

Framework for a New Culinary-Arts Curriculum

Peter Hertzmann

ABSTRACT: Modern chef training resembles an informal version of the traditional apprentice system. Unfortunately, most culinary schools graduates are ill prepared to work in a commercial kitchen environment. Even graduates who are able to successfully work in novice kitchen positions are seldom able to actually cook. The culinary schools producing these weak graduates have their curriculum partly to blame. In this paper, a framework for a new culinary-school curriculum is proposed that follows a modern-medical education model rather than an apprenticeship model.

The old method of learning a skilled trade was to be apprenticed to a master. After many years of training, the skilled apprentice was promoted to the position of journeyman. Additional experience and testing was then required before the journeyman advanced to being a master. Today, building-trades apprentices cannot earn a license solely with field work. They must endure a prescribed number of hours of classroom work and pass written tests. Apprentices must learn job-related science, customs, and codes besides learning how to use their tools.¹

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In a similar manner, physicians and surgeons² commence their training with two years classroom work followed by two additional years of observation with minor hands-on experience before they begin their true practical training.³ The final portion of their training, the part that takes place after they legally become medical doctors, may last as little as three years for physicians entering the practice of internal medicine or as long as six years for surgeons learning neurosurgery or plastic surgery.⁴ Some doctors add to their knowledge by completing supplementary subspecialty training as part of a multi-year fellowship.⁵

The major difference between training a carpenter and training a physician, other than actual course content, is that a significant portion of medical training involves both the overt and covert training of the students to think like doctors. Depending upon the realm of medicine of interest to the candidate, future physicians are trained to think like physicians and surgeons are trained to think like surgeons.⁶

Current training methods

Restaurant cooks follow one of two paths to attain their position in the kitchen. Either they enter the kitchen as a novice and learn their trade 'on the job', or they attend a cooking

school and then enter the kitchen as a novice doing the same work they would do without their diploma. I have yet to meet a chef who has hired a culinary-school graduate with no previous restaurant experience where the new cook didn't need to start at the bottom of the kitchen hierarchy. Many chefs tell me that they avoid inexperienced graduates because they often 'think they know it all'.⁷

There are chefs that require new cooks to have some form of certification or diploma before being hired as most culinary schools provide classroom work in sanitation and food safety before drilling the principles into the student's mind during the practical portion of their program.⁸

Cooking schools may be for-profit or non-profit organizations. They may be publicly operated or privately owned. An individual cooking school may have no accreditation and issue a simple diploma or certificate of completion, or the school may be fully accredited as a university and have both degree and certificate programs. The formal program may be as short as a few months of part-time participation or as long as four years of full-time attendance. The emphasis at some schools is all aspects of restaurant work or even the entire food industry while others spend all their time in the kitchen preparing recipes.⁹

Modern culinary education problems

'Because someone goes into culinary school doesn't mean they're wired for it.'¹⁰ 'We have a generation [of graduates] that's not passionate about what they're doing'¹¹ 'It's hard to find motivated students.... Students from City College¹² have a better attitude.'¹³ Young cooking-school graduates are often unwilling to put in the long hours required by fine-dining restaurants. The range of students completing cooking school is as great as the differences in the individual students modified by the program they attended. Mature students tend to take better advantage of the educational opportunities provided by the schools and have more realistic expectations of the work opportunities awaiting graduation. 'If you don't have a base of life going [into cooking school], you're not going to get it in school.'¹⁴

In the class environment, students usually work as groups to produce a few dishes for the class to taste, or they work singularly to produce two or three complete dishes. Whatever their range of education, 'most students are rarely ready to work in a [restaurant] kitchen.'¹⁵ They are unprepared to work a station by themselves on even a moderate evening.

