Use Thickening Agents for Soups and Sauces

Unit: Preparing Foods

Problem Area: Stocks, Sauces and Soups

Lesson: Use Thickening Agents for Soups and Sauces

Student Learning Objectives.

Instruction in this lesson should result in students achieving the following objectives:

1. **Describe how starch works to thicken soups and sauces.**
2. **Explain how thickening agents are incorporated in soups and sauces.**

Resources.

The following resources may be useful in teaching this lesson:

Cook, Von. "Food Guide—Thickening Agents," *ezinearticles.com*. Accessed Aug. 30, 2010. <http://ezinearticles.com/?Food-Guide—-Thickening-Agents&id=1537535>.

The Culinary Institute of America. *Professional Chef*, 8th ed. Wiley, 2006.

Labensky, Sarah R., Priscilla A. Martel, and Alan M. Hause. *On Cooking: A Textbook of Culinary Fundamentals*, 5th ed. Prentice Hall, 2010.

McGreal, Michael J. *Culinary Arts: Principles and Applications*. American Technical, 2008.

"Thickening Agents for Sauces," *everything2*. Accessed Aug. 30, 2010. <http://everything2.com/title/Thickening+Agents+For+Sauces>.

Equipment, Tools, Supplies and Facilities

- ✓ Overhead or PowerPoint projector
- ✓ Visual(s) from accompanying master(s)
- ✓ Copies of sample test, lab sheet(s), and/or other items designed for duplication
- ✓ Materials listed on duplicated items
- ✓ Computers with printers and Internet access
- ✓ Classroom resource and reference materials
- ✓ For the Interest Approach:
  - ♦ Stovetop or microwave oven
  - ♦ 2 sauce pans or microwave safe bowls
  - ♦ 2 wooden or other mixing spoons
  - ♦ ¼ cup arrowroot
  - ♦ Separate cup or bowl for mixing slurry
  - ♦ 4 to 5 cups of water (includes water for slurry)
  - ♦ ⅓ cup flour

Key Terms.

The following terms are presented in this lesson (shown in bold italics):

- ➤ amylase
- ➤ amylopectin
- ➤ beurre manié
- ➤ emulsion
- ➤ gelatinization
- ➤ homogenous
- ➤ instant starch
- ➤ liaison
- ➤ opaque
- ➤ purée
- ➤ reduction
- ➤ roux
- ➤ slurry
- ➤ starch
- ➤ translucent
- ➤ whole butter

Interest Approach.

Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

> *The nature of thickening liquids is a chemical reaction, so an experiment is a useful way of breaking the ice on this subject. Ask students what ingredients*

they think are used to thicken liquids and how they should be incorporated into the mixture to be thickened. Record their responses. Then illustrate the point with the following experiment.

Have two pans filled with 1 pint each of boiling or very hot water. Proceed with the experiment but do not reveal what is in each pan or what you are adding to each pan to thicken the liquid. To one of the pans, add ⅓ cup of flour, and stir the mixture with a wooden spoon. The water may thicken a bit, but it will be a lumpy mess. To the second pan, add a mixture of ¼ cup of arrowroot and ⅓ cup of water (already well mixed); mix well with a wooden spoon.

Ask students to describe what happened. What was in the mixture added to the liquids in the pans? Ask the students to talk about how a liquid could make water thicken when flour turned it into a lumpy mess.

CONTENT SUMMARY AND TEACHING STRATEGIES

Objective 1: Describe how starch works to thicken soups and sauces.

Anticipated Problem: What thickening agents are used in soups and sauces? How does starch thicken a liquid?

I. Starch

A. Thickening agents, except for eggs (and certain liaisons), are starches that give body to liquids, sauces, and soups. Adding the wrong starch can cause gravy to be lumpy, a sauce to curdle and/or separate, and a pie filling to be runny. Choosing the correct thickener for each cooking task helps eliminate most lumps and broken or runny mixtures. When a sauce or a soup is not thickened by reduction, a starch mixed with fat (hot or cold) or a cold liquid is often used to thicken the mixture. All natural starches have two basic starch types: ***amylase*** (a long straight-chained starch) and ***amylopectin*** (a short-branched starch). The most common starch thickeners are:

1. Grain starches—Flours (e.g., powdered wheat, corn, rice, or oats) have similar characteristics.
   a. They thicken at about 190°F.
   b. They are opaque in appearance.
   c. They weep when frozen and thawed.

