

# The Integration of the Flavor Imitation with Moral Virtue Education

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## Abstract

Flavors have been widely used in many products, and play a crucial role in food industry. Flavor Imitation is a basic curriculum providing comprehensive information about how to construct flavor formula and how to imitate flavors with natural and synthetic aroma raw materials. It is a compulsory curriculum opened for student whose major is flavor and fragrance technology and engineering. The mission of the university is not only to impart professional knowledge but also to cultivate and educate students. In order to better strengthen moral virtue education and cultivate students, moral virtue elements were integrated into the teaching process of flavor imitation. By the integration of flavor imitation with moral virtue education, students could not only grasp the knowledge of how to construct flavor formulas, but also could be fostered the rule awareness. Furthermore, this learning process is also helpful to make students always endeavor to do still better, train students to consider things from every angle, and will help train student to form unceasingly the enterprising habit. After a period of exploration and practice, it proved that the integration of flavor imitation with moral virtue education can result in a coordinated development of professional knowledge and moral virtue.

**Key Words:** *teaching exploration; flavor imitation; moral and virtue education; professional course*

## 1. Introduction

Flavors have been widely used in many products, such as baked goods, chewing gum, frozen dairy, gelatines, puddings, jams, condiments, relishes, alcoholic and nonalcoholic beverages, snack foods, gravies, and candy. Flavors also play a crucial role in food industry and in driving consumption. Flavoring agents and adjuvants are defined as substances added to impart of help impart

a taste or aroma in food by the U.S. Food and Drug Administration (Burdock, 2010). Flavors are mixtures blended with various aroma materials of natural and synthetic origin based on formula. Flavor and fragrance formulas are usually trade secrets in flavor and fragrance industries. Flavor imitation is a new course introduced for undergraduate students in the second year in Shanghai Institute of Technology. It is a compulsory course for flavor and fragrance technology and engineering major. Flavor Imitation is a basic course providing comprehensive information about how to construct flavor formula and how to imitate flavors with natural and synthetic aroma raw materials. This course teaches students how to design and create a flavor by selecting various aroma ingredients. The prerequisites include a background in Flavor Compounds Chemistry and Organic Chemistry. The most important thing is that students should be familiar with the odor characteristics and applications of various synthetic and natural aroma raw materials prior to taking this course.

The mission of the university is not only to impart professional knowledge to students but also to educate and cultivate students (Yu and Zhu, 2021). When teachers impart professional knowledge to students, they must also teach students how to behave and achieve the educational goal of cultivating students at the same time (Zhu et al., 2021). It is necessary to persist in taking the morality and cultivating students as the key point, put ideological work throughout the whole process of teaching, and realize full direction system of education and cultivating students in the whole teaching process. Professionals majoring in flavor and fragrance technology and engineering must not only have profound professional knowledge, but also have good moral accomplishment. In order to better strengthen moral virtue education and cultivate students, moral virtue elements were integrated into the teaching process of flavor imitation.

## 2. Methods

The aim of the study is to better strengthen moral virtue education and cultivate students in the teaching process of professional course. Moral virtue elements, such as the rule awareness, consciousness for ever greater perfection, and the enterprising habit, were integrated into the teaching process of flavor imitation. After a period of exploration and practice, the following experiences on the integration of moral virtue education into flavor imitation were summarized.