Most cooking schools ignore large sections of the food preparation industry. 'Schools prepare students to cook in restaurants or hotels, not other food-industry jobs.'¹⁶ 'I would be reluctant to hire a recent cooking school graduate. Six months is too little time to learn what you need to know.'¹⁷

'It took ten years after school to learn how to cook.'¹⁸ Unfortunately, when most students finish their culinary school education, they still do not know how to cook. Students have

learned how to prepare recipes but not how to cook. When I get into discussions with recent cooking school graduates and even some chefs, I pose a couple of challenges for them to think about. The first is to choose any primary ingredient, such as a meat or a vegetable, and quickly tell me ten ways to cook it without resorting to simply changing a sauce or some other simple variation. I want ten totally different preparations. The second challenge is to take ten recipes for different types of dishes and tell me, if there is one, the non-flavour or taste purpose of each ingredient. Knowing how to cook is not a matter of knowing how to complete recipes, it is knowing how to prepare complete meals given a basket of raw food without having to first find a recipe. As one culinary instructor I work with always says, 'You cook with the ingredients you have, not the ones you wished you had.'¹⁹

Students today are expected to understand basic arithmetic when they enter cooking school, yet many cannot multiple two fractions or even two decimal numbers when they graduate. Worse, they are incapable of estimating numerical results without the use of a calculator. Students today do not understand weights and measures or the concepts of accuracy and precision. Culinary-school graduates have, at best, a rudimentary knowledge of ingredients and usually no knowledge of their interaction. They don't understand heat transfer and heat flow. They don't understand how proteins react to heat, or the difference between non-enzymatic and enzymatic browning. Students do not understand how basic appliances work. Yes, they can turn a blender on and off, but they do not understand how blade design, motor horsepower, and tip speed can effect the minimum particle size in a puree or how particle size effects mouth feel. Today's graduates do not know the difference between hype and reality. They do not understand that the terms 'kosher' and 'sea' have no meaning past their marketing benefits when used as adjectives for salt. Most do not understand how to choose the right whisk, or even how to properly use a cook's knife.

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A proposal for a new curriculum

The education received by students in the culinary arts, needs to be closer in process to the education afforded medical students. The culinary student should receive an extensive education in the fundamentals of cooking, supported by appropriate laboratory experiences, before moving into the kitchen to prepare dishes.

The remainder of this paper is a proposal for a framework for a new curriculum to be taught in culinary schools.²⁰ The new curriculum framework is based on the fundamentals of food and its preparation rather than learning a series of recipes without an understanding of why the steps of a particular recipe matter. As a matter of completeness, baking in all forms is considered integral to the culinary arts and not treated as a separate subject. The curriculum framework does not distinguish between pastry and cooking. The new

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curriculum framework also contains elements designed to motivate and challenge the culinary student to be more responsible and mature upon graduation.

The first phase of the proposed curriculum framework emphasises the fundamentals of cooking without reverting to the food preparation. Laboratory work completed by the student is designed to complement the student's classroom work. For example, to complement the discussion about heat transfer, an exercise shall be performed to look at the relationship of hob type to pan materials. Each student would be responsible to run the exercise for different configurations and illustrate the results. The goal would be for the student to learn that the best heat transfer coefficient may not produce the most even heating of the surface of the pan. Because this is a test that cannot be rushed, the student needs to learn patience. Because multiple tests can be run simultaneously, the student needs to learn multi-tasking since it is rare for a cook in a professional kitchen to perform only one task at a time.

The first phase is also meant to be rigorous. Satisfactory completion of all classwork, laboratory exercises, and course tests would be required to progress to the next level of learning. This will be difficult for many potential students who lack the prerequisite skills. For this reason, parts of the coursework, such as the mathematics, is intended to be somewhat remedial, and students already well versed in portions of the coursework would be able to 'test out' of these portions. Even with extra effort, it is expected that many students will not advance to Phase 2 of the program.

This coursework is designed to be part of an all-inclusive program. There are programs designed specifically to be the opposite. As one cooking-school course syllabus states: 'The whole purpose of the course is to get you a job in the culinary field. The purpose of the course is NOT to teach you how to cook'.²¹ Upon starting the course at the school, each student acknowledges this statement in writing. The primary goal of this proposed curriculum framework *is* to teach students how to cook with the secondary goal of learning to do so in a professional environment. Most of what is taught during the first phase of the curriculum framework can not be learned 'on the job' through *staging* or apprenticing. It must be taught in a classroom and laboratory environment.

The second phase of the curriculum framework immerses the student in the different techniques of cooking but still without recipes. For example, to learn how to braise a dish, the student would combine the just-learned principles of braising with information about ingredients, flavour, heat, equipment, etcetera, and propose a plan for a preparation. After discussion with the instructor, the student would complete the preparation and critique the results. The process would be completed multiple times using a variety of ingredients for each technique.

