skills and How to Survive In America, Denver University, Colorado Center for Teaching International Relations.

BY JOVE! I THINK I'VE GOT IT!"

Match the most likely answer to its partner at left.

I. Length Matching

_____1. Two month old baby	A. 5 mm
_____2. First grade student	B. 25 mm C. 55 cm
_____3. Center on pro basketball team	D. 2 km E. 10 m
_____4. College coed	F. 160 cm G. 500 cm
_____5. Football field length	H. 1 m I. 210 cm J. 91 m

II. Mass Matching

_____6. Two month old baby	A. 1000 kg
_____7. Pro football play	B. 1 kg C. 250 g.
_____8. Miss America	D. 27 mg E. 4.5 kg
_____9. First grade student	F. 450 mg G. 23 kg
_____10. Car	H. 110 kg I. 5000 g J. 50 kg

III. Volume Matching

_____11. Bleach bottle	A. .5 ml
_____12. Can of soup	B. 1000 ml C. 41 ml
_____13. Aspirin tablet	D. 2 kl E. 4 ml
_____14. Tank of gasoline	F. .1 ml G. 250 kl
_____15. Thimbleful	H. 40 kl I. 60 l J. 250 ml

GOBBLY-GOOKS

1 glob peanut butter
2 scoops brown sugar
1 smidgen butter
3 dit-dots vanilla
1 handful flour
6 blobs sugar
2 ittsy-bits salt
4 glubs quick oats
1 small blib cocoa
4 dribbles of milk

Boil butter, sugars, milk, and cocoa. Remove from heat. Add peanut butter, vanila, oats, salt, flour. Glump onto waxed paper. Cool.

NO BAKE COOKIES

Equipment needed:

Dry measuring cups
sifter
liquid measuring cups
saucepan
measuring spoons
waxed paper
wooden spoon
tray or cookie sheet
two teaspoons

Ingredients:

1/4 cup butter
3/4 cup sugar
1/4 cup milk
1/4 cup peanut butter
1 1/2 cup quick oats
1/4 cup cocoa
1/4 cup brown sugar
1/8 teaspoon salt
1/2 teaspoon vanilla
1/4 cup flour.

Directions:

Mix butter, sugars, milk cocoa, and salt in saucepan. Boil for 1 minute at low heat. Add peanut butter, vanilla, oats, and flour. Stir. Drop on waxed paper on cookie sheet or tray. Allow to cool in refrigerator.

From: Neff, Kathy, Forecast, October 1985, p. 9.

WHO HAS? GAME CARDS

I HAVE 1 teaspoon.
WHO HAS 16 ounces?

I HAVE 1 pound.
WHO HAS 3 teaspoons?

I HAVE 1 Tablespoon.
WHO HAS 1/2 cup?

I HAVE 4 ounces.
WHO HAS 1 foot 6 inches?

I HAVE 18 inches.
WHO HAS 1 quart?

I HAVE 4 cups.
WHO HAS 2 - 1/8 teaspoons?

I HAVE 1/4 teaspoon.
WHO HAS 6 feet 3 inches?

I HAVE 2 yards 3 inches.
WHO HAS 1 meter?

I HAVE 100 centimeters.
WHO HAS 2 teaspoons?

I HAVE 2 cups.
WHO HAS 1 bushel?

I HAVE 4 pecks.
WHO HAS 2 liters?

I HAVE about 2 quarts.
WHO HAS 16 Tablespoons?

I HAVE 1 cup.
WHO HAS 3 - 1/4 cups?

I HAVE 6 ounces.
WHO HAS 6 teaspoons?

I HAVE 2 Tablespoons.
WHO HAS 1 gallon?

I HAVE 4 quarts.
WHO HAS 3 gallons?

I HAVE 12 quarts.
WHO HAS 36 inches?

I HAVE 1 yard.
WHO HAS 66 inches?

I HAVE 4 - 1/2 teaspoons.
WHO HAS 3 cups?

I HAVE 5 feet 6 inches.
WHO HAS 3/4 gallon?

I HAVE 3/4 quart.
WHO HAS 2.2 pounds?

I HAVE 3 quarts.
WHO HAS 32 ounces?

I HAVE 1 kilogram.
WHO HAS 1/3 Tablespoon?

I HAVE 1 quart.
WHO HAS 1 pint?

Note: Be sure all WHO HAS? questions have an answer or the game will stall.

WHAT'S FOR DINNER?

	1 FIRST PREFERENCE	2 LEAST ENERGY	3 DIFFERENCES (+ or -)
APPETIZERS: (CHOOSE ONE FROM EACH PAIR)			
Frozen Juice	$_____	$_____	$_____
Fresh Juice	$_____	$_____	$_____
Crackers (unwrapped)	$_____	$_____	$_____
Crackers (indiv. wrapped)	$_____	$_____	$_____
Butter	$_____	$_____	$_____
Margarine	$_____	$_____	$_____
MAIN DISH (PLEASE MAKE A FIRST AND SECOND CHOICE AS WE DO NOT ALWAYS CARRY EACH ENTREE.			
Luncheon Meat	$_____	$_____	$_____
Chicken	$_____	$_____	$_____
Turkey	$_____	$_____	$_____
Rice with Vegetables	$_____	$_____	$_____
Beef (grass-fed)	$_____	$_____	$_____
Beef (grain-fed)	$_____	$_____	$_____
VEGETABLE (SORRY. TODAY WE HAVE ONLY CARROTS. BUT YOU MAY CHOOSE YOUR PREFERRED TYPE).			
Fresh Carrots	$_____	$_____	$_____
Dehydrated Carrots	$_____	$_____	$_____
Frozen Carrots	$_____	$_____	$_____
Canned Carrots	$_____	$_____	$_____
DRINKS (PLEASE CHOOSE A FIRST AND SECOND CHOICE AS WE SOMETIMES RUN SHORT OF ONE KIND OF DRINK AT LUNCH.			
Soft Drink (alum. can)	$_____	$_____	$_____
Soft Drink (returnable bottle)	$_____	$_____	$_____
Milk	$_____	$_____	$_____
Beer (alum. can)	$_____	$_____	$_____
Beer (returnable bottle)	$_____	$_____	$_____
DESSERT: CHOOSE ONE.			
Apples (homegrown)	$_____	$_____	$_____
Apples (store-bought)	$_____	$_____	$_____
Walnuts (shelled)	$_____	$_____	$_____
Walnuts (unshelled)	$_____	$_____	$_____
Ice Cream	$_____	$_____	$_____
TOTAL BILL	$_____	$_____	$_____

FROM: Energy Conservation in the Home, U.S.Dept. of Energy, 1977.

ENERGY PRICE

(Prices are proportional to actual energy expenditure)

APPETIZERS:

Frozen Juice	.12
Fresh Juice	.46

Freezing and processing use a great deal of energy, both initally and for storage).

Crackers (unwrapped)	.10
Crackers (indiv. wrapped)	.15

Food excessively packaged or only available in small packages is more energy-intensive than unwrapped foods or foods available in bulk.

Butter	.15
Margarine	.05

MAIN DISH:

Luncheon Meat	1.60
Chicken	.96
Turkey	1.06
Rice with Vegetables	.45
Beef (grass-fed)	1.48
Beef (grain-fed)	2.08

Animals are inefficient converters of protein. A pound of meat requires about four times the energy to produce and market as a pound of vegetable protein. Some animals are more efficient converts of protein than others.

VEGETABLE:

Fresh Carrots	.12
Dehydrated Carrots	.92
Frozen Carrots	.31
Canned Carrots	.23

Processed vegetables require more energy than fresh vegetables; freezing and dehydration require large amounts of energy.

DRINKS:

Soft Drink (alum. can)	.45
Soft Drink (returnable bottle)	.31
Milk	.34
Beer (alum. can)	.50
Beer (returnable bottle)	.25

DESSERT:

Apples (homegrown)	.03
Apples (store-bought)	.19

Homegrown apple by commercial methods saves commerce and transportation; organic methods would save some more.

Walnuts (shelled)	1.04
Walnuts (unshelled)	.39
Ice Cream	.60

Large quantities of milk are used; freezing is necessary.

WHAT'S IN THE PACKAGE?

A. What's in the package?

1. What is the net weight of the food?

2. How many kilocalories could be provided by the food? Sometimes this information is printed on the package, otherwise the use of a kilocalorie table is necessary.

B. What's in the package?

1. List the kinds of packaging making up the container.

2. What is the weight of each component of the packaging material?

3. What is the energy used for each component?

4. What is the total of the energy used to make the components of the package?

Energy Used to Manufacture Packaging Materials

Material	Kilocalories/g	Kilocalories/oz
Paper, cardboard	6 kcal/g	168 kcal/oz
Steel, bimetal	12 kcal/g	336 kcal/oz
Aluminum	64 kcal/g	1,792 kcal/oz
Glass	7.5 kcal/g	210 kcal/oz
Plastic	3.5 kcal/g	98 kcal/oz

Calorie (spelled with a capital C) equals one food Calorie and is equal to one thousand calories (used physics) or one kilocalorie.

C. Understanding the difference.

1. What is the total kilocalorie content of the item (food kilocalories and kilocalorie content of the package)?
2. What is the fraction representing $\frac{\text{food kilocalories}}{\text{total kilocalories}}$?

3. What is the percent of total energy in the item that is food energy?

FROM: Reese, Chris, "What's In a Package", Counting on Energy, Blue Bell, PA. 1980.

HUMAN ENERGY NEEDS WORKSHEET

NAME_____

WEIGHT_____ kg (1 lb = .454 kg.)

1. Basal Metabolism: 1 kcal/kg/hr is an average human basal metabolic rate.

   1 kcal X _____kg X 24 hrs/day = _____kcal/day
   (your wt) (B)

2. Activity Needs:

Activity	Time(hr)	X	kcal/kg/hr (from data sheet)	= kcal/kg
TOTAL	24 hrs		TOTAL kcal/kg=	(C)

Total Activity Needs:

_____kcal/kg X _____kg = _____kcal/day
(C) (your wt) (A)

3. Total Needs:
   Basal metabolism (B) + activity needs (A) + effect of food ingestion (10% of B + A) = total energy needs. Therefore:

   (_____ + _____ X 1.1 = _____ kcal
   (B) (A)

Adapted from Counting On Energy, Project 3E, Montgomery County, Intermediate Unit, Blue Bell, PA 1980.

