EFFECT OF SELECTED INSTRUCTIONAL METHODS
ON ACHIEVEMENT

A thesis submitted in partial satisfaction of the requirements for the degree of Master of Science in Home Economics

by

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August, 1978
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Mrs. Louise Sutton, Chairperson

California State University, Northridge
This thesis is dedicated to my parents, Robert and Cynthia Lusk, for their patience, encouragement, and support throughout the course of my graduate work.
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ABSTRACT

EFFECT OF SELECTED INSTRUCTIONAL METHODS ON ACHIEVEMENT

by

Janet Louise Lusk

Master of Science in Home Economics

The purpose of this study was to ascertain the effect, if any, of two different instructional methods on learning. The two instructional methods studied were individualized learning packages and the traditional lecture/demonstration method. A Learning Activity Package was designed to introduce the student to the fundamental techniques of microwave oven cooking. Lesson plans using the lecture/demonstration method were developed to teach the same concepts.

Two intact high school food preparation classes in Culver City, California, were used. One class completed a Learning Activity Package and the other class was taught by the lecture/demonstration method. Pre- and posttests were administered to both classes.
Data from the survey indicated that the method of instruction had no significant effect on the level of achievement. The "t"-test was used to compare the means of the two samples. It was further noted that while the data were not significant at the .05 level, both classes showed an increase in test scores following the completion of the unit.
Chapter 1

INTRODUCTION

In the educational setting, different methods of instruction are used to teach concepts, facts, and ideas. One method of instruction cannot be expected to meet the needs of all students. According to Nawaz and Tanveer (1977:22), "Individualized instruction means personalizing of the instructional process to meet the individual needs and abilities of each learner." Educators and experts perceive individualized instruction "... as a concept, a philosophy, a reform, an innovation, a developmental construct and a humanistic trend in education" (Nawaz and Tanveer, 1977:22). Support for this type of instruction is found among teachers, students, and parents. According to Nawaz and Tanveer (1977:22), "Professional educators support the new idea in order to meet current demands of accountability and to improve the quality of classroom instruction."

Because of the rising popularity of microwave ovens, there exists a need for an effective instructional teaching device in microwave oven cooking techniques. Consumers are buying microwave ovens faster than manufacturers can produce them. By 1980, projected annual sales will reach four million units (Drew, Rhee and Stubbs, 1977:31). According to a popular magazine, approximately seven to eight percent of the homes in the United States already have a microwave oven, and by 1985 it is predicted that one out of every two households in America will have an electronic oven (Ladies Home Journal, 1977:154).
A research survey completed in 1977 in Bryan-College Station, Texas, concluded that consumers seemed to be intrigued by microwave ovens because the ovens cook food quickly, easily, and efficiently; yet these same consumers appeared to be buying microwave ovens without thoroughly understanding them. Many of the respondents in the survey were unsure of the techniques to employ for safe, efficient use of the appliance and for proper maintenance (Drew, Rhee and Stubbs, 1977:32).

An effective instructional method is needed for teaching microwave oven cooking techniques. The school setting provides an appropriate environment for evaluating the effect of methods of instruction on the level of achievement.

OBJECTIVES

The objective for the study was to develop and implement two methods of instruction of microwave cooking techniques and to determine if the method of instruction has an effect on student achievement in the classroom as measured by the amount of increase in the student's knowledge of microwave oven cooking techniques.

HYPOTHESES

Research Hypotheses

There is a difference in scores obtained on a posttest following the completion of a Learning Activity Package (LAP) versus the lecture/demonstration method of instruction.
There is a measurable difference in level of achievement resulting from selected instructional methods such as the Learning Activity Package and the lecture/demonstration method of instruction.

**Null Hypotheses**

There is no difference in scores obtained on a posttest following the completion of a Learning Activity Package versus the lecture/demonstration method of instruction.

There is no measurable difference in level of achievement resulting from selected instructional methods such as the Learning Activity Package and the lecture/demonstration method of instruction.

**ASSUMPTIONS**

It is assumed that the student knows basic food preparation techniques and can apply these skills in a laboratory setting.

It is assumed that the student will be able to read, comprehend, and follow the instructions in the Learning Activity Package.

**LIMITATIONS**

Limitations included factors that exerted an influence on the research project. Notable limitations in this study were the sample population, financial allotment, and the time schedule.

The population for this study was limited to two intact beginning food preparation classes at Culver City High School, Culver City, California. Since student abilities, interests, and backgrounds vary among school districts and between classes in the same school, the study did not attempt to generalize to other populations.
A second limitation concerned the money available for the research. Laboratory activities were designed around the funds available in the department. The use of low-cost food items and, whenever feasible, the sharing of supplies were necessary in order to stay within the budget.

Culver City High School had one microwave oven in the foods laboratory. This presented a limitation with regard to the type of experiences which were feasible. Approximately twenty students shared one oven within the time frame of fifty minutes.

Lastly, the time schedule posed a limitation. Within a twenty-week semester, many units need to be presented. Therefore, only five class periods could be devoted to the unit on microwave cooking. A second aspect of the time schedule was the number of minutes in one class period. If food items were to be prepared, a short preparation time coupled with a brief cooking period was essential.

**DEFINITION OF TERMS**

**Conventional cooking:** Food preparation using the range-top and/or oven.

**Curriculum** (Blackburn and Powell, 1976:107): "Consists of all the planned educational activities within the school environment."

**Electronic oven** (Drew, Rhee and Stubbs, 1977:32): Another term for microwave oven.

**Individualized instruction** (Kapfer and Kapfer, 1972:23):

It is a way of organizing that permits and encourages each student to progress at a pace and level and in a manner commensurate with his unique combination of abilities, previous achievement,
cultural background, interests, learning style, and needs.

**Instruction (Blackburn and Powell, 1976:107):**

Occurs in the curriculum environment. It encompasses the interactions and transactions that occur between students and teachers as well as between students and peers, students and community members, and students and other learning resources.

**Learning Activity Package (Kapfer and Kapfer, 1972:24):**

Is a form of communication between the student and the teacher that contains instructions for student activities leading toward specified performance outcomes. The Activity Package is designed to individualize instruction consistent with the factors in the definition of "individualized instruction."

**MHz:** Abbreviation for megahertz which is a frequency of one million cycles per second; unit of electrical frequency.

**Microwave (Panasonic, 1974:1):**

A form of energy similar to radio and TV waves...cause moisture molecules within the food to vibrate at extremely high speeds. This friction produces the intense heat which cooks the food.
"Creating alternative educational environments in schools and classrooms to accommodate similarities and differences and to promote human growth and development" are the basic purposes of schools according to Blackburn and Powell (1976:105). "Each student's background, social and economic status, hereditary characteristics, motivation and rate of learning are unique to him" (Fleck, 1974:107). Therefore, it cannot be assumed that all students will learn in the same way and at the same rate.

Before a method of teaching is formulated to meet these needs, the teacher first determines the goals of education. In the book edited by Kapfer and Kapfer (1972:22), James E. Smith, Jr., states that once the goals are clear, then the curriculum (content) and the instruction (teaching-learning strategies) can be organized to permit each student to best reach these goals. The following goals are stated by Smith (Kapfer and Kapfer, 1972:22-23):

Goal No. 1: Help each student to increase his achievement level in the content areas.
Goal No. 2: Help each student to develop the ability to direct his own learning.
Goal No. 3: Help each student to develop a positive self-concept.
Goal No. 4: Help each student to assume increasing amounts of social responsibility.
Goal No. 5: Help each student to acquire, prior to his leaving formal schooling, a saleable skill.
The primary objective is to help every student become a self-sufficient and self-directed learner. Once the goals are distinguished, the teacher is able to transfer them into concrete teaching methods and ideas (Chamberlain, 1975:141).

INDIVIDUALIZED INSTRUCTION

Individualized instruction appears simple; however, according to Smith (Kapfer and Kapfer, 1972:23), it is complex and requires the consideration of content, staff, schedule, facilities, self-instructional units, and classroom organization. Smith (Kapfer and Kapfer, 1972:23) further states:

Individualized instruction is not a goal. It is a way of organizing that permits and encourages each student to progress at a pace and level and in a manner commensurate with his unique combination of abilities, previous achievement, cultural background, interests, learning style and needs.

Before individualized instruction becomes a reality, goals must be identified. Once goals are established and agreed upon, several variables need to be considered and studied and all of these factors need to be coordinated into a workable form of individualized instruction.

The Learning Activity Package (LAP) meets the criteria for individualized instruction. Learning Activity Packages are designed "to allow students to learn particular skills or concepts or pursue areas of interest at their own learning paces" (Blackburn and Powell, 1976:108). A Learning Activity Package is defined by Smith (Kapfer and Kapfer, 1972:24) as "... a form of communication between the student and the teacher that contains instructions for student activities
leading toward specified performance outcomes.

As set forth by Atkinson (1976:129-130), factors that are essential to the implementation of individualized instruction include:

1. Know the student
2. Know the materials
3. Participate as a student
4. Prepare a management system
5. Check all equipment
6. Prepare for the unexpected

In order to tailor the curriculum to meet the needs of the students, the teacher must be familiar with and understand the needs of the students. In addition, if the teacher is to be the coordinator and facilitator for the Learning Activity Package, it is essential that he/she knows the materials. When a student refers to a particular article or specific item on a worksheet, the teacher needs to grasp the situation quickly. One way for a teacher to prepare him/herself for teaching the Learning Activity Package is by completing the activities as a participant. In that way, first-hand knowledge is obtained.