The final phase of the curriculum framework has the student preparing many classical preparations from recipes provided by the instructor and or researched by the student. The

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student would at the same time, create a variation of the dish intended to be simpler or modern. Part of the grading would be based on how far from the original the new dish journeyed while still being recognized as being that dish.

Additionally, as part of their last phase of training, students will be required to prepare the full gamut of culinary dishes using the ingredients provided by the instructor and no written recipes. Class after class, the students will demonstrate that they truly know how to cook.

During the entire program, students will be required to wash and maintain all equipment used during classes and or laboratory exercises. They will be responsible for storage of unused food items, sweeping and mopping the floor, and disposal of waste.

Missing from the program is training for the student in how to work a station during a meal rush. This can be best learned in the real situation and not one simulated in the classroom. Students may participate in some form of externship as part of the course requirements, but the externship may not be used as an alternative to completing the curriculum.

The most common complaint that I heard from chefs who could and or do hire the graduates of culinary schools was that the current supply of students are not passionate about cooking. Being able to cook competently is not enough. Thus an additional goal of this curriculum framework is to produce graduates who are passionate about food *and* its preparation. Ultimately, graduates must be both passionate about food and passionate about cooking.

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Framework Phase 1

Kitchen Math

Longhand arithmetic of decimal numbers

Longhand arithmetic with currency

Longhand arithmetic of fractions

Conversion of fractions to and from decimal numbers

Longhand arithmetic of time

Reading analogue clocks and timers

Division of shapes

Graphing

Calculating yield

Calculating concentration

Understanding simple statistics

Correlation vs. causation

Estimation

Measuring

Units of measure

Archaic units

Geographical differences

Scaling

Precision and accuracy

Microbiology for cooks

Microbes [bacteria, fungi, protista, viruses, parasitic worms, prions]

Food-borne illness

Viruses sicken, bacteria kill

Contamination sources

Symptoms vs. microbe

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Determining infectious dose	States [solid, liquid, gas]
Role of personal hygiene	Phase change [triple point, sublimation, reversibility]
Common misconceptions	Bulk heating
Food-related pathogens [worms, fungi, protists, bacteria, viruses, prions]	Heat flow [contours]
Avoidance	Introduction to heat sources [efficiency, paths of heat flow]
Suppression	Relationship to power and energy
Extermination	Fluid forms [non-Newtonian fluids]
Food safety	Gels
Understanding relevant sections of national food codes ²²	Emulsions
Understanding HACCP ²³	Suspensions [non-Newtonian fluids]
Food safety misconceptions	Foams
Hygiene [personal, kitchen]	Food politics
Food storage [temporary, long-term]	Sustainability
Food handler certification	Organic
Enforcement [jurisdiction] ²⁴	Hybridization vs. genetic modification
Worker safety	Industrial vs. small farms
Posture [lifting, walking, standing]	Heritage animal and plant programs
Protective equipment	Additives and adulteration
First aid [cuts, burns, falls, fainting]	Understanding processed foods
Thermodynamics	Labelling [regulated, marketing]
What is heat	Husbandry [certification systems]
Specific heat capacity	Diet systems
Heat transfer	Historical perspective
Heat flow	Types of diets [evolutionary, proactive]
Radiation [black body, line-of-sight]	Relationship to science [epidemiology, medically prescribed]
Convection [gas, liquid]	Food pseudoscience [beliefs vs. facts]
Conduction [solids, interfaces]	

Framework Phase 2

Common kitchen axioms

- Truths
- Partial truths
- Falsehoods

Flavour theory

- Flavour vs. taste
- Perspective
- Maillard (non-enzymatic browning) reactions
- Flavour pairing [prospective, analysis]
- Seasoning

Planning [integrated with the Ingredients, Equipment, and Cooking Techniques and Methods sections]