HUMAN ENERGY NEEDS FACT SHEET

Total human energy needs are primarily dependent upon an individual's basal metabolic rate, one's level of activity, and the calorie requirements of food ingestion. An approximation of one's basal metabolic rate can be calculated by assuming the expenditure of kcal/kg of body weight/hour. Energy consumed by activity can be estimated by using the table below, knowing one's body weight, and estimating time lengths for each activity. The overall energy requirements for food ingestion amount to approximately 10% of the sum of the basal metabolic rate plus the activity total. Therefore, total energy needs can be calculated as: (basal metabolism + activity total) X 1.1.

Energy Cost of Activities
(Exclusive of Basal Metabolism and Influence of Food)

Activity	kcal/kg/hr	Activity	kcal/kg/hr
Bicycling (century run)	7.6	Rowing in race	16.0
Bicycling (moderate speed)	2.5	Running	7.0
Boxing	11.4	Sawing wood	5.7
Carpentry (heavy)	2.3	Sewing hand	0.4
Cello playing	1.3	Sewing, foot-driven	0.6
Crocheting	0.4	Sewing, motor-driven	0.4
Dancing, foxtrot	3.8	Singing in a loud voice	0.8
Dancing, waltz	3.0	Sitting quietly	0.4
Dishwashing	1.0	Skating	3.5
Dressing and undressing	0.7	Sleeping	+
Driving automobile	0.9	Standing at attention	0.6
Eating	0.4	Standing relaxed	0.5
Fencing	7.3	Stone masonry	4.7
Horseback riding, walk	1.4	Sweeping with broom	1.4
Horseback riding, trot	4.3	Sweeping with carpet sweeper	1.6
Horseback riding, gallop	6.7	Sweeping with vacuum sweeper	2.7
Ironing (5 pound iron)	1.0	Swimming (2 mph)	7.9
Knitting seater	0.7	Typewriting rapidly	1.0
Laundry, light	1.3	Violin playing	0.6
Lying still, awake	0.1	Walking (3 mph)	2.0
Painting furniture	1.5	Walking rapidly (4 mph)	3.4
Paring potatoes	0.6	Walking at high speed (5.3 mph)	9.3
Ping Pong	4.4		
Piano playing (Mendelssohn's songs)	0.8	Walking downstairs	++
		Walking upstairs	+++
Piano Playing (Liszt's "Tarantella")	2.0	Washing floors	1.2
Reading aloud	0.4	Writing	0.4

Adapted from Introductory Nutrition, H.A. Guthrie, Mosby Co., St. Louis, 1979

\+ Assume that sleep requires no energy beyond basal needs

++ Allow 0.012 kcal/kg for an ordinary staircase with 15 steps without regard to time.

+++ Allow 0.036 kcal/kg for an ordinary staircase with 15 steps without regard to tim

BARGAIN HUNT I

Directions: Using your knowledge of couponing and store prices, find the least expensive item for each of the following categories. Your brain or calculator will be a handy tool for the calculations. Remember to round up to the nearest cent!

How Little Can You Spend?

Item	Brand	Size	Price	Coupon Amount	Double Coupon	TOTAL PRICE	*Location	Generic	BRAND Name	Store	Sale Item
Tomato Soup											
Canned Green Beans											
Plastic Wrap											
Milk											
Tuna											
Cereal (ready to use)											
Bread											
Peanut Butter											
Sample:											
Orange Juice	Town-house	6 oz	.49	.10	.10	.29	S. D.				
Honey											

* Locations: Special Displays, eye-level, upper shelf, lower shelf, near checkstand, other.

BARGAIN HUNT II
Unit Pricing

ctions: Using your knowledge of unit pricing, select the best buy per unit for each of the following items. Remember some items, as special displays, will not be unit priced. Your calculator or brain will be a handy tool for calculating these prices.

How Much Will You Spend To Get The Best Prices Per Unit?

	Brand	Size	Total Price	Unit Price	*Location	Generic	BRAND Name	Store	Sale Item
co p									
d en na									
ic p									
l ady to e)									
t ter									

e:

e ce	Sun-kist	12 oz	.89	.07	E. of I.				

ation: Special Displays, eye-level, top shelf, lower shelf, near checkstand, other.

This unit is designed to teach students steps in marketing a product. During this unit the students will do math calculations for increasing recipes, cost analysis, and a writing exercise through advertising the marketing product. Oatmeal/Chocolate Chip and/or 'M'&'M' cookies have been found to be a big success.

Directions:

OATMEAL COOKIES
or
CHOCOLATE CHIP COOKIES
or
'M' & 'M' COOKIES

Preheat oven to 350
1 cup shortening
3/4 cup brown sugar
3/4 cup white sugar
2 eggs
1 tsp hot water
1 tsp vanilla
1 1/2 cup flour
1/2 tsp salt
1 tsp soda
2 cups rolled oats
12 oz. chocolate chips or 'M'&'M' (optional)

1. Mix shortening, sugars, and vanilla.
2. Stir in eggs and water.
3. Stir in remaining ingredients.
4. Drop by teaspoons onto cookie sheet. Bake until lightly browned or 8 to 10 minutes. Immediately remove from baking sheet.

Makes 4 dozen medium cookies.

I. The above recipe is a single recipe that needs to be increased, to be used in this project. When increasing the quantities, convert them into the measurements that are the most accurate and easiest to measure. (Example: 1 Tbsp is easier to measure than 3 tsp.)

SINGLE	DOUBLE (Ex.: 1/3 x 2/1 = 2/3)	TRIPLE (Ex.: 1/3 x 3/1 = 3/3 = 1)
1 cup shortening	_____	_____
3/4 cup brown sugar	_____	_____
3/4 cup white sugar	_____	_____
1 tsp vanilla	_____	_____
2 eggs	_____	_____
1 tsp hot water	_____	_____
1 1/2 cups flour	_____	_____
1/2 tsp salt	_____	_____
1 tsp soda	_____	_____
2 cups rolled oats	_____	_____

II. To determine the cost of manufacturing each cookie a cost analysis is done for a triple recipe. Preceding the cost analysis a discussion is held on the differences in wholesale and retail pricing and the profit margins of various commodities. To keep the cookies at an affordable price for all the students in the student body, a very low profit margin of 1 or 2 cents might be considered.

To determine the cost of individual cookies, fill the following blanks.

1. Total recipe cost _____ divided by total number of cookies _____ = cost per cookie _____. (Wholesale cost/cookie.)

2. Cost per cookie _____ x PROFIT MARGIN!! _____ = Cookie cost _____. (Retail cost/cookie.)

HELPFUL EQUIVALENTS FOR CALCULATIONS:

Shortening	1 pound = 2 1/3 cups
Brown Sugar	1 pound = 2 1/4 cups
White Sugar	1 pound = 2 1/4 cups
Eggs	1 dozen = 12 eggs
Flour	1 pound = 4 cups
Rolled Oats	1 pound = 6 1/4 cups

III. Upon completion of the cost analysis, the students are ready to proceed to the advertising portion of this unit.

The students are to develop advertisements for the promotion of the cookie sale. Students will make advertisements in the form of posters and newspaper ads for the school paper and daily announcements.

Advertise Requirements:

Product selling.
Where selling.
When sale will occur.
Cost of one (1) cookie and multiple unit cost.
Manufacturers name.
Sales slogan.

Guidelines for Developing a Good Advertisement:

The ad must be simple and to the point.
The ad must be appealing and informative.

Supplies Needed:

Paper: Construction, Butcher, Newsprint, or Scratch.
Pencils: Colored.
Marking Pens.
Rulers.
Glue.
Tape.

COST ANALYSIS

Item	Cost as Purchased	Cost/1 Unit	Amount Required in Recipe	Cost for Recipe
Shortening				
Br. Sugar				
Wh. Sugar				
Vanilla				
Eggs				
Flour				
Rolled Oats				
Ch. Chips or 'M'&'M'				

Total Cost of Recipe _____

HELLO JELLO

Show the effects of contamination by using the following experiment:

Prepare 1 box of Jello with 1 cup of water. Divide it into three sterilized jars so that there is 1/2 to 1 inch of jello in the bottom of each jar. Close the jar and set aside to jell.

Label the first jar "Control," the second "Washed Hands," and the third "Dirty Hands." Open each jar individually to be contaminated and close quickly. Set aside until growth appears, usually 3 or 4 days. Should proof you are after fail to appear at once, keep the jars a little longer.

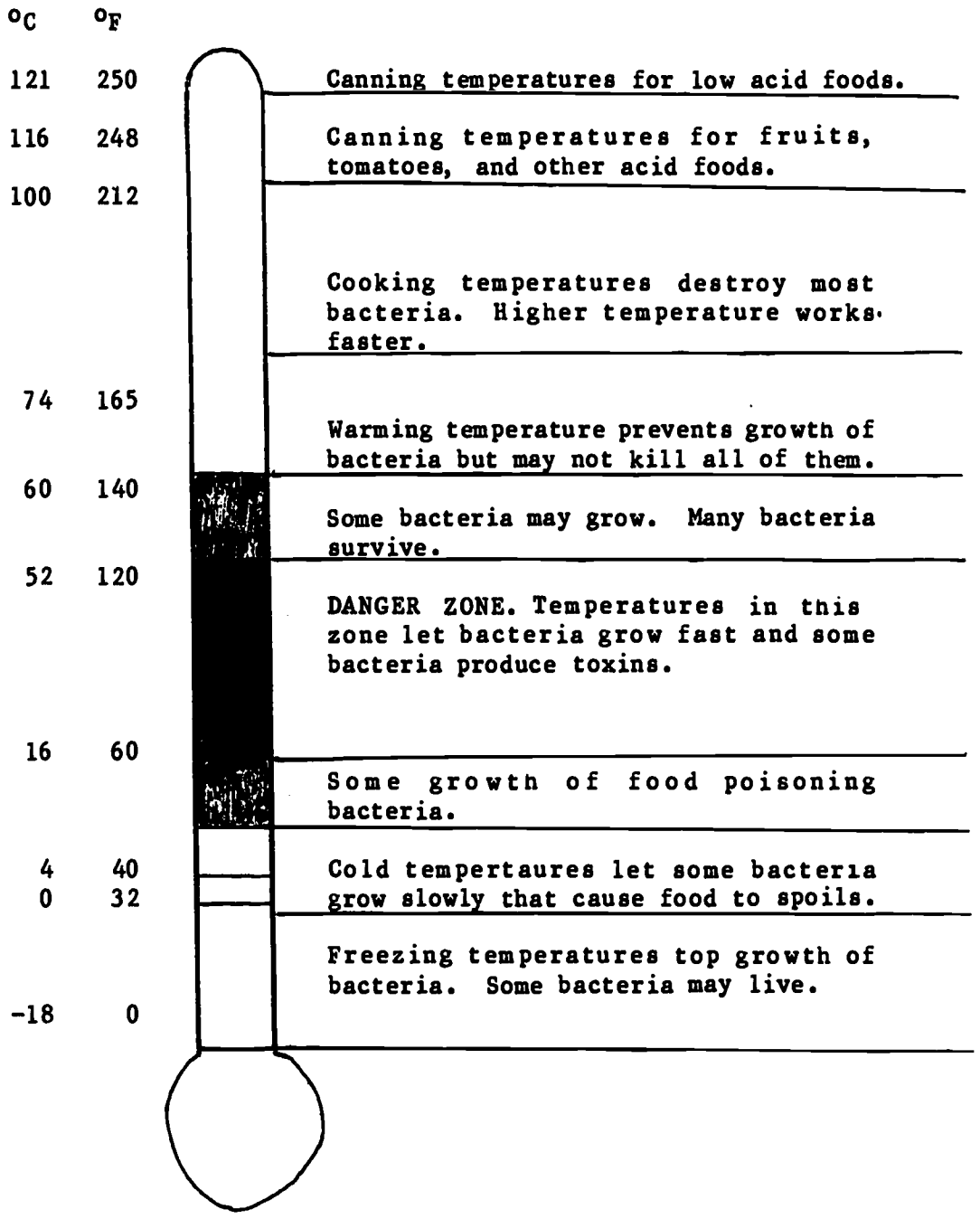
Additional things that contaminate food can be tested. Just make up more Jello as directed and be sure jars are sterilized. You can use the original "Control" jar of jello without doing another.

