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Food science in the junior high school foods class

Katherine W. Williams

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California State University
San Bernardino

FOOD SCIENCE IN THE JUNIOR HIGH SCHOOL
FOODS CLASS

A Project Submitted to
The Faculty of the School of Education
In Partial Fulfillment of the Requirements of the Degree
of Master of Arts
in
Education: Vocational Option
by
Katherine M. Williams, BA, MA
San Bernardino, California
August, 1988
Statement of the Problem:

Junior high school home economics courses which teach cooking should include more science in their curriculum. Foods classes teach how to cook. What is introduced in this project is information that teaches how food cooks and the scientific principles involved. The purpose of the project is to produce a course guide which includes scientific principles and which is suitable for junior high students enrolled in a foods class. The guide includes strong emphasis on the scientific principles involved in cooking. The subjects to be covered are bread making, cakes and cookies, meat cookery, eggs, salads, starches, and candies. Each chapter consists of an introduction, and explanation of ingredients commonly used, general scientific principles important to the preparation of those foods, and specific recipes for foods belonging in that category of foods.

Procedure:

Junior high school home economics course curriculums from a variety of school districts were examined. In nearly all cases, the curriculum contained only vague information about what should be taught regarding nutrition,
kitchen safety, and a sampling of recipe ideas. Very little was found on teaching scientific principles that would apply to preparing a simple meal.

Many college level textbooks were found that contained ample information about food science. Also, several cookbooks for home use were found to contain practical information on food science. This information was simplified and used in this project.

Description of the Curriculum Materials:

Once the resources were gathered it was determined what cooking areas to cover in this project. For each area chosen, two or three recipes were designed to incorporate specific scientific principles important to that type of cooking. Lesson plans and quizzes were designed for each unit. Illustrations were included to help emphasis particular skills.
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INTRODUCTION

Statement of the Problem

The Objective

The objective of this project was to integrate scientific principles into the foods curriculum of Jurupa Junior High School. The curriculum will emphasize practical scientific concepts involved in food preparation.

Context of the Problem

A major concern in education today is the push to return to the "basics." The basics are regarded as mathematics, reading, writing, and science. Vocational education is not regarded as an academic endeavor and tends to be dropped from programs in order to allow more time for students to take the basics. To help reverse this trend, the introduction of more academic emphasis into vocational education course work is necessary.

A major report to come out of the 1980's is "A Nation at Risk: The Report of the National Commission on Excellence in Education" stresses the immediate need to teach more science concepts to all students. Cooking is really a series of scientific procedures, so a Foods class is an ideal place to teach science as well as how to cook. Students will have the opportunity to see immediate results and to taste them (Goldberg and Harvey, 1983).

The National Commission on Secondary Vocational Education emphasized in its report, "The Unfinished Agenda," the need to upgrade the content of vocational education courses to make them more rigorous and to encourage a wider range of students to enroll in these courses (Lotto, 1985).
Ronald Fitzgerald (August, 1986) discussed in his article, "The Power of the Full Time Vocational-Technical High School," the new emphasis that should be placed on scientific literacy. He mentioned that the students enrolling in these courses are ones who may have previously seen little value in their academic courses, but will now accept the importance of academic skills in the world of work. Vocational education courses offer the opportunity to make general education courses more understandable.

All this new interest and attention on math and science is well deserved. Educators are now realizing that they are a very important part of the practical education needed by all students. Home economics is a good area to work on for the overall improvement of curriculum content. Many students take such courses with only the desire to have fun, but will soon realize the impact the classes can have on their entire education.

Junior high school homemaking programs generally include a unit on cooking or foods. A curriculum guide from a school district will indicate that this foods unit encompasses the preparation of many simple recipes. The recipes are generally grouped according to categories of foods: breads, salads, meats, etc. The recipes included in each category share common ingredients and principles of cooking. Most all recipes give explicit directions that are meant to help prepare the food. Because of this, the cook does not even have to think about what he is doing. As Harold McGee (1984) mentioned "amateurs who have not yet logged years at the stove might well profit from an explanation of the order that governs this sometimes disorderly pursuit of food preparation."

Joan Hansen (1984) stated that "junior high students are eager to learn and need to be given many hands-on experiences." Students at this age want
to know why things have to be mixed together in a particular order or why only so much of a certain ingredient can be used. They want to know what would happen to the end result, or final product, if something was omitted. These are very well valid concerns. Anyone interested in assuring that the end result of all the work and time put into the recipe would want to know these things.

"This is a critical period for chemical education," stated Arthur Grosser (1984). The American educational system is under heavy criticism and this may provide the opportunity for long awaited reform. This reform calls for more learning of the sciences. What better place can there be to introduce simple scientific information than in a cooking class that attracts a broad range of students.

Grosser went on to mention "The chemistry of cooking and, in particular the analysis of culinary recipes, is close to ideal a subject matter for the introduction of chemistry to an audience, especially one with a neutral or negative attitude toward science."

A well-organized kitchen in a home economics classroom is already a well-equipped laboratory. There is a source of water for washing equipment, heat for speeding up reactions, and a refrigerator to store materials and to cool down reactions. There is measuring equipment for determining exact amounts of substances. Adequate supervision and planning can make any experience in the kitchen rewarding and enlightening for the student.

Problem Statement

The problem was that junior high school home economics courses which teach cooking should include more science in their curriculum. Basically, Foods classes teach how to cook. What has been introduced into the course
work is information that teaches students how food cooks and the scientific principles involved.

**Purpose of the Project**

The purpose of the project was to produce a course guide suitable for junior high students enrolled in a Foods class. The guide has placed strong emphasis on the scientific principles involved in cooking.

**Definitions**

**Foods Class**
A one-semester course designed to include boys and girls, and covering topics of kitchen safety and sanitation, utensil usage, measuring techniques and actual food preparation.

**Food Science**
The chemical, physical, and biological processes taking place during the preparation of food.

**Assumptions**

It is assumed that:

1. Elements of food science can be presented simply to junior high school students.
2. Knowledge of the elements of food science will be eagerly learned by these students.
3. Understanding basic food science principles will make cooking more enjoyable and help eliminate cooking frustrations.

**Delimitations**

1. Lesson plans incorporating actual recipes would be useful only to home economics classes offering cooking laboratory time.
Limitations

This project was limited by:

1. The numbers and types of recipes that can be included; only recipes of general interest to this particular age group can be included.

Significance of the Project

A Foods Course in home economics would be greatly enhanced with the inclusion of scientific principles taught along with basic food preparation. In terms of current reforms being instilled in the schools curriculum, the time is perfect to incorporate science into the home economics program. This will not only improve the credibility of home economics at a time when its importance is being doubted by administrators and the general public, but it will make a profound impact on the understandability of science courses taught at that same level. Students enrolled in Foods will be able to see the practical application of the scientific theories taught in the science textbook. This will help eliminate a student's "neutral or negative attitude toward science," as mentioned by Grosser (1984).

Summary

In this introductory segment of "Cooking and Science for a Junior High Foods Class," the need has been demonstrated for the inclusion of scientific principles in the preparation of foods. Research has not proven that such materials presently exist for the junior high home economics teacher. This project will produce lesson guides and recipes helpful to such foods classes.
Organization of the Remainder of the Project

The remainder of the project will include: a review of the literature on food science and cooking; a section including an introduction to a junior high foods class; a section of classroom-ready recipes along with charts and illustrations, where applicable. In addition, a bibliography will follow.
Introduction

The review of the literature on food science was ordered in the following fashion; first, a review of books dealing with food science. Secondly, an overview of cookbooks that contained information on the science of food preparation. The last group of materials to be looked at was magazine and journal articles on the subject, and the review of literature was concluded with a summary.

Books

The authors of the books found, give a variety of explanations as to the purpose of writing about science and cooking. In his book, *On Food and Cooking*, McGee (1984) described the value of possessing a basic knowledge of food science by saying that people who cook are simply curious about what foods actually are and how cooking works. The typical cookbook only tells the cook the routine necessary to prepare a food and leaves out any information that will take the mystery out of cooking and explain the elementary principles of food preparation.

This 630 page book by McGee offered more than adequate information to present in a junior high school foods class. The units are well planned out and include several charts. These units include:

- Breads, Doughs, and Batters
- Sauces
- Sugars, Chocolate, and Confectionery
A portion of this book was utilized to explain about food additives and nutritive values of foods. Cooking methods and utensil materials were described in detail.

The first unit concerning milk offered insight to its value nutritionally. Milk is nature's nearly complete food. It contains almost all the nutrients needed by the human body--protein, fat, carbohydrates, vitamins, minerals, and water. It is the perfect food only lacking in vitamin C. Children need the equivalent amount of thirty-two ounces of milk each day. Adults need at least sixteen ounces. This can be consumed in the form of milk right out of a glass or it can be consumed in the form of cheese, yogurt or even ice cream.

Cooking with milk provides that extra opportunity to get all the daily milk requirement. Milk is used in such recipes as soups, puddings and casseroles. Cooking or heating milk must be done carefully. The protein in milk coagulate quickly causing the mixture to become lumpy. Milk will scorch easily because of the heavy casein protein molecules and the whey protein molecules falling to the bottom of the pan and burning.

The next unit in this book was about eggs. Eggs are composed of so many nutrients they are among the most nutritious foods on earth. There is no specific requirement for daily consumption of eggs. Eggs can be eaten in order to meet the days protein needs. One egg will supply the amount of protein needed to qualify as one serving from the meat and protein food group. All people need two servings daily from this group.

Egg cookery encompasses three areas--thickening liquids, providing foam (as in meringues), and stabilizing oil and water sauces such as with mayonnaise. The useful coagulation properties of eggs helps to make liquids
thicken. This happens when the protein in the eggs is exposed to heat (as in making custard) the proteins in eggs cluster together and form a bond.

Eggs get foamy due to the ability of the egg whites to increase in volume by as much as eight times when beaten. Yolks are poor foamers, but the albumen protein in the whites allow the foaming to take place. Cooking the foam will stabilize it. This is what happens with baked meringue. In cake batters containing eggs, the heat of the oven causes the air cells to expand making the batter rise.

Another unit found in McGee's book covers the topic of meat. The word "meat" means the body tissues of animals that can be eaten as food. Because the biochemistry of most animals is pretty much the same as humans, their tissues supply the amino acids (the building blocks of protein) that the body needs. The different tissues of plants are not as helpful. Lean meat consists of 75% water, 8% protein, and 3% fat. Our nutritional need for protein is only about two ounces daily. This would be the amount found in approximately one half pound of meat.

Cooking meat improves its flavor and texture. It also helps to kill harmful bacteria and makes it easier to digest. Heat helps to soften the connective tissue that surrounds the muscle. This makes it easier to chew. The fat and muscle tissue are also softened by heat which also aids in the eating and digestion of meat.

Fruits and vegetables were the next topic to cover. These are man's earliest primary source of food, because they are the beginning of the food chain. Nutritionally, this group of foods will provide the body with protein, carbohydrates, and many vitamins.
Cooking fruits and vegetables will leach out harmful compounds from the tissues; heat will intensify flavor and color. The cellulose (the rigid component in plant cell walls—also known as fiber) is softened by moist heat cooking. This makes it easier to eat and to digest.

Margaret McWilliams (1985) stated in the preface to her book, *Food Fundamentals*, that a sound understanding of food science principles will enable a cook to prepare products of high quality and to recognize why they turned out the way they did. Cookery and science should be taught in such a way that a student with no previous science course will be able to gain greater understanding of food principles.

This textbook began with a thorough explanation of how to measure ingredients. Considerable time was spent on the measuring of dry ingredients using specific dry measuring cups and spoons, and the reasons for using the spatula to level the measurement off. All modern recipes use only level measurements as opposed to times when recipes were written using heaping cups and spoons. Liquids and fats pose another particular situation for measuring. Clear liquid cups must be used for water and so on. When measuring fats the cook must remember to pack the ingredients in before leveling them off.

A thorough description of the methods used in cooking foods is given. McWilliams listed the methods as follows:

- **Conduction** - The transfer of heat from one molecule to the next.
- **Convection** - Transfer of heat throughout a system by movement of currents of heated air, water, or other liquid.
- **Radiation** - Transfer of energy directly from the source to the food being heated.
• Microwave oven - The oven heats the food by sending out small waves of energy from a magnetron tube. The water and/or fat molecules vibrate and heat foods.

Temperature also plays a very important part in the preparation and storage of foods. Freezing and boiling temperatures are influenced by the percentage of sugar present. Sugar dissolves and lowers the freezing point of ice cream and other foods high in sugar. Sugar solutions boil at higher temperature because sugar lowers vapor pressures. That is the pressure within a liquid for individual molecules to escape from the liquid.

The remainder of the text is organized into specific units. These include:

• Vegetables
• Fruits
• Salads and salad dressings
• Fats and oils
• Carbohydrates: starch and cereals cookery
• Carbohydrates: sugar cookery
• Proteins: milk and cheese
• Proteins: meat, poultry and fish
• Proteins: eggs
• Leavening agents
• Basics of batters and doughs
• Breads—quick and yeast
• Cakes, cookies and pastries
• Beverages
The first two units, fruits and vegetables, includes excellent charts that classify the various types of vegetables and fruits. This provides the student with information about what part of a plant a specific fruit or vegetable comes from. These classifications include the following—bulbs, roots, tubers, leaves, stems, "fruit" vegetables, and seeds.

Fruits and vegetables require special selection and storage procedures. This text provides adequate information on that topic. Selection of fresh produce can be difficult unless the buyer is aware of the availability of each item. Some fruits and vegetables are seasonal, meaning that it is ripe and ready to eat in only a particular season of the year. These include strawberries, pumpkins, and persimmons. Other fruits and vegetables are plentiful year-round, such as tomatoes, celery and lettuce.

A variety of cooking methods can be used when preparing vegetables for a meal. The particular technique chosen for a certain vegetable must assure that the color, flavor and nutrient content are retained. For example, green vegetables will retain their chlorophyll if the cooking time is short and a lid is not used.

Fruits are nicely categorized into types—berries, citrus, drupes, grapes, melons, and tropical or subtropical. Fruits can be eaten raw or cooked. In the cooking of fruits, as with apples, osmotic pressure plays an important role. Osmotic pressure is the pressure exerted to move water in or out of cells to equalize the concentration of solute in the cell and in the surrounding medium. When boiling apple slices and the desire is to keep the pieces in shape (as opposed to making apple sauce), sugar must be added to the boiling water in order to keep the water from drawing out the natural sugar in the apple cell.
The section on salads and salad dressings offered information about the use of gelatin. Gelatin is an animal by-product used to stiffen a liquid. Gelatin must be carefully dissolved completely and stirred well to insure a uniform mixture. The addition of an acid to the mixture will discourage the gelatin from thickening.

Fats and oils play a very important part in cooking. They add flavor and moisture to the end product. They can also be used to cook other foods in. Lard is one of the earliest fats used in cooking. Lard is fat rendered from hogs. Butter is also an animal product made from milk. Oils are mostly vegetable and can be cooked or heated to very high temperatures before "smoking."

In this textbook similar information was found on carbohydrates and sugars as was found in McGee's book. One thing brought up here, though, has to do with candy making. There are two types of candies—crystaline and amorphous. Crystaline is like fudge. It is easily bitten into or cut with a knife. Amorphous candies are like nut brittles, taffy and caramels. Their sugar content is very high and they are hard to chew.

Milk and dairy products were thoroughly discussed. The section on cheese cookery brings up important points. Cheese is ruined from cooking at high temperatures. It toughens easily and the oil will separate from the cheese. When cooking with cheese it should only be exposed to heat long enough to melt it.

The last section of this book that will be reviewed was the one concerning cakes. Cakes come in many types. Two of these are the shortened type, meaning that it contains lots of fat, and the foam type.
This type of cake uses lots of egg whites to make it light and fluffy, such as angel food. Generally, no fat or baking powder is used. The eggs must be carefully cracked and the yolk and white must be separated. There cannot be any yolk in the whites. Yolk contains lots of fat and this prevents egg whites from whipping up and holding air.

The *Cook's Companion* by Doris Townsend (1978) was another book useful to this project. This book offers substantial information about foods and food science in a dictionary format. Many "special feature" sections are included which explain such things as "What's in a food name?" Here, information is offered about the standardization of many food products on the market. For instance, chili con carne must contain at least 40% meat. Chili con carne with beans must contain 25% meat. "Putting Foods By" explains the chemical process of preserving foods. Jams and jellys are discussed as a way to preserve fruits. Specific amounts of sugar must be used in order to provide the preserving quality that sugar has. This sugar and fruit mixture must be boiled to a specific temperature in order to sufficiently dissolve the sugar crystals and to kill any bacteria that may be in the mixture.

James Beard wrote a wonderful book entitled *James Beard's Theory and Practice of Good Cooking* (1977). His book contained many recipes, but each one is preceded with tips and techniques about cooking that type of food.

His section on boiling offered much information about this method of cooking. Boiling is the action of liquid at various temperatures on food.

Meat is boiled in order to cook the surface and sear in the juices and flavors. After an initial boiling, the temperature should be turned down so the liquid only simmers, a process that will tenderize meat.
Vegetables are boiled or blanched (that is, to plunge the vegetables into boiling water and keep them there 2-3 minutes only and then quickly remove). Boiling water tenderizes them and breaks down and expands the tissues. It also brings out a well-defined flavor of the food.

Pasta (any noodle, macaroni, or spaghetti product) is boiled in water in order to expand the starch granules. Boiling pasta will also make it tender.

Sauteing is another important technique to understand. It differs from "frying" in that it is not totally immersed in hot fat. Vegetables and meats are examples of foods sautéed. The cooking of these foods in a small amount of fat (usually butter) will tenderize the food and add a nice flavor to the food. That cannot be achieved with boiling.

Kitchen Science, a book by Howard Hillman (1981), offered concise and specific information on science and cooking. His preface in the book stated that his information in the text will not only help a cook adapt recipes, or alter them, but will also help the cook to rely less on them!

The first unit covers cooking methods. Hillman explains the basic roles that heat plays in cooking. They are to:

- enhance a food's flavor, aroma, and color
- make food more chewable and digestable
- change a food—for example, butter—from a solid to a liquid
- reduce a food's volume by vaporizing some of its moisture content
- preserve a food by eliminating almost all of its water content
- destroy harmful bacteria

The unit covering eggs offered information on the storage of fresh eggs. Eggs can be kept in the refrigerator up to six weeks, if properly stored. They should be stored large side up and in the original carton.
If kept on the door, the constant shaking causes deterioration of the egg. Keeping the egg large side up makes the air pocket float at the top of the egg. This retards spoilage because it maximizes the distance between the yolk and the egg natural air pocket. This air space is potentially the egg's most prolific breeding environment for airborne pathogenic bacteria and the yolk is more perishable than the white (the albumen).

The Science Cookbook, by Julia B. Waxter (1981), provided materials useful to this project. The units are sectioned according to scientific principles—dissolution, oxidation, leavening, and so on.

The beginning unit on dissolution described the process as the separating of molecules from each other and spreading out or diffusing into a solvent. Temperature plays a spectacular factor in determining whether this will happen slowly or quickly. For example, dissolving honey in water will happen quickly if the water is hot. Some molecules do not separate into liquids and some can diffuse into some liquids, but not others. Grease can dissolve in gasoline, but not in water.

Oxidation was described as the process when molecules from the air combine with certain substances in foods. This process includes the chemical process of burning and rusting, as well as the discoloring of cut fruits and vegetables. When trying to prepare a fruit salad, there is always the potential problem of the apples or pears turning brown. Ascorbic acid (found in citrus fruits like oranges or lemons) combines with oxygen to create a protective covering.
Coagulation was another scientific process described. This is the situation that occurs when animal protein is heated—it becomes firm, or coagulated. Solidified protein cannot be returned to its original soft condition. Eggs are a perfect example of this and so is baked custard.