- Time management
- Ingredient sourcing
- Labour allocation

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Ingredients²⁵

- Animal [sources, physiology, life cycle, heat effects]
 - Mammals [cattle, sheep, pigs, rabbits]
 - Poultry [chickens, ducks, geese, pigeons, guinea fowl, pheasants]
 - Seafood [fish, molluscs, crustaceans, echinoderms]
 - Eggs [poultry, fish]
- Vegetables [source, physiology, life cycle, heat effects]
 - Leafy and salad vegetables [arugula, beet greens, bok choy, Brussels sprout, cabbage, celery, chard, collard greens, endive, fiddlehead, grape leaves, kale, lettuce, mustard, napa cabbage, pea sprouts and leaves, radicchio, sorrel, spinach, turnip greens, watercress]

Fruits [apple, apricot, aubergine, avocado, banana, bell pepper, berries, breadfruit, chayote, citrus fruit, courgette, cucumber, dates, durian, grape, jackfruit, lychee, mango, melon, nuts, olive fruit, pear, pepper, persimmon, pineapple, quince, squash, tomatillo, tomato]

Flowers and flower buds [artichoke, broccoli, caper, cauliflower, courgette flowers]

Podded vegetables [beans in pods, peanuts, peas, lentils, okra, shelled beans]

Bulb and stem vegetables [asparagus, cardoon, celery, fennel, garlic, kohlrabi, leek, lotus root, onion, shallot]

Root and tuberous vegetables [bamboo shoot, beetroot, burdock, carrot, cassava, galangal, ginger, Jerusalem artichoke, jicama, parsnip, potato, radish, salsify, sweet potato, taro, turnip, water chestnut, yam]

Sea vegetables [aonori, hijiki, kombu, nori, wakame]

Herbs [allspice, anise, basil, bay, borage, caraway, cardamom, celery seed, chives, cilantro, cinnamon, clove, coriander seed, cumin, dill, fennel, ginger, grains of paradise, horseradish, hyssop, juniper berry, kaffir leaves, lavender, lemongrass, liquorice, lovage, mace, marjoram, mint, mustard, nutmeg, oregano, parsley, pepper, prickly ash, rosemary, saffron, sage, sassafras, savoury, shiso, star anise, sumac, tarragon, thyme, turmeric, vanilla, wasabi]

Minerals

Edible minerals [table salt]

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- Sources
- Politicization
- Additives [functions, issues, application]
- Anti-caking agents [calcium silicate, iron ammonium citrate, silicon dioxide]
 - Colour additives [artificial colourings, natural colourings]
 - Dough strengtheners and conditioners [ammonium sulphate, azodicarbonamide, L-cysteine]
 - Emulsifiers [soy lecithin, mono- and diglycerides, egg yolks, polysorbates, sorbitan monostearate]
 - Enzyme preparations [transglutaminase, lactase, papain, rennet, chymosin]
 - Fat replacers [olestra, cellulose gel, carrageenan, polydextrose, modified food starch, microparticulated egg white protein, guar gum, xanthan gum, whey protein concentrate]
 - Firming agents [calcium chloride, calcium lactate]
 - Flavour enhancers [monosodium glutamate (MSG), hydrolysed soy protein, autolysed yeast extract, disodium guanylate or inosinate]
 - Flavours and spices [natural flavouring, artificial flavour, and spices]
 - Gases [carbon dioxide, nitrous oxide]
 - Gelling agents [gelatine, agar, sodium alginate, pectin, egg protein]
 - Humectants [glycerine, sorbitol]
 - Leavening agents [baking soda, monocalcium phosphate, calcium carbonate]
 - Nutrients [thiamine hydrochloride, riboflavin (vitamin B2), niacin, niacinamide, folate or folic acid, beta carotene, potassium iodide, iron or ferrous sulphate, alpha tocopherols, ascorbic acid, vitamin D, amino acids (L-tryptophan, L-lysine, L-leucine, L-methionine)]
 - pH control agents and acidulants [lactic acid, citric acid, ammonium hydroxide, sodium carbonate]
 - Preservatives [ascorbic acid, citric acid, sodium benzoate, calcium propionate, sodium erythorbate, sodium nitrite, calcium sorbate, potassium sorbate, BHA, BHT, EDTA, tocopherols (Vitamin E)]
 - Stabilizers and thickeners, binders, texturizers [gelatine, pectin, guar gum, carrageenan, xanthan gum, whey, methylcellulose]
 - Sweeteners [sucrose (sugar), glucose, fructose, sorbitol, mannitol, corn syrup, high fructose corn syrup, saccharin, aspartame, sucralose, acesulfame potassium (acesulfame-K), neotame]
 - Yeast nutrients [calcium sulphate, ammonium phosphate]
- Equipment [description, design, usage (both demonstration and hands on)]
- Hand tools [baking sheets, baking tins and plates, ballers, blow torch, bowls, brushes (bristle, high temperature), chocolate working tools, citrus juicers, cleavers, cooling racks, cups (prep, measuring), cutters, cutting boards, dough scrapers, egg slicer, fish scaler, food mills, graters (box, mouli, microplane®), grinders (meat, nuts, cheese), knives (chefs, paring, slicer), ladles, mandolins, meat pounder, openers (bottle, jar, can), pastry bags and tips, peelers, pH meter, pots, pressure