When using a LAP in the classroom, the teacher relies heavily on an effective management system. One aspect of a management system is record keeping. The student as well as the instructor needs an accurate, up-to-date record of work completed. An effective management system needs to provide for remedial and supplemental activities. In conjunction with this function, a serviceable method of handing out necessary supplies and materials needs to be developed.

If a Learning Activity Package is to be successful and meet its goals, the teacher must properly prepare the students before the
unit begins. There are four steps offered by Atkinson (1976:131-132) that aid in this objective:

(a) Outline new roles and responsibilities
(b) Prepare an overview of the activities
(c) Develop an appropriate mind set
(d) Insure that all students can operate the equipment

If a student has had no prior experience with a Learning Activity Package, the instructor must introduce him/her to the purpose, goal, and objectives of the LAP. In addition, a clear explanation of his/her role and responsibilities in completing the LAP needs to be given.

One method of introducing the concept to the student is by using a flow chart. This enables the student to see visually what is being explained in the class. Activities become more tangible when the student sees in print what the activity is to be. This, in turn, helps to develop an appropriate mind set. For optimum learning, students should understand and value the instructional objectives. If the student sees no value in the activities, there is little chance that he/she will want to participate. "Learning is an active, not a passive, process" (Nawaz and Tanveer, 1977:22). This implies that the student is an active participant in the learning process. Lastly, it is advisable that the teacher checks to see that all of the students can safely operate any necessary equipment.

When designing a self-instructional learning module, it is imperative that the organization of the unit is immediately and clearly communicated to the learner. "Any attempt at individualization should open up alternatives to the individual learner" (Nawaz and Tanveer, 1977:25). The directions and materials need to be self-explanatory.
First impressions are important. Smith (Kapfer and Kapfer, 1972:24) states that:

The title of the Activity Package should reflect the central theme, or primary idea, of the unit of work. Depending upon the amount or magnitude of the body of content, this primary idea may be broken down into secondary ideas (three to five subdivisions or constituent parts of the larger primary idea).

The second item to appear in the Activity Package is a statement of purpose for the student. It is essential that the student understand the purpose of the LAP. In addition, the teacher includes a statement indicating the importance or significance of the LAP. Unless the student perceives the activities as being important and relevant, it is doubtful that maximum learning will take place.

Thirdly, behavioral objectives are spelled out in detail. Students need to know what the objectives are for the LAP. The objectives leave no room for doubt or confusion as to the expected learning outcomes.

Evaluation is an important aspect of the package. The first part of the evaluation is for the student. This section is entitled Student Self-Evaluation rather than Pretest, as this is less threatening to the students (Kapfer and Kapfer, 1972:25). The purpose of the questions is to let the student see how much or how little he/she already knows about the unit. The second segment of evaluation is for both the student and the teacher. This section consists of a posttest. Questions in this test are graded and serve as a device for measuring the level of achievement that has taken place. Evaluation may take several forms: product-oriented, group discussion-oriented, or manipulative performance-oriented (Kapfer and Kapfer,
In other words, the posttest does not have to be limited to test questions. Achievement may also be measured by the end product, by observation, or by oral discussion.

The foundation of the LAP is the set of activities. Chamberlain (1975:142) writes:

It is generally accepted that motivation and learning increase when students have the opportunity to plan and select their own learning experiences, they are more likely to select experiences that are relevant to them.

For this reason, the activities in the LAP provide each student with a choice of alternatives concerning not only how, what, when, and where to learn but also opportunities for the efficient use of a wide range of learning resources.

The list below, as written by Smith (Kapfer and Kapfer, 1972:26), outlines activities that provide the learner with alternatives in terms of:

1. Multi-media--the use of various kinds of audiovisual equipment and the performance of sensory-oriented tasks;
2. Multi-mode--variations in process goals that determine the size of the learning group and the methodology...;
3. Multi-content--differing levels of sophistication or difficulty of all resource materials, whether printed or audio-visual; and,
4. Multi-activities--variations in terms of paper-and-pencil activities, such as listening, viewing, speaking, participating in academic games and simulations, manipulating, etc.

It is important to note that for many students it is difficult to make a decision when they are unaware of the alternatives available to them. At first, students may be given numbered choices; later on, they can take more responsibility and initiative in planning the activities.
Congruence must exist between the different parts of the LAP. In order to accomplish this, Smith (Kapfer and Kapfer, 1972:26) states that the teacher must:

(1) specify the level and conditions of acceptable performance, (2) provide learning activities incorporating the "multis" which relate to these objectives and which permit indepth or further work, and (3) ensure that all forms of assessment or evaluation, at the stated level and under the stated conditions, measure that which you indicated would be measured.

A final part to the Learning Activity Package is the section entitled, "Teacher's Instructions." This section "should include information which is extraneous to the student package but which is, nevertheless, essential to the smooth presentation, management, and evaluation of the system" (Kapfer and Kapfer, 1972:26). In addition, a complete list of references is included in the LAP. This is particularly important when a few instructors write a Learning Activity Package for an entire department.

An asset of using activity packages is that discipline is usually not a problem since students are more apt to be interested and involved in activities. However, it should be noted that there are disadvantages to using this format in the classroom. According to Chamberlain (1975:143), two factors to be considered when developing a LAP are that it is time-consuming and that classroom facilities may have to be altered.

Beginning an individualized curriculum and program of instruction involves determining the educational activities in which students will engage. These decisions are based upon the overall goals of a school and/or a teacher. According to Blackburn and Powell (1976:
once the school goals have been established, the success of individualizing relies heavily upon the "development of suitable curriculum plans, a decision about how the plans can best be individualized, and the implementation of those decisions through instructional activities." The basic parts of a Learning Activity Package are objectives, instructions to students and the teacher, pretest, activities, list of references, and posttest.

The proper goal is not to individualize as an end in itself, but rather to achieve the degree of individualization necessary to maximize student learning. Nawaz and Tanveer (1977:22) describe this type of learning environment with the following adjectives: "humaneness, openness, flexibility, and adaptability." In this atmosphere, true learning can take place.

LECTURE/Demonstration Method of Instruction

The lecture/demonstration method of teaching is often used in the home economics classroom. If this method is correctly used, it will increase the students' knowledge and stimulate interest in a given topic. When the lecture/demonstration method is presented poorly, students often become bored and disinterested in the subject matter.

The teacher's informal lecture that was used in this study was based on the following suggestions (Alcorn, Skinder and Schunert, 1970:155):

1. Lectures should be kept short. For high school students, fifteen or twenty minutes is the maximum length suggested.
2. The vocabulary and language style used in the presentation should be familiar to the students.

3. Lecture material must be presented in a logical and orderly manner. Students need to understand the objectives and goals for the lecture.

4. Visual aids and verbal illustrations when used correctly can help to clarify the subject matter.

The lecture method of instruction, when combined with the demonstration, provides an effective means for teaching home economics. Demonstrations in the classroom serve two purposes: to explain the how and why of processes; and, to encourage students to develop specific skills (Fleck, 1974:161). In order for a demonstration to be successful and effective, the teacher needs to plan and organize it in advance. A written outline of the lecture, a list of necessary supplies, a time schedule, and evaluation questions help the demonstration run smoothly.

Once the teacher has prepared the lesson, there are several suggestions offered by Alcorn et al. (1970:167) that deserve consideration. First, it is important that all students can view the demonstration clearly. At times, it may be advisable to have the students move their seats so that everyone can see. Before beginning the presentation, the teacher should tell the students what will be demonstrated, and then throughout the demonstration, the teacher should ask the students different questions in order to evaluate the learning taking place. Finally, at the conclusion of the demonstration, the objectives and learning outcomes for the students need to be
TECHNOLOGY OF USE OF THE MICROWAVE OVEN

It is easy to understand how microwaves work when we understand about the waves themselves. Microwaves are short, high-frequency radio waves. The energy is converted into electromagnetic energy by the heart of the oven, the magnetron tube. All electromagnetic waves tend to travel in straight lines and can be generated, transmitted, reflected, and absorbed.

The United States Department of Health, Education and Welfare (1974:1) states that "Microwaves are a form of radiant energy similar to radio waves and infrared waves, but they are in no way related to radioactivity." The Food and Drug Administration is responsible for establishing the safety standards for microwave ovens and has set the limit at five milliwatts per square centimeter, measured at a distance of two inches from the oven door. In addition, the FDA's safety standard also requires that a microwave oven have "at least two separate safety interlocks to shut off radiation as the oven door is opened" (U.S. Department of HEW, 1974:1).

The microwave energy penetrates 3/4" to 3" through all food surfaces (General Electric, 1974:6; Peet and others, 1975:218). At this point, they are absorbed by moisture, sugar, or fat molecules which begin to cook. Heat is then conducted into the center and out to the surfaces.

Certain basic cooking principles need to be followed when using the microwave oven. These are:
1. Arrange foods with the thickest portions to the outside of the dish.

2. Use a round or a bundt-shaped pan for best results.

3. Cover many foods with either paper towels, plastic wrap, or wax paper before cooking, depending on the amount of steam needed to cook the food item.