Vicki Cobb (1972) wrote a book entitled *Science Experiments You Can Eat*. The chapters are broken into such topics as solutions, suspensions, carbohydrates, proteins, kitchen chemistry and even plants we can eat.

Cobb's premise for this book was that a kitchen is really a well-equipped laboratory. Cooks and scientists work with chemicals. To a cook, sodium chloride is salt and tartaric acid is cream of tarter. Plants and animals are of interest to both cooks and scientists.

The portion of this book discussing gasses offered good information on baking cakes. Everyone loves to make cakes, but too often they do not turn out well due to a problem with the leavener (the ingredient used to make batter rise). The changes that occur as a cake bakes are dramatic. Tiny bubbles of carbon dioxide gas form and grow bigger as the batter gets warm. The batter surrounding these bubbles becomes permanently set as the protein from the milk and eggs coagulate (get firm) with the oven's heat. The flour used in the batter strengthens the walls of the gas bubbles so the cake doesn't fall as it is removed from the oven. Sugar holds in moisture to make the cake tender.

Baking powder is the most common leavener used in cakes. Baking powder is really a combination of baking soda, cream of tartar, and cornstarch. The cornstarch is in the baking powder to absorb moisture so the
baking soda and cream of tartar do not react before they are put in a batter. Batter mixed with this cream of tartar type baking powder must be baked right away after it is mixed. If it stands for a while before it is placed in a hot oven, most of the gas will escape and the cake will not rise as well.

Another type of baking powder is the "double acting." It was developed because it was often inconvenient to have to bake the batter as soon as it was mixed together. This other type of baking powder also contains an acid called sodium aluminum sulfate. This acid reacts with baking soda only when heated. The carbon dioxide bubbles would be released at that time.

**Cookbooks**

The one cookbook that is referred to most often when discussing food science is The Joy of Cooking, by Irma Rombauer and Marion Rombauer Becker (1975). This book was also quite large--about 850 pages. It consists mostly of recipes, but offers theories and principles about different types of cooking before each section.

The chapter concerning cereals and pastas begins with an explanation of basic cooking techniques. Cereals are edible as soon as the starch granules have swollen to their full capacity in hot liquid. Cereals must be added to the rapidly boiling water and stirred in so that each individual grain is surrounded by the hot liquid. The water temperature must remain at 212°F throughout the cooking time. It must be kept in mind that cereals increase in bulk when cooked. This will depend on the amount of water they absorb.

A large portion of the cookbook is about ingredients. In this section they are described thoroughly. One ingredient that is usually taken for granted is water. In cooking it is always assumed that the temperature of the water be between 60° and 80°F. If hotter or colder water is needed,
the recipe will state that. Soft water is best for cooking. Hard water can
thoughen beans, fruits and even shrivel pickles. It also can retard ferme-
tation of yeast.

Eggs are also discussed. Some facts to keep in mind when cooking
with eggs are:

• to check the freshness of an egg place it in water. If it floats it
  means it is old so do not use it
• do not use eggs fresher than three days for boiled eggs because they
  will turn greenish and be difficult to peel
• it does not matter if the yolk of the egg is light or dark or if the
  shell is white or brown

Flours come in a wide variety of types. All flours must meet specific
requirements set by the Food and Drug Administration. The two most
commonly used types are all purpose and cake. All purpose is a blend of
soft and hard wheats, white cake flour is made from the soft wheats only
which will produce a delicate cake.

There are some flours that are not made from wheat, but are used
frequently in cooking. They include cornstarch, corn meal, tapioca, and
arrowroot flour. All of these offer thickening power to liquids.

Journals

A few journal articles offered information relative to the project. In
the article by Jean Walker (April, 1984) "The Amateur Scientist" published in
Scientific American, the physics of making homemade ice cream is discussed.
The process of putting together the ingredients in described. First, cream is
• It is possible to explain a large number of recipe directions with only a few scientific principles.

Giving students the tools to think creatively and scientifically about this daily activity of cooking may change attitudes and relieve some of the anti-scientific burden of the times.

Summary

The review of the literature began with a brief description of the major books on the subject of food and food science. A few cookbooks offer specific information pertinent to the science of cooking as well as some journal articles. Their content was also examined for information useful for this project.
METHODOLOGY

Introduction

This section has detailed how the proposed project has been carried out. The various stages of putting together the project are listed and explained. The first section has described the subject content of the project. Next, the design of each chapter is described. Following this, a description has been given of the student population at Jurupa Junior High School.

Subject Content

Many aspects of food science are described in the literature on this topic. Not all topics are appropriate or necessary in a junior high school Foods class. The following subjects have been covered:

- Bread making - quick and yeast
- Cakes and cookies
- Meat cookery
- Eggs
- Salads - fruit and vegetables
- Starches - pastas, cereal, and rice
- Dairy products.

Sufficient data is available on these topics necessary for making basic units on each one.

Chapter Design

Each specific chapter, or unit, has been designed in a specific manner.
The chapters consist of these components:

- Introduction to the chapter
- Ingredients commonly used in the preparation of foods in this chapter
- General scientific principles important to the preparation of these foods
- Charts explaining or describing such principles
- Specific recipes for foods belonging in the chapter

**Students Population**

The students enrolled in Foods classes at Jurupa Junior High School encompass a wide range. The classes are taken nearly equally by boys and girls. The students have had little-to-no experience cooking foods starting from the raw ingredients. Many of them prepare simple dinners already because their parents work. Many parents commute long distances meaning that the students are at home alone until evening. Learning how to prepare easy, nutritious recipes is very helpful to the family. Income levels average middle to upper class, so purchasing foods necessary for most recipes is no problem. The ethnic makeup of the student population is mostly white and hispanic, but there are no specific food preferences. All students appear to equally enjoy a wide range of foods.

**Calendar of Events**

The events of this research project will occur in the following manner:

- **January 88**
  Gather all literature on the topic of food science.

- **February - May 88**
  Write specific chapter units for the project.

- **May 88**
  Complete the project and prepare it for approval and binding.
Summary

The methodology section has proceeded in the following manner:
First, subject content was outlined, then chapter design was described. The student population was also described. Finally, a brief calendar of events was listed.
REFERENCES


FOOD SCIENCE

IN THE JUNIOR HIGH SCHOOL FOODS CLASS
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INTRODUCTION

The junior high school Home Economics Foods Course is an ideal place to begin basic introductory science principles. Students at this age level are eager to learn and will do so when given practical, hand-on experiences. Scientific concepts must be taught to all students regardless of their future academic plans. Home Economics programs usually draw students from a broad cross section of the average school population. As these students participate in group cooking experiences, the teacher will find many concerns are brought up by the students about what happens when something is heated up or if an ingredient or two is left out. Discussing food science material with the students during this informal, non-threatening atmosphere will be a rewarding and worthwhile experience.

The recipes to follow will be in eight specific units. Each unit will begin with an introduction explaining ingredients commonly used in that particular category of recipes. Scientific principles related to these recipes will be discussed.

Recipes chosen for each unit are highly appealing to the junior high school cooking student. They are simple to prepare and require a minimum of ingredients. As the instructions are followed in each recipe the student will find insertions explaining any particular food science principle occurring.

Prior to the actual cooking activities of any Home Economics class, the student must be taught how to measure correctly and must display a thorough understanding of kitchen safety and sanitation rules.
With adequate materials, time, and preparation, students will discover that cooking and science are really "one" discipline. In addition, the new cook will find food preparation less frustrating or mysterious once he learns why things happen in the kitchen.

General Goals of the Course:

- to provide instruction of basic science principles in a fun, easy to understand fashion
- to allow students to observe scientific phenomenon as it occurs in such basic, everyday situations in the kitchen
- to prove to people involved in education that a non-academic subject like foods has a place in the academic world of curriculum
GLOSSARY

CARBOHYDRATE - It is a form of energy stored in food. The two types are sugar and starch. The body needs carbohydrates to maintain life.

CARBON DIOXIDE GAS - This is a harmless gas formed when baking soda, yeast, or baking powder is dissolved in a warm liquid. This gas is what makes the "fizz" in soda pop.

CELLS - The smallest unit of living matter. Some plants and animals are made up of only one cell. Human beings are made up of billions of cells.

COAGULATE - To thicken into a solid mass.

CONDENSE - To change from a gas to a liquid. It can also mean to remove a large portion of the water from a liquid such as in condensed milk.

DIET - The type of foods eaten by one person or by a particular culture or nation.

EMULSIFY - To separate a liquid into such fine drops that each drop floats freely throughout another liquid. For example, oil and water do not mix. Oil will float on top of the water unless it is emulsified.

EVAPORATE - When a liquid passes into a gaseous state. Such as water turning into steam.

FAT - One of the nutrients required by the body for energy and proper cell growth. It is found widely among various foods - mostly of the animal source.

GLUTEN - The protein in wheat flour which becomes sticky and elastic when moistened and stirred.
GLOSSARY (cont'd)

MIXTURE - A combination of ingredients.

MOLECULES - One of the smallest particles of any substance.

OXIDIZE - When oxygen molecules combine with the molecules of another substance to make a new substance. This occurs when iron turns to rust, and when the cut surface of fruit turns brown.

PROTEIN - One of the nutrients needed by the body for proper cell growth. It is made up of many amino acids that come from plants and from animals.

SIMMER - To cook slowly, just below the boiling point. There should only be a few bubbles rising to the surface of the liquid when it simmers.

STARCH - A form of carbohydrate. It is usually found in plants, and it provides energy for the body. Starch will absorb liquids when used in cooking.

TEXTURE - The feel and appearance of a food. Is it smooth, grainy, soft, hard, and so on?
Chapter One

Breads – Quick & Yeast
BREADS--QUICK and YEAST

STUDENT INFORMATION

Introduction

Basically, bread is a form of a flour and water mixture which has been baked in a loaf. Historically, bread has been around quite a long time. The earliest bread was a flat type bread that did not contain an ingredient to make it rise. It came into use nearly 10,000 years ago. Light, fluffy bread is a more recent discovery. About 4,000 years ago, the Egyptians discovered the wild yeast spores that float in the air. They found that once the yeast was mixed into the bread dough, it would rise and create a lighter textured bread.

Today, yeast is commercially produced and easily found in grocery stores. What the yeast does is leaven the bread. Leaven means "to rise." Other ingredients are also used in breads to make them rise. These include baking soda and baking powder.

A clear understanding of each leavener will make breadmaking an easier task. Each leavener will be briefly described.

Yeast

The addition of yeast to bread dough produces what we call "yeast breads." Today, yeast is purchased at the grocery store in small packages ready to be dissolved in water that is warmed to about 100°F. Yeast is a single-celled organism (see illustration) classified as a fungus. Once the cells become moistened in a warm liquid they multiply rapidly and begin to give off carbon dioxide gas.
This gas is trapped by the gluten in the wheat flour and causes the bread dough to swell up and get lighter.

Caution must be taken with the temperature of the liquid the yeast is dissolved in. If the liquid is above 130°F it will die. If it is too cool, the yeast will not become activated and multiply. A kitchen thermometer is your best guide to getting the correct temperature.

Baking Soda

Breads made with baking soda or with baking powder are called "quick breads." Baking soda is chemically referred to as "bicarbonate of soda." It is a kitchen chemical that is white, grainy powder. It will react with acid in other foods (such as milk or molasses) to quickly produce carbon dioxide bubbles. When baking soda is combined with other ingredients for a bread, or cake, the powder produces the carbon dioxide gas and makes the dough rise (or, more specifically, it leavens the dough.)
A simple, dramatic demonstration of the ability of baking soda to combine with an acid is to take a small amount of baking soda and pour in vinegar—which is an acid. These two ingredients rapidly combine and the gas carbon dioxide is released. Notice how the gas fizzes up from the liquid into the air. The gas is lighter than the liquid and so it rises to the top. The same thing can be observed in a glass of soda pop.

**Baking Powder**

This ingredient is also a white powder. It is a combination of baking soda (bicarbonate of soda), a starch, usually cornstarch, and an acid. This acid is usually cream of tartar. Cream of tartar is chemically known as potassium acid tartrate. It is sometimes called for in recipes that use beaten egg whites. It helps keep the beaten whites firm and fluffy.

When moistened, baking powder will also produce a gas called carbon dioxide. Most all baking powder sold at the grocery store is called "double acting." A small amount of gas is released when liquid is added to the dry ingredients of a bread or cake, but a larger amount of gas is released when the batter is heated in the oven. These gas bubbles form mostly in the first 10 or 15 minutes of baking. During this time the cake or bread could fall if the oven door is opened and slammed shut. This jolt would cause the bubbles to burst before the structure of the batter is firm.

**Flour**

Flour is the main ingredient of any bread, whether it is a yeast bread or a quick bread.
Flour is the fine powder product when a grain has been ground up, either by hand or mechanically. Wheat is the most basic, or widely used, of all grains. Some other grains often used in cooking include corn, oats, barley, rice, and rye.

A grain is the seed of grasses that are grown for human consumption. Each seed, or grain, has three distinct parts—bran, endosperm, and the germ. In scientific language, germ means the heart of a plant.

The endosperm is the larger portion of the grain. In wheat, this is what is ground up to make white flour. For whole wheat flour, the bran and the germ are also mixed in. The endosperm is the only part of the grain that contains gluten. This is the protein in the grain. Protein is one of the nutrients the body needs to build and repair itself.

Gluten builds the framework or structure of the final baked product—cake or bread. It has very elastic qualities. This gluten is developed when the dough is kneaded by hand or beaten with the electric mixer as with the making of a cake.
Starch makes up a large portion of the endosperm. Starch is one of the carbohydrates our bodies need to give us energy. In cooking, starch will act as a thickener of liquids. The nice brown crust formed on yeast breads is due to the reaction of the dry heat (from the oven) on the starch. A similar reaction can be seen when a slice of bread is toasted.

Goals

At the completion of this unit students will understand the importance of leaveners in bread preparations. They will be aware of the role wheat protein plays in forming the structure of a loaf of bread.
Lesson Plan

Title of recipe

Overnight Coffee Cake

Student Performance

Information, and Material that the Students Need:

Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:

The students will be able to successfully prepare the recipe for a quick bread. They will understand the role the leaveners play in the recipe.

How Students Will Be Evaluated:

The students will be evaluated on the successful completion of the recipe, their clean up work, and on their behavior.

Instruction

Set up:

The teacher will have all necessary ingredients ready ahead of time.

Introduction (focus, motivation and anticipatory set):

The students will be studying about how to prepare quick breads. They will be learning about the role the leaveners play in the preparation of the bread.

Content (key points of information):

The students will learn that the leaveners in this recipe will give off carbon dioxide gas and make the batter rise. Also, the acid mixed with the milk will make it taste tart.

Guided Practice (student activity):

The students will work in their groups in their kitchens and the teacher will monitor the class.

Closure (recap and wrap-up and/or clean-up):

The class will eat and enjoy the coffee cake. The students and teacher will evaluate the finished product. The class will review the role of the leaveners.
OVERNIGHT COFFEE CAKE

OBJECTIVES
The student will measure ingredients accurately. He/she will observe and identify the leavening affects of baking soda in a quick bread.

INGREDIENTS

<table>
<thead>
<tr>
<th>CAKE:</th>
<th>TOPPING:</th>
<th>GLAZE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 C. flour</td>
<td>1/4 t. salt</td>
<td>1/2 C. powdered sugar</td>
</tr>
<tr>
<td>1/4 C. sugar</td>
<td>1/2 t. cinnamon</td>
<td>4 t. milk</td>
</tr>
<tr>
<td>1/4 C. brown sugar</td>
<td>1/2 C. milk</td>
<td>1/3 C. shortening</td>
</tr>
<tr>
<td>1/2 t. baking soda</td>
<td>2 t. lemon juice</td>
<td>1 egg</td>
</tr>
<tr>
<td>1/2 t. baking powder</td>
<td>1/3 C. shortening</td>
<td></td>
</tr>
</tbody>
</table>

MAKES ONE 9" COFFEE CAKE

<table>
<thead>
<tr>
<th>CAKE:</th>
<th>TOPPING:</th>
<th>GLAZE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4 t. salt</td>
<td>1/2 t. cinnamon</td>
<td>1/2 t. vanilla</td>
</tr>
<tr>
<td>1/2 t. cinnamon</td>
<td>1/2 C. milk</td>
<td></td>
</tr>
<tr>
<td>1/3 C. shortening</td>
<td>2 t. lemon juice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 egg</td>
<td></td>
</tr>
</tbody>
</table>

INSTRUCTIONS

CAKE:
1. Grease a 9" round cake pan with 1 t. shortening.
2. Pour the lemon juice into the milk and let it sit.
3. Place all the cake ingredients in the large mixing bowl. Don't forget the milk. Beat with the electric mixer at low speed for about 30 seconds, then at medium speed for 3 minutes.

SCIENTIFIC NOTES

The acid will react with the protein in the milk and cause the protein molecules to curdle. This curdled milk will give a tart flavor to the baked product.

The baking soda will react with the acid in the milk to cause a generous amount of carbon dioxide molecules to form when the cake is baked. The baking powder will also give off carbon dioxide bubbles during baking.
OVERNIGHT COFFEE CAKE (cont'd)

INSTRUCTIONS

4. Pour the butter into the prepared pan.

5. Stir together the topping ingredients and then sprinkle them over the butter.

6. Cover the pan with plastic wrap and refrigerate overnight. If desired, the cake may be baked at this time.

7. When baked, place in a preheated oven set at 350°F. Be sure to remove the plastic wrap!! Bake for about 30 minutes or until the center of the cake feels firm when lightly touched.

8. During the last few minutes of baking, stir together the glaze ingredients. When the cake is fully cooked and out of the oven drizzle the glaze on the top of the cake. Cool a few minutes then serve.

SCIENTIFIC NOTES

The generous amount of baking soda, baking powder, and egg will react to give off carbon dioxide bubbles as soon as they are in the hot oven. Very little carbon dioxide is given off before if the batter is kept cold.

The baking time will vary depending on if it is baked right away or if it has been chilled. If it goes in the oven cold, it will take a few minutes longer to cook.
LESSON PLAN

Title of recipe

PUMPKIN BREAD

STUDENT PERFORMANCE

Information, and Material that the Students Need:
Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:
The students will be able to prepare a quick bread using baking soda as a leavener.

How Students Will Be Evaluated:
The students will be evaluated on the successful completion of the recipe, on their clean up, and on their behavior.

INSTRUCTION

Set up:
The teacher will have the necessary ingredients prepared ahead of time.

Introduction (focus, motivation and anticipatory set):
The students will study the student information on the preparation of the breads. They will learn about the role of the baking soda in the bread.

Content (key points of information):
The students will learn that carbon dioxide bubbles are released from the baking soda. The right amount of stirring is important to the result of the bread.

Guided Practice (student activity):
The students will prepare the recipe in their groups and the teacher will monitor the class.

Closure (recap and wrap-up and/or clean-up):
The class will eat and enjoy the finished product. The teacher and the students will evaluate the bread. The class will review the role of leaveners and stirring when preparing the bread.
PUMPKIN BREAD

OBJECTIVES

The student will measure accurately a simple quick bread recipe using baking soda as a leavener. The student will identify the effect of baking soda in the recipe.

INGREDIENTS

1 C. sugar
3/4 C. pumpkin
1 egg
1/4 C. oil
1 t. baking soda
1 1/4 C. flour

MAKES ONE 8" LOAF

1/2 t. cinnamon
1/4 t. ground cloves
1/4 t. salt
1/3 C. chopped walnuts

INSTRUCTIONS

1. Grease an 8" glass loaf pan with 1 t. shortening. Set aside. Preheat oven to 350°F.

2. In the large mixing bowl place the sugar, pumpkin, and the egg. Stir with the wire whip until smooth and well blended.