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cooker, ricers, rolling pins, sausage stuffer, scales (spring, balance, digital), scissors, scoops, skillets, spatula (flexible, stiff), spoons (solid, slotted, measuring), storage containers, strainers (chinois, sieves, colanders), syphon jar, thermometers (dial, digital, oven), Thermomix®, tongs, whisks]

Small appliances [blender, chocolate tempering warmer, circulator, crepe maker, dehydrator, food processor, homogenizer, hot plates, ice machine, immersion blender, microwave oven, panini grill, rice cooker, rotary evaporator, sausage stuffer, sealer (impulse, end, vacuum), stand mixer, thermal immersion circulator, toaster, waffle iron, water bath]

Large appliances [bowl chopper, centrifuge, cooktops (flattop, French-top, griddle, multi-hob), dough sheeter, floor mixer, freezers (walk-in, reach-in, flash), fryers, grills (gas, wood-fired, charcoal), ovens (conventional, convection, water vapour, combined, radiant, bread, brick), ranges, broilers (over-fired, cheesemelter), refrigerators (walk-in, reach-in, cabinet, flash), steam kettles, tilting cookers, warmers (cabinets, steam table)]

Cooking techniques and methods [description, demonstration, hands-on experience]

Wet-heat methods

Boiling [water, fat]

Simmering [water, fat]

Blanching [water, fat]

Low-temperature [active, passive]

Braising

Steaming

Pressure cooking

Shallow frying

Pan frying

Dry-heat methods

Baking and roasting

Grilling

Hot smoking

Cold methods

Fabrication and assembly

Cold smoking

Maceration

Acid cooking

Cryogenic cooking

Preservation methods

Drying [water-activity level]

Fermenting

Brining

Pickling

Auxiliary methods

Thickening [sauces]

Extraction [stocks]

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Framework Phase 3

Kitchen accounting	Asia [China, Korea, Japan, Vietnam, Thailand, India]
Principles of double entry bookkeeping	Mediterranean [Spain, France, Italy, Greece, Egypt, Tunisia, Morocco]
Balance sheets	The Americas [Mexico, Peru, the Caribbean, Brazil, Argentina, Chile]
Net vs. gross profit	Cooking with all five senses [rate of cooking, doneness, seasoning, flavouring, portioning, proportioning]
Cash flow	Classic dishes [original preparation and modernization, savoury and sweet]
Calculating labour expense	Select classic-dish recipes
Cost of benefits	Analyse ingredients [then vs. now]
Waste management	Analyse techniques and methods [then vs. now]
Personal development	Prepare dishes per original recipe
Personal finance	Prepare dishes per modern interpretation [simplified, rethought, deconstructed]
Banking	Improvise cooking
Budgeting	Prepare complete meals in a fixed time period given a preselected group of major ingredients and access to a reasonably stocked larder
Consumer credit	
Insurance	
Investments	
Retirement planning	
Stress management [meditation, tai chi, yoga]	
Résumé and cover-letter writing	
Interviewing skills	
Survey of world foods and cooking methods	

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Conclusion

The current methods of training future cooks, whether on-the-job or in a classroom, fail to produce workers who truly know how to cook. Current methods are geared towards producing workers who can follow instructions, whether written or verbal, but not towards employees who can truly create greatness out of the ordinary.