2. Root starches—Tapioca granules (quick cooking) and arrowroot flours have similar characteristics.
    a. They thicken between 140° and 160°F.
    b. They are clear in appearance (hot or cold).
    c. They thin when overbeaten.
3. Tuber starches—Potato starch has characteristics somewhere between the grain and the root starches.

B. Principles of starch cookery—***Starch*** is a bonded carbohydrate molecule found in plants whose molecules are tightly packed into small granules.
1. A chef must physically soften and separate the starch molecules in cold water before they are heated to ensure the mixture thickens to its greatest potential.
2. In a hot liquid, softened starch molecules absorb the liquid, swell abundantly, and burst out of their granular shells. As the starch granules pop, starch rushes into the hot liquid and thickening occurs, which is called ***gelatinization***. In contrast, if a dry uncooked starch is added directly into a warm or a simmering liquid, a lumpy mess that will not thicken will be the result. (Exceptions to this rule are chemically altered starches—such as instant flour and quick cooking tapioca—that can withstand this action.)
3. A cooked starch will thicken as it cools. The gel remains thick when it is chilled.
4. If a cooked starch mixture loses its ability to thicken, it is sometimes due to overcooking, too much acid, or freezing the product.
5. Cooked gels can "weep" upon cooling. Sometimes stirring the gel as it cools prevents weeping.
    a. The ratio of starch to liquid—to achieve a specific thickness—is standardized. Several charts are available.
    b. Some starch-thickened mixtures are clear and shiny. Some are dull and opaque, depending on the type of starch used and sometimes the cooking method. In general, the sheen and opaqueness of sauces is dependent on the amount of light blocked by the starch.
        (1) Cornstarch, arrowroot, and potato starches tend to produce shiny and more transparent sauces.
        (2) Flours—especially wheat flours—tend to produce more opaque and dull sauces.

C. ***Reduction*** is the thickening of a soup or sauce by the evaporation of a liquid. It is the simplest method of thickening soups and sauces. Reduction requires no addition of starch, only a longer and usually a slower (lower heat) cooking of the product that evaporates liquid (stock or broth), leaving a thicker soup or sauce by default. Reduction also has the benefit of adding no calories or fat, and reductions concentrate flavors. The right time to season a reduced sauce is following the reduction because reduction may intensify salt and other spices beyond a palatable level. Some reduced sauces may require straining.

D. ***Roux*** (pronounced roo) is a mixture of equal weights (parts) of flour and fat (usually clarified butter; chicken fat, bacon fat, and margarine are also used) cooked over medium heat and stirred constantly. Roux is the most common thickener for sauces and soups. The fat serves to "oil" the flour so it does not cause lumps when added to a liquid. Roux is cooked for varying lengths to create three types: white, blond, or brown. The richness of a sauce or a soup is enhanced by the color. The darker the roux, the richer the flavor. By cooking the roux, the starch in the flour is able to hold or absorb liquid. All three colors provide the same thickening strength. The longer a roux is cooked, the less thickening power it has.

   1. White roux—white or Béchamel cream sauces
   2. Blond roux—veloutés, supreme sauce, and allemande sauce (made with butter fat only)
   3. Brown roux—Cajun and Creole sauces (a dark brown color and a nutty aroma and flavor)

E. ***Beurre manié*** (pronounced burr-manyay) is a liaison mixture of equal weights of flour and butter kneaded together but not cooked. The mixture is kneaded together until smooth and is used in its raw state; it is added to liquids near the end of the cooking to thicken them. Sauces and soups that require a long simmering should not use beurre manié except at the end of the cooking period. A sauce that cooks too long after an addition of beurre manié may break or separate. It is often used with the small sauces.

F. ***Slurry*** (or a whitewash) is a thin paste mixture of water (or any liquid) and a powdered starch softened in cold water and then added to hot liquids to thicken them. The powder is always dissolved in a liquid prior to use to prevent lumps that would form if the powder were added directly into the liquid being thickened. Slurry thickenings generally add no noticeable flavor to the mixture. Starches are tasteless white powders and, unlike flour, contain no other elements (e.g., protein). They are a pure form and readily absorb liquids to make the liquid thicker. Cornstarch, tapioca, and arrowroot are common starches used in a slurry mixture. Flour is sometimes used in a slurry mixture, but the effect is not as palatable as a roux.