3. Add the oil and stir again until smooth.

4. Sift the flour, baking soda, cinnamon, cloves, and salt into the pumpkin mixture. Stir with a large spoon until all the dry ingredients are moist. Stir in walnuts. Do not overstir the batter or the bread will come out tough.

SCIENTIFIC NOTES

The shortening will keep the batter moist on the sides so it will be easy to take out of the pan.

The oil adds flavor and moisture to the bread. It will also make the bread tender.

The flour will give the bread its structure or framework. The baking soda will give off carbon dioxide bubbles to make the batter rise. Overstirring makes the gluten in the flour develop too much making the bread hard and tough.
PUMPKIN BREAD (cont'd)

5. Pour the batter into the prepared pan. Bake for about 45 minutes or until the top of the bread feels firm. Cool to room temperature before cutting.
LESSON PLAN

Title of recipe

WHOLE WHEAT BREAD

STUDENT PERFORMANCE

Information, and Material that the Students Need:

Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:

The students will be able to prepare a loaf of bread made with whole wheat flour.

How Students Will Be Evaluated:

The students will be evaluated on the successful completion of the recipe, on the clean up work, and on their behavior.

INSTRUCTION

Set up:

The teacher will have prepared ahead of time the necessary ingredients for the recipe.

Introduction (focus, motivation and anticipatory set):

The students have studied about yeast and its importance in bread baking. They have also studied about wheat and have learned about whole wheat flour.

Content (key points of information):

Students will need to be reminded of the importance of the temperature of the liquid when dissolving yeast. The kneading process will be discussed and demonstrated.

Guided Practice (student activity):

The students will work in groups preparing the recipe as the teacher monitors the classroom.

Closure (recap and wrap-up and/or clean-up):

The students will eat and enjoy the finished product. The quality of the bread will be determined by the students and the teacher. The class will review the role of yeast and the components of the whole wheat flour.
WHOLE WHEAT BREAD

OBJECTIVES

The student will be able to compare the characteristics of white and whole wheat flour. The student will be able to recognize the effects of yeast.

INGREDIENTS

<table>
<thead>
<tr>
<th>MAKE S 1 LOAF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 egg</td>
</tr>
<tr>
<td>2 T. molasses or honey</td>
</tr>
<tr>
<td>1/4 C. soft margarine</td>
</tr>
<tr>
<td>1 1/2 C. whole wheat flour</td>
</tr>
<tr>
<td>1 1/2 C. white flour</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INGREDIENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 envelope of dry yeast</td>
</tr>
<tr>
<td>1 C. very warm water (about 110°F)</td>
</tr>
<tr>
<td>1/4 t. salt</td>
</tr>
<tr>
<td>3 T. sugar</td>
</tr>
</tbody>
</table>

INSTRUCTIONS

1. In the large mixing bowl place the yeast. Stir in the very warm water and dissolve the yeast. Use a large spoon for this.

2. Add the salt, sugar, egg, molasses or honey, margarine, and the white flour. With the electric mixer, beat at low speed for about one minute. Stop and scrape the sides down. Beat at medium speed for two minutes. Put the mixer away.

3. Using the large spoon again, stir in the whole wheat flour.

4. Place 1/4 C. white flour on the large bread board and spread it all around. Scrape the dough onto the board. Roll the dough around on the floured surface to coat it well.

SCIENTIFIC NOTES

The yeast is a one-celled living organism that is activated by the warm water. When activated, the yeast cells give off carbon dioxide bubbles that will make the dough rise.

The white flour contains a protein called gluten. This gluten will give the bread its structure or framework. In order to develop this structure the dough must be well beaten at this point.
### Whole Wheat Bread (cont'd)

<table>
<thead>
<tr>
<th>Instructions</th>
<th>Scientific Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Knead the dough with a fold and press motion for 8-10 minutes.</td>
<td>The kneading will help to further develop the gluten in the flour. It will also help to distribute the yeast cells evenly so the bread will rise better.</td>
</tr>
<tr>
<td>6. Spread about 1 t. of shortening or oil in a large mixing bowl. Place the dough in the bowl and turn it over once. Cover the bowl loosely with plastic wrap and set at room temperature to rise until double in size.</td>
<td>This rising time will take anywhere from one to two hours depending on the warmth of the air. It will rise faster in a warm room.</td>
</tr>
<tr>
<td>7. Grease an 8&quot; glass loaf pan with 1 t. shortening.</td>
<td></td>
</tr>
<tr>
<td>8. Punch down the dough and then lift it from the bowl. Knead it in your hands or on the bread board a few times to make it smooth. Place the dough in the pan. Cover again with plastic wrap or a towel. Be sure it is only loosely covered to allow for lots of rising. Allow to rise until almost double in size.</td>
<td>This will press out a lot of carbon dioxide bubbles, but they will appear again as the dough sits in the pan.</td>
</tr>
<tr>
<td>9. Bake in a preheated oven at 350°F for about 45 min. or until the top of the bread is nicely browned.</td>
<td>The brown crust is a result of dry heat on starch molecules.</td>
</tr>
<tr>
<td>10. Allow the bread to cool to room temperature for best cutting results.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT QUIZ #1

BREADS-QUICK and YEAST

Put the letter that corresponds with the correct answer (a or b) pertaining to the second part of the question in the line on the left.

1. Breads has been made for nearly ____________.
   a. 5,000 years.
   b. 10,000 years.

2. About 4,000 years ago the Egyptians discovered ____________.
   a. yeast.
   b. flour.

3. Leaven means to ____________.
   a. flavor the bread.
   b. make the dough rise.

4. Baking soda, baking powder, and yeast are ____________.
   a. all leaveners.
   b. not necessary when baking breads.

5. Yeast is ____________.
   a. a single-celled organism.
   b. dissolved in boiling water.

6. Yeast cells give off ____________.
   a. a sweet flavoring.
   b. carbon dioxide gas bubbles.

7. Carbon dioxide gas is commonly found in ____________.
   a. soda pop.
   b. tap water.

8. Baking soda reacts with acids and will ____________.
   a. give off carbon dioxide bubbles.
   b. ruin the food.

9. When a quick bread is baking in the oven, the first part of the baking time is critical because ____________.
   a. the flavor is developed.
   b. the carbon dioxide gas bubbles are forming.

10. Flour contains a protein called ____________.
    a. gluten.
    b. bran.
Chapter Two

Cakes & Cookies
CAKES and COOKIES

STUDENT INFORMATION

Introduction

Cakes and cookies are some of the most tasty foods one could cook up in the kitchen. On the other hand, they can be very difficult and time consuming. Understanding the common ingredients and techniques in their preparation will add to the enjoyment of making them.

Cakes

There are several types of cakes, but only the butter and shortening type will be discussed. This type of cake depends mostly on the chemical action of baking powder or baking soda to make the batter rise (see Chapter One, Breads).

Eggs and steam are also leaveners important to making cakes. Eggs, when beaten, will puff up and hold their shape. The egg white has the ability to hold air bubbles as it is beaten. When the whole egg is beaten into the cake batter it also will hold in air bubbles. Once the protein in the egg begins to coagulate (thicken) from the heat of the oven, this makes a firm structure that will trap the air and give the cake batter a fluffy texture (see Chapter Four, Eggs).

Steam will be generated from the liquid added to the cake batter as it heats up in the oven. The liquid in a cake can be either water or milk. These are made up of molecules. As the liquid gets hotter, the molecules speed up their activity and move outward. This process is called dissolution.
Whether hot or cold, all molecules are in constant motion. Applying heat gives the molecules extra energy and steps up their activity. Chilling reduces the energy level and slows down their movement.

The method in which cakes cook, or bake, is called conduction. This is the process of transferring heat from one particle to another particle next to it. When a cake is placed in the hot oven, the outside of the cake begins to cook first. As the outside heats up (and also begins to rise) the middle of the cake will slowly cook and rise. The very middle of the cake is the last part to get fully cooked. It is important to bake the cake long enough to insure that the middle is well baked. If the cake is taken out of the oven too soon and it sinks, you cannot put it back in and expect it to rise. The best method to check if the cake is fully baked is to touch the center of the cake very lightly with your finger. If the cake springs back up then it is done. If your finger leaves a light impression, then it is not done and will need a few minutes of cooking.

The type of pan the cake is baked in will have significant effects on how well the cake bakes. A shiny pan is best to cook in because it will reflect heat and the cake will bake slowly. A dark, heavy pan will absorb too much heat and cause the crust on the cake to be thick and hard.
Cookies are also leavened with either baking soda or baking powder. There is no limit to the shape and size cookies can be made into. Simple drop cookies are the most common and will be discussed in this chapter.

Most cookies are higher in sugar and fat than cakes or bread. This high fat content makes the cookie dough melt and spread when it comes in contact with the oven. There are three types of fat that might be used in cookie dough. They are:

- **Butter** - This is made from the natural fat in milk.
- **Margarine** - This is "imitation butter." It is made from a vegetable oil which has been hardened chemically, milk, and food coloring.
- **Shortening** - This is vegetable oil that has been hardened chemically.

All of these fats will melt rather quickly. Once the cookies are placed in the oven to bake it can be observed that the dough spreads out on the pan. To avoid having the cookies spread out too flat it is helpful to chill the dough about one hour before dropping the dough onto the pans.

What is desired is a tender, flaky cookie. Cookie dough should be stirred only slightly. Too much stirring will begin to develop the gluten (the protein in flour) and make the baked cookies tough. The strands of gluten will bond together as the flour mixture is stirred and stirred. When the dough is baked, the oven heat thickens the protein and creates a tough cookie.

**Goals**

At the completion of this unit students will be aware of the specific importance of each ingredient used in baking of cakes and cookies. They will be aware of the baking process to follow to assure the best results.
LESSON PLAN

Title of recipe

CHOCOLATE CAKE

STUDENT PERFORMANCE

Information, and Material that the Students Need:
Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:
The students will be able to prepare a simple, tasty chocolate cake.

How Students Will Be Evaluated:
The students will be evaluated on the successful completion of the recipe, on their clean up work, and on their behavior.

INSTRUCTION

Set up:
The teacher will have prepared ahead of time the necessary ingredients for the recipe.

Introduction (focus, motivation and anticipatory set):
The students will be aware that they are learning about and preparing recipes in the category of cakes and cookies. They will have studied the student information for the cake and cookies unit.

Content (key points of information):
Students will be instructed in the purpose of key cake ingredients - baking soda, flour, and the oil.

Guided Practice (student activity):
Students will work in groups preparing the recipe as the teacher goes around the room monitoring the groups.

Closure (recap and wrap-up and/or clean-up):
Students will eat and enjoy the resulting recipe. The quality of the finished product will be determined by the students and the teacher.
CHOCOLATE CAKE

OBJECTIVES

The student will be able to measure accurately a simple cake recipe, and see the effects of a cake leavened with baking soda and vinegar.

INGREDIENTS

<table>
<thead>
<tr>
<th>INGREDIENTS</th>
<th>MAKES ONE 9&quot; CAKE</th>
</tr>
</thead>
<tbody>
<tr>
<td>½ C. flour</td>
<td>1 t. baking soda</td>
</tr>
<tr>
<td>1 C. sugar</td>
<td>1 t. vanilla</td>
</tr>
<tr>
<td>3 T. cocoa</td>
<td>1 T. vinegar</td>
</tr>
<tr>
<td>½ t. salt</td>
<td>1 C. water</td>
</tr>
<tr>
<td>½ C. oil</td>
<td></td>
</tr>
</tbody>
</table>

INSTRUCTIONS

1. Grease a 9" cake pan with 1 t. shortening. Preheat the oven to 350°F.
2. Place all cake ingredients in the large mixing bowl and beat by hand using the wire whip. Beat just until the batter is smooth. Do not overbeat.
3. Pour the batter into the greased pan and place in the oven. Bake for about 35 minutes or until the center of the cake feels firm when lightly touched in the center.

SCIENTIFIC NOTES

The grease on the pan will keep the sides and bottom moist while baking.

The baking soda and vinegar will begin to react right away. Bubbles of carbon dioxide will form and rise to the surface. Overbeating will break up these bubbles and the cake will not rise very high in the oven.

As the cake bakes, the first 10 minutes are when the carbon dioxide bubbles rise. If the cake is shaken by slamming the door the bubble will burst and the cake will fall. During the last half of the baking this is not a problem.
LESSON PLAN

Title of recipe

CHOCOLATE CHIP COOKIES

STUDENT PERFORMANCE

Information, and Material that the Students Need:

Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:

The students will be able to successfully prepare chocolate chip cookies. They will be able to identify the role baking soda plays in the recipe.

How Students Will Be Evaluated:

The students will be evaluated on the successful completion of the recipe for cookies, on their clean up, and on behavior.

INSTRUCTION

Set up:

The teacher will have ready the necessary ingredients for preparing the recipe.

Introduction (focus, motivation and anticipatory set):

The students will have reviewed the importance of the leavener used in this cookie recipe. The students will have studied the student information sheet for the unit on cakes and cookies.

Content (key points of information):

The students will have a clear understanding of the role leaveners make in drop cookies, such as chocolate chip cookies. Caution in not overbaking the cooking will be discussed.

Guided Practice (student activity):

The students will work together in their group and prepare the recipe. The teacher will monitor the class as the students work.

Closure (recap and wrap-up and/or clean-up):

The students will eat and enjoy the finished product. The class will discuss the importance of the baking soda in the recipe.
# CHOCOLATE CHIP COOKIES

## OBJECTIVES
The student will be able to explain the importance of the ingredients baking soda and flour in the preparation of these cookies.

## INGREDIENTS

<table>
<thead>
<tr>
<th></th>
<th>MAKES 2 DOZ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 egg</td>
<td>½ C. margarine</td>
</tr>
<tr>
<td>1 C. chocolate chips</td>
<td>¼ C. brown sugar</td>
</tr>
<tr>
<td>1 C. plus 2 T. all purpose flour</td>
<td>1/3 C. white sugar</td>
</tr>
<tr>
<td>½ t. baking soda</td>
<td>1 t. vanilla</td>
</tr>
<tr>
<td>½ C. chopped walnuts</td>
<td></td>
</tr>
</tbody>
</table>

## INSTRUCTIONS

1. Preheat the oven to 375°F. Use tin foil to cover two cookie sheets. Set aside.

2. In the medium size mixing bowl place the margarine. Beat with the electric mixer until smooth. Pour in the two sugars and beat at medium speed until well combined.

3. Add the egg and vanilla and beat until smooth.

4. Sift the flour, salt and baking soda into the medium size mixing bowl. Stir with a large spoon until the dry ingredients are moistened. Stir in the chocolate chips and walnuts.

## SCIENTIFIC NOTES

Exact temperature is important. If the heat is too high the cookies will overcook on the outside. If it is too low the ingredients will not set up in a nice cookie shape.

Margarine is an example of an emulsified mixture. Some ingredients naturally will not blend, such as water and oil. This is what margarine is made of. To get these ingredients to stay combined and not separate an emulsifier is added. This keeps the water molecules mixed up with the oil molecules so they do not separate from each other.

All purpose flour comes from the starchy endosperm of a wheat kernel. It contains some protein-called gluten-which builds the framework to make cookies hold their shape.
**INSTRUCTIONS**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Do not overstir.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>5.</strong> Use the one teaspoon measuring spoon as a scoop and scoop up the dough. Use a knife to scrape the dough off the spoon. Place the dough on the pans 3 across and 4 down.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>6.</strong> Bake one pan at a time. Bake each pan 10 to 12 minutes or until the tops of the cookies are nicely brown. Remove each cookie from the pan immediately and place them on cooling racks.</td>
<td></td>
</tr>
</tbody>
</table>

**SCIENTIFIC NOTES**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Baking soda will dissolve in the liquid of the egg, vanilla and margarine. It will then give off carbon dioxide bubbles to make the dough rise in the oven.</td>
<td>Be sure the cookies are all made the same size. Too small ones will burn and big ones will not cook all the way.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Hot air cannot circulate evenly in the oven with two large pans in it. The heat in the oven will harden the egg to give the cookies their firm texture. Remove the cookies from the hot pan when done. Metal holds in heat for a long time and the cookies will continue to bake if left on it.</td>
<td></td>
</tr>
</tbody>
</table>
LESSON PLAN

Title of recipe

SUGAR COOKIES

STUDENT PERFORMANCE

Information, and Material that the Students Need:
Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:
The students will be able to prepare a simple cookie recipe and understand the role the flour and baking powder plays in the recipe.

How Students Will Be Evaluated:
The students will be evaluated on the successful completion of the recipe, on their clean up and on their behavior.

INSTRUCTION

Set up:
The teacher will prepare the necessary ingredients for the recipe.

Introduction (focus, motivation and anticipatory set):
The class will be studying about how to prepare simple cakes and cookies. This recipe will reinforce scientific principles applied in cooking.

Content (key points of information):
The students will learn that the flour is the basic framework for the cookies. The baking powder is the leavener used to make the cookies fluffy.

Guided Practice (student activity):
The students will work in their groups to prepare the recipe. The teacher will monitor the classroom.

Closure (recap and wrap-up and/or clean-up):
The students will enjoy the finished product. The teacher and students will evaluate the success of the finished product. The class will review the role of the shortening and flour in this recipe.
SUGAR COOKIES

OBJECTIVES
The student will recognize and identify the effect of baking soda and shortening in the making of cookies.

INGREDIENTS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2/3 C. shortening</td>
<td>4 t. milk</td>
</tr>
<tr>
<td>3/4 C. sugar</td>
<td>1 3/4 C. flour</td>
</tr>
<tr>
<td>2 t. vanilla</td>
<td>1 1/2 t. baking powder</td>
</tr>
<tr>
<td>1 egg</td>
<td>pinch of salt</td>
</tr>
</tbody>
</table>

INSTRUCTIONS

1. Place the shortening, sugar, vanilla, and egg in the large mixing bowl. Beat with the mixer at low speed for about 2 minutes. Add the milk and mix just until smooth.

2. Sift the flour, baking powder, and salt into the large mixing bowl along with the other ingredients. Use a large spoon to stir all the ingredients together. Stir only until the dry ingredients are moist. Do not overstir.

3. Place a large piece of waxed paper or tin foil on the counter. Place the dough on the wrapping. Quickly shape the dough into a 12" roll. Wrap the foil or waxed paper up around the dough.

4. Chill the dough for 3-4 hours (or place in the freezer for later use).

SCIENTIFIC NOTES

The shortening is hardened vegetable oil. When added to baked goods it weakens the gluten structure of the protein in the flour. This will make the baked product tender and crumbly.

The baking powder in this recipe will make the cookies rise when they go into the oven. Be careful to not overstir. The gluten in the flour will begin to develop if it is stirred too much. This will produce a tough, dry cookie.

Shape the dough quickly with your hands. The warmth of your hands will begin to melt the shortening in the dough and make it sticky.