4. Before serving the food, allow for standing time to permit food to finish cooking after taking it out of the oven. To do this, place the dish on a wood or heat-resistant countertop and allow it to sit according to the recipe directions.

As previously stated, microwaves can be reflected. For example, metal reflects microwave energy. Therefore, the oven cavity is made of metal and bounces the energy off the walls and back into the food. For this reason, it is not advisable to cook food items in metal containers or dishes that have a metal trim. Glass, paper, and china are appropriate cooking utensils for use in the microwave oven.

Microwave ovens cook foods fast and are convenient for thawing or cooking frozen foods (U.S. Department of HEW, 1974:2). From a nutritional standpoint, "current research findings show that the nutritive values of microwave-cooked foods are similar to those of foods cooked by conventional methods if all the liquid is used in both cases" (Drew, Rhee and Stubbs, 1977:32).
Chapter 3

RESEARCH PROCEDURES

Experimental research studies are designed to determine the effect of one variable upon another. This study was developed in an effort to ascertain the effect, if any, of the method of instruction on student achievement and to compare the difference in levels of achievement resulting from use of the Learning Activity Package and the lecture/demonstration methods of instruction.

SELECTION OF THE SAMPLE

The Learning Activity Package and the series of lecture/demonstrations were geared to the high school student. For this research study, the sample population consisted of students in two intact beginning food preparation classes at Culver City High School, Culver City, California. Results of this study cannot be generalized to other populations. In addition, there was no way to assure that each element of the population had an equal chance of being selected. Therefore, the type of sampling technique fell under the category of non-probability.

Dependent Variable

The dependent or measured variable in this study was the learning achievement of the student. The data were obtained by means of pre- and posttests.
Independent Variables

The method of instruction represented the independent variable. The Learning Activity Package and the lecture/demonstration methods of instruction were the two types utilized in this research project.

Intervening Variables

Intervening variables that would be important and that might have a potential influence on the results included the school schedule, the time of day the class met, the student's attendance, and the student's previous experience with the subject matter.

Controls

Controls that were necessary to handle the intervening variables included:

1. Both groups of students had the same classroom atmosphere and were instructed by the same teacher.

2. Instructional objectives and facilities were the same for both groups.

3. Care was used in administering the pretest and posttest. Student "sharing" of the questions and answers within the classroom and between groups needed to be kept at a minimum.

INSTRUCTIONAL PROCEDURES

Prior to the beginning of the research study, two facts were known about the sample population: (1) Group A met at 10:30-11:20 A.M., and Group B met at 1:10-2:00 P.M. (2) Group A and B each had approximately twenty students enrolled.
The methods and procedures utilized in the implementation of the LAP were patterned after the guidelines described in the literature and included:

1. Brief introduction of Learning Activity Packages--what a LAP is, objectives and goals of the LAP.
2. Discussion concerning students' role and responsibility in completing the LAP.
3. Summary, overview of LAP activities using a flow chart. Following the discussion, the flow chart was posted in the classroom for student reference.
4. Demonstration on how to correctly operate the equipment to be used. Verification to determine that all students could safely operate the equipment required.
5. Evaluation was based on a written, objective posttest and on the completion of the LAP activities. Teacher observation, the end product, and written answers to the LAP activity questions were used to evaluate student achievement.

The methods and procedures utilized in the implementation of the lecture/demonstration method of instruction included:

1. Lectures were limited to fifteen to twenty minutes in length. At the beginning of each lecture, the objectives for the lesson were explained to the students. At the conclusion of the lecture, a summary of the lecture objectives and content was given.
2. To insure that the demonstrations ran smoothly, the teacher outlined the supplies and equipment necessary for the demonstration and practiced giving the demonstration prior to the
presentation to the class.

3. Throughout the demonstration presentation, the teacher asked the students questions to assess their understanding of the subject matter.

4. In order that all students could see clearly, the teacher had the students move their seats into a semi-circle around the demonstration table.

5. Evaluation was based on answers given on a written, objective posttest.

COLLECTION OF THE DATA

The method of collecting data to measure learning achievement for this research was limited to the pretest and posttest. Students were given a pretest prior to the introduction of the unit. The lecture/demonstration method was used to instruct Group A and the Learning Activity Package was the method of instruction for Group B. Following the completion of the unit, the researcher administered the posttest. The results of these tests provided the raw data used in the statistical analysis and interpretation of the results from the study. Scores were given in numerical values.
Chapter 4

ANALYSIS AND EVALUATION OF THE FINDINGS

The purpose of the study was to determine whether the method of instruction had an effect on student achievement in the classroom. Instructional objectives of both the Learning Activity Package and the lecture/demonstration methods of presentation were to increase the student's knowledge of the operation of the microwave oven and of food preparation using microwave ovens.

DESCRIPTION OF THE SAMPLE

Students in two intact high school beginning food preparation classes were the participants in this study. Group A was identified as being the class taught by the traditional lecture/demonstration method of instruction, and Group B was taught using the Learning Activity Package method of instruction. Group A consisted of nineteen students and Group B had sixteen students.

Of the nineteen students in Group A, eleven were male and eight were female. When students were identified by grade level, ten were sophomores, four were juniors, and five were seniors. Group B consisted of sixteen students: nine were male and seven were female. In this group, there were six sophomores, three juniors, and seven seniors (Table 1).

A higher percentage of students in Group B than in Group A had never used a microwave oven before and did not own a microwave oven.
Table 1
Demography of Sample

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N*</td>
<td>%</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>11</td>
<td>58</td>
</tr>
<tr>
<td>Female</td>
<td>8</td>
<td>42</td>
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<tr>
<td>Grade level classification</td>
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<td>Sophomore</td>
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<td>52</td>
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<td>Junior</td>
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<td>21</td>
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<tr>
<td>Senior</td>
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<td>26</td>
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<tr>
<td>Experience with a microwave oven</td>
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<tr>
<td>Have a microwave oven at home</td>
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<td>21</td>
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<tr>
<td>Do not have a microwave oven at home</td>
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<td>79</td>
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<tr>
<td>Frequency of use of microwave oven</td>
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<tr>
<td>Never used one before</td>
<td>8</td>
<td>42</td>
</tr>
<tr>
<td>1-2 times before</td>
<td>2</td>
<td>10</td>
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<tr>
<td>3-6 times before</td>
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<td>16</td>
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<tr>
<td>More than 6 times before</td>
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<td>32</td>
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* N = 19

** N = 16
oven at home. It was also important to note that a higher percentage of students in Group A than Group B had used a microwave oven more than six times before they studied the unit.

RESULTS OF PRE- AND POSTTESTS

Data were obtained by administering a pretest and a posttest to both groups of students. Controls that were implemented in order to handle the intervening variables were: both groups of students had the same classroom atmosphere, instructional objectives, and facilities. Care was exercised when giving the test in order to prevent student "sharing" of the questions and answers within the classroom. Students sat at different tables and were not permitted to have any supplies or reference materials on the table. The pretest and posttest scores for both groups are given in Table 2.

The self-evaluation pretest mean for Group A was 70.5 percent and for Group B it was 73.1 percent. The posttest mean for Group A (lecture/demonstration method) was 87.7 percent and for Group B (LAP) it was 86.6 percent. Group A showed an increase of 17.2 percent in pre- and posttest scores; Group B showed an increase of 13.5 percent. The median score for Group A was as follows: pretest median score was 70; posttest median score was 90. The pretest median score for Group B was also 70, and the posttest median score was 87. In posttest results, the two groups had a similar median score with Group A scoring slightly higher.

The "t"-test was used to compare the means of the two samples and was used to determine the significance of differences between the means. The level of significance used was .05. The "t" value found
Table 2
Scores on Pre- and Posttests

<table>
<thead>
<tr>
<th>Student</th>
<th>Group A* Pretest</th>
<th>Group A* Posttest</th>
<th>Group B** Pretest</th>
<th>Group B** Posttest</th>
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<tr>
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* N = 19
** N = 16
was .31. At the .05 level of significance, the criterion "t" value is 2.03. Therefore, the data were not significant at the .05 level. There was no significant difference in scores obtained on a posttest following the completion of a Learning Activity Package versus the lecture/demonstration method of instruction.

The "t"-test was also used to compare the amount of achievement between the two groups. The "t" value found was .003. At the .05 level of significance, the criterion "t" value is 2.03. Therefore, there was no measurable difference in level of achievement resulting from selected instructional methods such as the Learning Activity Package and the lecture/demonstration method of instruction.
Chapter 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY

This study was designed to ascertain the effect, if any, of the method of instruction on student achievement. Two types of instruction were utilized in this study: the lecture/demonstration method of instruction and the self-instructional learning package method of instruction.

Because of its rising popularity, the microwave oven was selected as the topic for the unit. A short, one-week unit was designed to teach high school students correct microwave oven cooking techniques. Students in two intact beginning food preparation classes at Culver City High School, Culver City, California, were the participants in the study. The accumulated data were analyzed and statistical treatment was applied as appropriate.

The results of the study were evaluated in terms of the previously formulated null hypotheses.

Null Hypothesis 1: There is no difference in scores obtained on a posttest following the completion of a Learning Activity Package versus the lecture/demonstration method of instruction. Statistical analysis showed there was no significant difference in the scores, and, therefore, the null hypothesis was accepted.
**Null Hypothesis 2:** There is no measurable difference in level of achievement resulting from selected instructional methods such as the Learning Activity Package and the lecture/demonstration method of instruction. A comparison of the pretest and posttest scores for both groups showed that there was no significant difference in level of achievement between the groups. Therefore, the null hypothesis was accepted.