G. A ***purée*** (pronounced pure-AY) is the French term for mashed cooked vegetables, fruits, rice, etc. When cooked foods are blended, processed, or effectively pulverized, they produce a thick pasty product that may be used as a thickening agent. As thickening agents, puréed products that are high in starch (e.g., beans, potatoes, and grains) are most effective. Soups and sauces can be thickened by adding a puréed substance to them or by puréeing solid foods already in the soup or in the sauce.

H. Liaison (pronounced lee-ay-zohn) is the French term for all types of thickening (including roux). In the United States, ***liaison*** (often considered a separate form of thickening) is a mixture of cream and beaten egg yolks added at the last minute to sauces and soups. A crucial step in this process is the gradual heating of the beaten eggs (to prevent premature coagulation of the egg proteins) before they are added to a sauce or soup. Some of the heated sauce or soup is gradually

beaten in to the cream and eggs to warm the mixture but not cook it. The slightly heated egg and/or cream mixture is added to the heated mixture (usually off the heat source) and is then returned to the heat source to continue cooking. The addition of the partially heated liaison thickens the sauce as it cooks. Egg and cream liaisons require the most expertise to prepare and are common in the preparation of custard sauces. The liaison process is also used when making egg and butter or oil emulsions.

1. An ***emulsion*** is a homogenous mixture of two or more generally unmixable ingredients—such as oil and water—in which globules of the oil or fat are held in suspension by egg yolks. A chef uses two elements to form an emulsion: chemicals (e.g., lecithin in egg yolk and/or acid) and energy (e.g., whisking or beating). Some classic sauces use the liaison process to make an emulsion, resulting in a thick sauce. Mayonnaise and hollandaise sauces are commonly prepared emulsions.
2. Heavy cream and crème fraîche may also be used as a last minute liaison to thicken a sauce or soup and should be incorporated in the same manner as egg and cream mixtures. Heavy cream needs to be heated and thickened before adding it to a warm mixture. Crème fraîche may be stirred directly into a warm or simmering sauce or soup.

I. Other thickening agents

1. The addition of cold ***whole butter*** (regular unsalted butter as purchased and not clarified) bits is often used at the end of sauce making to gently thicken the sauce and to give it some sheen. The presence of milk solids in whole butter assists in thickening the sauce. Additionally, if the sauce contains an acid (e.g., lemon juice or vinegar), the addition of whole butter will further thicken the sauce. A caution with late additions of butter is that the sauce must be served immediately. Reheating the sauce negates the thickening power of the cold butter bits.
2. Bread crumbs and finely ground nutmeats add texture and thicken sauces and soups.
3. Browned flour is a slow and inexpensive way to thicken sauces and soups. Flour is placed in a dry skillet. It is stirred constantly over low heat or is browned in the oven and stirred occasionally to brown evenly. Browned flour does not have the thickening power of regular flour, but it does add Cajun flavor to a dish.
4. File powder is ground sassafras leaves and is used to flavor and thicken gumbo soups. File powder can become stringy when heated, so it is usually added to individual dishes of gumbo after the soup is removed from the heat source.

Teaching Strategy: *Use VM–A, VM–B, and VM–C to review. Describe various thickening agents used in soups and sauces. Due to the delicacy of liaison and emulsion sauces, the thickening processes are best demonstrated to students. Use VM–D.*

Objective 2: Explain how thickening agents are incorporated in soups and sauces.

Anticipated Problem: How should thickening agents be added to soups and sauces?

II. Incorporating thickening agents

A. Roux is the most commonly used thickener for soups and sauces. A roux is best when cooked and slightly or completely cooled prior to use; it may be stored for many weeks in the refrigerator (or longer in the freezer). When hot, a roux may be crumbly, but it clumps together when cooled. Although a roux may be used hot or cold, mixing a hot roux into a hot liquid usually makes lumps. A standard product is produced with a hot roux and cold liquid or a cold roux and a hot liquid. The slow cooking of a roux is important to add flavor to the dish and to allow for the proper expansion of the starch in the flour. A well-produced roux will absorb six times its own weight when cooked.