Chilling the dough will harden the shortening and the egg.
**SUGAR COOKIES (cont'd)**

<table>
<thead>
<tr>
<th>INSTRUCTIONS</th>
<th>SCIENTIFIC NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>When ready to bake it, unwrap it onto a cutting board. Use a sharp knife and slice into 1/4&quot; slices.</td>
<td>This will make it easier to slice and the cookies will hold their shape better as they bake if they start cold.</td>
</tr>
<tr>
<td>5. Place tin foil on a cookie sheet. Place sliced dough on the cookie sheet with about one inch space between each cookie.</td>
<td>Allow for room for the cookies to spread as they bake. The baking powder is going to cause them to puff up and out quite a bit.</td>
</tr>
<tr>
<td>6. Bake one cookie sheet at a time. Bake for about 10 minutes or until the cookies are just barely turning brown on the edges.</td>
<td>It is best to bake only one cookie sheet at a time. The hot air will not circulate well in the oven if two large pans are in there at one time.</td>
</tr>
<tr>
<td>7. Once the cookies are done, remove them from the hot cookie sheet and place them on the cooling rack.</td>
<td>The cookies will continue to cook if they are left on the hot pan. That will make them hard and dry. The cookies need to cool immediately once they are fully baked.</td>
</tr>
</tbody>
</table>
LESSON PLAN

Title of recipe

YELLOW CAKE

STUDENT PERFORMANCE

Information, and Material that the Students Need:
Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:
The students will be able to prepare a simple cake recipe and understand what made the cake rise.

How Students Will Be Evaluated:
The students will be evaluated on the completion of the recipe, on their clean up work, and on their behavior.

INSTRUCTION

Set up:
The teacher will have prepared ahead of time the necessary ingredients.

Introduction (focus, motivation and anticipatory set):
The class will be studying about how to make cakes. They will have read the student information sheet at the front of the unit.

Content (key points of information):
The students will learn that baking powder is a key ingredient for cakes. It gives off carbon dioxide bubbles that push up the batter.

Guided Practice (student activity):
The students will work in their groups to prepare the recipe and the teacher will monitor the class.

Closure (recap and wrap-up and/or clean-up):
The class will eat and enjoy the finished product. The class will review the role of baking powder in cake batters.
# YELLOW CAKE

## OBJECTIVE

The student will be able to describe the characteristics of the ingredient baking powder on the baking of a cake.

## INGREDIENTS

<table>
<thead>
<tr>
<th>MAKES ONE 9&quot; CAKE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 cube margarine, soft</td>
</tr>
<tr>
<td>1 C. sugar</td>
</tr>
<tr>
<td>2 eggs</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

## INSTRUCTIONS

1. With 1 t. shortening, grease a 9 inch round cake pan. Set aside. Preheat the oven to 350°F.

2. Sift the flour and baking powder into the medium size mixing bowl. Set aside. The greasing of the pan will keep the cake on the side soft and easier to get out of the pan.

3. Place the margarine and the sugar in the large mixing bowl. Beat at low speed with the mixer for about 2-3 minutes. The baking powder will help make this cake rise. It is a chemical mixture of baking soda and cream of tartar. When this mixture is dissolved it will begin to give off carbon dioxide bubbles that will make the batter rise as it bakes in the oven.

4. Add the eggs and vanilla, and beat until smooth. The mixing will soften the fat molecules. This will make the margarine combine well with the sugar and begin to dissolve it. This will add a little extra liquid for the batter.

The beaten eggs will puff and hold their shape as the cake bakes in the oven. This is because the protein molecules in the egg harden as the cake bakes and traps air bubbles as they rise to the surface of the cake.
<table>
<thead>
<tr>
<th>INSTRUCTIONS</th>
<th>SCIENTIFIC NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Add one-half of the flour mixture to the large mixing bowl. It isn't necessary to measure it exactly. Beat at medium speed until smooth.</td>
<td>The beating time is necessary to thoroughly combine all the ingredients. Also, the beating will develop the gluten (the protein in flour) that will build the framework for the cake.</td>
</tr>
<tr>
<td>6. Pour in one-half of the milk and beat at medium speed until smooth.</td>
<td></td>
</tr>
<tr>
<td>7. Add the remaining flour and beat until smooth. Do the same with the remaining milk. Now, beat for 2 minutes at medium speed.</td>
<td>During the first stage of baking, the batter is forming its structure. As the batter temperature increases, the steam rises to the surface of the cake and the carbon dioxide bubbles from the leavening agent are released. During the second stage, the risen batter is set into its permanent shape by the oven heat. Proteins in the flour, egg, and milk have coagulated. The browning of the cake top is the final stage. This browning will also improve the flavor of the finished product.</td>
</tr>
<tr>
<td>8. Pour the batter into the prepared pan. Spread it around to make it even.</td>
<td></td>
</tr>
<tr>
<td>9. Bake for 35 minutes or until the center of the cake feels firm when lightly touched.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT QUIZ # 2

CAKES and COOKIES

Put the letter that corresponds with the correct answer (a or b) pertaining to the second part of the question in the line on the left.

1. Baking powder and baking soda are used in cakes to make them
   a. rise.
   b. moist.

2. Other leaveners in cakes are
   a. salt and flour.
   b. eggs and steam.

3. Eggs help leaven a cake because
   a. the protein coagulates from the heat.
   b. the egg provides flavor.

4. Dissolution is when molecules
   a. speed up their activity and move outward.
   b. the batter dissolves from heat.

5. Chilling causes
   a. molecules to stop moving.
   b. molecules to slow down.

6. To test if a cake is done
   a. touch it lightly in the center.
   b. poke it with a sharp knife.

7. Do not cook cakes in
   a. dark, heavy pans.
   b. shiny pans.

8. To make a tender cookie be sure to stir the dough
   a. several minutes.
   b. only slightly.

9. Margarine is a fat often used in cookies. Margarine is
   a. imitation butter.
   b. hard to find at the store.

10. The fat used in the cookie dough is important because
    a. it tastes so good.
    b. it makes the cookies spread out as they bake.
Chapter Three

Meat & Fish
MEAT and FISH

STUDENT INFORMATION

Introduction

Beef will be the meat discussed in this section. The scientific principles that apply to beef can generally be applied to pork and lamb. Eating fish has gained much popularity recently, and it is important to understand a few scientific concepts relating to fish cookery.

Beef

A little anatomy must be understood in order to know the best method of cooking a piece of meat. There are actually only two basic areas of the animal—areas that get lots of exercise and areas that get very little exercise.

The muscle is the portion of the animal eaten. The muscle tissue is made up of bundles of tiny fibers surrounded by connective tissue. Also, the muscle contains fat and glycogen (animal starch). The fat will provide desirable eating qualities in the cooked meat. The glycogen is a reserve of fuel for the muscle activity while the animal is alive. The muscles that get lots of exercise will be tough cuts of meat. In these areas, the fibers are thicker, require longer cooking time, and lots of moisture while cooking. The muscles getting the least exercise will have thin fibers that can be cooked quickly over dry heat, such as a barbecue.
The body parts getting lots of exercise are the shoulder and the leg. The bones in these areas are large and round. The areas getting little exercise are the ribs and loin. The bones here will be thin and flat.

As muscle tissue cooks for any length of time, the fibers soften and become more edible. There is another biological factor to consider. Connective tissue surrounds the muscle fibers. It is a clear covering that becomes tender and dissolves when the meat is cooked slowly and with plenty of moisture. The more the muscle of an animal exercises, the more connective tissue there will be around the fibers. This explains why the parts of the animal getting a lot of exercise will be tougher than the parts getting little exercise. As this connective tissue melts from cooking it dissolves into a gelatin-like substance. It will be gummy and thick when chilled. The gelatin used to make gelatin desserts comes from animals.

Fat is one more thing to consider when cooking with meat. Fat surrounds nearly all muscle fiber. If there is a lot of fat in the muscle, it is quite visible and is seen as white streaks throughout the meat. This is called "marbling." Fat is firm when cold, but melts quickly as the meat is cooked. The fat is actually quite desirable in meat because it adds flavor to the meat and helps make it juicy and tender.
In summary:

- Tough cuts of beef come from the parts of the animal getting a lot of exercise, such as the leg and shoulder area. These muscles will have a lot of connective tissue surrounding the muscle fibers. The type of meat from these areas will make good pot roast, stews and ground beef. Meats for roasts or stews will require plenty of liquid as they cook and will require long cooking times—up to two hours.

- Tender cuts of beef come from the areas that get the least exercise. There will be little connective tissue. An example of this area is the ribs. Ribs are very tender and cook on a grill quite well in a short time.

Fish

Fish is very tender and flaky when cooked. The muscle tissue of fish differs from beef in that the fibers are very short and there is very little connective tissue around them. For this reason, fish can be cooked in a very short time and needs very little moisture while cooking. Some added fat, such as margarine or oil, will improve the flavor of the cooked fish. Fish has very little fat of its own.

Raw fish is slightly transparent in appearance. When it is fully cooked the flesh will be opaque. That means that you cannot see through it. The function of cooking is to make changes in texture, and to improve flavor.

Goals

At the conclusion of this unit students will be able to identify the reasons that some cuts of meat are tougher than others. The students will be able to recall that fish can be cooked in a short time and should not be overcooked.
LESSON PLAN

Title of recipe

FRIED FISH

STUDENT PERFORMANCE

Information, and Material that the Students Need:

Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:

The students should be able to prepare a simple dish using a protein food that requires very little cooking.

How Students Will Be Evaluated:

The students will be evaluated on their successful completion of the recipe, on their clean up, and on their behavior.

INSTRUCTION

Set up:

The teacher will have ready ahead of time the necessary ingredients.

Introduction (focus, motivation and anticipatory set):

The students will be studying how to cook protein foods. This recipe will be an example of cooking a tender fish main dish.

Content (key points of information):

The students will learn that fish has very little connective tissue in the muscle and requires very little cooking.

Guided Practice (student activity):

The students will prepare the recipe in their groups and the teacher will monitor the class.

Closure (recap and wrap-up and/or clean-up):

The students will eat and enjoy the finished product. The class will review the composition of the muscle tissue of fish and discuss why it cooks quickly.
FRIED FISH

OBJECTIVE

The student will recognize the short cooking time required for fish due to the structure of the edible portion of this food.

INGREDIENTS

2½ to 3 lbs. white fish fillets
½ C. flour
½ C. cornstarch
1 C. milk

SERVES 6

1 egg
1 T. baking powder
1 t. salt
½ t. pepper

INSTRUCTIONS

1. Place the fillets on paper towels to remove any excess moisture.

2. In the medium size mixing bowl combine the flour, cornstarch, milk, egg, baking powder, salt and pepper using a fork or a wire whip. Stir until smooth.

3. Fill the electric deep fryer to the amount specified by the manufacturer. Plug in and allow to heat up. Do not allow any water to splash into the deep fryer when it is hot.

SCIENTIFIC NOTES

A fillet is the section of the fish running along the ribs. Moisture must be removed to prevent splattering when it comes in contact with hot oil. The water would cause the oil to splatter.

An electric deep fryer will safely heat up oil to 375°F. This is the temperature necessary to properly cook deep fried foods. The heat will quickly cook and crisp the outer portion of the food. Enough heat will penetrate to the middle of the food to cook it.
FRIED FISH (cont'd)

INSTRUCTIONS

4. Cut the fillets into small portions if they are large. Dip one piece at a time in the batter. Allow excess batter to drip off. Put one or two pieces of the fish into the deep fryer. Do not over crowd it.

5. Allow the fish in the deep fryer to cook until nicely browned on both sides. This will take 2 to 3 minutes.

6. Once the pieces are cooked remove them from the hot fat and keep warm in a pan in the oven with the heat turned low-about 200°F.

7. Serve with catsup or tartar sauce.

SCIENTIFIC NOTES

Overcrowding the deep fryer will cause the temperature of the oil to drop. When that happens, the food will just sit and soak up oil rather than cook it quickly.

Fish will cook very quickly because it has almost no connective tissue.
LESSON PLAN

Title of recipe

SPAGHETTI AND MEATBALLS

STUDENT PERFORMANCE

Information, and Material that the Students Need:
Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:
The students will be able to prepare a simple main dish using ground beef as the main ingredient.

How Students Will Be Evaluated:
The students will be evaluated by the successful completion of the recipe, on their clean up, and on their behavior.

INSTRUCTION

Set up:
The teacher will have prepared ahead of time the necessary ingredients for the recipe.

Introduction (focus, motivation and anticipatory set):
The students will be studying about meat cookery. This recipe will demonstrate how ground meat becomes solid when fried.

Content (key points of information):
The students will learn about what makes a cut of meat tough. This recipe uses such meat, but the students will learn how to cook it so it will be tender. The role of the egg in the meatball will be reviewed.

Guided Practice (student activity):
The students will work in groups preparing the recipe as the teacher monitors the class.

Closure (recap and wrap-up and/or clean-up):
The students will eat and enjoy the finished product. The quality of the product will be evaluated by the students and teacher. The class will review the role of the egg in the recipe and the importance of cooking the meat over low heat.
SPAGHETTI and MEATBALLS

OBJECTIVE

The student will measure accurately the ingredients necessary to prepare this recipe. They will also identify the coagulating properties of protein in meat and eggs.

INGREDIENTS

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Sauce</th>
<th>Meatballs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 C. tomato sauce</td>
<td>1 pound ground beef</td>
</tr>
<tr>
<td></td>
<td>½ t. salt</td>
<td>½ t. salt</td>
</tr>
<tr>
<td></td>
<td>2 T. Italian herb and spice blend</td>
<td>1/8 t. garlic powder (fill the 1/4 t. half full)</td>
</tr>
<tr>
<td></td>
<td>14 t. salt</td>
<td>2 eggs</td>
</tr>
</tbody>
</table>

SERVES 4-6

INSTRUCTIONS

Sauce

1. Place all sauce ingredients in the 2 quart saucepan and stir well. Place over high heat and bring to a boil. Once it reaches a boil reduce the heat just until it simmers. Cover and simmer one hour. Stir occasionally.

Meatballs (prepare as sauce simmers)

1. Beat the eggs with a fork in a small mixing bowl.

SCIENTIFIC NOTES

Water will boil at 212°F. This mixture is not pure water so it will have a slightly different boiling point. Covering the pan while the sauce simmers will hold in the steam. Steam is really water molecules escaping from the surface of the liquid. This will occur even when not boiling but does occur more rapidly when boiling. If too much steam escapes the liquid will condense. That means that there will be fewer water molecules in the mixture.

The purpose of putting eggs in the meatballs is to help them hold their shape.
SPAGHETTI and MEATBALLS (cont'd)

INSTRUCTIONS

2. Place the meat and spices in the large mixing bowl and pour in the eggs. With very clean hands mix the ingredients together well.

3. Shape the meat mixture into meatballs only one inch in diameter. Have the ruler out to help with making the correct size. Place meatballs on a plate. When they are all made chill them about one-half hour in the refrigerator.

4. Place about half the meatballs in the large frying pan and put over low-to-medium heat. This may seem like not enough heat, but it will cook the meat well without burning it. Allow the meatballs to cook on one side then gently turn them using the turner (the wide, metal spatula). Turn very gently so they do not break apart.

5. When the first meatballs are well browned all over, remove them from the frying pan and put in the remaining meat. Cook the same way as the first batch.

6. Serve the sauce and meatballs over cooked spaghetti noodles. They should be cooked according to the directions on the package.

SCIENTIFIC NOTES

As the meatballs cook, the protein in the egg will coagulate (harden) and keep the meatballs in a nice round shape instead of turning into crumbled ground beef. Bacteria from your hands can spread into the meat. If the meat is not cooked immediately, this bacteria will grow in the moist, high protein environment.

Chilling the meatballs before frying so the fat in the meat will solidify. This means that the fat molecules will harden and the meatballs will hold their shape better during frying.

As the meatballs cook in the pan the fat in the beef will melt and run to the bottom of the pan. The protein in the beef and in the egg will coagulate (harden) and form a firm structure. Ground beef comes from a though part of the animal and will need long, slow cooking in order to tenderize it.
LESSON PLAN

Title of recipe

SPICY BEEF CHUNKS

STUDENT PERFORMANCE

Information, and Material that the Students Need:
Recipes and materials.

What Students Should Be Able to Do By The End Of The Lesson:

The students will be able to prepare a simple main dish with
a cut of beef that is tough and requires special cooking.

How Students Will Be Evaluated:

The students will be evaluated on the successful completion of
the recipe, on their clean up, and on their behavior.

INSTRUCTION

Set up:

The teacher will prepare ahead of time the necessary ingredients.

Introduction (focus, motivation and anticipatory set):

The students will be studying about meat and how to cook it.
They will read the student information at the front of the
unit.

Content (key points of information):

The students will learn about what makes meat tough or
tender. The students will learn that long cooking time and
lots of liquid will be required to tenderize tough meat.

Guided Practice (student activity):

The students will work together in their groups and the
teacher will monitor the classroom.

Closure (reap and wrap-up and/or clean-up):

The students will eat and enjoy the finished product. The
class will review the method necessary to cook a tough cut of
meat.
SPICY BEEF CHunks

OBJECTIVE

The student will learn how to solve the problem of cooking tough meat and making it tender when fluffy cooked.

INGREDIENTS

<table>
<thead>
<tr>
<th></th>
<th>SERVES 4-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 T. oil</td>
<td>1 t. leafy Oregano</td>
</tr>
<tr>
<td>1/4 C. chopped onions</td>
<td>½ t. salt</td>
</tr>
<tr>
<td>large pinch or dash of garlic powder</td>
<td>1 C. water</td>
</tr>
<tr>
<td>1/4 C. vinegar</td>
<td>1 C. green chili salsa</td>
</tr>
<tr>
<td>½ C. tomato sauce</td>
<td>1 pound stewing beef</td>
</tr>
</tbody>
</table>

INSTRUCTIONS

1. Place the oil in the large frying pan and turn the heat to the lowest setting. Add onions and stir and cook 3-4 minutes. Remove the pan from the heat and spoon out the onions into a small bowl. Set them aside.

2. Place the meat in the frying pan and put over low to medium heat. Cook and stir constantly until the meat is pretty well brown all over.

3. Place the onions back into the frying pan along with all the remaining ingredients, including the 1 C. of water. Stir well.

4. Adjust the heat under the pan so that the mixture will only simmer—that is, when there are a few bubbles coming up from the bottom of the pan.

Scientific Notes:

- Cooking the onions in hot fat will soften the walls of cellulose in the vegetable. Cellulose is what gives the vegetable structure and it does not break down completely from cooking or from digestion. Heat only softens it.

- The redness of the meat is cooked away from contact with heat. The protein in the meat, called myoglobin, changes from a red color to a brown color as the temperature of the meat rises.

- When a liquid is simmering, the temperature of it is just slightly below the boiling point of water which is 212°F.
**SPICY BEEF CHUNKS (cont'd)**

<table>
<thead>
<tr>
<th>INSTRUCTIONS</th>
<th>SCIENTIFIC NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not let it come to a full boil.</td>
<td>The simmer time will be very long being that this meat is from a tough cut of beef. This meat has a lot of connective tissue within the muscles. To soften that, it will require lots of cooking time and lots of liquid.</td>
</tr>
<tr>
<td>5. Cover the pan with a lid and allow the mixture to simmer for 1½ hours. Check it occasionally to stir and adjust the heat, if necessary.</td>
<td></td>
</tr>
<tr>
<td>6. At the end of the cooking time, the meat will be ready to serve over hot noodles.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT QUIZ # 3
MEAT and FISH

1. The two basic areas of an animal are
   a. those that get lots of exercise or little exercise.
   b. bones and organs.

2. The muscles are made up of fibers surrounded by _________.
   a. skin.
   b. connective tissue.

3. Tough meat comes from _________.
   a. the muscles getting lots of exercise.
   b. overcooking it.

4. As meat cooks, the muscle fibers will _________.
   a. melt.
   b. soften.

5. Connective tissue is what _________.
   a. surrounds the muscle fibers.
   b. keeps bones in place.

6. Gelatin comes from _________.
   a. plants.
   b. animals.

7. Marbling is desirable in meat because _________.
   a. it adds flavor and makes meat juicy.
   b. reduces the calories.

8. Fish requires short cooking times because it has _________.
   a. so few bones.
   b. very little connective tissue.

9. Cooking fish is important because it will _________.
   a. improve the flavor and texture.
   b. makes it easier to see the bones.