**CONCLUSIONS**

Data from the study indicated that the method of instruction had no significant effect on the level of learning and student achievement. It was important to note that the posttest mean scores for the two groups were very close: 87.7 percent for Group A and 86.6 percent for Group B. Both groups showed an increase in achievement following the completion of the unit.

The time of day may have been an important variable in this study. Group A, which utilized the lecture/demonstration method of instruction, met from 10:30-11:20 A.M. By comparison, Group B, the Learning Activity Package class, was the last class of the day, 1:10-2:00 P.M. and met immediately after lunch. Class attendance for Group B was not as consistent as for Group A.

Group B had a higher percentage of students that had never before used a microwave oven. Only two students in that class owned a microwave oven at home, and only four students had used a microwave oven more than six times.
In addition to the time of day and the students' previous experience in using microwave ovens, the students' learning habits were important in this study. Instructors previously had used a combination of lecture, discussion, demonstration, and student laboratory activities to teach home economics units. The Learning Activity Package was a new concept and method for the students in Group B. Consequently, students were somewhat uncertain about working on their own and sought reinforcement from the teacher at the beginning of the unit. As the students became more familiar with the activities, they became more independent and were able to complete an activity with minimum assistance.

It was apparent, from the analysis of pretest and posttest scores, that both groups increased their level of knowledge. In Group B, no one scored lower than 70 percent on the posttest. In Group A, the lowest score was 60 percent. The pretest range of scores was Group A = 40 to 100 percent and Group B = 50 to 100 percent. Posttest scores ranged from 60 to 100 percent for Group A and from 70 to 100 percent for Group B. For both groups, there was an increase of 20 percent from the lowest pretest score when compared to the lowest posttest score.

RECOMMENDATIONS

Based on the results of this study, several recommendations can be made. The need exists for further research in the following areas:

1. The study could be replicated using academically matched classes which meet at the same time of day and with a second posttest
administered several weeks after completion of the unit to determine if there is a difference in learning retention.

2. The study could be replicated using students who have had prior experience in working with Learning Activity Packages in the classroom.
REFERENCES


Joseph, Marjory L. "Selected Research Classification Strategies." Los Angeles: California State University, Northridge, 1977. (Mimeographed)


APPENDIX A

UNIT LESSON PLANS

MICROWAVE OVEN COOKING TECHNIQUES
MICROWAVE OVEN COOKING TECHNIQUES

TOPIC: Microwave Oven Cooking Techniques

MATeRIALS:
Microwave oven, blackboard and chalk, food supplies for demonstration, pre- and posttest lecture notes. The following copies are to be handed out to students: crossword puzzle, finding-the-word puzzle, microwave oven cooking techniques, meat food group cooking techniques.

OBJECTIVES:

1. At the end of the unit on microwave oven cooking techniques, the student will be able, on a written test, to correctly identify principles of food preparation to follow according to the criteria discussed in class.

2. At the end of the unit, the student will be able to correctly define the following terms: electronic oven, microwave energy, variable power, standing time.

3. Following the completion of the unit, the student will be able to correctly identify on a written test at least three items that should not be used in a microwave oven, and at least five items that may safely be used in the microwave oven.

4. Following the unit on microwave oven cooking techniques, the student will be able to describe the correct way to clean the microwave oven according to the criteria discussed in class.

5. Following the completion of the unit, the student will be able to list at least three rules to remember when cooking in the microwave oven.
STUDENT SELF-EVALUATION

The Self-Evaluation questions are to help you see how much you already know about microwave oven cooking techniques. The questions will be corrected in class, however, your score will not affect your grade. When you finish, turn your paper over and wait until the rest of the class is finished.

Circle the letter "T" if the statement is True and the letter "F" if the statement is False.

T  F 1. The terms "electronic" and "microwave" are used to describe the same kind of oven appliance.
T  F 2. Microwaves are non-ionizing, electromagnetic energy.
T  F 3. Microwaves make the food radioactive.
T  F 4. A microwave oven cooks food faster than a regular or conventional oven.
T  F 5. Portable microwave ovens need special electrical outlets in the kitchen.
T  F 6. The use of metal utensils (like a spoon or fork) can damage the microwave oven.
T  F 7. A microwave oven is very easy to clean.
T  F 8. "Variable power" means that the microwave oven has more than one power level.
T  F 9. "Standing time" is when you wait before putting the food in the microwave oven to cook.
T  F 10. Glass and paper may be safely used in the microwave oven.
LECTURE/DISCUSSION #1

I. Administer pretest to students
   A. Pretest
   B. Correct pretest

II. Introduction
   A. History of microwave ovens
   B. Operation of oven, microwave characteristics
      1. Microwave energy
      2. Magnetron tube
      3. Waves similar to radio, TV
      4. Waves reflected off of metal
      5. Frictional heat example

III. Energy
   A. 15 amp., 115-120 volt circuit
   B. 1978 cost: 2¢ a day for family of four
      (3.5¢/kwh for 219 kilowatt hours per year)
   C. Greatest savings when cooking small amounts
   D. Compare to coffeemaker

IV. Safety
   A. Never a case of injury recorded with HEW
   B. Do not open while oven is on
   C. Do not place any object between oven front face and the door
   D. Keep soil or cleaner residue from getting on seal
   E. Do not operate if damaged
   F. Have adjusted or repaired only by properly qualified service personnel
   G. Do not use metal in the oven
   H. Check for leakage
LECTURE/DISCUSSION #2

I. Review history, operation, energy, safety

II. Foods that adapt well to preparation in microwave oven
   A. Vegetables
   B. Frozen foods to be defrosted
   C. Leftover foods
   D. Eggs
   E. Bacon
   F. Fish
   G. Chocolate to be melted
   H. Foods to be reheated

III. Foods that do not adapt well to preparation in the microwave oven
   A. Eggs in shell
   B. Pancakes
   C. Popcorn
   D. Foods to be canned
   E. Foods cooked in deep fat
   F. Food in narrow neck bottles
   G. Large food loads

IV. Microwaving techniques
   A. Standing time
   B. Arranging on shelf
   C. Shielding
   D. Rotating
   E. Covering
      1. Plastic wrap
      2. Wax paper
      3. Paper towels, napkins
   F. Vegetable peels, skins
   G. Adding moisture to foods
      1. Water--1 tbsp.
      2. Sprinkle fruit juice--dried fruits
      3. Wet paper towels--fish, tortillas
      4. Apple slices--to soften brown sugar
V. Selection of Utensils

A. Appropriate

1. Glass
2. China
3. Plastics
4. A round or a bundt-shaped pan

B. Not appropriate

1. Gold trim on plates
2. Metal containers

VI. Factors which affect cooking

A. Density of food
B. Quantity of food
C. Starting temperature of food
D. Shape of food
E. Location of vulnerable foods
F. Height in oven of foods
G. Moisture content of food

VII. Preparation of fruits and vegetables

A. Demonstration: baked apples, baked potatoes, baked bananas
B. Prick skins to prevent excess steam from building up (potatoes)
C. Salt foods after cooking
D. Plastic wrap used to cover food
E. Frozen in pouch; pierce pouch to release steam
LECTURE/DISCUSSION #3

I. Review of cooking techniques (ditto copy)

II. Meat food group

A. Chicken, poultry
   1. Brush with butter and browning sauce
   2. Cover legs, wings with small piece of foil
   3. Standing time; use of foil

B. Eggs
   1. Never cook in shell; dangers
   2. Pierce yolk
   3. Have at room temperature before cooking

C. Beef
   1. Plastic rack to collect fat drippings
   2. Do not salt before cooking
   3. Turn roasts for more even cooking
   4. Browning agent for browner, richer color

D. Fish
   1. Moist paper towel for steam
   2. Cook until it flakes easily

III. Demonstration: bacon, eggs, meatballs
LECTURE/DISCUSSTION #4

I. Review of history, operation, techniques

II. Dairy foods
   A. High fat content in cheese
      1. Melts quickly
      2. Layer the cheese between other ingredients
      3. Use medium power
      4. Process cheese is less stringy
   B. Demonstration: nachos

III. Breads
   A. Cakes—demonstration: carrot cake, chocolate cake
      1. A round or a bundt pan is best
      2. Standing time is important
      3. Medium high, then high power best
      4. Muffins taken out at once from cups
      5. Cupcakes, cakes rise higher than usual
      6. Bake muffins in circular pattern
   B. Yeast breads
      1. Not too successful
      2. Moist breads best
      3. No browning occurs

IV. Meal-planning techniques
   A. Good nutrition
   B. Meats cooked first
   C. Vegetables, breads last
   D. Cook desserts early in day or while eating the main course
   E. Time considerations
   F. Assignment: plan a meal
      1. Must be well-balanced
      2. One food from each food group (minimum)
      3. Three or more foods prepared in microwave oven

V. Review
   A. Review
   B. Questions
LECTURE/DISCUSSION #5

I. Review, questions
II. Posttest
III. Correct posttest
APPENDIX B

LEARNING ACTIVITY PACKAGE
MICROWAVE OVEN COOKING TECHNIQUES

A Learning Activity Package (LAP) for High School Students
TEACHER SECTION

To the teacher or facilitator of this Learning Activity Package:

Generalization: Students will be introduced to the history, safety, operation, and cooking techniques involved in using a microwave oven.