Some other ways you might contaminate jars of Jello to see what happens are:

1. cough in a jar
2. drop in a hair
3. wipe the floor with a tissue and shake into the jar
4. wash our hands, tough your finger to your tongue, then touch the Jello in a jar.

Other contaminants can be selected. Be sure to use only one to a jar and label each.

SAFE TEMPERATURES



Adapted from Keeping Food Safe to Eat, Home and Garden Bulletin No. 162, U.S. Dept. of Agriculture, 1970.

DUTCH BABIES

Use the appropriate ingredients for the pan size you want to make. The 3 egg recipe easily feeds two people.

PAN SIZE	MARGARINE	EGGS	MILK	FLOUR
2-3 quart	1/4 cup	3	3/4 cup	3/4 cup
3-4 quart	1/3 cup	4	1 cup	1 cup
4-4 1/2 quart	1/2 cup	5	1 1/4 cup	1 1/4 cup
4 1/2 -5 quart	1/2 cup	6	1 1/2 cup	1 1/2 cup

Melt margarine in pan in 425° oven. Beat eggs. Add milk. Add flour.

Pour mixture into hot pan with melted margarine. Bake until golden brown approximately 20 minutes.

Find the best method to get the puffiest pancake. Try each of the following methods of preparation:

a) Bake in cold pan vs. hot pan.
b) Beat egg with fork, electric mixer, or wire whisk.
c) Add all ingredients at the same time vs. one at a time.

****

PITA

1 pkg yeast
1 1/3 cup warm water
1 t. salt
1/4 t. sugar
1 T. oil
3-3 1/2 cup flour
Corn meal

Dissolve yeast in warm water. Stir in salt, sugar, oil, and 1 1/2 cups of flour. Beat until smooth. Add enough of the remaining flour so dough is easy to handle.

Turn dough onto floured board. Knead until dough is elastic (10 minutes). Place dough in greased bowl, placing dough greased side up. Cover and let rise in warm place until doubled in size (approx. 1 hour).

Punch dough down and divide into 6 parts. Shape into balls. Rise 30 minutes.

Sprinkle 3 ungreased baking sheets with cornmeal. Roll dough into circle 1/8" thick. Let rise 30 minutes. Heat oven to 500°. Bake for 10 minutes. Fill pita with various fillings.

Recipe from Betty Crocker's Breads, New York: Golden Press, 1974.

SNACK IN-BASKET

What do you and a big business executive have in common? One thing is that both of you have to make decisions every day.

Have you ever stopped to think that each time you eat, you make a decision? Sometimes the decision is only to eat or not to eat. At other times you also decide what to eat.

You probably have several snacks each day. What to eat for snacks deserves some good decision making. Snacks help you get the calories you need every day. Since you are probably still growing and because you may be more physically active than an adult, you probably need more calories in relation to your size than you will later. It is, however, easy to get too many calories through snacks.

Since snacks have become such a way of life, we need to think about what nutrients are present in the snacks. Many snacks contain mostly fats and carbohydrates (sugars and starches). If activities cut into regular meals, you may need to get part of your vitamins, minerals, and protein through snacks. You may also need some of these nutrients in snacks if your meals do not include all that you need.

* * * * *

Business executives sometimes practice making decisions using the in-basket. That means they are given many papers in their "in-basket" to decide what should be done. They then put them in the out-basket.

You can practice making snack decisions using the same technique.

Directions: Decide how many calories you want through snacks in one day. This will be based on whether you want to gain, lose or keep your present weight.

Record Snack Calories Goal _____

SNACK IN-BASKET

Read each situation and then circle the snack you would choose. You may also pass and not take a snack. The objective is to come as close to the calories you chose at the end of the day, with foods that are high in vitamins and minerals. Circle your choice or leave blank.

1. You still feel hungry as you leave for school. What do you take to eat on the way?	Apple	Doughnut
2. At morning break you are thirsty. Which do you drink?	Soda Pop	Milk
3. You are hungry an hour before lunch. Which do you eat?	Orange	Candy Bar
4. You still want something to nibble on after lunch. Which do you eat?	Potato Chips	Carrot sticks
5. During mid-afternoon you feel drained. What do you eat?	Graham crackers	Choc. Chip cookies
6. You are thirsty after that What do you drink?	Lemonade	Coke
7. You stop for a snack after school. What do you get?	Carrot Cake	Fruit Salad
8. Dinner will be late tonight so you have a little snack first. What do you eat?	Sugar Coated Cereal	Granola Munchies
9. While you do your homework you want some buttered toast. What do you put on it?	Applesauce	Strawberry Jam
10. Just before you go to bed, you decide to get something to drink. What do you choose?	Buttermilk	Milk Shake

Look up the calories in the foods you chose. RECORD_____

How does that compare with what you decided to eat?

How many foods that were high in vitamins and minerals did you eat?

How many foods from each of the basic foods groups did you choose?

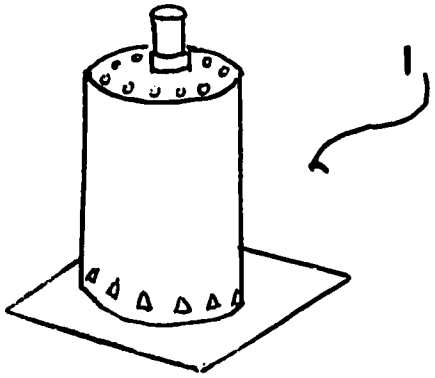
How do you rate your snacks for the day? _____

FROM: Blankenship, Martha, BASE Home Economics Curriculum, West Virginia, 1981.

COFFEE CAN CALORIMETRY

(Adapted from Counting on Energy, Project 3E,
Montgomery County, Bluebell, PA)

Materials
Coffee can
Large test tube
Duct tape
Wire stand
Metal or asbestos pad
Test fuels
Matches
Thermometer
Balance
Graduated cylinder



Procedure:

1. Prepare calorimeter by cutting out bottom of can, punching vent holes around bottom, punching vent holes in top, and cutting hole in top just large enough for test tube to fit through.

2. Prepare fuel stand by bending small piece of welded wire screening.

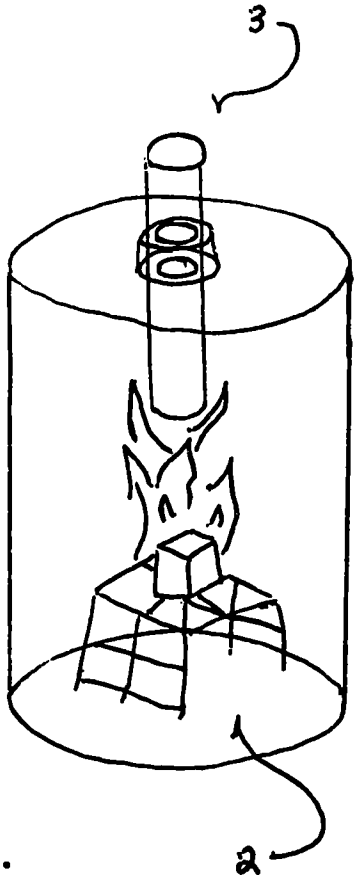
3. Prepare test tube by wrapping it with a collar of duct tape to hold it in position.

4. Half fill test tube with water.

5. Measure volume of water (to nearest tenth of a ml).

6. Measure temperature of water (in ^{o}C).

7. Weigh fuel (to nearest tenth of a gm).



8. Ignite fuel and immediately place in calorimeter.

9. As soon as the fuel has been consumed, measure the water temperature (in ^{o} C).; if water boils, start again with less fuel.

10. Calculate the heat transferred to the water:

$$\text{Calories} = \frac{\text{final temperature } (^{o}C) - \text{start temperature } (^{o}C)}{\text{volume of water (ml)}}$$

11. Calculate the number of calories in each gram of fuel:

$$\text{cal/gm} = \frac{\text{calories transferred}}{\text{grams of fuel}}$$

T I N C A N I C E C R E A M

Ice cream without an ice-cream maker!

1 cup milk
1 cup whipping cream
1/2 cup sugar
1/2 teaspoon vanilla extract
Nuts or fruit as desired

Put all ingredients in a 1-pound coffee can with a tight fitting plastic lid. Place lid on can. Place can with ingredients inside a 3-pound can with a tight-fitting plastic lid.

Pack larger can with crushed ice around smaller can. Pour at least 3/4 cup of rock salt evenly over ice. Place lid on 3-pound can. Roll back and forth on a table or cement slab for 10 minutes. Open outer can. Remove inner can with ingredients. Remove lid. Use a rubber spatula to stir up mixtures; scrape sides of can. Replace lid. Drain ice water from larger can. Insert smaller can; pack with more ice and salt. Roll back and forth for five more minutes. Makes about cups.

Science Applications:

1. Find the melting point of the ice. Add the rock salt and find the new melting point? What effect did the salt have on the melting temperature?