10. Cooked fish is opaque, which means _________.
    a. you cannot see through it.
    b. it is aqua in color.
Chapter Four

Eggs
EGGS

STUDENT INFORMATION

Introduction

Cooking eggs, or cooking with eggs, can be a simple task or a challenging adventure. Eggs are so versatile and delicious they can be cooked and eaten alone, or they can be an important part of an elegant recipe.

An egg is the seed, or germ, of the offspring of birds. It is covered by a thick shell. The egg contains a thick, clear liquid called the white or albumen. This surrounds a colored matter called the yolk. The name comes from Old English for the word yellow. The egg white is nearly all protein, the nutrient our bodies need to grow and repair itself. The yolk is high in fat. Our bodies need fat for energy and proper cell growth.

Eggs can perform many important functions in cooking. These include:

- **Thickening or coagulation.** This occurs when the beaten egg is blended with a liquid (usually milk) and heated. The protein molecules link together when heated. The once liquid egg now becomes a solid, and it has the ability to hold water molecules with it. This is what makes a creamy, thick pumpkin pie filling out of milk, pumpkin, sugar, spices and eggs.

- **Leavening.** This means to make something "rise." Since egg whites can hold so many air bubbles when they have been beaten, they have the ability to make something, such as a cake batter, light and fluffy as it bakes.
As the cake batter heats up, the air bubbles expand and the eggs white stretches. The oven heat also makes the egg white coagulate (thicken) so it will help the batter to become firm and hold its shape.

Goals

This unit will teach students the variety of things that can be done with eggs. The students will be able to describe how eggs thicken, and how egg whites get fluffy.
LESSON PLAN

Title of recipe

FLUFFY WHITE FROSTING

STUDENT PERFORMANCE

Information, and Material that the Students Need:
Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:
The students will be able to successfully complete a recipe for fluffy white frosting. They will be able to indentify the foaming properties of eggs.

How Students Will Be Evaluated:
They will be evaluated on the successful completion of the recipe, on their clean up work, and on their behavior.

INSTRUCTION

Set up:
The teacher will prepare ahead of time the necessary ingredients.

Introduction (focus, motivation and anticipatory set):
The unit of study at the time is eggs. The students will be learning about the various cooking properties of eggs.

Content (key points of information):
This recipe requires the preparation of a foam from the egg white. Students will learn that the protein in the egg white makes the foam solid after beating several minutes.

Guided Practice (student activity):
The students will work in their groups to prepare the recipe. The teacher will monitor the class.

Closure (recap and wrap-up and/or clean-up):
The class will use the prepared frosting to top a chocolate cake. The class and teacher will evaluate the success of the recipes. The class will review how to properly whip egg whites.
FLUFFY WHITE FROSTING

OBJECTIVES
The students will be able to identify one property of cooking with egg white. That will be the property of beating it into a foam.

INGREDIENTS

<table>
<thead>
<tr>
<th></th>
<th>MAKES ENOUGH FOR A 9&quot; LAYER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 medium or large size egg at room temperature</td>
<td>1/4 t. cream of tartar</td>
</tr>
<tr>
<td>1 1/4 C. powdered sugar</td>
<td>1 t. vanilla</td>
</tr>
<tr>
<td></td>
<td>1/4 C. water, boiling</td>
</tr>
</tbody>
</table>

INSTRUCTIONS

1. Only the egg white is actually needed for this recipe. To separate the yolk and the white, get out two small bowls. Crack the egg open into one of the bowls. Examine it carefully for any shell. 

2. Examine the yolk carefully to make sure the yolk has not broken. If the yolk has broken and has gotten into the white, it cannot be used for this recipe. The high fat content of the yolk will keep the egg white from whipping up.

3. Place your fingers over the second bowl and pour the egg through your fingers. The egg white should run through the fingers and into the bowl and the yolk should stay up in your fingers. Discard the yolk or save it for use in some other recipe.

SCIENTIFIC NOTES

The name yolk comes from the Old English for "yellow." It is almost onehalf fat and contains almost all of the egg's calories, and most of the vitamin A and iron.
**FLUFFY WHITE FROSTING** (cont'd)

<table>
<thead>
<tr>
<th>INSTRUCTIONS</th>
<th>SCIENTIFIC NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Place the egg white into the small mixing bowl.</td>
<td>Water boils when it reaches 212°F.</td>
</tr>
<tr>
<td>5. Place the water in the small saucepan and bring it to a boil over high heat.</td>
<td>Powdered sugar is used instead of regular granulated sugar because the particles are smaller and will dissolve faster. Cream of tartar is an ingredient called tartaric acid. This acid is added to egg whites because it helps hold the air until the egg white is thickened by the heat of the boiling water.</td>
</tr>
<tr>
<td>6. While the water is being brought to a boil, place the powdered sugar, cream of tartar, and vanilla into the mixing bowl with the egg white.</td>
<td>The egg white has now made a foam. Its volume is almost eight times what it was before. A foam is a stable mass of bubbles. The heat from the boiling water causes these air bubbles to expand as air is beaten into the egg white. The heat also causes the protein in the white to get firm or &quot;coagulate.&quot; This is what makes the frosting hold stiff peaks.</td>
</tr>
<tr>
<td>7. Immediately place the boiling water into the small mixing bowl with the other ingredients. Beat at high speed with the electric mixer for several minutes until the frosting is thick and makes peaks when the beaters are turned off and pulled out of the bowl. (see illustration)</td>
<td></td>
</tr>
<tr>
<td>8. Using a plain knife, spread the frosting on the cooled cake.</td>
<td></td>
</tr>
</tbody>
</table>
LESSON PLAN

Title of recipe

HARD COOKED EGGS

STUDENT PERFORMANCE

Information, and Material that the Students Need:

Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:

The students will be able to cook hard cooked eggs correctly.

How Students Will Be Evaluated:

The students will be evaluated by the successful completion of the recipe, on their behavior, and on their clean up work.

INSTRUCTION

Set up:

The teacher will have prepared ahead of time the necessary ingredients for the recipe.

Introduction (focus, motivation and anticipatory set):

The students will have studied about foods high in protein and about special techniques required when cooking them.

Content (key points of information):

The correct temperature of the water and the length of cooking time will be reviewed.

Guided Practice (student activity):

The students will work in groups preparing the recipe as the teacher monitors the class.

Closure (recap and wrap-up and/or clean-up):

The students will discover how the eggs have turned from a liquid into a solid during the cooking process. Also, the class will discuss the many possible recipes that the hard cooked egg can be used in.
HARD COOKED EGGS

OBJECTIVES

The student will observe the effect of heat on eggs in the shell. Students will identify principles of egg cookery.

INGREDIENTS

6 EGGS

- 6 eggs (more or less depending on amount needed)
- cold water

INSTRUCTIONS

1. Place the eggs carefully in a saucepan large enough so that all eggs are in one layer.

2. Fill the pan with cold water—enough to cover the tops of the eggs by about one inch.

3. Place the pan over medium heat. Allow the water to come to a boil.

4. Once the water reaches a boil, immediately turn the heat down so the water will only simmer—that is, there should be only a few bubbles coming up to the surface.

5. Simmer the eggs for 15 minutes.

6. At the end of the cooking time, pour out the hot water and put the pan under cold running water for about one minute.

SCIENTIFIC NOTES

- The shells are less likely to break if they are not stacked on top of each other.

- In order to fully cook all the eggs, water must circulate around the whole egg.

- The water temperature will reach 212°F when boiling. Place a thermometer in the pan to observe this.

- Eggs should not actually be allowed to boil. This would cook them at too high a temperature and cause them to be tough and make the yolk turn a little green. Eggs will begin to thicken and cook at a temperature as low as 144°F.

- The eggs must be cooled down right away to prevent them from overcooking.
### HARD COOKED EGGS (cont'd)

<table>
<thead>
<tr>
<th>INSTRUCTIONS</th>
<th>SCIENTIFIC NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Allow the eggs to cool to room temperature. To take the shell off, lightly crack the shell then roll the between the palms of your hand to free the tough skin between the egg and the shell. Carefully peel the egg. Once the shell is all removed, rinse the egg under cold water to flush off any chips of shell left on the egg.</td>
<td></td>
</tr>
<tr>
<td>8. The eggs are now ready to be sliced or chopped to use in salads and so on.</td>
<td></td>
</tr>
</tbody>
</table>
LESSON PLAN

Title of recipe

SCRAMBLED EGGS

STUDENT PERFORMANCE

Information, and Material that the Students Need:
Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:
The students should be able to successfully complete the recipe. The student will recognize the change in eggs when exposed to heat.

How Students Will Be Evaluated:
The students will be evaluated on the successful completion of the recipe, on their clean up work, and on their behavior.

INSTRUCTION

Set up:
The teacher will have prepared ahead of time the necessary ingredients.

Introduction (focus, motivation and anticipatory set):
The students will have studied the student information at the beginning of the unit. They will be planning on preparing a simple breakfast.

Content (key points of information):
The students will discuss the role that heat plays on the coagulation of the protein in eggs. The correct temperature and length of cooking time will be discussed.

Guided Practice (student activity):
The students will work in groups to prepare the recipe as the teacher monitors the room.

Closure (recap and wrap-up and/or clean-up):
The students will eat and enjoy the finished product. The students and teacher will review basic principles of cooking with eggs.
SCRAMBLED EGGS

OBJECTIVES
The student will recognize the coagulating effects of heat or the protein in eggs.

INGREDIENTS
8 eggs
2 T. margarine
3. T. milk

SERVES 4

INSTRUCTIONS
1. Crack open the eggs and place them in the large mixing bowl. Add the milk and beat with wire whip until the yolks and the whites are well combined.
2. Melt the margarine in the large frying pan over low heat. Once melted, pour in the eggs.
3. Turn the heat up to between the low setting and medium. The eggs should begin to cook quickly on the bottom. Stir them gently with a large wooden spoon or with the wide metal spatula.
4. Cook the eggs only long enough to have all the egg solid. There should be no runny egg left.
5. Remove from the heat at once or they will overcook. Serve at once. Season with salt and pepper, if desired.

SCIENTIFIC NOTES
The liquid from the milk will replace lost moisture from the eggs as they cook in the pan.
Keep the heat low while melting margarine. It has a low burning point and if it does burn, even just a little, the flavor of the eggs will be ruined.
The thickening of the eggs is actually the protein molecules in the eggs coming together and forming large clumps. This is called coagulation.
Egg protein will toughen if cooked too long. There is no way to reverse it once it happens.
UNIT QUIZ #4

EGGS

Put the letter that corresponds with the correct answer (a or b) pertaining to the second part of the question in the line on the left.

1. Eggs can be
   a. boiled only
   b. cooked and eaten alone, or combined in a recipe with other ingredients.

2. The part of the egg that can be whipped into a fluffy foam is the
   a. white
   b. yolk.

3. An egg is the ________ of the offspring of birds.
   a. seed
   b. brain.

4. The word "yolk" means
   a. high in fat
   b. yellow.

5. Two important functions that eggs can perform are
   a. thickening and leavening
   b. simmering and boiling.

6. Coagulation is when
   a. the protein molecules thicken
   b. the water around the egg boils.

7. An egg turns from a liquid to a solid because of a process called
   a. coagulation
   b. dissolution.

8. Leavening means
   a. to rise
   b. to spread evenly.

9. Oven heat makes egg whites
   a. dissolve
   b. thicken.

10. The egg yolk is high in
    a. fat
    b. vitamin C.
Chapter Five

Fruits & Vegetables
Introduction

Fruits and vegetables are commonly referred to as though they belong to the same category of food type. What they do have in common are their nutrients. Fruit and vegetables are rich in vitamins and minerals, in particular, vitamin A and C and the mineral iron. Fresh fruits and vegetables are more nutritious because heat from cooking destroys the vitamin C.

First, a brief explanation about the differences between fruits and vegetables.

Fruits

Fruits come from the part of the plant that surrounds the seed. In some cases even the seed is eaten, such as with tomatoes. A fruit is the edible portion of the plant that grows around its seed which means that several foods we are used to calling vegetables are really fruits. For example-squash, avocado, cucumber, and bell peppers.

Fruits with visible seeds.
Vegetables,

Vegetables, on the other hand, come from all the other parts of the plant. Here are a few examples:

• Leaves - Lettuce, spinach
• Stalk - Celery
• Root - Carrots
• Bulbs - Carrots
• Tubers - Potatoes

Preparation

Most fruits and vegetables need only to be rinsed off and/or peeled before eating. In some cases cooking is necessary to make the food easier to digest. Fruits and vegetables contain cellulose. Cellulose is never completely digested by the body and passes through it quickly. This effect helps aid digestion and is important to good health. Examples of cellulose in the plants we eat are:

• the skin around tomatoes and grapes
• the stringy parts of celery stalks
• the skin around corn kernels

Cellulose is not changed by the effect of heat, it is only softened slightly. The cells that make up cellulose are hard and are generally filled with lots of water.

Cooking fruits and vegetables tenderizes them by weakening the cell walls and drawing out water. The problem with cooking plant foods is to not cook them so long that they become mushy.

Some fruits and vegetables are quite fragile and will darken after being cut open. The fruits and vegetables that have this happen are apples, bananas, pears and raw potatoes. What is actually happening is the surface of flesh of the fruit is going through oxidation.
Oxidation is the combining of oxygen molecules with the molecules of another substance. This is the same thing that happens when iron rusts. Oxygen is present in the air. About 21% of the air is composed of oxygen.

There are two solutions to this problem. One would be to cover the fruit tightly with plastic wrap after it is cut. The other thing to do is to sprinkle an acid like lemon juice on it. The acid in the juice acts as an antioxidant, which means it keeps oxygen from combining with another substance. When preparing fruits for a salad, try this use of lemon juice to prevent the salad from becoming unappetizing in appearance.

Goals

Students will be able to explain the differences between a fruit and a vegetable. An understanding of oxidation will be clear at the end of this unit.
LESSON PLAN

Title of recipe

**CARROT SALAD**

STUDENT PERFORMANCE

Information, and Material that the Students Need:

Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:

The students will be able to successfully complete a recipe using fresh vegetables.

How Students Will Be Evaluated:

The students will be evaluated on the successful completion of the recipe, on their clean up work, and on their behavior.

INSTRUCTION

Set up:

The teacher will have ready ahead of time the necessary ingredients.

Introduction (focus, motivation and anticipatory set):

The students will have read and studied the student information for this unit on fruits and vegetables.

Content (key points of information):

The students will learn how to carefully prepare fresh vegetables—such as carrots—before using in cooking.

Guided Practice (student activity):

The students will prepare the recipe in their groups and the teacher will monitor the class.

Closure (recap and wrap-up and/or clean-up):

The students will eat and enjoy the finished product. The class will review how to handle fresh produce before using it in a recipe.
CARROT SALAD

OBJECTIVES
The student will recall the classification method of vegetables and fruits.

INGREDIENTS

| 4 large carrots | 3/4 t. salt |
| 1/2 C. raisins  | 1 T. lemon juice |
| 1/2 C. chopped walnuts or peanuts | 1 C. mayonnaise |

MAKES 4 SERVINGS

INSTRUCTIONS

1. With a vegetable scraper, scrape the sides of all the carrots. Cut off the top and bottom of each carrot.

2. Grate each carrot using the large holes of the cheese grater. Place the grated carrots in the large mixing bowl.

3. With a large spoon, stir in the remaining ingredients until well combined. The mayonnaise should completely coat all the grated carrots. Chill until served.

SCIENTIFIC NOTES

A carrot is a root of a plant. This makes it a vegetable. A fruit comes from the food surrounding the seed of a plant. The sides must be scraped and removed because the vegetable grows underground and will be dirty.

Mayonnaise is an example of an emulsion. That is when two ingredients are held together by a third ingredient. In this case it is oil and vinegar held together by egg. Oil and vinegar will always quickly separate when shaken together. Beating in an egg prevents the separation of oil and vinegar. This helps make the oil droplets very tiny and not come together again.
LESSON PLAN

Title of recipe

CREAMY FRUIT SALAD

STUDENT PERFORMANCE

Information, and Material that the Students Need:
Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:
The students will be able to prepare a fruit salad and know how to keep some of the fruits from turning brown.

How Students Will Be Evaluated:
The students will be evaluated on the successful completion of the recipe, on their clean up work, and on their behavior.

INSTRUCTION

Set up:
The teacher will have ready ahead of class the necessary ingredients.

Introduction (focus, motivation and anticipatory set):
The students will have studied the student information on the unit for fruits and vegetables.

Content (key points of information):
The students will learn the difference between fruits and vegetables, and how to keep some fruits from turning brown when cut open.

Guided Practice (student activity):
The students will work in groups to prepare the recipe and the teacher will monitor the classroom.

Closure (recap and wrap-up and/or clean-up):
The students will eat and enjoy the finished product. The class will review the method used to prevent the surface of the cut apple from turning brown.
CREAMY FRUIT SALAD

OBJECTIVES
The student will be able to explain how to prevent a cut apple from turning dark on the surface. And, the student will be able to identify the whipping properties of cream.

INSTRUCTIONS

½ C. whipping cream
2 T. sugar
2 bananas-sliced
2 canned peach halves, chopped into small pieces

SERVES 4-6

1 red apple
½ C. crushed pineapple-drained
1 T. lemon juice

INSTRUCTIONS

1. Wash off the apple and dry it. Place it on a cutting board and cut it in half. Then cut each half into quarters. Cut out the core of each quarter. Chop the quarter apple into bite size pieces and place them in the large mixing bowl. Immediately sprinkle the lemon juice on the apples and toss around with a spoon.

2. Place the drained crushed pineapple, sliced banana, and chopped peaches into the bowl with the apple.

3. In a small mixing bowl with high sides place the whipping cream and sugar. Beat at low speed with the electric mixer until it begins to thicken.

SCIENTIFIC NOTES

The cut surface of the apple will oxidize quickly. What happens is that the oxygen in the air reacts with the apple much like iron rusts. An acid like lemon juice will act as an antioxidant and keep the apple surface white.

When the cream is whipped air is incorporated in the liquid. The fat molecules form around the air bubbles and form a solid structure. This is why the whipped cream holds its shape for a short time.
CREAMY FRUIT SALAD (cont'd)

<table>
<thead>
<tr>
<th>INSTRUCTIONS</th>
<th>SCIENTIFIC NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Increase the speed to medium and beat until stiff peaks form when the mixer is turned off and the beaters are pulled up through the cream. Do not overheat or the cream will turn into butter! The fat may get too solid if whipped too long. With the rubber scraper, gently stir the whipped cream into the fruit. Serve at once or chill up to one hour.</td>
<td>The whipped cream should be kept chilled until served to keep the fat molecules hard.</td>
</tr>
</tbody>
</table>
LESSON PLAN

Title of recipe

EASY APPLE DESSERT

STUDENT PERFORMANCE

Information, and Material that the Students Need:

Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:

The students will be able to prepare a simple, tasty dessert starting with fresh apples.

How Students Will Be Evaluated:

The students will be evaluated on the successful completion of the recipe, on their clean up work, and on their behavior.

INSTRUCTION

Set up:

The teacher will have prepared ahead of time the necessary ingredients.

Introduction (focus, motivation and anticipatory set):

The students have studied about fruits and vegetables and have read the student information sheet for this particular unit.

Content (key points of information):

The students will learn about how to keep cut fruit from turning brown on the surface. The students will learn about what happens to fruit when it is cooked.

Guided Practice (student activity):

The students will work in groups preparing the recipe as the teacher monitors the classroom.