1. Roux is whisked into the soup or sauce with a hand whip or an electric hand blender while beating continuously. The full thickening strength of roux is not realized until the mixture comes to a boil. The mixture should cook gently until it reaches the desired consistency and any trace of raw flour taste has disappeared.
2. Roux, more than other thickeners, can easily lump in sauces if not incorporated properly. The goal for sauces in particular (but some soups too) is to make a smooth homogenous mixture. ***Homogenous*** is a product that is completely uniform in nature, so the top, the middle, and the bottom is an identical consistency throughout—without lumps. The use of energy in the form of whisking, mixing, or blending is required to prevent lumps and results in a smooth and homogenous product. Some lumping can be strained out of the mixture.
3. Liquids thickened with roux will be ***opaque*** (no longer transparent or clear). Roux-thickened liquids tend to be rich, heavy, thick (depending how much is used), and sticky when left to dry on utensils or other objects.

B. Beurre manié could be used to thicken soup, but it is far more commonly used to thicken small sauces (those derived from a mother sauce), such as lyonnaise, béarnaise, and mornay. This raw mixture of kneaded flour and butter must be whisked or blended into the hot liquid to avoid lumping. As it is a raw mixture, beurre manié must be brought to a boil in the sauce to ensure that the flour is fully cooked and to avoid any raw or "floury" taste. The incorporation of beurre manié will result in an opaque finished product.

C. Slurries are most commonly used to prepare sauces but are equally effective for soups. Slurries must be thoroughly mixed, and the starch must be fully dissolved prior to its addition to a cooking sauce or soup. Any bits of powdered starch or small "globs" of starch and liquid will result in lumps in the cooked product. The liquid used to dissolve and mix the starch should be cool or cold for best results; it will thicken quickly when heat is added.

1. Soups and sauces thickened with a slurry mixture will result in a clear to translucent product, depending on how much mixture is used. A ***translucent*** product is a product in which the fluid is partially opaque, but light still passes through it; it looks "glaze-like." This type of sauce or glaze is particularly common in Asian cuisine and cooked fruit sauces (e.g., cherries, apples, and berries).
2. The thickening strength of a slurry mixture varies from starch to starch, as does its stability. All slurries are less stable in maintaining a thick liquid compared to a roux. Also, there are times when it is not viable to heat a sauce, even though thickening is still desired. In these cases, a slurry mixture would be of no value.
    a. Pure potato starch has strong thickening powers, but it is quite unstable when overheated. When overheated, it can break down and lose its ability to thicken fairly quickly. However, it does create a bit more transparent product than flour, and liquids do not need to cook as long as flour mixtures.
    b. Tapioca flour (or Brazilian arrowroot) is made from the cassava root or manioc and has similar properties to potato starch. It is usually used to thicken fruit sauces and clear glazes. Tapioca is a good choice for chilled or frozen foods because it does not break down the way a flour-thickened sauce does when frozen. If boiled, however, it will become stringy.
    c. Cornstarch has about twice the thickening power of flour and gives food a glossy and translucent appearance. Cornstarch comes in two types: regular and waxy maize.
        (1) Regular cornstarch thickens well but may cause the mixture to be cloudy.
        (2) Waxy maize is a modified cornstarch that produces a clear mixture and is used in most commercially prepared pie fillings.
        (3) Cornstarch is also used to help Asian sauces cling to and coat meats and deep-fried foods.
    d. Arrowroot is a starch made from a tropical root that has the benefit of thickening a liquid before it reaches the boiling point. It has twice the thickening power of flour. Arrowroot is an excellent choice for delicate soups or sauces in which boiling is not desirable. It has a bit more thickening power than cornstarch but does not thin as much as cornstarch does when heated. It does not have to be heated to remove any floury taste, so it thickens at a lower temperature than flour or cornstarch. Arrowroot is best when used immediately before serving and when it is not reheated. In French cooking, there is a common thickening called Liaison à l'Arrowroot made with veal stock.
    e. ***Instant starch*** is precooked starch that thickens cold liquids when whisked in briskly to the liquid; no heat is required. It is a glaze similar to a slurry mixture that is created when the cooked, dehydrated, and pulverized instant starch powder is added to a cold liquid. It is commonly used in instant puddings.