Objectives:

1. At the end of this LAP on Microwave Oven Cooking Techniques, the student will be able to prepare selected food items according to the criteria set forth in the LAP.

2. At the end of this LAP, the student will be able to correctly define the following terms: electronic oven, microwave energy, variable power, "standing time."

3. Following the completion of this LAP, the student will be able to correctly identify, on a written test, at least three items that should not be used in a microwave oven and at least five items that may be safely used in the microwave oven.

4. Following the completion of this LAP, the student will be able to demonstrate the correct way to clean the microwave oven according to the criteria given in the LAP.

5. Following the completion of this LAP, the student will be able to list at least three rules to remember when cooking foods in the microwave oven.
Resources Needed:

A. **Equipment:** Microwave oven, food supplies, cooking utensils.

B. **Printed resource material:**

   Los Angeles Times: "Vegetables: To Wave or Waive," November 3, 1977
   "Power Setting: How Low Is Low?" November 10, 1977
   "Buying the Right Appliance," December 15, 1977
   "Muffins Can Be a Challenge," February 16, 1978

   The Microwave Times, Vol. 3, No. 4, Burnsville, Minnesota:


C. **Resource articles:**

   These articles were compiled by the author of this LAP and are included at the end of this section. The articles are to be made available to students for use in Activity A.

D. **Facilities:** Cooking facilities, space needed to set up the different activities in the kitchen area.

E. **Evaluation:**

   Activity A is worth a maximum of 25 points
   Activities B-G are worth a maximum of 10 points each
   Activity H is worth a maximum of 15 points
   Posttest is worth a maximum of 50 points
   Quest Activities are worth a maximum of 20 points

Grades:

A = 135 or more points
B = 120-134 points
C = 105-119 points
D = 90-104 points
E = 89 and below
Students receiving fewer than 70 percent of the points in any activity will be asked to repeat or do additional activities in that section.

**Quest Activity** points will be counted as extra credit and will be added to the student's final point tally. Quest Activity points will be limited to a maximum of 20 points.

**Materials included in the Student Section:**

1. A statement of purpose and a list of objectives to be achieved.

2. An outline of activity choices included in LAP.

3. A record sheet for recording points earned.

4. A Student Self-Evaluation quiz to help each student assess his/her own entry level knowledge. The student must complete this self-evaluation instrument and have it checked by the teacher before proceeding in this LAP. The answers to this quiz are found on the next page of the Teacher's Section.

5. A description of Activities A-H. Worksheets and recipes are included. Students will need to borrow copies of resource articles from reference file.

**Concluding Instructions to the Teacher:**

When the student has completed all of the activities in this LAP and achieved 70 percent or higher on each one and believes he/she can do the objectives, then he/she should obtain a copy of the posttest from the teacher. The posttest is located in this section. After completing the posttest, he/she should return it to the teacher for scoring. If he/she achieves a score of 70 percent or better, he/she may do a quest activity for extra points or proceed to the next LAP. If he/she does not achieve a score of 70 percent or better, he/she should do additional activities in the areas of weakness and then
retake the posttest. The posttest is located at the back of the teacher section.
STUDENT SELF-EVALUATION ANSWER KEY

1. True
2. True
3. False
4. True
5. False
6. True
7. True
8. True
9. False
10. True
POSTTEST

Directions: Answer the following questions to the best of your ability. Turn the paper in to the teacher when you finish so that it can be graded. The test is worth a maximum of 50 points.

Explain the meaning of the following words (3 points each):
1. Electronic oven: ____________________________________________________________

2. Variable power: __________________________________________________________

3. Standing time: ____________________________________________________________

If the item listed below can safely be used in the microwave oven, put a "yes" next to it. If it cannot be used in the microwave oven, put a "no" next to the word (2 points each).

_____ 4. paper towels
_____ 5. glass baking pan
_____ 6. metal spoon
_____ 7. glass measuring cup
_____ 8. vegetables frozen in a plastic pouch
_____ 9. dishes with a gold trim
_____ 10. wax paper
_____ 11. plastic wrap
_____ 12. metal pan

13. Explain the best method to use when cleaning a microwave oven (2 points)
14. For best results in cooking, how should food be arranged or located in the microwave oven? (2 points)

15. What needs to be done before cooking to a potato or other vegetable with a peel or outer skin? (2 points)

16. What shape of baking pan is the best to use when making a cake or meatloaf? (2 points)

The following statements refer to microwave ovens and procedures for cooking foods in a microwave oven. Circle the letter "T" if the statement is True and the letter "F" if the statement is False. (1 point each)

T F 17. Microwave ovens use less energy than regular ovens.
T F 18. Microwave ovens cook small amounts of food faster than regular ovens.
T F 19. Microwave ovens are bad for your health and should not be used.
T F 20. Microwave ovens keep the kitchen cool because the surrounding air does not get hot.
T F 21. Microwaves are waves very much like radio waves.
T F 22. Microwaves can pass through most glass, paper, and some plastics.
T F 23. Salt beef before putting it in the microwave oven to cook.
T F 24. Use paper towels to cover the food in a microwave oven when you want a lot of steam to cook the food.
T F 25. Eggs may be safely cooked in the shell if you prick a hole in one end of the shell before cooking it in a microwave oven.
T F 26. Use paper towels to absorb the grease when cooking bacon in a microwave oven.
T F 27. Always use HIGH power when cooking cheese.
T F 28. Cakes cook best in a round or a bundt pan.

T F 29. The surface of a muffin or cupcake may appear moist; check for doneness with a toothpick inserted into the center of the cake. When it comes out clean, the cake is done.

T F 30. A potato, which is dense, would cook faster than a piece of coffeecake which is porous.

T F 31. Foods that attract microwave energy should be placed on top so that they are exposed to the most energy. (Example: since cheese attracts microwave energy, it should be placed on top of a casserole.)
POSTTEST ANSWER KEY

1. Another word for microwave oven.
2. Oven has more than one power level.
3. Letting the food sit after cooking; time after the cooking period when the food finishes cooking by conduction of heat.
4. yes
5. yes
6. no
7. yes
8. yes
9. no
10. yes
11. yes
12. no
13. Use a damp sponge and wipe the oven after each use.
15. Prick or pierce the skin to release the pressure/steam.
16. Round, circle
17. True
18. True
19. False
20. True
21. True
22. True
23. False
24. False
25. False
26. True
27. False
28. True
29. True
30. False
31. False
MICROWAVE OVENS

It is easy to understand how microwaves work when we understand about the waves themselves. Microwaves are short, high-frequency radio waves. The energy is converted into electromagnetic energy by the heart of the oven, the magnetron tube. All electromagnetic waves tend to travel in straight lines and can be generated, transmitted, reflected, and absorbed.

Metal reflects microwave energy. Therefore, the oven cavity is made of metal. The energy bounces off the walls and back into the food. Cooking in metal is not recommended because it interferes with the energy. Coffee cups with silver or gold trim should not be used in the oven, for example, as the metal trim reflects the energy and can cause sparking. This could damage the oven.

Microwaves pass through most glass, paper, china, and some plastics. Utensils made of these items are good to use when cooking in the microwave oven. Plastic dishes should only be used for warming foods—the high heat of cooking could damage them. Metal dishes should not be used in the oven.

Food, which contains water molecules, absorbs microwaves. The molecules vibrate at a very rapid rate. This speed creates frictional heat which cooks the food. An example of frictional heat is when you rub your hands together and feel warmth. The microwave energy penetrates 3/4" to 3" through all food surfaces. At this point, they are absorbed by moisture, sugar, or fat molecules which begin to cook
Heat is then conducted into the center and out to the surfaces.

A microwave oven saves you time and energy. The greatest savings occur when cooking small amounts of food. The microwave oven operates on a grounded, 15 amp, 115-120 volt household circuit. The amount of energy required to operate a microwave oven is similar to that used in operating a coffeemaker.

Microwave ovens are safe to use. The United States Department of Health, Education, and Welfare (HEW) has never recorded a case of injury from use of microwave oven. If you were to expose yourself to microwave energy on purpose, you would feel heat and move away.

Important microwave oven cooking techniques include the following:

1. Foods should be arranged with the thickest portions to the outside of the dish. This lets them cook through without overcooking the thinner areas (Example: drumsticks).

2. Use a round-shaped pan for cakes, meatloaf.

3. Allow for standing time after taking the item out of the oven. This lets the food finish cooking—place the dish on a wood or heat-resistant countertop.

4. Turn foods while baking. For example: half-way through the cooking time when baking a cake, rotate the pan 1/2 turn (turn the dish until the side which was to the back of the oven is to the front). This helps the food to cook evenly.

5. Prick or pierce potatoes in several places before cooking to release the pressure and steam.

6. Cover foods with paper towels when heating sandwiches and cooking bacon. It prevents steaming and splattering.

7. Cover foods with plastic wrap when cooking fish and vegetables. This holds in steam and heat. Be sure to turn back one corner of the plastic wrap so the wrap will not split during cooking.
8. Use wax paper for a light cover when cooking some fruits and meats. Use it when you want to hold in heat for faster cooking without steaming the food.