2. Experiment with crystal formation. What happens to the mixture if you do not stir or roll it?

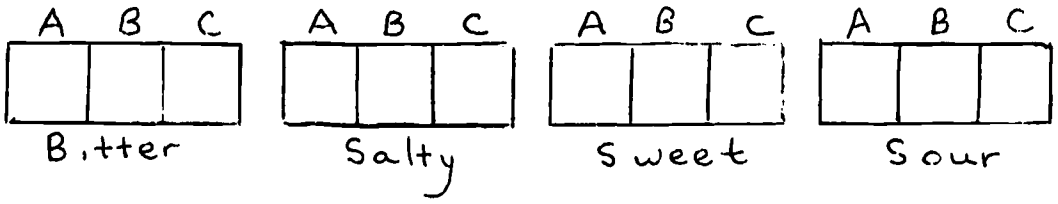
3. Compare different types of ice: homemade, commercial, gourmet, ice milk. Have a taste panel and identify the highest quality product (best taste, smoothest, smallest crystals, best color, best mouth feel, etc.) After the taste panel is completed, compare the products for cost, fat content, and additives. What is added to the cheaper brands to make them seem like they contain more fat? What does the color of ice cream tell you? Which ice creams contained the highest fat content?

4. What nutrients are contained in ice cream? What do you think is the most important nutrient contribution of ice cream? How does the nutrient density of ice cream compare to other desserts?

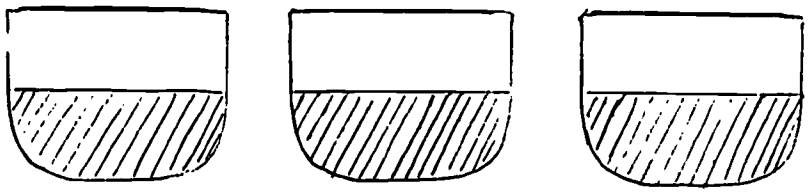
FROM: Thomas, Dian, "Tin Can Ice Cream", H-P Books (ISBN: 0-89586-167-4).

T O N G U E T E A S E R S

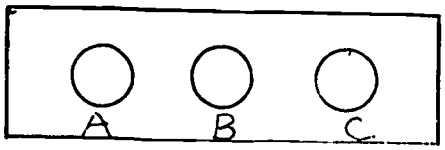
Give each student four pieces of wax paper and instruct the student to label the papers bitter - salty - sweet - sour. Label areas for samples A, B, and C.



Using small containers prepare two of diluted lemon juice that are the same and one that has a weaker dilution.



Pass the three dishes of labeled solution and have each student take a small sample of A, B, and C.



Follow the same procedure for bitter, salty, and sweet solutions.

Suggestions for bitter - caffeine may be purchased at the drug store.

FROM: Blankenship, Martha, BASE Home Economics Curriculum, West Virginia, Oct. 1981.

MORE THAN MEETS THE EYE

We use many senses to determine the flavor of foods. For each food below, check those senses which you feel are most important in judging the flavor of that food. You may want to check more than one of the senses for each food., After you have completed your worksheet, discuss what other students ways in which your responses are different or the same.

FOOD	TASTE 	SMELL 	SIGHT 	TOUCH 	SOUND 
APPLE					
PEANUTS					
FRENCH FRIES					
RAISINS					
CORN FLAKES					
CARROTS					
PUDDING					
WATERMELON					
PIZZA					
JELLO					
ORANGE					
CRACKER					

FROM: Blankenship, Martha, BASE Home Economics Curriculum, West Virginia, 1981.

GLUTEN BALL EXPERIMENT--THE STRUCTURE OF BREAD

Objective: To see how gluten development is affected by type of flour.

Procedure:

1. To 100 g of flour add water from a measuring cup to produce a dough that can be kneaded with the hands. Record the volume of water used.

2. Knead the dough for 10 minutes and immerse in a beaker or bowl of water for 5 minutes.

3. Knead the dough gently in the beaker until the water becomes "milky" in appearance, being careful not to let the ball of dough fall apart . Decant water through a strainer lined with finely woven cheesecloth

4. Add a fresh supply of water and repeat #3.

5. Repeat #4. until the water is clear. Retrieve bits of gluten from the cheesecloth and add to the ball.

6. Squeeze as much water as possible from each gluten ball and weigh.

7. Weigh out equal amounts of gluten balls and bake at 450° for 15 minutes. Lower temperature to 300° and bake 40 minutes longer.

8. Rank the balls in order of increasing yield and increasing size.

EFFECTS OF INGREDIENTS AND COOKING TIMES ON VEGETABLES

Science Concept: Acidity and Alkalinity

Science Competencies:

1. Identity the effect of adding an acid ingredient to the cooking water of vegetables.

2. Identify the effect of adding an alkaline ingredient to the cooking water of vegetables.

3. Discover the effect of overcooking or undercooking vegetables.

Procedure:

1. Divide vegetables (2 1/2 cups cut green beans, 2 1/2 cups sliced carrots, 5 cups sliced red cabbage and 2 1/2 cups cubed potatoes) into five equal parts.

2. Cook each vegetable 5 different ways:

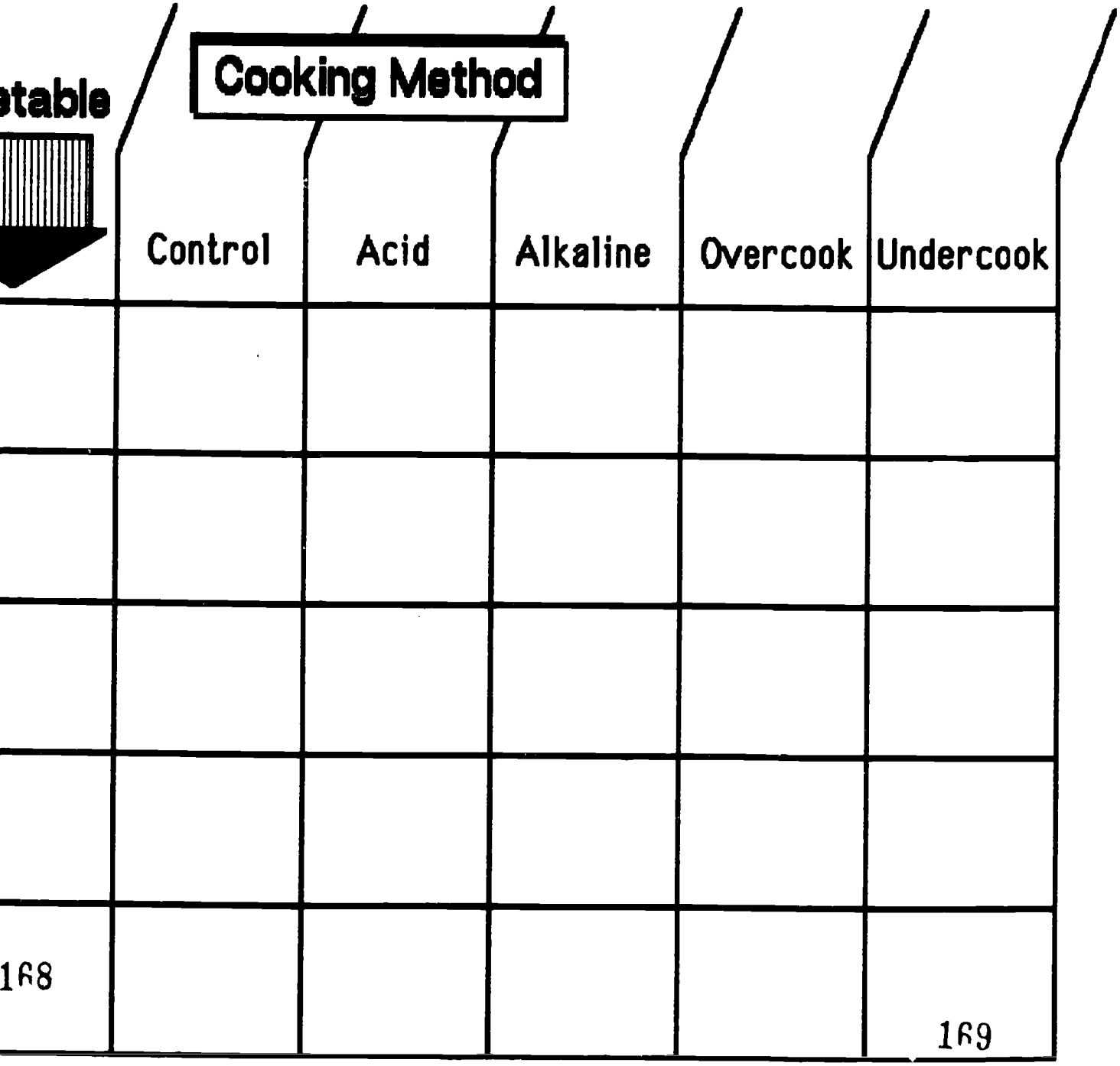
   a. Control: Cook in one cup of water until just tender
   b. Acid medium: add one tablespoon of vinegar to one cup of water and cook until tender
   c. Alkaline medium: add one teaspoon of baking soda to one cup of water and cook until tender
   d. Overcooked: cook for one hour, adding water as needed to prevent burning.
   e. Undercook: Cook vegetables in small amount of water for 3-5 minutes.