Closure (recap and wrap-up and/or clean-up):

The students will eat and enjoy the finished product. The quality of the dessert will be determined by the teacher and the students. The class will discuss just how they kept the cut apples from turning brown and how the texture of the apples changed from cooking.
EASY APPLE DESSERT

OBJECTIVE

The student will be able to identify one method of preventing oxidation of cut fruit.

INGREDIENTS

| 6 green cooking apples such as Granny Smith or Pippin | 1 egg |
| 2 T. lemon juice | large pinch of cinnamon |
| 1 C. flour | large pinch of nutmeg |
| 1 C. sugar | 1 t. baking powder |

SERVES 4-5

1/3 C. oil

INSTRUCTIONS

1. Into the medium size mixing bowl sift the flour, sugar, and baking powder. Set aside. The baking powder is a chemical combination of baking soda, cream of tartar, and cornstarch. When it is moistened and heated it will give off carbon dioxide bubbles which will make the crusty topping puff up.

2. Preheat the oven to 350°F. Grease a 9" square baking pan with 1 t. shortening. The shortening in the pan will melt from the oven heat and keep the food on the sides of the pan moist and prevent them from sticking and drying out.

3. With a small knife, carefully cut the skin off each apple. Cut each apple into quarters then slice the core out of each quarter. Cut the quarters into bite size pieces and place in the large mixing bowl. Sprinkle with the lemon juice and toss well with two spoons. The lemon juice sprinkled on the cut apples will help prevent oxidation of the surface of the apples. This will prevent the apples from turning brown.

SCIENTIFIC NOTES

The shortening in the pan will melt from the oven heat and keep the food on the sides of the pan moist and prevent them from sticking and drying out.

The lemon juice sprinkled on the cut apples will help prevent oxidation of the surface of the apples. This will prevent the apples from turning brown.
## EASY APPLE DESSERT (cont'd)

<table>
<thead>
<tr>
<th>INSTRUCTIONS</th>
<th>SCIENTIFIC NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Pour the apples into the greased pan.</td>
<td></td>
</tr>
<tr>
<td>5. Beat the egg with a fork in a small bowl. Now, pour the egg into the medium size bowl with the flour, stir with the fork until the egg is well blended in.</td>
<td>The addition of the oil will add moisture and improve the flavor of the crusty topping.</td>
</tr>
<tr>
<td>6. Sprinkle the cinnamon and nutmeg over the apples in the pan. Now, sprinkle the flour mixture over the apples being sure to cover the apples evenly.</td>
<td>The oven heat softens the cell walls in the apple. This will make the apple easier to eat and digest and will improve the flavor.</td>
</tr>
<tr>
<td>7. Pour the oil over all the ingredients in the pan --do not stir.</td>
<td></td>
</tr>
<tr>
<td>8. Bake for about 35 minutes or until the topping is lightly browned.</td>
<td></td>
</tr>
<tr>
<td>9. Cool slightly and serve with vanilla ice cream.</td>
<td></td>
</tr>
</tbody>
</table>
LESSON PLAN

Title of recipe

STRAWBERRY JAM

STUDENT PERFORMANCE

Information, and Material that the Students Need:
Recipes, ingredients, special storage containers.

What Students Should Be Able to Do By The End Of The Lesson:
The students will be able to prepare a simple jam using fresh strawberries.

How Students Will Be Evaluated:
The students will be evaluated on the successful completion of the recipe, on their clean up work and on their behavior.

INSTRUCTION

Set up:
The teacher will have prepared ahead of class the necessary ingredients for the recipe.

Introduction (focus, motivation and anticipatory set):
The students will be aware that they are learning about and preparing recipes using fruits and vegetables. Bread will have been prepared earlier to serve with the jam.

Content (key points of information):
Students will be told about the role and importance pectin has in the preparation of this jam recipe.

Guided Practice (student activity):
Students will work in groups preparing the recipe as the teacher goes around the room monitoring the groups.

Closure (recap and wrap-up and/or clean-up):
Students will sit at their own tables and eat and enjoy the resulting recipe. The quality of the finished product will be determined by the students and the teacher.
STRAWBERRY JAM

OBJECTIVE
The student will be able to recognize the effects of pectin in cooking and to be able to explain what pectin is.

INGREDIENTS

<table>
<thead>
<tr>
<th>MAKE 2 CUPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 pint fresh strawberries</td>
</tr>
<tr>
<td>1 1/2 C. sugar</td>
</tr>
<tr>
<td>1/2 C. light corn syrup</td>
</tr>
</tbody>
</table>

INSTRUCTIONS

1. Place all strawberries in the colander and rinse well under cold running water. Allow to drain a few moments.

2. With a small knife trim off the stem and leaves. Cut each strawberry in half and place in the large mixing bowl. Note that the seed of strawberries are on the outside of the fruit and not the inside!

3. Place about one-half of the cut berries in the medium size bowl and crush them with a potato masher or pastry blender. Add the other half and crush them as well. The crushed berries will be quite moist. The cell walls are broken from crushing and the water comes out of the cell.

4. Pour the sugar and corn syrup into the crushed berries. Stir well with a large spoon. Corn syrup is the natural sugar from kernals of corn.

5. Into a small mixing bowl pour the pectin and lemon juice. Pectin is a stringlike molecule which comes from the cell walls in plants, more specifically from apples and citrus fruit (like lemons). The acid from the lemon will cause the pectin to form a very solid mixture. This occurs when the stringlike molecules bond together.
### STRAWBERRY JAM (cont'd)

<table>
<thead>
<tr>
<th>INSTRUCTIONS</th>
<th>SCIENTIFIC NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Pour this into the crushed berries and stir exactly 3 minutes. This will allow enough time to fully distribute the pectin fully.</td>
<td>The stirring time is critical. It takes awhile to evenly distribute the pectin and acid molecules among the strawberries so that a firm mixture is made.</td>
</tr>
<tr>
<td>7. Pour the mixture into a clean container with a tight lid. This can be stored in the refrigerator for up to 2 weeks.</td>
<td>Harmful bacteria may begin to grow in food left in the refrigerator too long. Some bacteria can grow even at 40°F.</td>
</tr>
</tbody>
</table>
UNIT QUIZ #5

SALADS-FRUITS and VEGETABLES

Put the letter that corresponds with the correct answer (a or b) pertaining to the second part of the question in the line on the left.

1. Fresh fruits and vegetables are more nutritious than cooked because ____________________________.
   a. heat destroys some vitamins.
   b. cooking washes away the protein.

2. A fruit is ____________________________.
   a. any plant that tastes sweet.
   b. the food surrounding the seed of the plant.

3. Avocados, pumpkins and tomatoes are ____________________________.
   a. fruits.
   b. vegetables.

4. A vegetable comes from ____________________________.
   a. any other part of the plant.
   b. the root of the plant only.

5. Fruits and vegetables contain cellulose which is ____________________________.
   a. not broken down by cooking or even digestion.
   b. high in calories.

6. Cellulose is softened and made easier to eat by ____________________________.
   a. cooking.
   b. freezing.

7. If vegetables are boiled too long they become ____________________________.
   a. hard and dry.
   b. mushy and unappetising.

8. When some fruits are cut open the surface turns brown because of ____________________________.
   a. oxidation.
   b. cellulose.

9. An acid like lemon juice helps prevent ____________________________.
   a. the surface from turning brown.
   b. vitamin loss.

10. Oxidation is when ____________________________.
    a. the surface molecules combine with oxygen.
    b. the cut fruit dries out.
Chapter Six

Starch – Pasta, Cereal & Rice
STARCH - Pasta, Cereal & Rice

STUDENT INFORMATION

Introduction

Starch comes from plants and provides the body with energy. Many plants we eat are high in starch and can provide the body with nearly one-half of the energy required for one day. This unit will cover these three sources of starch.

• PASTA - Noodles, macaroni and spaghetti are made from a wheat kernal ground into flour. The kernal of wheat is packed with starch.

• CEREAL - A cereal is any plant that produces a grain, or kernal, that can be used for food. Wheat, oats, corn and even barley are examples of cereals.

• RICE - This is also a cereal, or grain from a plant. It is discussed alone because of its great importance to the human diet.

Pasta

Pasta is made up of three groups - noodles, spaghetti, and macaroni. All are made basically the same way. The ingredients for pasta are water, semolina flour and in the case of egg noodles, eggs are added along with water.

Semolina flour is made from a particular wheat called durum. The grains from this wheat contain more protein than grains of wheat used to make all purpose flour.

Protein in wheat is referred to as gluten. Gluten will stretch like elastic when it is wet and has been kneaded by hand or machine. Kneading
is a process of pressing down and folding the dough in half. This is usually
done for a few minutes. Due to the fact that semolina flour is high in
protein it will hold its shape better when it is cooked.

Pasta must be cooked in large amounts of boiling (212°F) water. The
starch in the semolina flour will absorb water as the pasta cooks making the
noodles, macaroni, or spaghetti at least double in size at the end of the
cooking time. As the starch cooks in the boiling water it is actually going
through a process where it will gelatinize. To gelatinize means that the
molecules soften from the hot liquid and swell in size. As the mixture cools
it will thicken and hold its shape. A starch granule is made up of many
molecules of starch. If the granule sits in cold water nothing happens to the
starch tightly packed inside it. As the water heats up to boiling, or
becomes more energetic, it will break open the granule and the starch
molecules escape into the water. This can be observed by watching the
foam build up on the surface of a pan of boiling rice or pasta. This foam is
actually molecules of starch.

After starch has become gelatinized, it will thicken as it cools. In
the case of pasta, it is served hot so the starch stays soft and flexible.

Cereal

Plants called grasses produce a grain. These grains are generally
clustered together somewhere near the top of the plant. The grains are
removed from the plant and are processed into what are called cereals. The
cereals most commonly used are wheat, rice, corn, oats, barley and rye.

Each grain actually contains three sections - the bran, endosperm, and
the germ. Refer to the illustration in the bread unit. Cold cereals are made
up of the endosperm section. The bran and the germ are removed and used for other purposes.

Hot cereals are generally made up of the whole grain. The human digestive system is unable to handle these whole grains raw so they must be cooked in large amounts of boiling water (212°F). When this occurs the bran is only softened somewhat. This outer layer is high in fiber (a part of the food that the digestive system cannot breakdown completely) and should be softened before eating. The endosperm is made up of starch. As with cooking pasta, the starch in cereal grains will swell as it absorbs the boiling water surrounding it. Cereal grains will double and sometimes triple in volume after cooking. One cup of dry oatmeal will equal two cups or more after cooking.

Rice

Rice is also the starchy grain of a grass, but it will be discussed separately because of its extreme importance as one of the worlds food crops. Rice feeds about half of the world population.

One cup of raw (uncooked) rice will equal 3 cups when fully cooked. Before the rice grains are sold, the hard outer hull is removed. What is left is the starchy endosperm. Rice is cooked in boiling water for 20-30 minutes. As the rice is boiling the starch granules absorb water and swell up. When fully cooked, the rice grain is three times its size. The fully cooked rice is easy to eat and digest, and contains a good source of energy the body needs.
Goals

This unit will teach students about one of our major sources of energy which is starch. Students will learn about where it is found in our foods and how to cook it.
LESSON PLAN

Title of recipe

CHOP SUEY CASSEROLE

STUDENT PERFORMANCE

Information, and Material that the Students Need:
Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:
The students will be able to prepare a simple main dish and be able to describe how rice cooks into soft grains.

How Students Will Be Evaluated:
The students will be evaluated on the successful completion of the recipe, their clean up work, and on their behavior.

INSTRUCTION

Set up:
The teacher will have prepared ahead of time the necessary ingredients.

Introduction (focus, motivation and anticipatory set):
The students will be learning about how to cook foods that are considered starch. The students will have read the student information on starch.

Content (key points of information):
The students will learn how to cook a starch to make it edible. The students will learn that starch absorbs water as it cooks in a boiling liquid.

Guided Practice (student activity):
The students will prepare the recipe in their groups and the teacher will monitor the classroom.

Closure (recap and wrap-up and/or clean-up):
The students will eat and enjoy the finished product. The class will review how rice cooks and also the difference in volume between cooked and uncooked rice.
# CHOP SUEY CASSEROLE

## OBJECTIVES

The student will be able to recognize the effect of heat and water on grains of rice. The student will be able to measure accurately the difference in the volume between uncooked and cooked rice.

## INGREDIENTS

<table>
<thead>
<tr>
<th>Items</th>
<th>Quantities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 pound ground beef</td>
<td></td>
</tr>
<tr>
<td>1⅛ C. uncooked rice</td>
<td></td>
</tr>
<tr>
<td>3 C. water</td>
<td></td>
</tr>
<tr>
<td>1 can cream of celery soup</td>
<td></td>
</tr>
</tbody>
</table>

## INSTRUCTIONS

1. Place the water in the large saucepan and put over high heat to boil. Once it begins boil, pour in the rice and stir a few times to prevent the rice from sticking.

2. Allow the water to get back to a boil. Once it is boiling, reduce the heat under the pan so the liquid will only simmer—that is where there are just tiny bubbles coming to the surface of the water. Cover the pan tightly and simmer about 12-15 minutes or until all the water is absorbed. Set the timer!

3. As the rice simmers, begin to cook the meat. Place the ground beef in the large frying pan. Place it over low to medium heat. As it cooks, crumble the meat with a wooden spoon. Cook until no more pink appears in the meat. Turn off the heat and spoon out the grease.

## MAKES 3-4 SERVINGS

<table>
<thead>
<tr>
<th>Items</th>
<th>Quantities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4 C. chopped onions</td>
<td></td>
</tr>
<tr>
<td>2 stalks of celery, chopped</td>
<td></td>
</tr>
<tr>
<td>2 T. soy sauce</td>
<td></td>
</tr>
</tbody>
</table>

## SCIENTIFIC NOTES

The water will boil at 212°. Place a candy thermometer on the side of the pan and watch the temperature rise as the water heat up.

When the water simmers it allows for more gentle cooking. Also, the water will not evaporate as quickly this way. The lid on the pan helps hold in liquid that has evaporated from the water.

Ground beef is meat from the part of the animal that is tough. It requires slow cooking and low heat to soften it.
### INSTRUCTIONS


5. In the large mixing bowl place the soup, cooked meat, and the cooked rice. Stir gently.

6. Heat the oven to 350°F. Place the casserole mixture in an ovenproof casserole dish. Sprinkle the soy sauce over it all. Cover with foil and bake for 25 to 30 minutes. Serve at once.

### SCIENTIFIC NOTES

- The heat will soften the cell walls of the celery and onions. It will also make the flavor of the onion less strong.

- Before adding the rice to the bowl, measure the amount of cooked rice there is when the cooking time is complete. The water that it was cooked in is now absorbed into the grains of rice. The starch in the center of the grain absorbs water and swells up.

- Covering the casserole with tin foil will help keep the moisture in the food. It would dry out if cooked uncovered. The soft grains of rice would lose the moisture that was boiled into them earlier.
LESSON PLAN

Title of recipe

COOKED PASTA

STUDENT PERFORMANCE

Information, and Material that the Students Need:

Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:

The students should be able to successfully prepare a cooked pasta. The students will be able to describe what happens to starch when boiled.

How Students Will Be Evaluated:

The students will be evaluated on the successful completion of the recipe, on their clean up, and on their behavior.

INSTRUCTION

Set up:

The teacher will have prepared ahead of time the necessary ingredients.

Introduction (focus, motivation and anticipatory set):

The students will have studied the student information sheet on starch. The students will be planning on preparing an Italian meal with a pasta dish included.

Content (key points of information):

The students will learn that starch molecules swell up with liquid as they cook, and that cooking makes starch easy to digest.

Guided Practice (student activity):

The students will work in their groups and the teacher will monitor the class.

Closure (recap and wrap-up and/or clean-up):

The students will prepare a sauce to serve with the pasta. The class and teacher will review the changes starch molecules make while cooking.
COOKED PASTA
(Spaghetti, Macaroni and Noodles)

OBJECTIVES

The student will measure accurately the water and pasta necessary to produce properly cooked noodles, macaroni, or spaghetti. The student will be able to identify the characteristics of cooking a food high in starch.

INGREDIENTS

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>About 1/4 pound pasta per serving.</td>
<td>About 4 quarts of water per pound of pasta.</td>
</tr>
</tbody>
</table>

INSTRUCTIONS

1. Place the water in a saucepan large enough to hold the required water. Place it over high heat and bring it to a boil.

2. Add the pasta to the boiling water and stir well to prevent it from sticking together as it cooks.

3. Allow the pasta to boil for about 12 to 15 minutes. To check for doneness, lift a piece out of the boiling water. Allow it to cool a moment, then taste it. If there is no taste of raw flour remaining then it should be done.

4. Place the colander in the sink and pour the pasta into it. Shake well to remove the excess water.

SCIENTIFIC NOTES

Attach a candy thermometer to the pan and watch the temperature rise. It will go to 212°F when at a full boil.

During this boiling time the starch molecules in the pasta will absorb the water and swell 2 to 3 times in size. This happens quickly with boiling water, but would taken a long time with cold water.
<table>
<thead>
<tr>
<th>INSTRUCTIONS</th>
<th>SCIENTIFIC NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Allow the pasta to boil for about 12 to 15 minutes. To check for doneness, lift a piece out of the boiling water. Allow it to cool a moment, then taste it. If there is no taste of raw flour remaining then it should be done.</td>
<td>During this boiling time the starch molecules in the pasta will absorb the water and swell 2 to 3 times in size. This happens quickly with boiling water, but would take a long time with cold water.</td>
</tr>
<tr>
<td>4. Place the colander in the sink and pour the pasta into it. Shake well to remove the excess water.</td>
<td></td>
</tr>
<tr>
<td>5. Serve with a spicy tomato sauce or cheese sauce, or toss with butter.</td>
<td></td>
</tr>
</tbody>
</table>
LESSON PLAN

Title of recipe

OATMEAL CAKE

STUDENT PERFORMANCE

Information, and Material that the Students Need:

Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:

The students will be able to prepare a recipe successfully that uses a whole grain starch. They will recognize how starch swells when cooked.

How Students Will Be Evaluated:

The students will be evaluated on the successful completion of the recipe, on the clean up work, and on behavior.

INSTRUCTION

Set up:

The teacher will have ready for the students the necessary ingredients.

Introduction (focus, motivation and anticipatory set):

The students will have studied about cooking with starch - in particular, whole grain starch.

Content (key points of information):

Students will review what happens to starch when it is cooked with hot liquid.

Guided Practice (student activity):

The students will work in their groups to prepare the recipe as the teacher monitors the room.

Closure (recap and wrap-up and/or clean-up):

The students will eat and enjoy the finished product. The completed recipe will be evaluated by the teacher and students. The class will review the cooking characteristics of whole grain starch, that is, how it swells up as it absorbs liquid.
# Oatmeal Cake

## Objectives

The student will recognize how starch is changed by cooking it in a hot liquid.

## Ingredients

<table>
<thead>
<tr>
<th></th>
<th>Makes Two 9” Cakes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 C. quick (not instant) cooking oatmeal</td>
<td>2 eggs</td>
</tr>
<tr>
<td>1 C. boiling water</td>
<td>1 C. flour</td>
</tr>
<tr>
<td>½ C. margarine</td>
<td>1 t. baking soda</td>
</tr>
<tr>
<td>1 C. brown sugar</td>
<td>1 t. baking powder</td>
</tr>
<tr>
<td>1 large banana—very ripe</td>
<td>pinch of salt</td>
</tr>
<tr>
<td></td>
<td>1 t. cinnamon</td>
</tr>
<tr>
<td></td>
<td>½ t. ground cloves</td>
</tr>
</tbody>
</table>

## Instructions

1. Grease two 9" round cake pans with 1 t. shortening, Set aside.

2. Preheat the oven to 350°F.

3. In a small mixing bowl place the dry oatmeal. Pour the boiling water over it and stir just a few times. Set aside.

4. Put the brown sugar and margarine in the medium size mixing bowl. Beat with the mixer at medium speed until they are well combined—about 2 minutes.