Foods cooked in the microwave or electronic oven will brown if they have a high fat content and cook more than fifteen to twenty minutes. If you want a darker, richer brown color, use a browning agent.

Cleaning the microwave oven is fast and easy. Use a damp sponge and wipe the oven after you use it. Because the oven itself does not get hot, foods cannot bake on and burn.

The newer models have a feature known as variable power. This means that the oven has more than one power level and, therefore, it gives you more flexibility in cooking.

After you have finished reading this article, answer the questions listed under Activity A.
QUESTIONS AND ANSWERS ABOUT MICROWAVE OVENS

1. What is microwave energy and how does it work in cooking food?

Microwaves are very short, high-frequency radio waves, and your microwave oven is similar to a miniature broadcasting system. The waves are produced by an electronic tube called a magnetron. These waves are reflected from metal, and are transmitted or passed through glass, plastic, and paper. They strike the water molecules that are a part of food, causing the molecules to hit against others, creating frictional heat. This heat created inside the food is what cooks the food.

2. What kinds of dishes may be used in the microwave oven?

Dishes or utensils that you already have may be suitable for micro-waving. Oven glass casseroles, cooking dishes, measuring cups and custard cups are good to use. Pottery or china which does NOT have gold or silver trim or glaze with a metallic sheen can be used. Most glass ceramic oven-to-table ware is labeled "suitable for microwaving." Never use metal in the microwave oven.

3. How can I know for sure whether or not a dish is safe to use?

To test dishes for use in the microwave oven—measure 1 cup water in a glass cup. Place in oven beside dish. Microwave one minute at HIGH. If water becomes hot, the dish is microwave safe. If the dish becomes hot, it should not be used for microwave cooking.

4. If we could see a microwave, what would it look like?

Microwaves are about 5" long. Microwaves penetrate 3/4" to 3" into the food surface—through the top, bottom, and sides. They are attracted to moisture in the food.

5. Do meat or other foods brown?

Browning in meat depends on two factors: fat content and cooking time. Small items of meat that cook very quickly do not have time for surface browning to take place. A piece of meat that cooks for 15-20 minutes will brown naturally. Use a browning agent before cooking if you want a deeper brown color. Baked products (cakes, cookies) cook too fast to brown.

6. Do I need special wiring in the home for the microwave oven?

Microwave ovens operate from a 115-120 volt household convenience outlet (it should be a grounded 15 amp. circuit). The oven uses about
the same amount of electricity as a frying pan or coffeemaker.

7. What are some good microwaving techniques?

--Arrange foods in a ring, so that all sides are exposed to microwave energy.

--Arrange foods with the thickest portions to the outside of the dish. This enables them to cook through without overcooking the thinner areas. Arrange foods of equal size in a ring, leaving the center empty.

--Prick or pierce potatoes in several places before cooking to allow steam to escape.

--Repositioning a dish in the oven helps food cook evenly. To rotate 1/2 turn, turn the dish until the side which was to the back of the oven is to the front.

--Use a round-shaped pan for cakes, meatloaf.

8. How do I know what to use for covering foods while cooking?

Covering food while it is cooking helps to retain moisture in the food. Follow these rules:

Paper towel or napkin: bacon, sandwiches. Lets steam escape while it promotes even heating and prevents splatters.


Tight cover: Plastic wrap holds in steam as well as heat. Turn back one corner to let excess steam escape. Fish and vegetables are cooked this way.

9. What is variable power?

The microwave oven or electronic oven often comes with more than one power level. When the oven has more than one power level, it has variable power. This gives you more flexibility in cooking.

10. Are microwave ovens safe to use?

Yes. The United States Department of Health, Education and Welfare has no records of anyone being harmed by a consumer microwave oven that was used according to manufacturer's instructions. The microwave energy stays inside of the oven.

11. How do I clean the microwave oven?

To clean the microwave oven, use a damp sponge and wipe it clean. Because the oven cavity does not get hot, foods do not have a chance to bake on and stick.
12. How much does it cost to operate a microwave oven?

The greatest savings occur when cooking small amounts of food. It costs approximately two cents a day for a family of four. This is based on a 1978 energy cost of 3.5¢/kwh for 219 kilowatt hours for one year.

When you finish reading the Questions and Answers, complete the questions listed under Activity A.
STUDENT'S SECTION

MICROWAVE OVEN
COOKING TECHNIQUES

A Learning Activity Package (LAP) for
High School Students
TITLE: Microwave Oven Cooking Techniques

CONCEPT: Microwave ovens are here to stay. Approximately 7-8 percent of the homes in the United States already have one, and by 1985 one out of every two households may own a microwave oven.

PURPOSE: To introduce you to the history, safety, operation, and cooking techniques involved in using the microwave oven.

OBJECTIVES: When you have finished the activities in the Learning Activity Package (LAP), you will be able to do the following:

1. At the end of this LAP on Microwave Oven Cooking Techniques, you will be able to prepare selected food items according to the criteria set forth in the LAP.

2. At the end of this LAP, you will be able to correctly define the following terms: electronic oven, microwave energy, variable power, "standing time."

3. Following the completion of this LAP, you will be able to correctly identify, on a written test, at least three items that should not be used in a microwave oven and at least five items that may be safely used in a microwave oven.

4. Following the completion of this LAP, you will be able to demonstrate the correct way to clean the microwave oven according to the criteria given in the LAP.

5. Following the completion of this LAP, you will be able to list at least three rules to remember when cooking foods in the microwave oven.

This LAP has eight Learning Activities. Each Activity is designed to teach you new information about microwave cooking--some of the Activities will be written and some will give you a chance to cook (and eat!!) a food recipe using the microwave oven. To find out more about the Activities, turn the page........
Don't panic!! Next to each Activity you see several projects. This means that you have a choice and get to decide which project to do—that's right, you only need to complete one project for each Activity!!

Here is a brief outline of the Activities and choices:

ACTIVITY A: Questions and Answers or Microwave Oven article or Teacher lecture/discussion

ACTIVITY B: Crossword Puzzle or Finding-the-Word game or Fill-in-the-Blank puzzle

ACTIVITY C: Vegetable choices: Baked Potato or Baked Apple or Ambrosia Bananas

ACTIVITY D: Meat choices: Spicy Meatballs or Scrambled Eggs or Crispy Bacon

ACTIVITY E: Dairy choices: Nachos or Macaroni and Cheese or Cheese Sandwich

ACTIVITY F: Bread choices: Muffins or Chocolate Cupcakes or Carrot Bread Cupcakes

ACTIVITY G: Read Consumer News article or Read Microwave Oven Times article or Read the L.A. Times article

ACTIVITY H: Write a menu for the microwave oven or Make a visual project (using magazine pictures) to plan a meal

QUEST ACTIVITIES: These are extra credit activities. Suggestions are listed at the back of the LAP.

POSTTEST: After you have completed all of the activities, the teacher will give you a posttest. The posttest is worth 50 points.
STUDENT ACTIVITY RECORD SHEET

After you finish an Activity, have the teacher sign below. Be sure to write down the name of the project that you did.

<table>
<thead>
<tr>
<th>Name of Project Completed</th>
<th>Teacher Signature</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTIVITY A:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTIVITY B:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTIVITY C:</td>
<td></td>
<td></td>
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<tr>
<td>ACTIVITY D:</td>
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<tr>
<td>ACTIVITY E:</td>
<td></td>
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<td>ACTIVITY F:</td>
<td></td>
<td></td>
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<tr>
<td>ACTIVITY G:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTIVITY H:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QUEST ACTIVITY:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

POSTTEST POINT TOTAL: ___________________ TOTAL LAP POINTS: ___

For an "A" grade: 135 or more points
For a "B" grade: 120-134 points
For a "C" grade: 105-119 points
STUDENT SELF-EVALUATION

Before beginning the Activities, try to answer the following questions. When you finish, get the answer sheet from the teacher. This will be corrected but not graded; it is to help you see how much you already know about microwave oven cooking techniques!

Circle the "T" if the statement is True and circle the letter "F" if the statement is False.

T  F  1. The terms "electronic" and "microwave" are used to describe the same kind of oven appliance.
T  F  2. Microwaves are non-ionizing, electromagnetic energy.
T  F  3. Microwaves make the food radioactive.
T  F  4. A microwave oven cooks food faster than a regular (or conventional) oven.
T  F  5. Microwave ovens need special electrical outlets in the kitchen.
T  F  6. The use of metal utensils (like a spoon or fork) can damage the microwave oven.
T  F  7. A microwave oven is very easy to clean.
T  F  8. "Variable power" means that the microwave oven has more than one power level.
T  F  9. "Standing time" is when you wait before putting the food in the microwave oven to cook.
T  F  10. Glass and paper may be safely used in the microwave oven.

After you finish and check your answers, turn the page and select your first project under Activity A!
ACTIVITY A

You must finish Activity A and B before you do the other Activities.

Choices for Activity A are:

1. Read article called "Questions and Answers" or
2. Read article called "Microwave Oven" or
3. Listen, watch the teacher (lecture/discussion) and answer discussion questions.

After you do one of the three activities listed above, answer the following questions: (you may use this paper for your answers)

1. Microwaves are produced by an electronic tube called a

2. Three kinds of dishes that may be used safely in the microwave oven are:

3. Microwave energy penetrates only about ___ inches into the food. The rest of the cooking takes place by conduction of heat.