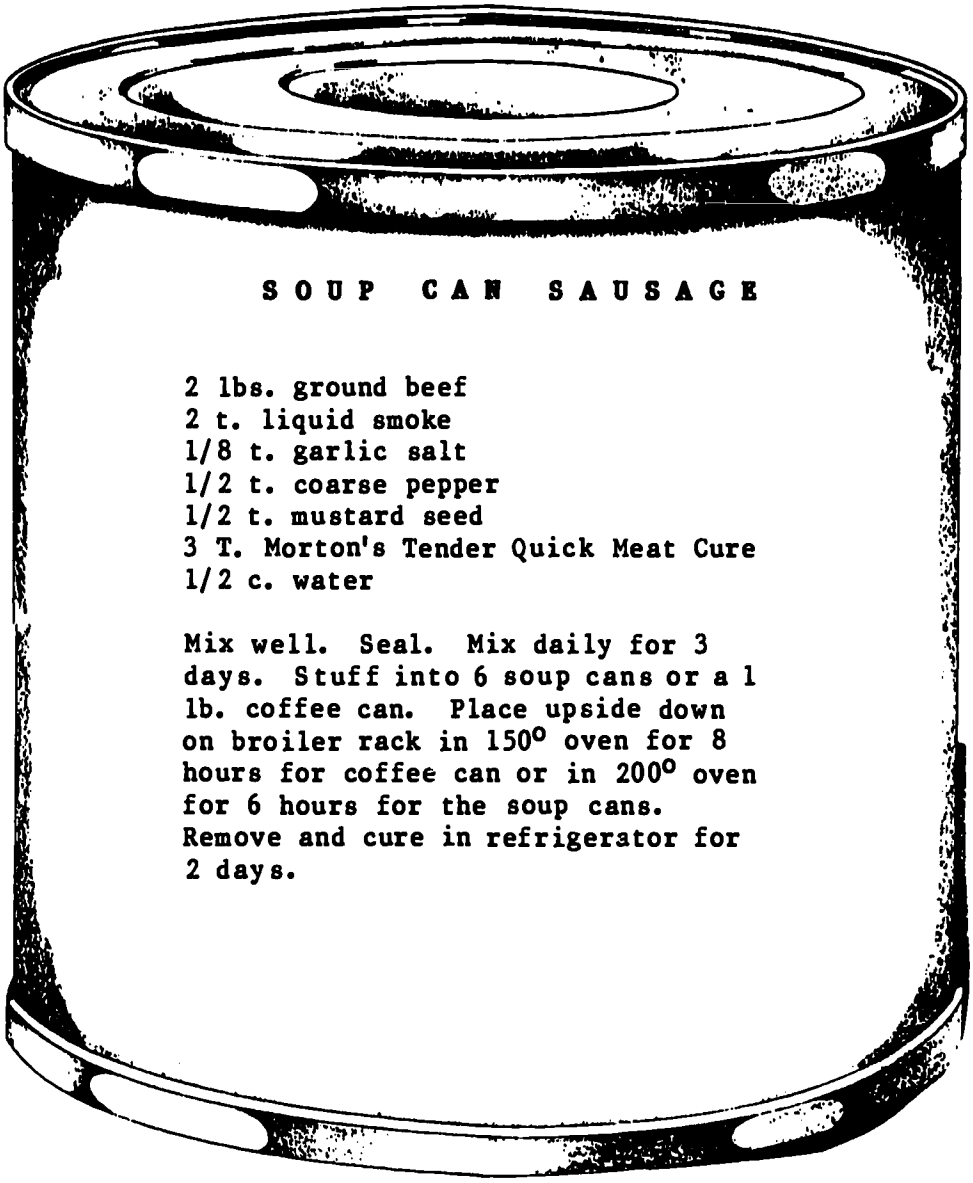
3. Display each vegetable on a white plate with a place card indicating the cooking method. Have students complete the Vegetable Cooking Method Table.

4. Have the students summarize what they learned by answering these questions:

a. How does the addition of an acid or alkaline affect the color of vegetables?
b. How does the addition of an acid or alkaline affect the texture of vegetables?
c. How does the addition of an acid or alkaline affect the nutrient value of vegetables?
d. How does cooking affect the color of vegetables?
e. How does cooking affect the texture of vegetables?
f. How does cooking affect the nutrient value of vegetables?

This exercise was developed by Martha Northway, Ennis High School from Help Yourself, Choices in Foods and Nutrition, Educator's Guide, Butterick Publishing.


etable
Cooking Method
Control
Acid
Alkaline
Overcook
Undercook



SOUP CAN SAUSAGE

2 lbs. ground beef
2 t. liquid smoke
1/8 t. garlic salt
1/2 t. coarse pepper
1/2 t. mustard seed
3 T. Morton's Tender Quick Meat Cure
1/2 c. water

Mix well. Seal. Mix daily for 3 days. Stuff into 6 soup cans or a 1 lb. coffee can. Place upside down on broiler rack in 150° oven for 8 hours for coffee can or in 200° oven for 6 hours for the soup cans. Remove and cure in refrigerator for 2 days.

1. Observe the color of the meat after it is first mixed. What color is it?

2. Read the ingredient list on the meat cure label. What is the purpose of the different ingredients?

3. Why do you mix daily for 3 days? What happens during this time period?

4. What is the color of the meat before stuffing it into the cans?

5. What is the color of the meat after cooking?

6. Why is such a low temperature used in the cooking?

LABORATORY EXPERIMENTS ON COOKWARE

From: Aluminum Cookware and Bakeware, Mirro Aluminum Company

Heat Conductivity Tests for Cookware

1. Brown Flour Test
   a. Select utensils which are of approximately the same bottom diameter but which are made of different materials- aluminum, steel, iron, etc. (A series of 10" fry pans is ideal.)
   b. Brush shortening evenly on the inside of each pan.
   c. Dust flour in the bottom of the greased pan and shake out the excess. (Just like greasing and flouring a cake pan.)
   d. Place pan on thermostatically controlled unit of range set at 350° f. (If TCU is not available, set heat at medium high.)
   e. With a stop watch or minute minder, time each pan for 2-1/2 minutes. Let the unit cool before putting on the next pan.
   f. Line all the pans up and compare the evenness of browning and note any burned spots. (If flour isn't browned in some pans, return the pans to the unit and time how much longer it takes to brown.)

2. Baking Chocolate Test
   a. Select 10" fry pans made of different materials.
   b. Place a square of baking chocolate in the center of pan and another on the edge.
   c. Place pan over medium heat and observe the way the chocolate melts. Check the time required for melting and/or scorching to take place. Compare the square in the center with the square on the edge.
   d. Repeat experiment with each pan, allowing the unit to cool between tests.

"Waterless Cooking" Test for Cookware

a. Select saucepans of the same capacity. (A series of 2 or 3 quart saucepans is ideal.)
   b. Place a measured amount of water (1/4 cup or 1/2 cup) in pan. (Start with water that is the same temperature in each pan.) Cover the pan.
   c. Set on high heat. Using a stop watch, measure the time required to bring the water to a boil.
   d. When water boils, turn heat to low and continue coking for a specified length of time (15 or 30 minutes).
   e. Measure the water loss.
   f. Repeat experiment with each pan, allowing the unit to cool between tests.
   g. For further information, repeat the test with the pans uncovered or with different heat settings.

Preheat Tests for Fry Pans

a. Place fry pan or griddle over medium-high heat. At 30 second intervals drop a teaspoon of water on the pan. When the water "dances" and tiny beads form, the pan is at correct frying temperature. Note the time required for preheating.

b. Place fry pan or griddle over medium-high heat. Place a teaspoon of butter or margarine in the center of the pan. As soon as it begins to brown, the pan is at correct frying temperature. Note time required for preheating.

c. Both preheat and heat conductivity tests can be expanded to include actual cooking of such foods as pancakes or fried eggs. (To fry eggs, pan is heated only until butter melts - not browns - and heat must be turned low as soon as eggs are placed in pan.

Interior Finish Test for Cookware

a. Using an uncoated and a Teflon-coated fry pan, fry an egg in each pan after preheating properly and greasing each pan lightly to "condition" it. Note any difference in ease of turning or removing eggs.

b. Using an uncoated and a Teflon-coated fry pan, fry an egg in each, varying conditions such as amount of fat used, high and low temperatures, etc. Note any differences in ease of turning or removing eggs or in appearance of finished product.

Exterior Finish for Bakeware

1. Pie Pans.
   a. Select an aluminum pan with a shiny finish (natural or polished) and a dull finish (anodized).

   b. Bake a pie shell ("scratch" or mix) in each pan, using the same time, temperature and position in oven for each pan. Compare baked pie shells.

2. Loaf Pans.
   a. Select two aluminum loaf pans (9 x 5 x 3"), one with a shiny finish (natural or polished) and one with a dull finish (anodized).
   b. Using either a "scratch" quick nut bread recipe or a "scratch" yeast bread recipe or two loaves of frozen yeast bread, bake bread in each pan using the same time, temperature and position in oven for each pan. Compare baked bread.

Pressure/Temperature Relationship in Pressure Cooker

   a. Prepare custard mixture as follows:
      beat 2 eggs slightly with 2 tablespoons sugar and a dash of salt. Add 2 cups hot milk (not boiled) and 1 teaspoon vanilla.
   b. Pour custard in individual heat-proof glass cups and arrange them on rack in pressure cooker with 1/2 cup water in cooker.
   c. Cover, set control at 5 lbs. and cook exactly 1-1/2 minutes after control jiggles. Reduce pressure normally.
   d. Repeat steps a, b and c (above) except cook at 15 lbs.
   e. After both batches of custard have cooled, compare texture and amount of syneresis.

L U K E W A R M

Background: The water heater is the second largest energy eater in your home, consuming about 15% of household energy (excluding transportation) and representing $.09 of every total energy dollar. The amoung of energy (and dollars) spent on maintaining a supply of hot water varies with family size and water use habits. It's important to use hot water conservatively.

Time Required: 20 minutes

Materials: Chalkboard/overhead projector

Procedure:

1. Copy Tables 1 and 2 onto chalkboard or transparency.

2. Discuss Table 1 with students.

   a. Have them estimate the number of gallons of hot water used per day in the average 4-member family.

   b. Ask them to calculate how many gallons of hot water would be used typically in 365 days. (Assume that hot water is approximately 60% of the total water consumption when hot and cold are used together, as in bathing.)

   c. Students should then calculate using Table 2:
      1. the number of kilowatt hours an electric water heat would consume in heating the number of gallons (from b) to normal washing temperature in one year.
      2. the number of cubic feet of natural gas required (as in 1) for a gas water heater.
      3. the estimated operation cost per year of one electric water heater.
      4. the estimated operation cost per year of one gas water heater.

From: Energy Activities for the Classroom, ERIC Center for Science, Mathematics and Environmental Education, College of Education, The Ohio State University, 1976.

TABLE 1.

HOW WATER IS USED BY A TYPICAL AMERICAN FAMILY OF FOUR

USE	GALLONS USED PER DAY
Dishwashing	15
Cooking, Drinking	12
Utility sink (washing hands, etc.)	5
Laundry	35
Bathing	80
Bathroom	8
Toilet	100
TOTAL	225

TABLE 2.

Gas and Electricity Needed to Heat
One Gallon Water to Normal Washing Temperature

Source	Amount	Cost Per Unit
Gas	1 cubic foot	.0014 cents
Electricity	.25 kilowatt hour	4.5 cents

Taken from: Counting on I , Blue Bell, PA, 1980.