## 3. Results and discussion

### 3.1 Foster students the rule awareness

Flavor formula construction is one of the main contents in this course. Flavor safety is of utmost importance to everyone around the world. When selecting raw aroma materials for designing flavor formula, students are cultivated to obey the regulation and standards. In China, all food additives are described in the National Food Safety Standard and the Standard of Using Food Additives (GB-2760). The principles of use of aroma components are stipulated in this standard. The permitted aroma components, the range of use and the maximum amount or residual amount of these components are specified in GB-2760. The raw aroma materials for blending flavors must be permitted in the standard GB-2760 in China. Otherwise, even if a raw material has a good aroma, it cannot be adopted as an ingredient in the formula for blending a flavor. Furthermore, the aroma ingredients used for blending flavors should meet the corresponding quality specifications. The amount of aroma ingredient in food should not exceed the maximum allowable amount. The purpose of the addition of flavors in food is to produce, change or improve the taste or aroma of food. The amount of flavors used in food should be as little as possible on the premise of achieving the desired purpose. Of course, flavors are banned from some foods such as sterilized milk, rice, and fresh fruits in China. This learning process not only teach students how to select aroma ingredients for designing formula and constructing flavors, but can also enhance the rule awareness.

### 3.2 Make students always endeavor to do still better

Dairy product flavor imitation is another main content in the course. Dairy products are various products made from cow milk, goat milk as the main raw materials. The main dairy products include milk, cream, butter, condensed milk, yogurt, cheeses and so on (See Figure 1). These dairy products have different flavors.

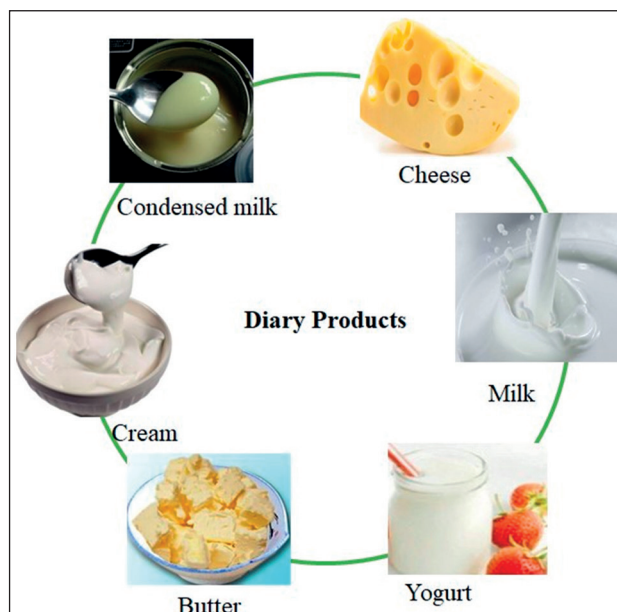


Figure 1. The dairy products

Milk is a whitish liquid containing proteins, fats, lactose, and various vitamins and minerals. The fresh milk we usually eat is pasteurized milk. Cream is the yellowish fatty component of unhomogenized milk that tends to accumulate at the surface. Animal whipped cream is obtained by separating the fat in milk. Butter is a soft whitish or yellowish fatty solid that separates from milk or cream when it is churned. Vigorous agitation of the milk or cream can cause the protein film of the milk fat globule to rupture, and the milk fat flows out of the globule. After losing the protection of protein, fat and water separate. Fats slowly float up, gather, and become pale yellow. The upper layer of fats is separated and squeezed to remove water. Thus, the butter is obtained. Condensed milk is a dairy product and a beverage made from fresh milk or goat milk after sterilization and concentration. Usually the fresh milk is vacuum concentrated to remove most of the water.

Its characteristic is that it can be stored for a long time. Yogurt is a tart, custard-like dairy product made from milk curdled by the action of bacterial cultures. Cheese is a solid fermented dairy product prepared from the pressed curd of milk.