D. The use of reduction is more common for sauces than for soups, primarily because in a production setting the volume of a sauce is generally much less than the volume of a soup. Yet the technique is identical for each. The continual addition of heat to the liquid at a level to reach simmer causes the liquid to evaporate, thereby reducing the volume of the remaining liquid. The effect is to thicken the remaining liquid in the pan or pot. Starch thickeners or solid food particles are generally present in the liquid being reduced, making this technique viable. Obviously, a pot of pure water boiling and reducing will not result in thicker water.

E. The use of purées to thicken liquid is far more common in soups than sauces, but it is equally effective in both. The process requires solid matter to be completely cooked to the point of falling apart or turning to mush in the liquid, followed by mechanically blending or processing the mixture to a smooth homogenous liquid. Fiber in the solid matter helps thicken the liquid, but starchy solids (e.g., beans, peas, or potatoes) have a particularly strong thickening effect. Soups (e.g., split pea and cream of potato) are good examples of liquids thickened with puréed starchy ingredients. Puréed soups or sauces are particularly heavy and opaque and often separate if roux or slurry is not added. Stirring is usually required prior to service to bring the liquid back to a homogenous state.

F. Liaisons are seldom used in soup, and only specific sauces use the technique. Liaisons follow a classic technique of gradually heating eggs to thicken sauces. Gently warming eggs and incorporating them as part of the sauce—making certain to heat the mixture just enough to thicken the liquid but avoiding temperatures hot enough to fully coagulate the protein—results in a smooth, rich creamy sauce. The eggs are the thickening agent, but heating beyond 185°F would cause the eggs to solidify and the sauce to break (or separate).

   1. Liaisons are common for making custards (e.g., rice pudding, pastry cream, Italian custard, and the vanilla cream sauce crême Anglaise). All of these custards are thickened with eggs, using this technique.
   2. Liaisons are used in classic sauces, such as hollandaise, where the egg yolk and butter are thickened by use of energy (mixing speed and heat) and by chemicals (the lecithin in the yolk and the acid in lemon juice). The sauce would not thicken without the egg yolk, but the all of these elements are required to make the sauce work.

G. Whole butter additions are primarily used as a finishing technique for several small sauces and are rarely used in soups. When appropriate, small bits of whole unsalted butter are added to sauces at the end of the cooking process, usually after the sauce has been removed from the heat. The result is an enriched sauce that “tightens up moderately” before use.

H. Troubleshooting thickening agents

   1. To prevent lumps: Starch is dispersed grain by grain in some type of medium (e.g., cool liquid, sugar, and hot or cold fat) and then stirred to keep the separated starch granules from sticking together. A cool or cold liquid slowly stirred into flour or starch produces smooth sauces and soups. When starch is mixed

with a fat, the fat can be hot or cold. A slurry mixture, a roux, or a beurre manié process helps prevent lumping.

2. To prevent thin or runny mixtures: Each type of starch must be cooked just enough to reach its greatest thickening potential. When cooked too long (or mixed too aggressively), the mixture thins as the bonding capacity of the starch begins to break down. Also, the presence of a large amount of acid (e.g., lemon juice) and/or sugar (a tenderizer) can cause the starch not to swell and thicken. Stirring a mixture after it has completely cooled will also cause the mixture to thin.
3. To avoid overly thick sauces and soups: The starch mixture (sauce or soup) should reach a gentle boil to determine if additional liquid must be added for the desired consistency. When cool, starches can appear exceptionally thick. Heat will reveal the true consistency.
4. To prevent curdling: Curdling can be a problem with cream-based soups and may be avoided by ensuring that the roux cooks long enough. When roux is insufficiently cooked, the flour separates from the fat. As a result, the mixture appears "broken." Other causes of curdling are:
   a. A high acid content may cause a soup (e.g., tomato) to curdle. Cooking the tomato separately will reduce the acid level.
   b. The use of cake or pastry flour in place of wheat or rice flour may result in curdling.
   c. Curdling may also occur from cooking a soup after the liaison has been added.

Teaching Strategy: *Use VM–E to review the correct incorporation of thickeners to soups and sauces. Assign LS–A to have students conduct research about thickening agents and to begin a recipe or formula portfolio.*

- **Review/Summary.** Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. Questions at the ends of chapters in the textbook may also be used in the review/summary.