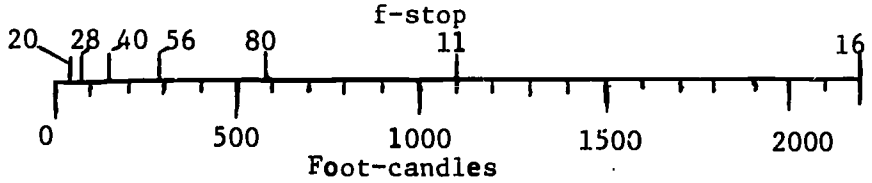
DIM IT

Is there enough light for you to safely and efficiently perform your tasks; or are you wasting energy by using more light than you need? To find out, measure the light intensity, in footcandles, with a light meter. Compare your findings with the recommendations listed below.

TASK	RECOMMENDED LIGHT LEVEL* (in footcandles)
Reading and Writing	
books, magazines, newspapers	30
handwriting and indistinct print	20
critical seeing tasks	100
drafting	200
Office Areas	
bookkeeping, business machine operation	100
filing, mail sorting	50
conferring, interviewing	30
General	
any area involving a visual task	30
washrooms	30
areas for relaxation, conversation	10
playing cards, billiards	30
Kitchen, Laundry, Grooming	
sink	70
counter space	50
laundering, ironing, grooming	50
Sewing, Handicrafts	
occasional sewing	50
close craftwork, reading diagrams	100
measuring, sawing, assembling	50
Industrial (condensed)	
rough-easy seeing	30
rough-ordinary seeing	50
medium	100
fine	500

If you don't have light meter that reads directly in footcandles, you can use a photographer's light meter or a camera with a built-in meter.

First set the film speed of the light meter at ASA 100. Then set the shutter speed at 1/60 sec. Find the appropriate f-stop, and read the corresponding number of footcandles from the chart below.



Sources: "Planning Your Home Lighting." Home and Garden Bulletin No. 138, U.S. Department of Agriculture.
Standard Practice A 11.1 1973 of the American Standards Institute.

O U R E N E R G Y S L A V E

Use of electricity has increased over the years. To see how much more energy you use than your grandparents did, check the appliances that your family uses now; then check those which you think your parents and grandparents used when they were children.

THE INCREASING USE OF ELECTRICITY

ITEM	avg. kwh/mo.	Your family	Parents	Grandparents
Dishwasher	35			
Microwave Oven	16			
Electric Range	98			
Blender	1			
Can Opener	1			
Electric Clock	1			
Automatic Coffeemaker	8			
Toaster	3			
Slow Cooker	12			
Refrigerator	152			
Vacuum Cleaner	4			
Clothes Washer	9			
Clothes Dryer	80			
Space Heater	75			
Water Heater	400			
Color TV	55			
B&W TV	30			
Radio-Record	9			
Power Saw	4			
Electric Blanket	12			
Hair Dryer	10			
Electric Toothbrush	1			
Room Air Conditioner	72			
Electric Fan	12			
Electric Furnace	1100			
Yard Light	30			
Garage Door Opener	1			

Reference: U.S. Dept. of Energy, Your Energy World, 1978.

WHICH COSTS THE MOST?

Background: Due to the different power requirements (watts) of household appliances, some cost more to operate per hour than others.

Time Required: 30 minutes

Materials: 1. Worksheet #1
2. Overhead projector
3. Chalkboard

Procedure

1. Make a spirit master of Fig. 1.
2. Make a transparency of Table 1.
3. Explain the concept of a "mill" (.001 of a dollar).
4. Ask students to choose 10 appliances they "need" in their homes.
5. Instruct them to plot a histogram of the cost per hour vs. the ten appliances, using Fig. 1.
6. Make a "class data" composite histogram on the chalkboard listing the ten most expensive appliances per hour of operation.
7. How could money and energy be saved in the future use of each appliance?

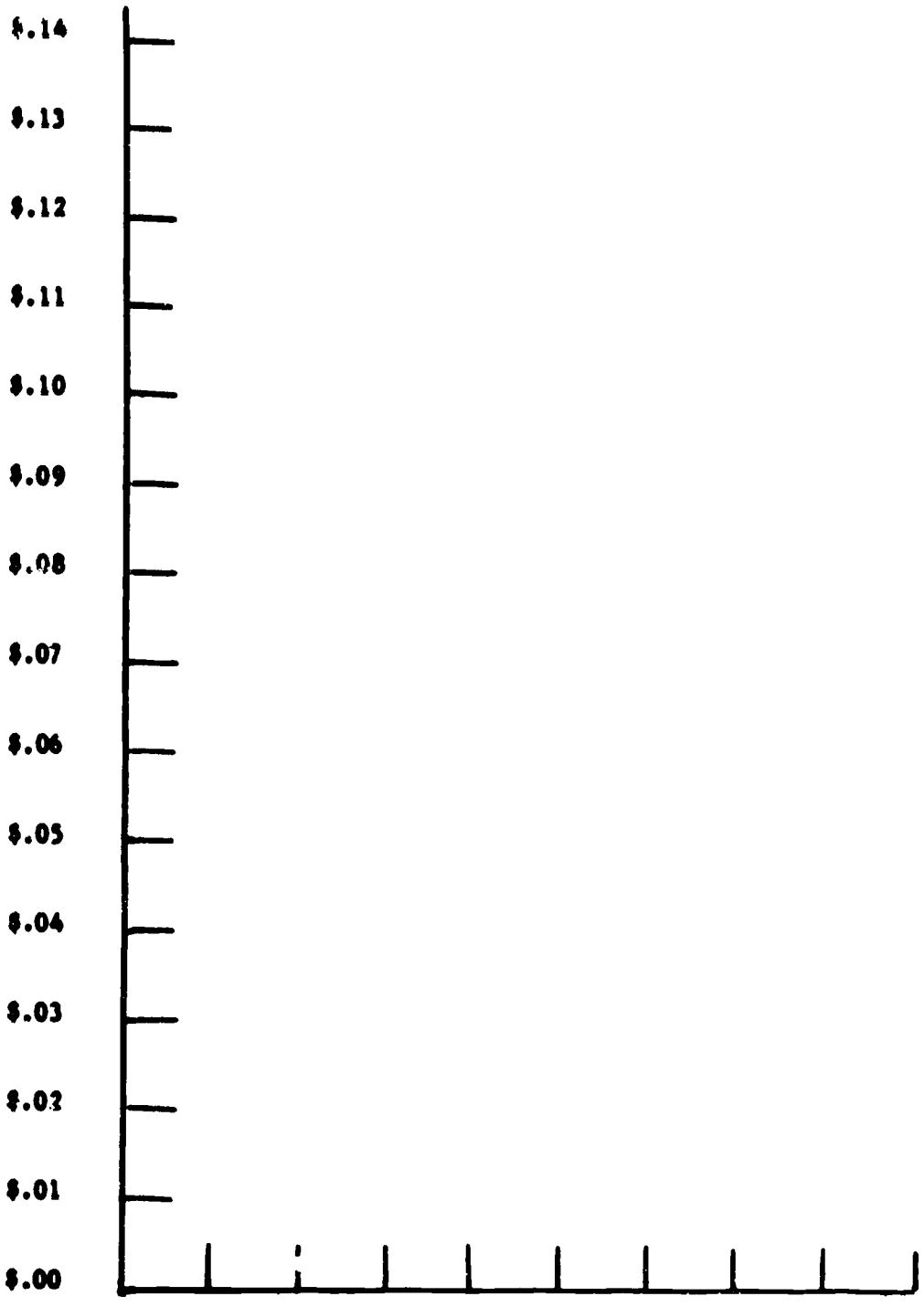
Reference: Adapted from Energy Activities for the Classroom, ERIC Center for Science, Mathematics, and Environmental Education, College of Education, The Ohio State University, 1976, pp. 23-24.

TABLE 1.

COST OF ELECTRICITY FOR ONE HOUR OF USE

1.	Toothbrush	$ .0002 (.02 of a cent)
2.	Toaster	$ .04
3.	How Water Heater:	
	Tub Bath	$ .09-.14
	Shower	$ .07-.115
	Automatic Washer	$ .17
	Dishes by Hand	$ .02
	Dishwaster	$ .09-.14
4.	Freezer	$ .005 (1/2 cent)
5.	Lights:	
	Incandescent - 1000 watt	$ .0038
	Fluorescent - 40 watt tube	$ .0019
6.	Record Player	$ .004
7.	Air Conditioning	$ .038
8.	Radio	$ .002
9.	Television:	
	Black and White:	
	Solid State	$ .002
	Tube	$ .006
	Color:	
	Solid State	$ .007
	Tube	$ .01
10.	Range:	
	Large Burner	$ .038
	Small Burner	$ .02
	Bake	$ .02
	Broil	$ .13
11.	Dishwasher	$ .045
	Hot Water	$ .14
12.	Refrigerator/Freezer -14 cu/ft:	
	Frostless	$ .008
	Manual	$ .005
13.	"Radar" Range - Microwave Oven	$ .05
14.	Clock	$ .007

FIGURE 1.
HISTOGRAM



OVEN USE AND ENERGY CONSUMPTION

The student will be able to demonstrate the energy consumption differences of conventional and microwave ovens.

Activities:

A microwave oven has the capability of saving energy as a result of the short cooking time needed for some foods. However, many foods may still be more efficiently cooked in a conventional oven.

In the home economics laboratory, compare the energy required to cook the following food items: cake, tuna, casserole, frozen TV dinner, frozen broccoli, and baked potatoes. To determine the energy used to cook each item, calculate the energy used in kilowatt-hours. This can be done by first determining the wattage of the cooking unit (listed on the appliance):

_____watts for microwave oven (usually around 1,450 watts)

_____watts for conventional oven (usually around 12,200 watts)

Then determine the amount of time the unit operates to cook the food item. The operation time of the microwave oven will be easy to determine since it operates continuously and is usually equipped with a light that indicates when the oven is operating) and add them to arrive at the total time of operation required to cook the food item.

Once the wattage and cooking times are determined, the energy use can be calculated. For example: if a cup of squash requires 30 minutes to cook in a 12,000 watt oven, it requires 6 kilowatt-hours of energy:

$$\underline{12,000} \text{ watts} \times \underline{30} \text{ minutes} \times \frac{1}{60,000} = \underline{6} \text{ kilowatt-hours}$$

*(The conversion factor is $\frac{1}{60,000}$ since there are 1000 watts to a kilowatt and 60 minutes to an hour.)