Different dairy products have different processing techniques, so different chemical reactions occur during the processing. The chemical reactions in dairy products processing include enzymatic hydrolysis reaction, thermal reaction, oxidation reaction, microbial fermentation reaction and so on. It is these reactions that produce aroma components. Fatty acids can be obtained by enzymatic hydrolysis of milk fats. Especially some short-chain fatty acids can enhance milk flavor. Fatty acids are dehydrated by thermal reaction and some aroma products such as ketones and lactones can be obtained. Sugars and amino acids undergo Maillard reaction under heating and some aroma sulfur-containing and nitrogen-containing compounds can be produced. Some aroma aldehydes can be obtained by oxidative cleavage of unsaturated fatty acids. Lactic acid, aroma alcohols and esters can be produced by microbial fermentation of sugar and lactose. Different dairy products have different aroma characteristics due to the various reactions in different processes. When simulating the odor of dairy product, students should know the influence of chemical reaction in the processing of dairy products on aroma substances. The odor characteristics of various dairy products should be grasped. Furthermore, the odor characteristics of raw material should be very familiar.  $\delta$ -Lactones, such as  $\delta$ -dodecalactone,  $\delta$ -decalactone and  $\delta$ -undecalactone (see Figure 2) have milky aroma. These  $\delta$ -lactones can be adopted in flavor formula to provide milky note.

Some ketones, such as pentanedione, butanedione and 3-hydroxy-2-butanone (see Figure 3) have buttery aroma. These ketones can be selected in flavor formula to provide buttery note ( Burdock, 2010; Surburg and Panten, 2006).

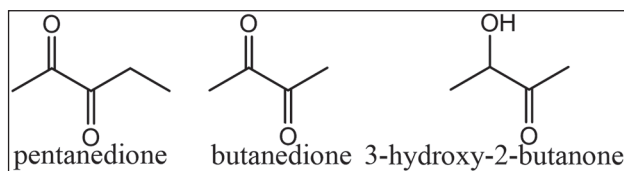


Figure 3. The chemical structures of three ketones

Although these aroma compounds with milky note and buttery note can be used as the main raw material for blending flavors of dairy products, the application of other materials should also be mastered. For example, although the odor of oleic acid (see Figure 4) is faint, it can provide fatty taste in condensed milk flavor.

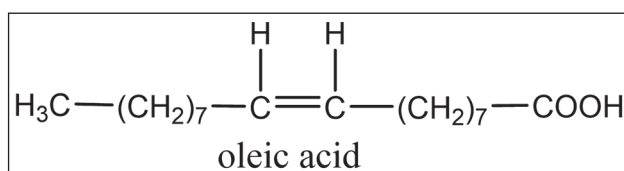


Figure 4. The chemical structure of oleic acid

Not only the odor but also the taste should be considered in flavor imitation. Oleic acid darkens on oxidation, and a lard-like taste and odor can be produced. Although *cis*-6-nonenal (see Figure 5) has a fruity odor reminiscent of melon, in milk flavor it can improve the fresh feeling (Zhu and Xiao, 2017). It will promote students to think further. This learning process is helpful to make students always endeavor to do still better.