- **Application.** Use the included visual master(s) and lab sheet(s) to apply the information presented in the lesson.

- **Evaluation.** Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. A sample written test is provided.

Answers to Sample Test:

Part One: Matching

1. d
2. f
3. e
4. a
5. b
6. c

Part Two: True/False

1. T
2. F
3. F
4. T
5. T
6. T
7. F
8. T
9. F

Part Three: Completion

1. whole butter
2. translucent
3. reduction
4. homogenous
5. starch
6. liaison
7. body
8. molecules
9. lumps

Sample Test

Name _____

Use Thickening Agents for Soups and Sauces

Part One: Matching

Instructions: **Match the term with the correct definition.**

a. reduction
b. instant starch
c. emulsion
d. roux
e. liaison
f. slurry

_____1. A mixture of equal weights of flour and fat cooked over medium heat and stirred constantly

_____2. A thin paste mixture of water (or any liquid) and a powdered starch softened in cold water and added to hot liquids to thicken them

_____3. A mixture of cream and beaten egg yolks added at the last minute to sauces and soups

_____4. The thickening of a soup or sauce by evaporation of liquid

_____5. A precooked starch that thickens cold liquids when whisked in briskly to the liquid; no heat required

_____6. A homogenous mixture of two or more generally unmixable ingredients in which globules of the oil or fat are held in suspension by egg yolks

Part Two: True/False

Instructions: **Write *T* for true or *F* for false.**

_____1. Sauces thickened with a slurry can break down and lose their thickness.

_____2. Soups thickened with a roux are usually clear or transparent.

_____3. Beurre manié is a thickener that requires no cooking.

_____4. Tapioca is a starch that can be used in a slurry mixture.

_____5. Roux can be used successfully in soups and sauces.

_____6. Potatoes can be cooked in a soup and then puréed right in the soup to thicken it.

_____7. A standard product is produced with a hot roux and hot liquid or a cold roux and a cold liquid.

_____8. Tapioca is a good starch choice for chilled or frozen food because it does not break down the way a flour-thickened sauce does when frozen.

_____9. When roux is overcooked, the flour separates from the fat, and the mixture appears "broken."

Part Three: Completion

Instructions: **Provide the word or words to complete the following statements.**

1. Sauces can be enriched and thickened by adding _____ at the end of the cooking process, usually off the heat.
2. Sauces thickened with slurry are generally _____ in their appearance rather than opaque.
3. Soups are seldom thickened by _____.
4. Soups thickened using the purée method should create soups and sauces that are _____; they should not be lumpy or have different textures throughout.
5. The actual ingredient in rice, beans, arrowroot, and tapioca that absorbs liquid and thickens soups and stews is _____.
6. Sauces thickened with eggs will almost always require the technique called _____ to prevent the eggs from solidifying prematurely.
7. Thickening agents, except for eggs (and certain liaisons), are starches that give _____ to liquids, sauces, and soups.
8. Starch is a bonded carbohydrate molecule found in plants whose _____ are tightly packed into small granules.
9. To prevent _____, starch is dispersed grain by grain in some type of medium and then stirred to keep the separated starch granules from sticking together.

THICKENING AGENTS FOR SOUPS AND SAUCES: REDUCTION, ROUX, AND BEURRE MANIÉ

Reduction

- This boiling teapot exemplifies "reduction." As the liquid evaporates into the air via steam, the amount of liquid in the pot is "reduced." As a sauce reduces, some of the liquid evaporates and condenses the flavors.

Roux (pronounced roo)

- A roux is the most common thickener used in soups and sauces. It is a cooked mixture of equal parts of flour and fat (usually clarified butter). A roux thickening begins by cooking fat and flour together.

♦ **Beurre manié** (pronounced burr-manyay)

- Beurre manié is a mixture of equal weights of flour and butter kneaded together but not cooked. The mixture is kneaded together until smooth and is used in its raw state. It is added to liquids near the end of the cooking to thicken them and should not be simmered. It is often used with the small sauces.