4. What kind of wiring is needed for a microwave oven in the home?

5. Microwaves are short wavelengths which are

6. Is a microwave oven safe for you to use?

7. Browning of meat depends on two things: ___ and ___

8. Why do you need to turn some foods when cooking in the microwave oven?

9. What shape pan is best to use when baking cakes?
10. What is the best method to follow when cleaning the microwave oven?

11. Variable power is when

12. When cooking potatoes or other vegetables that have a skin or outer peel, you should

13. A good rule to follow is never to use utensils in the microwave oven.

14. The word electronic oven also means

15. The greatest microwave energy savings occur when cooking amounts of food.

When you finish, check your answers with the answer sheet. If you missed more than three answers, go back and reread the project. Cross out any missed answers and write down the correct answer for each question.

TURN THE PAGE AND START ON ACTIVITY B WHEN YOU HAVE FINISHED ACTIVITY A.
ACTIVITY B

Select one of the projects:

1. Crossword Puzzle
2. Finding-the-Word Puzzle
3. Fill-in-the-Blank

When you finish, have the teacher check it and sign her name on your Activity Record Sheet.

Project: Fill-in-the-Blank

As the title says, just fill in the correct answer in the blank!

Microwave cooking is a faster way of preparing many foods when compared to other methods. If your microwave oven or ________ oven has more than one power level, it has ________ power. The first recipe you decide to prepare is a vegetable dish. First you place the vegetables in a baking pan and cover them with ________ or ________. When the oven door is ________, you can press the start button. When half of the cooking time is left, _______ the baking dish 180°. This will help the food to cook more evenly. When done, remove from the oven and allow for a ________ ________ which will finish cooking the dish. The best-shaped cake pan is one that is ________. (This is also used when making a meatloaf.) On a hot summer day, the microwave oven is nice to use because the surrounding air does not get warm, so the kitchen stays ________.
ACTIVITY B

Project: Finding-the-Word Puzzle

The following sentences tell you something about microwave ovens. Find the underlined word in each sentence in the puzzle at the bottom of the page.

1. Microwave energy cooks food very fast.

2. Paper, plastic wrap, wax paper, and glass may be used in the microwave oven.

3. Plastic bags that vegetables are frozen in can be used if the bag is pierced.

4. You have to pierce or puncture an egg yolk to prevent any pressure from building up when the egg cooks.

5. Be sure the oven door is closed before starting the microwave oven.

6. After taking a baked potato or meat item out of the oven, allow for "standing time."

7. Microwave energy is a type of non-ionizing radiation that is safe.

8. There are four Basic Food Groups: Meat, Milk, Bread and Cereal, and Fruits and Vegetables.

9. The electronic oven is another name for the microwave oven.

10. A microwave oven is very easy to clean.

11. Bake all cakes and meatloaves in a round pan for best results.
ACTIVITY B

Directions: Circle the hidden words.

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

Project: Crossword Puzzle

Directions: Answer each question and place the answer in the appropriate blank space in the puzzle.

ACROSS
3. Clear baking pan that can be used in the microwave oven.
10. The kitchen stays ___ because the oven doesn't get hot.
14. Microwaves penetrate the food 3/4 to 3 ________.
15. Another word for electronic oven is ________ oven.
16. Place muffins in a _____ pattern in the microwave oven.

DOWN
1. Type of paper that is used in oven; candles are made of it.
2. Cheese belongs to this group; another word for milk group.
4. Use a damp _____ when cleaning the microwave oven.
5. More than one power level is ____ power.
6. Never use ____ utensils in the microwave oven.
7. A paper ____ may be safely used in the microwave oven.
8. Variable ____.
9. Make sure the oven door is ____ before starting the oven.
11. Rotate or give the food dish a half ____ part way through the cooking period.
12. Pierce or prick the potato skin to release the ____ and prevent excess steam from building up.
13. The best-shaped pan to use when making cakes is _______.
ACTIVITY C

Vegetable Project

Read the article "Vegetables: To Wave or Waive."
Choose one recipe from the three choices listed on the next page and answer the questions below.

After reading the article, answer the questions:

1. When microwaving fresh vegetables, use __ to ___ tablespoons water for one pound fresh vegetables. This is just enough to make _____ in which the vegetables cook.

2. You should salt vegetables _____ cooking. If you sprinkle salt on the surface of the vegetable before cooking, it may cause ____ spots or shriveling.

3. Use _____ or _______ to hold in the steam while cooking vegetables.

4. Pierce vegetables with a fork to prevent a build-up of ________.

5. Cook vegetables only until they can barely be pierced with a sharp fork. Let the _____ _______ finish the cooking job.

TURN THE PAGE AND CHOOSE ONE OF THE RECIPES TO PREPARE....
ACTIVITY C: Fruits and Vegetables

Select one recipe:

BAKED POTATOES

1. Wash the potato. Next, pierce the skin several times to release the pressure and excess steam as it cooks.
2. Place on paper towel in the microwave oven. If cooking more than one, arrange in a ring so that all sides can be exposed to equal amounts of microwave energy.
3. Cook on HIGH power according to the chart. Turn potatoes half way through the cooking time.

<table>
<thead>
<tr>
<th>Amount</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 potato</td>
<td>4-6 min</td>
</tr>
<tr>
<td>2 potatoes</td>
<td>6-8 min</td>
</tr>
<tr>
<td>3 potatoes</td>
<td>8-12 min</td>
</tr>
</tbody>
</table>

Potato may still feel firm when done; wrap in foil and let stand 5 minutes to soften.

BAKED APPLES

1. Wash and core apple. Slit through skin around center of each fruit to prevent bursting. Place in a small dish.
2. Fill each fruit core with:
   - 2 Tbsp. brown sugar
   - 1/8 tsp. cinnamon
   - 1 tsp. butter
3. Pour 2 Tbsp. water around apple. Cover with plastic wrap, leaving small opening as a vent for excess steam.
4. Bake according to chart below:

<table>
<thead>
<tr>
<th>Amount</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 apple</td>
<td>2-4 min</td>
</tr>
<tr>
<td>2 apples</td>
<td>4-5½ min</td>
</tr>
<tr>
<td>3 apples</td>
<td>6-7 min</td>
</tr>
<tr>
<td>4 apples</td>
<td>7-8 min</td>
</tr>
</tbody>
</table>

Cook on HIGH power; check for doneness after minimum time; return to oven if necessary.

BANANA AMBROSIA

1. Mix together in small cup:
   - 2 Tbsp. orange juice
   - 1 Tbsp. brown sugar
2. Place 1 Tbsp. butter in the bottom of a glass dish.
3. Place in microwave oven for 15 seconds on HIGH to melt.
4. Place one peeled, quartered banana in dish. Coat with butter. Spoon orange juice/brown sugar mixture over banana.
5. Cook, uncovered, on HIGH for 2-2½ minutes or until bananas are soft, glazed, and warm.
6. Remove from oven. Serve either warm or cold.
ACTIVITY D

Meat Project

Read the following hints and suggestions. Then turn the page and select one recipe from the three choices as your project.

CHICKEN AND POULTRY

--Brush with butter and browning sauce before roasting.
--Cover leg and wing tips with aluminum foil. This will prevent them from overcooking.
--Allow to stand 10-15 minutes covered with aluminum foil after cooking. The temperature will increase 5°F.-10°F. during this time.
--If you have variable power: use HIGH for small birds and MEDIUM for ducks, turkeys. Poultry weighing less than 3-4 pounds should be cooked at MEDIUM-HIGH or HIGH.

EGGS

--Always cook better at room temperature.
--Never cook an egg in its shell in the microwave oven! The pressure builds up and the egg will explode—could hurt you and the oven!
--Crack shell and empty egg into a small glass dish. Be sure to pierce the yolk with a toothpick or fork...otherwise the yolk could explode while cooking and you'd have a mess to clean up!!
ACTIVITY D: Meat Project

BEEF

--Should be placed on a plastic rack...lets the fat drain off while it's cooking.
--DO NOT SALT before roasting beef. Salt takes out the moisture and makes it tough. Pepper and other spices are okay to use before cooking.
--Food should be turned around during roasting...this allows for more even roasting. Pour off excess fat after half of the cooking time has gone by.
--Use a browning agent if you want a darker color.

FISH

--Watch it carefully...fish takes only a short time to cook.
--Cook only until it flakes easily with a fork.
--Rule-of-thumb: Allow six minutes per pound for whole fish, steaks, and fillets.

TURN THE PAGE AND DECIDE WHICH RECIPE YOU WANT TO PREPARE....
ACTIVITY D: Meat Project

Select one of the following recipes as your project.

**SPICY MEATBALLS**

The teacher has already prepared the meatball mixture.

1. Take 1/2 cup of the recipe mixture.
2. Divide this into four meatballs of equal size.
3. Place meatballs on a paper towel; set on top of a glass baking dish.
4. Cover with wax paper. Place in microwave oven.
5. Cook 45 seconds to 1 minute on HIGH power.
6. Remove from oven. Let stand 1 to 1½ minutes before eating.