The framework proposed above for a new culinary-school curriculum is designed to produce graduates that understand all aspects of cooking. Students who successfully complete the program will have a true understanding of professional cooking and all that the profession demands including a broad knowledge of materials, methods and techniques, equipment, planning, achieving goals and objectives, and interpersonal relationships.

Notes

1. National Electrical Contractors Association, 'Professional Development: State Code & Licensing Requirements', <<http://www.necanet.org/professional-development/careers-in-electrical-contracting/licensure/state-code-licensing-requirements>> [accessed 3 March 2015].
2. In actuality there are five types of doctors: physicians, surgeons, radiologists, pathologists, and psychiatrists. There are also crossover doctors such as gynecologists that often treat patients both as a physician and a surgeon.
3. Peterson's Nelnet, LLC, 'A Brief Synopsis of Medical School', <<http://www.petersons.com/graduate-schools/synopsis-medical-school-requirements.aspx>> [accessed 3 March 2015].
4. American College of Surgeons, 'How many years of postgraduate training do surgical residents undergo?' <<https://www.facs.org/education/resources/medical-students/faq/training>> [accessed 3 March 2015].
5. American College of Surgeons, 'Post-Residency Fellowships', <<https://www.facs.org/education/resources/medical-students/postres>> [accessed 3 March 2015].
6. American College of Surgeons, 'Section I: Surgical Traits', <<https://www.facs.org/education/resources/residency-search/traits>> [accessed 3 March 2015].
7. Roland Passot (Executive Chef and Owner, La Folie Restaurant, San Francisco, CA), in discussion with author, 2 March 2015.
8. Adam Weiner (Culinary Instructor, JobTrain, Menlo Park, CA), in discussion with author, 5 March 2015.
9. Information collected from the individual websites and or catalog of a number of schools including Art Institute of California, City College of San Francisco, Culinary Institute of America, Johnson & Wales University, Institute of Culinary Education, International Culinary Center, JobTrain, and Mission College.
10. Christian Hallowell (Customer-Dedicated Executive Chef for Delta Airlines, Gate Gourmet, College Park, GA), in discussion with author, 3 March 2015.
11. Simón de Swaan (Food and Beverage Director, Four Seasons Hotel, New York, NY), in discussion with author, 6 March 2015.
12. City College of San Francisco, a public, two-year institution.
13. Passot.
14. Charles Vollmar (Chef and Owner, Epicurean Exchange, Orinda, CA), in discussion with author, 2 March 2015.
15. Passot.
16. Hallowell.
17. Vollmar.
18. Vollmar.
19. Weiner. Weiner has a similar line that he tells his students often, 'Cook with the equipment you have, not with the equipment you wish you had.'
20. In preparing the framework, as well as relying heavily on personal experience, a number of works were consulted: *Academic Catalog 2014–2015* (Hyde Park NY: Culinary Institute of America, 2014), pp. 46–70; James Beard, *James Beard's Theory and Practice of Good Cooking* (New York: Alfred A Knopf, 1977); Jack Bishop (ed), *The Science of Good Cooking* (Brookline MA: America's test Kitchen, 2012); Glynn Christian, *How to Cook Without Recipes* (London: Portico Books, 2008); Marian Cole Fisher, *Twenty Lessons in Domestic Science* (Chicago: Calumet Baking Powder Company, 1916); Harold McGee, *On Food and Cooking: The Science and Lore of the Kitchen* (New York: Charles Scribner's Sons, 1984); Nathan Myhrvold, Chris Young, Maxime Bilet, *Modernist Cuisine: The Art and Science of Cooking* (Bellevue WA: The Cooking Lab, 2011); Barb Stuckey, *Taste: What You're Missing* (New York: Free Press, 2012).
21. Adam Weiner, *JobTrain Culinary Arts Program Adult and Out of School Youth (Full Time) Course Syllabus* (Menlo Park CA: JobTrain, 2015), p. 12.
22. It is important that students be familiar with the national food code for the country they plan to work in.
23. The student should understand what a HACCP plan is and how to comply with one. Creating a HACCP plan is beyond the scope of this program.
24. Food safety enforcement may be the responsibility of multiple organizations with different jurisdictions.
25. The detail level of the discussion of ingredients will vary with ingredient importance, frequency of use, and complexity.