THICKENING AGENTS FOR SOUPS AND SAUCES: SLURRY

- Slurry
  - A slurry mixture is a thin paste of water and a tasteless white starch powder used to thicken liquids. Starch molecules readily absorb liquids and make the liquid thicker. Cornstarch, tapioca, and arrowroot are common starches used in a slurry mixture. This image happens to be cornstarch, but virtually all starches used in cooking have this fine white powdery appearance. Flour is sometimes used in a slurry mixture.

- Tapioca is a common thickener for soups and sauces, puddings, and many commercially prepared items. It looks like cornstarch, but it comes from the Cassava root pictured here.

THICKENING AGENTS FOR SOUPS AND SAUCES: PURÉE, LIAISON, AND EMULSION

- Purée (pronounced pure-AY)
  - A purée is the French term for mashed cooked vegetables, fruits, rice, etc. When cooked foods are blended, processed, or pulverized, they produce a thick pasty product that may be used as a thickening agent. The purée shown is a blueberry and sweet rice purée for baby food or a dessert sauce.

- Liaison (pronounced lee-ay-zohn)
  - A liaison is a mixture of cream (heavy cream or crème fraîche) and beaten egg yolks added at the last minute to sauces and soups to thicken them and to improve the flavor. For this bowl of watercress soup, the crème fraîche liaison has also been added as a garnish.

- Emulsion
  - An emulsion is a homogenous mixture of two or more generally unmixable ingredients. To mix two generally unmixable ingredients, a chef uses a chemical and/or energy. Mayonnaise and hollandaise sauces are commonly prepared emulsions.

STARCH THICKENERS RATIO CHART

Thickener	Amount for 1 Cup of Liquid
All-purpose flour	Thin: 1 T. Medium: 2 to 2½ T. Thick: 3 to 4 T.
Cornstarch	1 T. = 2 T. wheat flour
Potato starch and arrowroot	1 T. = 2 T. wheat flour
Sweet or white rice flour	2 t. = 1 T. wheat flour
Quick-cooking tapioca	1 T. = 2 T. wheat flour

THICKENING AGENTS IN ACTION

- Roux
  - As roux cooks, cool liquid is added to make a thick paste that can be thinned into soup or sauce. The roux may be cooled and added to a hot liquid later. Note how opaque this roux looks.

- Roux as a thickening agent for soup
  - Taken to the next step, the roux was the thickening agent for this New England clam chowder. Look at the drip coming down the side of the bowl—thick and opaque.

- Purée of mashed vegetables as a thickening agent
  - This soup looks as thick as the roux-thickened clam chowder, but this was thickened with cooked and puréed potatoes for cream of potato soup.

- Slurry fruit glaze
  - The blueberry glaze on this cheesecake is a good example of a “finishing” slurry. It is a thick glaze, but notice how you can somewhat see through this shiny translucent sauce.

- Liaison with egg—hollandaise sauce
  - Sauces thickened with eggs in the liaison method typically look like this creamy yellow and buttery hollandaise sauce.

LS–A

Name _____

Research Thickeners for Soups and Sauces

Purpose

The purpose of this activity is to use three-dimensional problem-solving skills to research the information necessary to answer the questions.

Objectives

1. Identify thickening agents and their uses.
2. Explain the applications of thickening agents.
3. Conduct relevant research.

Materials

- lab sheet
- writing utensil
- professional culinary texts and cookbooks

Procedure

1. Work independently on these six research projects. The results of your research will become part of your portfolio of professional cooking recipes and formulas. When you find a recipe or formula you wish to retain—other than when the research project asks you to attach—please create a copy for your portfolio. Use classroom professional culinary texts, cookbooks, journals, and information from the lesson and Internet Web sites to find the answers to the following research activities.
2. **RESEARCH Project A:** All of the listed sauces and soups use a primary thickening agent. Based on the names of the thickening agents in this lesson, record which *one thickening*

agent is commonly used to thicken each item. Check several sources to find the most typical answer.