**SCRAMBLED EGG**

Ingredients: 1 Tbsp. butter 1 egg
1 Tbsp. milk or water Pinch of salt, pepper

1. Melt butter in a non-metallic dish in the microwave oven. It will take 15-20 seconds on HIGH.
2. Beat remaining ingredients together in a small bowl.
3. Place the egg mixture in the dish with the melted butter.
4. Cook on HIGH power for 1 minute, stirring the eggs after 30 seconds.
5. Stop cooking eggs when they are slightly softer than desired; they will continue to cook after they are removed from the oven. Allow to stand 1-2 minutes before serving to allow for the "standing time" to finish cooking the egg.

**BACON**

1. Take 2 strips of bacon. Place on a piece of paper towel and cover the bacon with another piece of paper towel.
2. Cook for 1 minute on HIGH power in the microwave oven. Let stand 1 minute after removing it from the oven.
3. Wipe out the microwave oven with a damp sponge or towel.
ACTIVITY E

Dairy Project

Select one recipe from the list below as your project.

NACHOS

1. Mound about 1 tsp. bean dip or refried bean mixture on each corn chip (total 8 chips).
2. Top with 1/8" thick slice of cheese to cover bean dip.
3. Place the 8 corn chips in a circle on a plate that has been lined with a paper towel.
4. Microwave on HIGH 15-30 seconds, until the cheese is melted. Let stand 30 seconds before eating.

MELTED CHEESE SANDWICH

1. In a conventional toaster, toast 2 slices of bread.
2. When bread is toasted, assemble sandwich. Place one slice of cheese between the pieces of bread. If desired, spread a small amount of butter on the outside of the bread.
3. Cook, uncovered, at MEDIUM-HIGH 30 seconds or until cheese is melted. Watch carefully so that it doesn't burn.

FROZEN MACARONI AND CHEESE

1. Take 1 cup of frozen macaroni and cheese which has been defrosted and place it on a paper plate. Cover with wax paper.
2. Place in the oven and cook for 2-3 minutes, turning the food after 1 minute. When you open the door to turn the food, stir it. This will distribute the heat more evenly.
3. Allow for a standing time of 1-2 minutes before eating.

While you are waiting your turn to use the oven, read the information sheet on Microwaving Techniques.
MICROWAVING TECHNIQUES

For best results, follow the suggestions listed below:

1. Foods that do not microwave well are: eggs in shell, pancakes, popcorn, any foods in large amounts.

2. Methods of food preparation that do not work well are: canning, deep-fat frying.

3. Stirring: Stir cooked portions from the outside to the center.

4. Standing time: Is especially important in microwave cooking. Do not place on a cooling rack; foods should be set directly on a wood board or hot pad.

5. Arranging on oven shelf: Arrange foods in a ring so that all sides are exposed to microwave energy.

6. Arranging in a dish: Arrange foods with the thickest portions to the outside of the dish. This lets them cook through without the thinner portions overcooking. An example is chicken drumsticks.

7. Rotating or turning foods: Repositioning a dish in the oven helps food cook evenly. To rotate 1/2 turn, turn the dish until the side which was to the back of the oven is to the front.

8. Covering: Depending on the desired moistness of the food and the amount of steam that you want, use paper towels, wax paper, or plastic wrap to cover foods as they are cooking.

9. Add water: When reheating dry leftovers. Sprinkle fruit juice instead of water on dried fruits before covering them and cooking.

10. Soften brown sugar: Place in a glass measuring cup and put a slice of apple on top. Cover or seal tightly and microwave 15 seconds or more until moisture from the apple has softened the sugar.

11. Line a cake dish: With a paper towel to absorb moisture during cooking and make the cake easy to remove from the dish.

12. Bury vulnerable foods: Foods which attract microwave energy such as cheese or meat should be buried, when possible, in sauce or other ingredients to prevent overcooking.
MICROWAVING TECHNIQUES

13. Prick foods so the steam and pressure can escape (potatoes, apple skins, egg yolks).

14. Use a round-shaped or a bundt-shaped pan for everything!
ACTIVITY F

Bread Project

Read the article called "Muffins Can Be a Challenge." Answer the following questions. Get the answer key from the teacher and check your answers when you are done.

1. Most microwave cookbooks suggest giving the tray of muffins 1/4 or ___ turn once or twice to insure even cooking.

2. To test muffins to see if they are done, you should:

3. Cooked muffins should be removed from cups ___ to a cake rack.

4. Allow no ___ in the cooking cups for muffins.

When you have answered the questions and checked your answers, turn the page and select one of the recipes as your project.
ACTIVITY F: Breads

The teacher has already prepared the batter.

Select one of the batters from the list below:

1. Fluffy Muffins
2. Chocolate cupcakes
3. Carrot cake cupcakes

Directions: Fill two cupcake liners half full with batter. Place in the plastic, round cupcake baker. Cook according to the time chart below.

<table>
<thead>
<tr>
<th>CUPCAKES</th>
<th>TIME</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15-30 seconds</td>
<td>Turn after 30 seconds.</td>
</tr>
<tr>
<td>2</td>
<td>45-60 seconds</td>
<td>Arrange in circle in oven.</td>
</tr>
<tr>
<td>4</td>
<td>1½ - 1¾ minutes</td>
<td>Turn the baker half-way around after half of the cooking time has elapsed. When cooking several cupcakes, you may notice that some will be done before others. If so, remove cupcakes as they are done and continue cooking the rest a few seconds more.</td>
</tr>
<tr>
<td>6</td>
<td>2½ - 2-3/4 minutes</td>
<td></td>
</tr>
</tbody>
</table>

MUFFINS

<table>
<thead>
<tr>
<th>MUFFINS</th>
<th>TIME</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1 - 1-3/4 minutes</td>
<td>Rotate plastic baker one half turn after half of the cooking time has elapsed.</td>
</tr>
<tr>
<td>4</td>
<td>2 - 3 minutes</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>3 - 5 minutes</td>
<td></td>
</tr>
</tbody>
</table>

To test for doneness: Test after minimum time. A wooden toothpick inserted in center will come out clean. Muffins will appear barely set—there may be moist spots on the surface.
ACTIVITY G

Articles on Microwave Ovens

This Activity can be completed anytime during the week. While you are waiting your turn to use the oven, you could be working on this project.

The purpose of this Activity is to introduce you to the different news articles that have been written about microwave ovens during the last few months. After reading the article of your choice, answer the following questions:

Name of the article I read:

1. Are microwave ovens safe to use? 
2. Four safety tips I learned to follow when using a microwave oven are:
   1. 
   2. 
   3. 
   4. 
3. Two (2) advantages to using a microwave oven are:
   1. 
   2. 
4. If I want more details about microwave ovens, I can write for information to:

Reminder: Have you checked each Activity with the teacher as you have finished it?
ACTIVITY H

Meal Planning Project

This Activity gives you a chance to plan a meal of your choice. You may plan a breakfast, lunch, or dinner menu. The only requirements are that (1) it is well-balanced and includes at least one item from each of the four food groups; and (2) it includes at least three items that will be cooked or reheated in the microwave oven. You will not be preparing this meal in class.

Your project may be written or completed by using appropriate magazine pictures. Use the space below in planning the meal. (If using pictures, it will be necessary for you to use this form and a separate piece of paper.)

Type of meal planned: _______________________________________________________

How many people the meal is for: _____________________________________________

What I will cook for the meal: _________________________________________________

(At least one item from each food group, no limit on the number of food items you can serve at the meal.)

How long each item will take to cook in the microwave oven:

Name of food item: ___________________________ Time to cook: ____________

______________________________________________________________

______________________________________________________________

______________________________________________________________

Food items that will not be cooked in the microwave oven but will be served at the meal: (example -- water, milk)

________________________________________________________________________

Hooray!! You have completed all of the Activities prescribed in this LAP. Now secure a copy of the posttest from the teacher; complete the test and return it to the teacher.
QUEST ACTIVITIES

Congratulations! You have finished all the Activities in this LAP.

If you would like to do an additional Activity and earn extra credit points, select an Activity from the list below. Quest Activities are limited to a maximum of 20 points.

1. Go alone or with a friend to an appliance store and compare the different brands of microwave ovens. Answer the following questions on a piece of paper and give to the teacher:
   a. Brand names of microwave ovens you looked at.
   b. Model numbers of microwave ovens.
   c. Special features that the ovens have.
   d. Prices, warranties that come with the ovens.

   Compare at least two different brands.

2. Alone or with a friend plan, prepare, and serve a meal at home using the microwave oven. To receive credit, write down the menu and have your parent or guardian sign the form.

3. Write a consumer letter to one of the companies that makes microwave ovens. You can ask a question, give an opinion, or seek additional information on their product. To receive credit, give the letter to the teacher in a stamped, addressed envelope. She will read the letter and then mail it for you.

4. Think of an Activity that you would like to do--be sure to talk to the teacher before doing the Activity.

   ![Image of a cartoon turtle]
APPENDIX C

STUDENT INFORMATION QUESTIONNAIRE
STUDENT INFORMATION QUESTIONNAIRE

Please answer the following questions:

1. Name: _______________________________________________________
2. Grade level: ___________________________________________________
3. Male/Female: ___________________________________________________
4. Do you have a microwave oven at home? __________________________
5. If you have a microwave oven at home, have you cooked or reheated foods in it? __________________________
6. How many times have you used a microwave oven before?
   a. Never have used one before____________________________________
   b. Used one 1-3 times before_____________________________________
   c. Used one 4-6 times before_____________________________________
   d. Used one more than 6 times____________________________________