Resources: Worksheets, Stop-Watch

Developed By: U.S. Department of Energy

OVEN USE AND ENERGY CONSUMPTION

FOUR BAKED POTATOES:

Conventional Oven:

_____watts x _____minutes x $\frac{1}{60,000}$ = _____kilowatt-hour.

Microwave Oven:

_____watts x _____minutes x $\frac{1}{60,000}$ = _____kilowatt-hour.

* *

Tabulate Your Results

Food Item	Energy Use By Conventional Oven	Energy Used By Microwave Oven
CAKE	_____kilowatt hr.	_____kilowatt hr
TUNA CASSEROLE	_____kilowatt hr.	_____kilowatt hr
TV-DINNER	_____kilowatt hr.	_____kilowatt hr.
FROZEN BROCCOLI	_____kilowatt hr.	_____kilowatt hr.
BAKED POTATOES	_____kilowatt hr.	_____kilowatt hr.

Suggestions:

1. Remember that tht quantities and types of foods cooked in the ovens must be the same to provide valid comparisons.

2. What would have been the effect on energy consumption if more than one food was cooked in the oven at once? Would this method of conserving energy be more effective for conventional or microwave ovens?

3. You may wish to choose different foods to test. If so, try to select a arange of items from "dense" (such as meat) to "much less dense" (such as squash) to provide dramatic results.

   Students prepare a a variety of foods in lab using conventional and microwave ovens.

WORKSHEET ON OVEN USE AND ENERGY CONSUMPTION

CAKE (Use the same recipe in each oven)

Conventional Oven

_____watts x _____minutes x $\frac{1}{60,000}$ = _____kilowatt-hour.

Microwave Oven:

_____watts x _____minutes x $\frac{1}{60,000}$ = _____kilowatt-hour.

* *

TUNA CASSEROLE

Conventional Oven:

_____watts x _____minutes x $\frac{1}{60,000}$ = _____kilowatt-hour.

Microwave Oven:

_____watts x _____minutes x $\frac{1}{60,000}$ = _____kilowatt-hour.

* *

FROZEN TV DINNER

Conventional Oven:

_____watts x _____minutes x $\frac{1}{60,000}$ = _____kilowatt-hour.

Microwave Oven:

_____watts x _____minutes x $\frac{1}{60,000}$ = _____kilowatt-hour.

* *

FROZEN BROCCOLI

Conventional Oven:

_____watts x _____minutes x $\frac{1}{60,000}$ = _____kilowatt-hour.

Microwave Oven:

_____watts x _____minutes x $\frac{1}{60,000}$ = _____kilowatt-hour.

* *

EVALUATING THE ENERGY EFFICIENCY RATING OF AN APPLIANCE

1. To determine the Energy Efficiency Rating (EER) of an appliance, the appliance output as expressed in Btu's (British Thermal Units)/hour are divided by the input energy, the watts. The formula is:

$$\frac{\text{Btu's/hour}}{\text{WATTS}} = \text{EER}$$

Example: Air Conditioner A has a capacity of 10,000 Btu/Hr. and wattage of 1375.

$$\frac{\text{Btu's}}{\text{WATTS}} = \text{EER} \quad \frac{10,000}{1,375} = 7.3 \text{ for EER}$$

Air Conditioner B has a capacity of 10,000 Btu's/Hr with a wattage 860

$$\frac{\text{Btu's}}{\text{WATTS}} = \text{EER} \quad \frac{10,000}{860} = 11.6 \text{ for EER}$$

Which is the more efficient model?

2. To determine the difference in efficiency, first subtract the EER of the less efficient model from that of the higher model.

$$11.6 - 7.3 = 4.3 \text{ difference}$$

3. Then divide the difference (4.3) by the EER rating of the more efficient model (11.6) to learn the approximate % saving of the energy.

$$\frac{4.3}{11.6} \times 100 = 37\%$$

4. To apply this percent of efficiency to an individual situation, let's assume that one might use the air conditioner for 700 hours of cooking per year and that the cost of electricity is 2.7 cents/killowatt hour.

   The estimated yearly operating costs for the less efficient model can be calculated as follows:

   Wattage $\frac{1375}{1000}$ X .027 (cost) X 700 (hrs) = $25.98 yearly operating cost
   1 kw -

5. To determine the estimated yearly savings for the high efficiency model: multiply $25.98 times 37 percent = $9.16 = the estimated yearly saving for the high efficiency model for one year.

6. The cost to operate the higher efficiency model would be determined by subtracting $9.16 from $25.98. Thus $16.82 = the cost to operate the higher efficiency model for one year.

Compare the Cost of Energy Efficiency forAppliances Other Than Air Conditioners:

Ex. 16.0 Cubic ft. no frost refrigerator

If brand X label states that it requires 162 kwh/month and brand Z label indicates that it requires 130 kwh/month -- to determine the percentage of efficiency of brand Z use this formula:

1) Subtract: 162 kwh/mo. - 129 kwh/mo. - 32 kwh/month

   Divide: $\frac{32 \text{ kwh/mo.}}{130} = 25\%$ or brand Z is approximately 25% more efficient

This difference may be converted into dollars for a more practical comparison.

2) Multiply the difference between the two models--32 kwh/mo. times the average local utility rate.
   a) $.024 (utility rate for Missoula) X 32 = $.79/mo. difference in operating cost for brand Z over brand X

   b) Multiply -- $.79 X 12 mo. = $9.48 difference in operating cost per year or a $9.48 savings for purchasing brand Z.

Using 15 years as the average life of a refrigerator.

   c) Multiply $9.48 X 15 = $142.20 --- total savings for the life of the refrigerator.*

*This does not account for increases in utility rates, thus the savings may be greater. However, one must analyze the cost difference between the two refrigerators.

HOW MUCH AIR CONDITIONER DO I NEED?

The electric Energy Association has come up with a simple "WHILE-divided-by-60 formula that should help consumers in properly calculating requirements for air conditioners. This is how it goes:

W = room width
H = room height
I= insulation (ranging from 10 for superior to 18 for room with many windows)
L = room length
E = exposure for the longest outside wall (20 for West, 18 South, 17 East, 16 North)

$$\frac{W \times H \times I \times L \times E}{60} = \text{Btu's required}$$

EXAMPLE: A room facing north with moderate insulation that measures 20 x 25 x 8 ft. would need the following:

20 x 8 x 14 x 25 x 16 = 896,000 ÷ 60 = 14,933 Btu's

Therefore, a 15,0000 Btu unit should be suitable.

NOW IT'S YOUR TURN!! Measure your living room at home and figure out what type of air conditioner would be most appropriate.

W _____

H _____

I _____

L _____

E _____

W x H x I x L x E ÷ 60 = Btu's

_____ x _____ x _____ x _____ x _____ ÷60 = _____

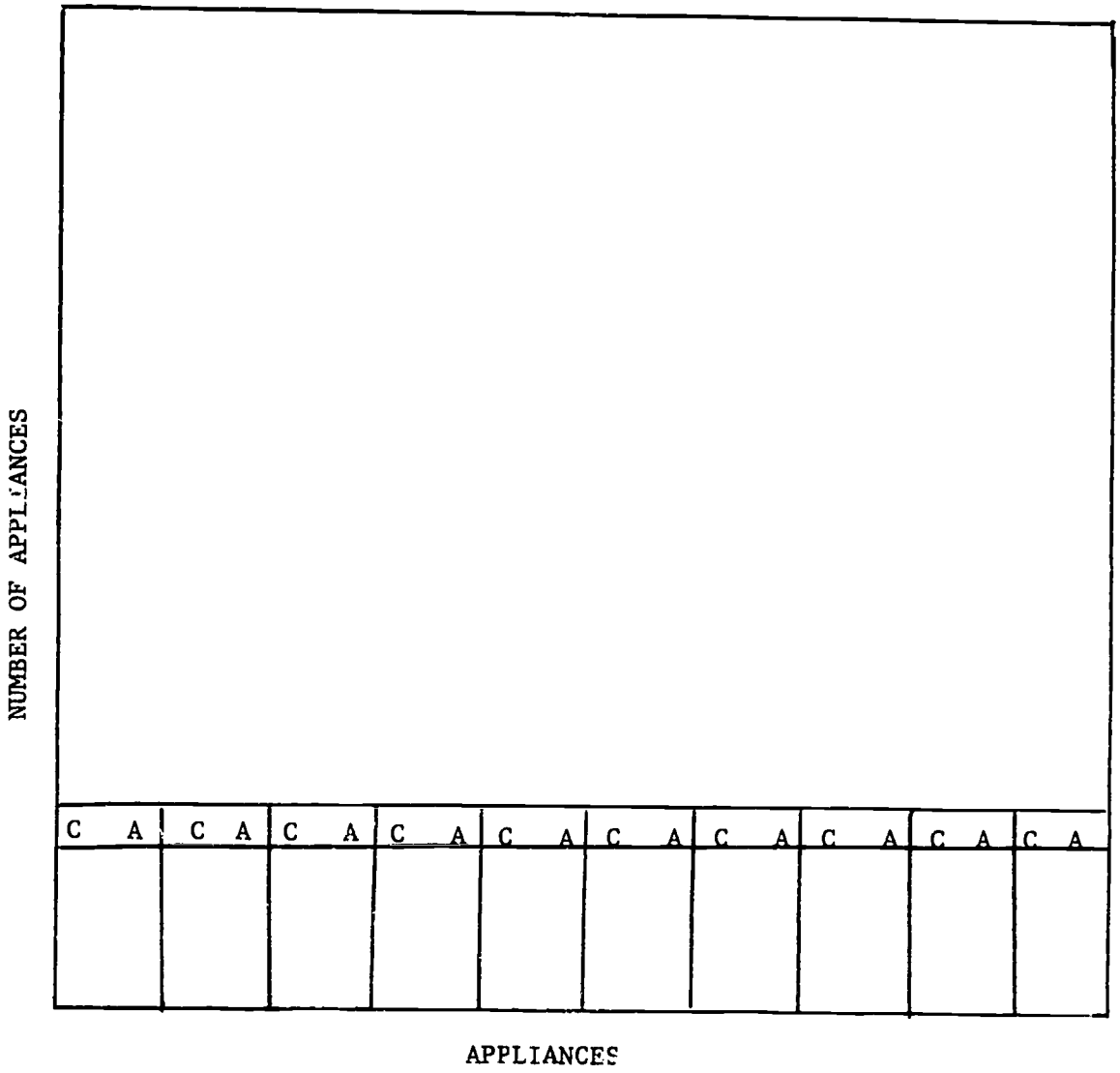
HOME APPLIANCE USE

Directions:

1. Survey parents on what appliances they had at home when they were younger and what appliances class members now have.

2. Using the survey results, fill in the ten spaces at the bottom of the graph with the names of the ten most popular appliances.