Soup or Sauce	Primary Thickening Agent
a. Cream of chicken soup	
b. Velouté sauce	
c. Béarnaise sauce	
d. Cream of asparagus soup	
e. French vanilla ice cream	
f. Sweet and sour pork	

3. **RESEARCH Project B:** Find two sauces that include reduction in the recipe, and attach copies of those recipes.

   a. _____
   b. _____

4. **RESEARCH Project C:** Name two advantages of using roux rather than a beurre manié thickener. Explain your choices in full. After researching, use your own line of logic to fully answer the question. Note the amount of space available for your answers.

   a. Advantage #1:

   b. Advantage #2:

5. **RESEARCH Project D:** Thickening agents, arrowroot, cornstarch, and tapioca were identified as typical starch thickeners. Research starch thickeners. Then identify and describe the characteristics of at least two others. There are more than two potential answers.

   a. Starch Thickener #1: _____
   b. Starch Thickener #2: _____
   c. Starch Thickener #3: _____ (optional)

6. **RESEARCH Project E:** Starch thickening agents have different strengths of thickening power and different abilities to hold their thickening strength for various lengths of time. List four starch thickeners in the space provided, and then record how well each one thickens compared to the other three and how long each one will hold its thickening strength before breaking down compared to the others—stability. You don't have to show

your answer in actual hours, but rank them from most stable (answer "a") to least stable (answer "d").

Thickener	Thickening Ability	Stability
a.		
b.		
c.		
d.		

7. **RESEARCH Project F:** Many puréed soups use a roux as a thickening agent in addition to the mashed ingredients. Find at least two recipes or formulas as examples, and explain why both thickeners were used. Use your knowledge and logic to answer the question. Attach two recipes or formulas for puréed soups that use two thickeners.

   a. _____
   b. _____

Research Thickeners for Soups and Sauces

1. The provision of professional culinary texts, cookbooks, journals, and Internet access will work to facilitate the breadth and variety this lab should produce.
2. **RESEARCH Project A:** You may need to remind students to find the most typical thickening agent and to check more than one source before filling in their choice. This list is intended as a guide. Please use your judgment while grading.

Soup or Sauce	Primary Thickening Agent
a. Cream of chicken soup	**Roux**
b. Velouté sauce	**Roux**
c. Béarnaise sauce	**Eggs**
d. Cream of asparagus soup	**Asparagus purée and/or roux (both acceptable)**
e. French vanilla ice cream	**Eggs**
f. Sweet and sour pork	**Slurry**

3. **RESEARCH Project B:** Find two sauces that include reduction in the recipe and provide copies of those recipes.
   a. **Answers will vary and could include the following sauces: Espagnole (classic brown), bordelaise, Robert, lyonnaise, and périgueux.**
   b. **Check the provided recipe as proof of the reduction step.**
4. **RESEARCH Project C:** Name two advantages of using roux rather than a beurre manié thickener. Potential answers are:
   a. **Advantage #1: The sauce would not need to cook as long with roux as a roux is already a cooked product.**
   b. **Advantage #2: The sauce could be completed ahead of time with roux, and a beurre manié must be incorporated just prior to service.**
   c. **Advantage #3: Roux prevents the risk of the sauce tasting "floury" or "starchy" as it is already cooked.**

5. **RESEARCH Project D:** In the lesson, arrowroot, cornstarch, and tapioca were identified as typical starch thickeners. Research starch thickeners, and identify and describe at least two others. Potential answers are the following:

   a. **Potato starch**
   b. **Rice starch**
   c. **Soy powder**
   d. **Ground or powdered nuts**
   e. **Clear-jel**
   f. **Kudzu powder**

6. **RESEARCH Project E:** Starch thickening agents have different abilities to thicken and different abilities to hold their thickening strength for various lengths of time—stability. Potential responses are four of the following five starch thickeners from most to least stable:

Thickener	Thickening Ability	Stability
a. **Flour**	**Low thickening**	**Most stable**
b. **Arrowroot**	**Strongest thickener**	**2nd most stable**
c. **Cornstarch**	**2nd strongest thickener (tie)**	**3rd most stable**
d. **Potato starch**	**2nd strongest thickener (tie)**	**4th most stable**
e. **Tapioca**	**Least thickening**	**Least stable**

7. **RESEARCH Project F:** It is common that many puréed soups use a roux as a thickening agent in addition to the mashed ingredients. Find at least two recipes or formulas, and explain why two thickeners were used in each case. Responses will vary but would generally state that:

a. & b. **The most common (and accurate) response is that the purée alone may not thicken the soup to the desired consistency.**

   c. **Review the attached recipes and/or formulas to confirm the student explanations.**