5. Add the eggs and beat at medium speed until smooth.

## Scientific Notes

The shortening will keep the cake moist on the sides and help keep it from sticking.

The starch molecules in the grains of oatmeal will absorb the hot water quickly. This would not happen easily with cold water.

In the mixing process the margarine will soften and the vegetable oil in the margarine will begin to dissolve the sugar slightly.

Beating the eggs will help make them fluffy. The air beaten in will make bubbles that are held together by the protein molecules in the egg white.
### OATMEAL CAKE (cont'd)

<table>
<thead>
<tr>
<th>INSTRUCTIONS</th>
<th>SCIENTIFIC NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Into a separate bowl, sift the flour, baking soda, baking powder, salt, cinnamon, and cloves.</td>
<td>The mashing will cause the cell walls to burst and the liquid will run free. The mashed banana will be almost a liquid.</td>
</tr>
<tr>
<td>7. In a small bowl, slice the banana and mash it with a fork.</td>
<td>The oatmeal will have at least doubled in size due to the absorbption of water.</td>
</tr>
<tr>
<td>8. Before using the oatmeal for the cake batter, measure it to see just how much more there is now that it has soaked in the boiling water.</td>
<td>The action of the baking soda, baking powder, and the egg will make this thick cake batter rise.</td>
</tr>
<tr>
<td>9. Place the mashed banana and sifted dry ingredients in the medium size mixing bowl with the egg mixture. Beat with the mixer at low speed 2 minutes.</td>
<td></td>
</tr>
<tr>
<td>10. With a spoon, beat in the oatmeal for one to two minutes.</td>
<td></td>
</tr>
<tr>
<td>11. Pour into the prepared pans and bake about 25 minutes or until the centers feel firm when lightly touching them.</td>
<td></td>
</tr>
<tr>
<td>12. Cool to room temperature and frost with vanilla frosting or serve with vanilla ice cream.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT QUIZ 6

STARCH-PASTA, CEREAL and RICE

Put the letter that corresponds with the correct answer (a or b) pertaining to the second part of the question in the line on the left.

1. Starch comes from _____________________________.
   a. plants.
   b. mostly animals.

2. Our bodies need starch for _____________________________.
   a. its high mineral content.
   b. its energy content.

3. Pasta includes all macaroni, noodles, and spaghetti which are made of _____________________________.
   a. wheat flour.
   b. whole grains.

4. Oats, corn, and barely are examples of _____________________________.
   a. rices.
   b. cereals.

5. Semolina flour is _____________________________.
   a. made from durum wheat which contains lots of protein.
   b. a dark colored flour.

6. Gluten is the ____________________________ found in wheat.
   a. starch.
   b. protein.

7. In order to cook properly, pasta must be cooked in water that is _____________________________.
   a. boiling.
   b. simmering.

8. Each grain contains three parts called the bran, endosperm, and the _____________________________.
   a. root.
   b. germ.

9. Rice is also a grain and about ____________________________ of the world’s population eats it.
   a. one-half.
   b. one-eighth.

10. As rice boils it will ____________________________ water.
    a. absorb.
    b. discolor.
Chapter Seven

Dairy Products
DAIRY PRODUCTS
STUDENT INFORMATION

Introduction

The dairy products group actually includes anything made from milk. These foods include all types of milk, cream, butter, and cheese. Each of these will be touched on briefly.

The foods in this group offer plenty of the things the body needs to be healthy. Milk has lots of calcium for strong bones and teeth, and a good amount of protein to help build and repair the body tissues. For growing children and teenagers, there should be plenty of milk products in their meals each day.

Milk

Fluid milk can be served in a glass or poured over cereal at mealtimes. Cooking with milk creates some tricky situations. Milk contains a large amount of protein. It must be warmed over low heat when cooking with it on top of the stove.

There are three types of protein in milk - casein, albumin, and protein globulin. This protein in milk is affected by heat, and by the addition of something acid - like lemon juice, vinegar, or tomato juice. When milk is placed in a saucepan and cooked over high heat, the protein in the milk will burn and scorch the bottom of the pan. If the milk boils too long, eventually the protein in the milk will coagulate. This means that the protein molecules begin to stick together and form large curds or clumps in the liquid. This is not harmful to eat, but it will look unappetising in a cream soup made with lots of milk.
Some recipes require something acidic to be added to milk. For example, when making tomato soup, tomato sauce is mixed with milk. This will cause an immediate coagulation of the protein in the milk. The ingredients can no longer be used for soup if this happens. To avoid the problem, the milk must first be thickened with flour. Once the thickening process occurs, the acidic ingredient can be blended into the milk.

There are a few situations where fluid milk is intentionally thickened with the addition of bacteria. Yogurt and buttermilk are such examples. To produce yogurt, the bacteria lactobacillus bulgaricus and streptococcus thermophilus are blended into milk. Bacteria are tiny microscopic, one cell organisms. There are about 1,600 different types on earth. After the addition of these bacteria, the mixture is held at about 110°F for four hours. During this time a thick, smooth product is created. Buttermilk used to be the liquid mixture left behind after butter was made. Today, buttermilk is made in a similar style to yogurt. Nonfat milk has a bacteria added to it so a thick, creamy texture is developed. The end product is rather sour or tangy. When used in baking breads and cakes, the flavor of buttermilk adds an appealing taste to the finished product.

Cream

Cream is made up of fat globules (clusters of fat molecules) taken out of milk. This cream is used to produce whipped cream for dessert toppings or to make butter. When cream is whipped it doubles in volume. Whipped
cream is really a foam made up of air and water that is thickened by the protein in the cream. As the whipping process takes place, the molecules of protein become attracted to each other and form a thin film of coagulated (thickened) molecules. This film is what makes the liquid cream turn into a soft, solid mixture that can be spooned on top of desserts. The fat molecules surround the foamy bubbles as the cream is whipped and help give the foam a solid appearance.

Butter is made from cream that has been removed from milk. The cream is churned - that is, it is stirred very hard until the fat molecules start to cluster together and form large clumps of butter. The solid pieces of butter are strained out from the liquid that is left. This liquid is called buttermilk. As mentioned previously, most buttermilk today is manufactured by adding bacteria to milk.

Butter is used frequently as the fat for cakes, cookies and other dessert items. Occasionally, some foods are fried in a pan with butter. Butter burns easily, though and the heat must be kept low. The smoking point of butter is 250°F. Smoking point refers to the temperature at which a fat, when heated, will produce smoke. What is really happening is the fat in the butter is breaking down into a visible gas. These smoke fumes produced from the hot butter are unpleasant and the taste of the food cooking in the butter is ruined. The low smoking point of butter can be compared to the smoking point of cooking oil which is 500° to 750°F.

Cheese

The last product from the milk group to be discussed is cheese. The making of cheese begins with the process of making milk sour by adding bacteria. This time bacteria may be from lactic acid. Lactic acid occurs
naturally in milk. An artificial method to sour and curdle milk is sometimes used. In this case rennet is added to milk. Rennet contains an enzyme which breaks down milk into curds and whey. An enzyme is a chemical that causes a specific reaction to take place. The curds and whey that are formed are then separated. The curds - the thick clumps of milk - are strained out from the whey. These curds are the protein molecules that have attached together to form large chunks. This will be processed into cheese. The yellowish liquid called whey can be used by the food product industry for a variety of purposes.

Cooking with cheese requires some special care. Cheese must be heated over low heat and only for a very short time. Cooking for too long and at too high a temperature will toughen the protein in the cheese making it stringy and chewy rather than soft and tender. One example of this would be the making of cheese sauce to pour over cooked vegetables. A cheese sauce is made by cooking slowly milk, butter, and flour in a saucepan. This mixture is cooked until slightly thickened. Grated cheese is then stirred into the same pan and heated until it melts. If this mixture is allowed to come to a full boil or to cook for too long, the protein in the cheese will become stringy and the appearance of the cheese sauce will be ruined. Once the proteins harden, they can not be smoothed out again.

Goals

Students completing this unit will be able to list several foods made from milk. The students will be aware of special cooking principles involved with milk and milk products.
LESSON PLAN

Title of recipe

MACARONI AND CHEESE

STUDENT PERFORMANCE

Information, and Material that the Students Need:

Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:

The students should be able to successfully complete the recipe, and will learn how milk is thickened to make a sauce.

How Students Will Be Evaluated:

The students will be evaluated on the successful completion of the recipe, on their clean up, and on their behavior.

INSTRUCTION

Set up:

The teacher will have prepared ahead of time the necessary ingredients.

Introduction (focus, motivation and anticipatory set):

The students will be learning about how to cook with milk products. They will study the student information section for this unit.

Content (key points of information):

The students will learn that milk must be cooked over low heat and that flour will thicken milk. The addition of grated cheese will make a cheese sauce.

Guided Practice (student activity):

The students will work in their groups and the teacher will monitor the class.

Closure (recap and wrap-up and/or clean-up):

The students will serve and eat their finished product. The teacher and the students will evaluate the product. The class will discuss how the milk thickened from the flour and why it was important to use low heat.
MACARONI and CHEESE

OBJECTIVES

The student will be able to measure the difference in volume of a starch, such as pasta, before it is boiled in water and after. Students will be able to describe how starch molecules absorb water.

INGREDIENTS

| 1 C. dry elbow macaroni | 2 T. flour |
| 4 C. water | 4 oz. Velvetta cheese |
| 2 T. margarine | 1 C. milk |

SERVES 3-4

INSTRUCTIONS

1. In the large saucepan bring the 4 C. of water to boil.

2. When the water is boiling pour in the macaroni. Stir several times to prevent the macaroni from sticking. Allow the water to get back to a full boil and then boil the macaroni for 10 minutes. Cook uncovered. (see step #4)

3. Place the colander in the sink and drain the macaroni well.

4. While the macaroni is boiling, start the cheese sauce. Fill the bottom part of a double boiler with the appropriate amount of water.

SCIENTIFIC NOTES

Water boils at 212°F. Place a candy thermometer on the side of the pan and observe the temperature readings.

As the pasta cooks in boiling water the starch molecules absorb water and swell up. This will not happen if the water is cold or if it is not cooked long enough. Some foam will appear on the surface of the water. This is the starch coming out of the pasta.

Measure the cooked, drained pasta and observe that it has doubled in volume due to the absorption of the boiling water.

Margarine will be solid when kept chilled, but will gradually melt when exposed to heat.
### INSTRUCTIONS

Set it on high heat. Place the margarine in the top pan and place the pan over the boiling water. Allow the margarine to melt. Stir the flour into the margarine until smooth.

5. Pour the milk into the top of the double boiler. Stir with a wooden spoon until smooth.

6. Stir and cook the mixture in the top pan until it becomes slightly thickened.

7. The milk mixture will be thickened now. Cut the Velvetta into 6 or 8 cubes and drop into the top pan.

8. Cook the cheese mixture just long enough to melt all the cheese. Place the cooked macaroni and the cheese sauce into a large mixing bowl and stir well. Serve at once.

### SCIENTIFIC NOTES

The various fats in margarine break down gradually and eventually soften the whole structure.

Use a wooden spoon when cooking on the stove instead of metal. Metal holds in heat and will burn your hand if it is left in the pan. Wood will not hold in heat like metal.

Cooking in a double boiler will help prevent the burning of foods. The water in the lower pan boils generating steam. The steam then circulates around the bottom of the top pan. It is the heat from the steam (which is slightly hotter than boiling water) that cooks the food. This will never get so hot as to burn the food in the pan.

The milk has thickened because the starch in the flour has absorbed the water in the milk. The starch molecules will swell up and retain enough liquid to make them double in size. Be sure to cut the cheese into small pieces before melting in the sauce because it will melt faster that way.
LESSON PLAN

Title of recipe

PUMPKIN PIE

STUDENT PERFORMANCE

Information, and Material that the Students Need:

Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:

The students will be able to prepare a pumpkin pie and understand how the filling thickened.

How Students Will Be Evaluated:

The students will be evaluated on the successful completion of the recipe, on their clean up work, and on their behavior.

INSTRUCTION

Set up:

The teacher will have prepared ahead of time the necessary ingredients for the recipe.

Introduction (focus, motivation and anticipatory set):

The students have studied about cooking with milk and have reviewed the student information for the unit on milk. This recipe will teach them about how milk can be thickened.

Content (key points of information):

Two important ingredients in this recipe - milk and eggs - are to be discussed. Students need to be aware that the protein in milk and eggs thickens, and makes the pie filling firm.

Guided Practice (student activity):

The students will work in groups preparing the recipe as the teacher monitors the classroom.

Closure (recap and wrap-up and/or clean-up):

The students will eat and enjoy the finished product. The quality of the finished product will be determined by the teacher and the students. We will discuss how the pie filling changed from liquid to solid, and why it did so.
**PUMPKIN PIE**

**OBJECTIVE**

The students will be able to recognize the effect of eggs on a creamy pie filling. They will be able to identify the coagulating properties of the eggs.

**INGREDIENTS**

| 1 9" frozen pie crust | 3/4 C. sugar |
| 2 eggs | ½ t. salt |
| 2 C. canned pumpkin | 1 t. cinnamon |
| 1/4 t. ground cloves | ¼ t. ground ginger |
| 1½ C. evaporated milk (12 oz. can) |

**INSTRUCTIONS**

1. Preheat the oven to 425°F.

2. Put the eggs in the large mixing bowl and beat until the yolks and the whites are completely combined.

3. Into the medium size mixing bowl sift the sugar, salt, cinnamon, ginger, and cloves. Now, pour this mixture, the pumpkin, and the milk into the large mixing bowl. Use the wire whip to blend everything completely.

4. Pour the filling carefully into the crust. Place the pie into the oven and bake for 15 minutes at 425°F. Then, reduce the heat to 350°F and bake 45 more minutes. To test for doneness insert the tip of a knife into the center of the filling. If it comes out clean, it is done. Set on cooling rack to cool to room temperature. Refrigerate any pie not eaten after a few hours.

**MAKES ONE 9" PIE**

**SCIENTIFIC NOTES**

In this recipe the eggs will act as a thickener. The protein molecules will coagulate from the heat of the oven. This will give the filling its firm texture.

The oven heat will cause the protein in the eggs to coagulate making the filling firm. The finished pie should not stay out at room temperature for more than 3-4 hours because bacteria may grow in the moist filling.
TITLE OF RECIPE

RANCH STYLE SALAD DRESSING

STUDENT PERFORMANCE

Information, and Material that the Students Need:
Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:
The students will be able to successfully prepare a salad dressing. They will be able to describe what happens when acid is added to milk.

How Students Will Be Evaluated:
The students will be evaluated on their successful completion of the recipe, on their clean up, and on their behavior.

INSTRUCTION

Set up:
The teacher will have prepared ahead of time the necessary ingredients.

Introduction (focus, motivation and anticipatory set):
The students will be learning about how to cook with milk, and the special cooking properties of milk and milk products.

Content (key points of information):
The students will become aware of what happens to milk when an acid is poured into it.

Guided Practice (student activity):
The students will work in their groups to prepare the recipe and the teacher will monitor the class.

Closure (recap and wrap-up and/or clean-up):
The students will serve the dressing with a salad. The class will review special properties of milk and how they are utilized in cooking.
RANCH STYLE SALAD DRESSING

OBJECTIVE

The student will observe the effect of acid on a milk product. The student will be able to define coagulation.

INGREDIENTS

<table>
<thead>
<tr>
<th>1 C. dry milk powder</th>
<th>2 t. dry mustard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4 C. sugar</td>
<td>1 t. garlic powder</td>
</tr>
<tr>
<td>4 t. leafy basil</td>
<td>1 t. salt</td>
</tr>
</tbody>
</table>

INSTRUCTIONS

1. Use a large spoon to stir all ingredients together in a bowl. Store tightly covered.

To prepare the liquid dressing to make 1 cup.

INGREDIENTS

<table>
<thead>
<tr>
<th>1/4 c. dry mix</th>
<th>1/4 c. water</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 mayonnaise</td>
<td>2 t. lemon juice</td>
</tr>
</tbody>
</table>

INSTRUCTIONS

1. Place the dry mix, mayonnaise, water, and lemon juice in a medium size mixing bowl. Stir well with a wire whip until smooth.

The mixture will have thickened slightly from the acid reacting with milk. The protein molecules in the milk coagulate (clump together) causing large curds to form. Mixing with a wire whip will smooth out the curds but the mixture remains thickened.
RANCH STYLE SALAD DRESSING (cont'd)

<table>
<thead>
<tr>
<th>INSTRUCTIONS</th>
<th>SCIENTIFIC NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Keep chilled until serving with green salad. Shake or stir well before serving.</td>
<td>Keeping the mixture cold will help keep its thickened shape. Also, it will help prevent the growth of bacteria that can occur anywhere from 40°F up to 140°F.</td>
</tr>
</tbody>
</table>
LESSON PLAN

Title of recipe

VANILLA ICE CREAM

STUDENT PERFORMANCE

Information, and Material that the Students Need:
Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:
The students will be able to prepare a quick ice cream.

How Students Will Be Evaluated:
The students will be evaluated by the successful completion of
the recipe, of their clean up, and on their behavior.

INSTRUCTION

Set up:
The teacher will have prepared ahead of time the necessary
ingredients for the recipe.

Introduction (focus, motivation and anticipatory set):
The students will be studying about milk and dairy products.
The students will learn about the cooking properties of cream.

Content (key points of information):
The students will learn about what happens when cream is
whipped. They will learn that it makes a foam that holds its
shape. They will learn why this happens (because the fat
solidifies).

Guided Practice (student activity):
The students will work in groups preparing the recipe as the
teacher monitors the class.

Closure (recap and wrap-up and/or clean-up):
The students will eat and enjoy the finished product. The
teacher and the students will evaluate the results. The class
will review how the liquid cream turned into a foam.
VANILLA ICE CREAM

OBJECTIVES

The student will be able to explain why ice cream comes out smooth and fluffy even though it is a frozen product.

INGREDIENTS

1 can sweetened condensed milk

INGREDIENTS

MAKES 5 CUPS

2 T. vanilla
1 pint whipping cream

INSTRUCTIONS

1. Place the sweetened condensed milk and the vanilla in the medium size mixing bowl and stir well using a wire whip.

2. Place the whipping cream in the medium size mixing bowl. Beat it at low speed with the mixer until it begins to thicken. Gradually increase the speed and beat it until stiff peaks form when the mixer is shut off and the beaters are pulled up. Do not overbeat! It will turn into butter if overbeaten.

3. Using the wire whip, blend together the whipped cream and the sweetened condensed milk in the large mixing bowl. Blend just until completely combined.

4. Pour into a freezer container at once. Freeze several hours.

MAKES 5 CUPS

This type of milk is simply regular milk that has had one-half of the water removed and has had sugar added in high concentrations.

SCIENTIFIC NOTES

Whipping cream comes from the cream in milk. It is about 30% butter fat. When beaten, air bubbles are mixed in and held together by the fat molecules. If the cream is beaten too much the fat molecules become hard and form clumps of butter.

The air bubbles formed in the mixture will make the ice cream smooth even when frozen. Without the bubbles the ingredients would freeze hard as a rock.

The freezer temperature of about 0°F will keep the water molecules well frozen and hard. Water will freeze at 32°F.
LESSON PLAN

Title of recipe

VANILLA PUDDING

STUDENT PERFORMANCE

Information, and Material that the Students Need:
Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:
The students should be able to successfully complete the pudding recipe, and be able to explain why starch thickens the milk.

How Students Will Be Evaluated:
The students will be evaluated on the successful completion of the recipe, on their clean up, and on their behavior.