3. Above each of the ten appliances, mark the number owned by class members and the number owned by adults. Draw bars to represent these numbers.



WASTING AWAY

There are many appliances on the market today designed to perform the same functions. Some can do their jobs more efficiently than others. Here is a simple procedure which will allow you to check the efficiency of a coffee pot.

_____1. Check the wattage rat of the coffee pot. It should be stamped on a label on the underside of the pot. If only voltage and amperage are listed, multiply them to yield wattage.

_____2. Pour 1 pint of water into the coffee pot. Measure the temperature in ^{o}F.

_____3. Turn the pot on. Allow it to heat for 10 minutes. Turn it off and measure the temperature again in ^{o} F.

_____4. Calculate the energy transferred to the water in BTU. With 1 pint of water, the energy (in BTU) equals the change in temperature (in ^{o} F), so substract #2 from #3.

_____5. Calculate the electricity consumed in watt-hours. Multiply the wattage rating of the pot by the number of minutes it was turned on and divide by 60 to get watt-hours consumed (#1 x 100 ÷ 60).

_____6. Calculate the energy consumed in BTU. 1 watt-hour equals 3.4 BTU, so multiply #5 by 3.4.

_____7. Calculate a ratio of efficiency. Divide #4 by #6.

FROM: Counting on Energy, Project 3E, Montgomery County, Blue Bell, PA.

RAISE IT 'N' LOWER IT

Space heating and cooling is the greatest single energy user in the home. It accounts for 41% of our total personal energy consumption. Therefore, our heating and cooling systems offer the greatest opportunities to save energy. Raising and lowering thermostat settings to reflect use patterns of your home and variations in seasons can save energy dollars.

During the heating season, set your furnace thermostat to 65° F during the day if your home is occupied, 60°F or lower at night and while the building is unoccupied. Each degree of thermostat setting reduction can save up to 3% of your heating bill.

During the cooling season, set your air conditioner's thermostat to 78° or restrict usage, utilizing natural ventilation and/or circulating fans. You can save up to 4% per degree set - forward on the cost of cooling your house. While away from home, turn your air conditioner off.

This table estimates possible savings in energy resulting from lowered night-time thermostat settings during the entire heating season.

Night Temperature Setting	Percent Savings
70 ° F	0%
65 ° F	5%
60 ° F	10%

2. Last January, the Browns kept their daytime and night time thermostat set at 70 ° F for the entire month. Their heating bill was $41.10. In February, they set back the thermostat to 60 ° F from 10:00 p.m. to 6:00 a.m.

a. If January and February were equally cold months and if there was no increase in fuel costs, estimate how much money they saved in February.

b. If the savings in (a) was average for four winter months, how much heating money could have been saved from December through March?

Reference: Energy Information Associates, Inc., 2690 W. Main Street, Littleton, CO 80120.

HOME ENERGY GAME

Materials and Equipment: Game board, markers, decks of question cards and "Special" cards, list of questions and answers, rules for games.

Introduction: Have materials out on tables. As an attention-getter, ask the following questions:

How many know what your family electricity bill was last month?
How many know how to read your gas meter?
How many of you saved water in the last couple of days by taking a quick shower instead of a bath?
How many of you either walked to school or car-pooled to school today?
How many of you can list three forms of energy?

Rules for Playing:

1. Divide students into groups of four or five. One student in each group should act as monitor with the answer key.
2. Shuffle decks of cards.
3. Each player should select a different marker and place it on the "Start" square.
4. Each player takes his/her turn by drawing the top card on the pile of questoin cards, reading the question aloud, and then stating the answer. If the player answers the question correctly according to the answer sheet, she/he advances the number of squares indicated on the card. If the player answers incorrectly, she/he remains on the same square.
5. Players landing on a "Special" square will pick a card from the "Special" deck and follow directions given on card.
6. Play continues in a clockwise rotation until someone reaches the "Success" square on the board. The first player to do so is the winner.
7. Questions with more than one possible answer may be accepted by group and/or teacher approval.

Question Card:

1. Give the name or symbol for the independent testing agency which tests electrical products for safety. (Underwriter's Laboratory or UL) 2 points.

2. T-F If electric appliances are disconnected before cleaning or repairing, there is on danger of electric shock. (True) 1 point

3. The amount of power used by small appliances is measured in ____. (Watts) 2 points

4. T-F You get more light from one 100-watt bulb than from two 50-watt bulbs even though they use the same amount of energy. (True) 1 point

5. T-F Flourescent lights are more efficient and more economical than incandescent lights. (True) 1 point

6. When baking in the oven with aluminum foil, which side should be to the outside? Why? (Dull side) 2 points (Helps to absorb heat) 2 points

7. Of the energy-consuming equipment in the average home, which two use the highest percentage of energy? (furnace-heating and the water heater) 2 points each

8. List two hints in cooking foods which save energy. (Cook at lowest suitable heat, use little amount of water, thaw food completely before cooking, do not overcook or use tight fitting lid.) (Other answers possible.) 4 points.

9. T-F Hot water aids in optimum use of the garbage disposal (False) 1 point

10. One dripping faucet may cause the loss of a possible total of ___ gallons of water per day. A. 5 gallons B. 25 gallons C. 50 gallons (C. 50 gallons) 1 point

11. When using the clothes washer to keep energy and water usage to a minimum, match the water level to the ____ size.

12. T-F As a general rule, small appliances use less energy than large ones when preparing a given food. (True) 1 point

13. List two features of pots and pans which help conserve energy (besides the materials they are made of). (Tight fitting lid, straight sides and flat bottoms) 4 points

14. Why do surface burner pans save energy when kept shiny and clean? (Reflects more heat) 3 points

15. Of the following which 3 appliances use the most electricity?

16. T-F A pop-up toaster uses less energy than a toaster oven.

17. Name 2 ways to reduce energy used by the freezer. (Planning trips to avoid opening door too often, keep freezer as full as possible, defrost often.) (Other answers possible) 4 points

18. Name one way we can use the clothes washer to save energy. (Full loads, cold water rinses) 2 points

19. List at least two ways to save energy when drying clothes. (Keep filter clean, dry only until damp, remove clothes immediately, use only for bulky items, use clothes lines) 4 points

20. List an effective way of reducing energy by the dishwasher. (Open door during heat cycle and let air dry, wash only full loads.) (Other answers possible.) 2 points

21. T-F A dishwasher requires the same amount of energy to wash a 3-place-setting of dishes as it does to wash an 8-place-setting load. (True) 1 point

22. Choose the best answer. Cooks may reduce heat loss in the oven by avoiding: (a) Turning the light on during cooking. (B) opening the oven door during baking: (c) use of metal pans in the oven. (b) 2 points

23. Name 2 ways to reduce energy used by the refrigerator. (Avoid opening door often, avoid packing the refrigerator; if safety is not a factor, cool hot foods before refrigeration.) (Other answers possible.) 4 points

24. Why do self-cleaning ovens use less energy than regular ovens during oven baking? (more insulation in self-cleaning oven.) 3 points

25. T-F A 5% moisture content left in clothes after drying cycle will reduce wrinkling if they are removed immediately. (True) 1 point

26. If dried on the permanent press cycle, clothes will wrinkle less if allowed to cool in the dryer before removing. (False) 1 point

27. T-F A non-self-cleaning oven costs less per hour to use than a self-cleaning oven. (False) 1 point

28. T-F At 1979 prices a gas clothes dryer costs more to operate per load than an electric clothes dryer. (False) 1 point

29. T-F If preparing two baked potatoes, it takes less energy to use the microwave than a regular oven (True) 1 point

30. T-F Preheating your oven for 15 minutes before baking saves energy. (False) 1 point

31. T-F Microwave cooking is most efficient at the high setting (True) 1 point

32. List a technique to use to conserve water when preparing dishes for the dishwasher. (Use rubber spatula-no need to ~~rinse off dishes.~~) 3 points

33. Explain how keeping drinking water in the refrigerator saves water. (Eliminates need to run water in faucet to get cold water.) 2 points (Also allow 2 points for answer: It won't save water for those who are willing to drink at tap temperature.)

34. Why does using cold water in the washer save energy? (Eliminates water heating costs) 2 points

35. T-F Washing a full load of clothes takes less water than two half-loads. (True) 1 point

36. When hand rinsing dishes, list a technique to save water. (Do not leave water running during rinse. Fill sink full of water and dip dishes in.) 2 points

37. List two refrigerator placements which increase its energy use. (Heat vent, dishwasher, range, windows and sunlight may cause energy loss if next to the refrigerator.) 4 points

38. Give one way to conserve water regarding faucets. (Shut off faucets completely, put a water-saver on shower head, repair leaky faucets.) 2 points

39. Why should user manuals for equipment to read in order to save energy? (To get most efficent use of your equipment, prevents possible damage, prevents safety hazards.) (Other answers possible.) 2 points

40. T-F If a glass pan is used for baking a cake, the baking time will be decreased. (False) 1 point

41. T-F Keeping your freezer defrosted results in less energy use. (True) 1 point

42. T-F Energy efficiency is reduced when overloading electrical circuits. (True) 1 point

43. Name 3 places in your home where warm air may escape during the winter. (Cracks, doors, windows, fireplaces, walls, foundations, ceilings.) (Other answers possible.) 3 points

44. Name 2 ways to reduce heat loss from the home. (Stop air leaks, replace furnace filters, add insulation, use storm windows, caulk and weatherstrip windows and doors, other answers possible.) 2 points

45. T-F An automatic defrosting refrigerator uses the same amount of energy as does a manual defrosting refrigerator. (False it uses more.) 1 point

46. Give three examples of where human energy can substitute for fuel energy. (Opening can by manual method, washing dishes by hand, avoiding use of electric toothbrush, ride a bike or walk, hanging clothes on lines to dry.) (Other answers possible.) 3 points

47. T-F Keeping the lint filter clean in the clothes dryer has on effect on the energy efficiency of that appliance. (False) 1 point

48. Explain why using light colors for walls and ceiling helps to conserve energy. (Reflects more light and requires less artificial lighting.) 2 points

49. T-F Space heaters are low energy users. (False) 1 point

50. How do oven timers reduce energy waste? List one way. (Eliminates opening oven door and/or lifting lids.) (Other answners possible.) 1 point

51. If preparing a chicken for casseroles, which appliance would be the most energy-efficient to use? Choose best answer. (a) microwave, (b) pressure cooker, (c) simmering on low heat on range. (pressure cooker) 1 point

52. When is the best time to use the self-cleaning feature on a dirty oven? (when oven is already hot or at night when fuel use is lower.) 2 points

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