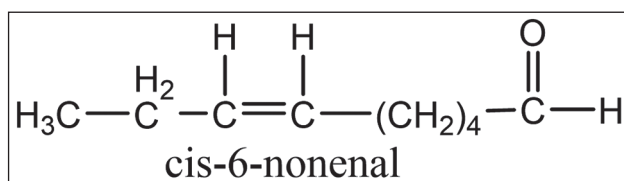


Figure 5. The chemical structure of *cis*-6-nonenal

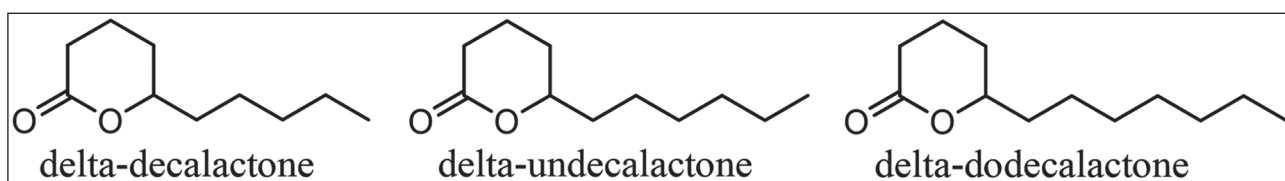


Figure 2. The chemical structures of three  $\delta$ -lactones

### 3.3 Train students to consider things from every angle

Mint flavor has been widely used in toothpaste, mouthwash, chewing gum, frozen dairy, beverages, and so on. In this curriculum, students are required to design a mint flavor formula. L-menthol (see Figure 6) and some natural essential oils such as arvensis mint oil and peppermint oil, are used as the main ingredients of mint flavor. L-menthol is the main component of arvensis mint oil and peppermint oil. It has a cooling sensation and characteristic odor of mint. After learning the basic curriculum flavor compounds chemistry, most students are familiar with these common aroma raw materials, and can think of selecting them for blending mint flavor. However, menthol, arvensis mint oil and peppermint oil have high volatility and cannot last long. This is a new problem facing students and arouse students thinking. Students need to find a way to solve this problem. Menthyl lactate, a menthol simulator and booster, can provide a sharp and aggressive cooling impact. Ethyl menthane carboxamide can provide a long-lasting cooling effect. Menthyl lactate and ethyl menthane carboxamide (see Figure 6) can be added in formula to impart long-lasting odor ( Burdock, 2010; Surburg and Panten, 2006).

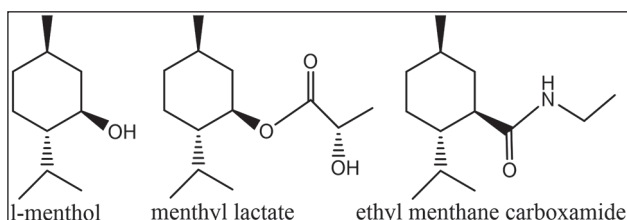


Figure 6. The chemical structures of l-menthol, menthyl lactate and ethyl menthane carboxamide

Menthol has a penetrating sensation and is irritant to mouth at high concentrations. Therefore, students need to think of ways to improve its taste. The odor and taste of star anise oil are intensely sweet. The appropriate addition of star anise oil can provide a sweet taste and reduce irritation caused by menthol. Of course, the addition of anise oil should not affect the main aroma characteristics of mint. Furthermore, roundness and fun are also important to mint flavor and can arouse students' imagination. Some aroma ingredients with spicy note, fruity note, or floral note can also

be added in mint flavor formula to add roundness and fun. Eucalyptus oil also has cooling taste. The appropriate addition of eucalyptus oil in mint flavor formula can also enhance antibacterial and anti-inflammatory effects (Zhou and Xiao, 2007). The blending of mint flavor can stimulate students to think in many ways. This learning process can train students to consider things from every angle.

### 3.4 Forms unceasingly the enterprising habit

Flavor imitation cannot reach the goal in one step. Firstly, students should smell the standard sample to identify its odor characteristics. Secondly, they should select natural and synthetic aroma raw materials to construct an initial flavor formula based on the notes they identified by smelling the standard sample. Thirdly, students blend the flavor based on the initial flavor formula that they designed before ( Zhu and Xiao, 2015, 2017; Zhou and Xiao, 2007). When all the aroma raw materials are added completely and the initial flavor is produced. They should evaluate the flavor by nose using smelling slips. Usually, after numerous modifications and adjustments, a desired flavor can be obtained. In this process, students may experience countless failures. Only by overcoming many difficulties and after many revisions can the desired flavor be obtained. And as such, this learning process will help train student to form unceasingly the enterprising habit.

## 4. Conclusions

Flavors have been widely used in many products and play an important role in food industry. Flavor imitation is a basic curriculum opened for students whose major is flavor and fragrance technology and engineering in Shanghai Institute of Technology. By the integration of flavor imitation with moral virtue education, students could not only grasp the professional knowledge, but also could be fostered the rule awareness. Furthermore, it was also helpful to make students always endeavor to do still better, to train students to consider things from every angle, and to train student to form unceasingly the enterprising habit. It proved that the integration of flavor imitation with moral virtue education can result in a coordinated development of professional knowledge and moral virtue.

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