INSTRUCTION

Set up:
The teacher will have ready ahead of time the necessary ingredients.

Introduction (focus, motivation and anticipatory set):
The students will be studying about how to cook with milk and why milk can be thickened with starch.

Content (key points of information):
The students will learn about the starch molecules (from cornstarch) absorbing the water in the milk to make a thick mixture. They will learn why the mixture must cook over low heat.

Guided Practice (student activity):
The students will prepare the recipe in their groups and the teacher will monitor the classroom.

Closure (recap and wrap-up and/or clean-up):
The students will eat and enjoy the finished product. The teacher and students will evaluate the success of the finished product. The class will review the role of the cornstarch and discuss why the double boiler was used.
VANILLA PUDDING

OBJECTIVES

The student will measure accurately a simple dessert recipe. The student will be able to identify the effects of a starch in a recipe using large amounts of milk.

INGREDIENTS

<table>
<thead>
<tr>
<th>3 T. cornstarch</th>
<th>1 egg</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4 C. sugar</td>
<td>2 T. margarine</td>
</tr>
<tr>
<td>2 C. milk</td>
<td>1 t. vanilla</td>
</tr>
</tbody>
</table>

INSTRUCTIONS

1. Place water in the bottom of the double boiler. Place the pan over high heat to bring it to a boil.

2. In the top of the double boiler stir together the cornstarch and sugar. Set the top pan over the bottom pan.

3. In the medium size mixing bowl beat the egg using a wire whip. Beat in the milk until well combined. Pour this into the top of the double boiler and stir well using a wooden spoon.

4. Keep the water boiling in the lower portion of the double boiler. Cook the pudding for about 8 minutes.

SCIENTIFIC NOTES

The cornstarch comes from the starch molecules of corn kernals. When heated with a liquid the starch molecules will swell and absorb liquid making it thicken.

The egg in this recipe will also make the milk thicken. The protein molecules in the egg will coagulate as they heat up. This coagulation causes a thickening effect. Eggs begin to thicken at 144°F.

As the water boils in the bottom pan it creates steam. The steam is hot enough to cook the food in the top pan but not so hot as to burn it.
## VANILLA PUDDING (cont'd)

### INSTRUCTIONS

5. When the mixture is thickened, remove the top pan from the heat.

6. Stir in the vanilla and margarine. Stir until the margarine melts.

7. Pour the mixture into dessert dishes and allow to chill until firm. Serve with whipped cream.

### SCIENTIFIC NOTES

If the pan is allowed to stay over the hot steam too long it will overcook the egg. This will cause the protein to form hard clumps that will not stir out.

During the cooling process the swollen starch molecules will have time to become a solid mass. This will make the pudding hold its shape when spooned out.
UNIT QUIZ #7

DAIRY PRODUCTS

Put the letter that corresponds with the correct answer (a or b) pertaining to the second part of the question in the line on the left.

1. The dairy products group includes __________________________.
   a. eggs.
   b. anything made with milk.

2. One of the most important nutrients found in milk is ________.
   a. calcium.
   b. vitamin C.

3. Because milk contains lots of _______________ it must be cooked over low heat.
   a. water.
   b. protein.

4. Acid added to milk will make the milk ________________.
   a. curdle.
   b. turn brown.

5. When protein coagulates, the molecules actually ____________.
   a. stick together and form a clump.
   b. dissolve.

6. Yogurt is made by adding ________________ to milk.
   a. bacteria.
   b. sugar and fruit.

7. The clusters of fat molecules in milk are called ____________.
   a. globules.
   b. carbohydrates.

8. Cream can be whipped because it ________________.
   a. contains more water than fat.
   b. will hold air after beating.

9. Cheese is really milk that has had an ________________ added to it to make it hard.
   a. acid.
   b. aroma.

10. Cheese must be cooked with low heat, otherwise it will become ____________________.
    a. runny.
    b. hard and very chewy.
Chapter Eight

Candies
CANDIES

STUDENT INFORMATION

Introduction

Making candy can be one of the more fun areas of cooking, yet it can also be very tricky. There are some general principles of cooking that must be considered when preparing such wonderful treats.

The main ingredient in candy is sugar which comes from the plants called sugar beets and sugar cane. Sugar beets grow plentiful in the United States and sugar cane (a 20-foot-tall member of the grass family) grows in several countries around the world. The beet and cane are processed into what is commonly called table sugar. This is the white, granulated sugar used to cook many foods.

Corn syrup is another form of sweetener used in making candy. The natural sugar is processed out of the kernals of corn. Then, a thick, clear syrup is produced. The value of using corn syrup in making candy is that it will not form grainy crystals during the cooking process. Such crystals will create an unpleasant texture to the finished product.

Three types of candy will be discussed. These include fudge, caramel, and hard candy.

Fudge

This type of candy is classified as a crystalline. That means that sugar is dissolved with heat and then crystallized again to make small crystals. A crystal is formed when a liquid gradually forms into a solid, such as with water freezing into ice. Small crystals feel smooth in the mouth, whereas
large crystals feel sharp and very grainy. The particular size the crystals come out is determined by the type of ingredients, how long they are cooked, and how well the ingredients were beaten after cooking.

The critical step in making fudge is boiling together the sugar and the milk. Keeping track of the exact temperature of the ingredients is a must and can be done with the use of a candy thermometer. In the case of making fudge, the temperature should not go over about 235° or 240°F. This temperature will produce soft, tiny crystals which will taste creamy when the fudge is complete.

Caramel

This kind of candy is noncrystalline. That is, tiny crystals of sugar are not formed in the cooking process. Caramel is made with milk, sugar, and butter. These ingredients are boiled a little higher than fudge - to about 245° or 250°F. The mixture is not stirred very much, thus not allowing for the formation of crystals. This produces a chewy texture.

Caramel flavor comes from the browning (or nearly burning) reaction between the milk proteins and the sugar. When the sugar is heated to the point that its molecules break apart, the chemical reaction of caramelization begins. This will produce the distinct flavor of caramel. A simple way to see caramelization is to put a small amount of sugar in a pan and heat it over medium heat. Stir or shake constantly and watch the sugar turn darker in color. When it is only light brown it is at the point of being caramel-like in flavor.
Hard Candy

Lollipops are made from simply boiling sugar, water, and corn syrup together until the mixture reaches a temperature of 300°F. At this point, the mixture will be only 1 or 2% moisture. The water is nearly all boiled out and all that remains is the sugar. The boiled mixture is poured into molds and cooled without any stirring. This prevents the formation of tiny crystals. The addition of corn syrup to the hard candy ingredients helps prevent tiny crystals from forming.

The following chart of candy temperatures will indicate various types of candy made as the mixtures are cooked longer and longer.

<table>
<thead>
<tr>
<th>Temperature of sugar and water mixture</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>230°-235°F</td>
<td>thin syrup</td>
</tr>
<tr>
<td>235°-240°F</td>
<td>fudge</td>
</tr>
<tr>
<td>246°-250°F</td>
<td>caramel</td>
</tr>
<tr>
<td>250°-265°F</td>
<td>marshmallows</td>
</tr>
<tr>
<td>270°-380°F</td>
<td>hard candy</td>
</tr>
</tbody>
</table>

Goals

Students will be able to use a thermometer to determine the correct temperature of the ingredients. Crystal formation will be observed in preparing fudge.
LESSON PLAN

Title of recipe

CARAMEL CORN

STUDENT PERFORMANCE

Information, and Material that the Students Need:

Recipes and ingredients.

What Students Should Be Able to Do By The End Of The Lesson:
The students will be able to prepare the caramel corn recipe successfully. The students will learn how to properly cook a sugar mixture when making candy.

How Students Will Be Evaluated:
The students will be evaluated on the successful completion of the recipe, on their clean up, and on their behavior.

INSTRUCTION

Set up:
The teacher will prepare the necessary ingredients for the recipe.

Introduction (focus, motivation and anticipatory set):
The unit of study is candy and the students will learn about sugar mixtures in the preparation of candies.

Content (key points of information):
The students will learn that popcorn pops because the moisture in the kernal turns to steam and bursts open the kernal. The students will understand why the sugar mixture can only boil so long.

Guided Practice (student activity):
The students will work on the recipe in their groups. The teacher will monitor the classroom.

Closure (recap and wrap-up and/or clean-up):
The students will enjoy the finished product. The class will review the reason the kernals pop open and how the caramel topping was made.
CARAMEL CORN

OBJECTIVES

The student will be able to identify the reason that corn kernals pop.

INGREDIENTS

POPCORN:
2 T. oil
1/4 C. popping corn

MAKES ABOUT TWO QUARTS

INSTRUCTIONS

1. You will need a large frying pan with a tight fitting lid. Place the oil in the frying pan and place over medium heat for one minute only.

2. Add the corn kernals to the pan and cover tightly. With one hand, hold the lid on firmly. With the other hand, shake the pan slightly above the heat. Shake until it sounds as tough all kernals have popped. This shaking (also called agitation) is necessary to keep kernals from sitting too long on the bottom of the pan and burning.

3. Remove the popped kernals from the pan and place in a large mixing bowl. Be careful not to allow any unpopped kernals to get into the bowl.

SCIENTIFIC NOTES

The oil will get hot and rise to a temperature necessary to pop the corn kernals.

Corn kernals are the seeds of the corn plant. These kernals contain a small amount of moisture necessary to keep the cells alive. When a kernal of popping corn is heated quickly, the water inside turns to steam. This steam puts strong pressure on the seed and bursts the tough outer coating. The soft starchy material inside the seed now is puffed up around the husk.
CARAMEL CORN (cont'd)

INGREDIENTS

<table>
<thead>
<tr>
<th>CARAMEL TOPPING:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 C. brown sugar</td>
<td>1/4 t. baking soda</td>
</tr>
<tr>
<td>2 T. light corn syrup</td>
<td>1/4 t. salt</td>
</tr>
<tr>
<td>1/4 C. butter or margarine</td>
<td></td>
</tr>
</tbody>
</table>

INSTRUCTIONS

1. Place all ingredients for the topping in a small heavy saucepan. A good stainless steel or thick aluminum pan is best.

2. Place the pan over medium heat. Stir constantly and allow the mixture to get to a full boil. A full boil is when you have bubbles coming up from the center of the pan and not just around the edges.

3. Once the full boil is reached, stir very gently and boil for four full minutes.

4. Remove the pan from the heat and immediately pour the caramel over the popped corn in the bowl. Pour and stir quickly and try to get all the corn covered.

5. Place tin foil over a cookie sheet, scatter the caramel corn over the foil. Set in an oven and set at 200°F for about 20 minutes. Cool to room temperature and eat.

SCIENTIFIC NOTES

A pan made from thin metal will cause sugar to burn. Sugar must melt slowly and mix with the other ingredients to help prevent burning.

During this cooking time, the mixture will reach a temperature of about 240°F. This sugar mixture will be thick and chewy when cooled.

The hot sugar mixture will harden as it cools. The moisture content of the caramel will be very low because of the boiling process.

This added cooking time allows the caramel mixture to crispen and get hard on the popped corn.
LESSON PLAN

Title of recipe

FUDGE

STUDENT PERFORMANCE

Information, and Material that the Students Need:
Recipes, ingredients, and candy thermometers.

What Students Should Be Able to Do By The End Of The Lesson:
The students will be able to prepare fudge successfully and understand how boiling the sugar will make the fudge thicken.

How Students Will Be Evaluated:
The students will be evaluated on the successful completion of the recipe, on their clean up, and on their behavior.

INSTRUCTION

Set up:
The teacher will have prepared ahead of time the necessary ingredients.

Introduction (focus, motivation and anticipatory set):
The students will be studying about how different candies are prepared. They will learn that the boiling of sugar and water is the important step in candy making.

Content (key points of information):
The use of a candy thermometer is critical in the preparation of this recipe. An exact temperature must be reached.

Guided Practice (student activity):
The students will prepare this recipe in their kitchens and the teacher will monitor the class.

Closure (recap and wrap-up and/or clean-up):
The students will eat and enjoy the finished product. The students and teacher will evaluate the fudge. The class will review the use of a thermometer in the recipe and of the importance in keeping track of temperatures of the mixture.
FUDGE

OBJECTIVES
The student will recognize the importance of accurately reading a thermometer in the making of fudge. The student will be able to accurately measure the ingredients.

INGREDIENTS

| 3 C. sugar | 1 1/2 C. milk |
| 2/3 C. cocoa | 1/4 C. butter or margarine |
| 1/8 t. salt (fill the 1/4 t. half full) |

MAKES 36 SQUARES

INSTRUCTIONS

1. With 1 t. butter or margarine, grease a 9" square pan, set aside.

2. Place the sugar, cocoa and salt in a heavy, 4 qt. size saucepan. Stir in the milk. Stir carefully to not allow food to splash up on the sides of the pan. That food may burn and drip into the fudge and ruin the flavor.

3. Place the pan over medium heat and stir slowly and constantly. Bring the mixture to full boil. A full boil will be when there are bubbles into middle of the pan.

4. Place the candy thermometer on the side of the pan. Be sure the bottom of the thermometer does not touch the bottom of the pan. Allow the mixture to boil until it reaches 234°F. Do not stir during this step!! Do not stir at this step. Stirring will cause formation of sugar crystals which are not desirable at this point. They would make the fudge taste rough.

SCIENTIFIC NOTES

Stir carefully to not allow food to splash up on the sides of the pan. That food may burn and drip into the fudge and ruin the flavor.

A full boil will be when there are bubbles into middle of the pan.

Do not stir during this step!! Do not stir at this step. Stirring will cause formation of sugar crystals which are not desirable at this point. They would make the fudge taste rough.
5. Remove the pan from the heat at once. Add the butter or margarine and vanilla, but do not stir. Allow the mixture to cool to 110°F.

6. With a large spoon-such as a wooden spoon-beat the fudge until it thickens and just begins to lose some of its gloss. Quickly spread into the prepared pan. Allow to sit 3 to 4 hours before cutting into squares.

<table>
<thead>
<tr>
<th>INSTRUCTIONS</th>
<th>SCIENTIFIC NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Remove the pan from the heat at once. Add the</td>
<td>The beating at this point will develop sugar crystals that will give the fudge its</td>
</tr>
<tr>
<td>butter or margarine and vanilla, but do not stir.</td>
<td>thick texture. Do not over beat or it will become too thick to pour and it will not</td>
</tr>
<tr>
<td>Allow the mixture to cool to 110°F.</td>
<td>be creamy in texture.</td>
</tr>
<tr>
<td>6. With a large spoon-such as a wooden spoon-beat</td>
<td></td>
</tr>
<tr>
<td>the fudge until it thickens and just begins to</td>
<td></td>
</tr>
<tr>
<td>lose some of its gloss. Quickly spread into the</td>
<td></td>
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<tr>
<td>prepared pan. Allow to sit 3 to 4 hours before</td>
<td></td>
</tr>
<tr>
<td>cutting into squares.</td>
<td></td>
</tr>
</tbody>
</table>
LESSON PLAN

Title of recipe

LOLLIPOPS

STUDENT PERFORMANCE

Information, and Material that the Students Need:
Recipes, ingredients, special molds for making lollipops, and candy thermometers

What Students Should Be Able to Do By The End Of The Lesson:
The students will be able to prepare a recipe for lollipops.

How Students Will Be Evaluated:
The students will be evaluated on the successful completion of the recipe, on their clean up work, and on their behavior.

INSTRUCTION

Set up:
The teacher will have prepared ahead of time the necessary ingredients for the recipe.

Introduction (focus, motivation and anticipatory set):
The students have been studying about candy making and the boiling of sugar mixtures in the preparation of candy. They will have studied the student information at the beginning of the unit.

Content (key points of information):
The students will be informed of the key aspect of making candy - the boiling of sugar and water. Students will learn that using a candy thermometer is vital when making candy.

Guided Practice (student activity):

Students will work in groups preparing the recipe as the teacher monitors the classroom.

Closure (recap and wrap-up and/or clean-up):

Students will eat and enjoy the finished product. The quality of the finished product will be determined by the teacher and the students. We will discuss what happened to the sugar mixture as it boiled on the stove several minutes.
LOLLIPOPS

OBJECTIVES

The students will be able to accurately use a cooking thermometer in the preparation of a recipe.

INGREDIENTS

<table>
<thead>
<tr>
<th>MAKE ABOUT 10</th>
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<tbody>
<tr>
<td>1 C. sugar</td>
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<tr>
<td>½ C. water</td>
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<tr>
<td>1/3 C. light corn syrup</td>
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INSTRUCTIONS

Special note: Hard candy molds are necessary to prepare this recipe. They are available at specialty stores selling cake decorating supplies. The molds can be either metal or hard plastic. Before preparing the recipe set up the molds you are using. Place lots of tin foil under them to catch any drippings of the lollipop mixture.

1. Place the water, sugar and corn syrup in a heavy saucepan. Do not use a pan with a non-stick surface because this mixture will get so hot it will cause the coating to peel off. Place the saucepan over medium heat and stir constantly until the sugar has dissolved. Be careful to not let the mixture splash up on the sides of the pan. This mixing of the sugar to dissolve it will take only about one minute.

2. Set the spoon aside now. Do not stir it anymore. Attach the candy thermometer to the side of the pan being careful to get the bottom of the

SCIENTIFIC NOTES

It is important to do this step carefully. Be sure you use a good heavy saucepan because a thin aluminum pan will cause the mixture to burn too easily. A heavy pan will distribute the heat over the bottom of the pan more evenly. Do not let the mixture splash on the upper sides of the pan because this will burn and drip into the mixture in the bottom of the pan causing it to taste burned.
<table>
<thead>
<tr>
<th>LOLLIPOPS (cont'd)</th>
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<tbody>
<tr>
<td><strong>INSTRUCTIONS</strong></td>
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<tr>
<td>thermometer in the candy mixture but NOT touching the bottom of the pan.</td>
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<tr>
<td>3. Increase the heat under the pan to the point where it is almost high, but not all the way high.</td>
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<td>4. Allow this to boil until it reaches the 300°F mark. This is called &quot;hard crack&quot; point. This may take anywhere from 8-10 minutes.</td>
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<tr>
<td>5. As soon as the mixture has reached 300°F remove the pan from the heat.</td>
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<td>6. Using a wooden spoon, stir in the coloring and flavoring. Stir slowly until all bubbling has stopped.</td>
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<tr>
<td>7. Very quickly pour the mixture into the prepared molds. Allow molds to sit about 1 hour before taking the candy out.</td>
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UNIT QUIZ #8

CANDIES

Put the letter that corresponds with the correct answer (a or b) pertaining to the second part of the question in the line on the left.

1. Sugar is made from
   a. sugar beets and sugar cane.
   b. certain fruits.

2. Corn syrup is a form of sweetner that comes from
   a. the corn stalk.
   b. kernals of corn.

3. Fudge is a type of candy that has
   _______ in it.
   a. corn syrup.
   b. crystals

4. Crystals are formed when a liquid gradually turns into a
   _______.
   a. solid.
   b. cream.

5. Caramel flavor is made when sugar is allowed to
   _______.
   a. brown slightly.
   b. dissolve.

6. Lollipops and other hard candies are made when the sugar and water is boiled to
   _______.
   a. 300°F.
   b. 212°F.

7. Corn syrup is used in making candy because it will not form
   _______.
   a. bubbles.
   b. crystals.

8. Sugar cane is commonly grown in
   _______.
   a. Africa.
   b. the U.S. and around the world.

9. Making candy can be fun, yet
   _______.
   a. tricky.
   b. very easy.

10. Caramel candy does not contain
    _______.
    a. peanuts.
    b. crystals.
# ANSWERS TO QUIZES

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<thead>
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