

Can Improvisation Save Culinary Education?¹

Jonathan Deutsch

“Ordering one tuna, gluten free guest, requested the preps from the steak rather than the noodles.”

“We have an onion and garlic allergy at table 14, seat 2. That’s absolutely everything—stocks, sauces, marinades, garnishes. Think through your *mise*. Don’t mess this up. Do something on the fly if you need to.”

“Chef, the private party of 18 for tonight said they’ll be 26. Can we make it work?”

“Chef—you asked for whole dressed trout as an entrée but these are huge! Should we send them back, fillet them for something else, or change the menu description?”

“Did you cut yourself? That looks really bad. Go take care of that and I’ll take over your station.”

“Chef, someone turned my oven off so these didn’t bake all the way through. What should I do?”

“Did you just taste that with your finger? This is an open kitchen! You’re gonna make me go viral, and not in a good way!”

Where cooking is performance (Kirshenblatt-Gimblett, 1999), cooking in professional settings demands improvisational performance. To be sure there’s a script—a chart—a *repertoire de la cuisine*, a menu. Playing Frédéric Chopin at home on a piano may be analogous to preparing a classic dish, with peak ingredients, an artistic endeavor to be sure. But doing so with the pressures of a busy time-sensitive foodservice environment, with hundreds of factors and decisions (some controllable—some uncontrollable) shaping the outcomes, under the

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scrutiny of the public, and increasingly, critical and media eyes, requires a deft and improvisational performance artist.

In this paper I argue that the standard approach to culinary education in the US (and, indeed, in much of the world)—cooking via replication of recipes—is a mismatch and inadequate preparation for the very real demands of the profession, where an improvisational culinary artist has better preparation for success. I offer suggestions for pedagogical techniques that could obviate or remedy a crisis in culinary education.

Culinary Education in Crisis

Culinary education in the US is in crisis. The past years have brought declining enrollment and the closure of a number of postsecondary culinary arts programs, including all sixteen Le Cordon Bleu campuses in the US (Allen, 2017; Dadonna, 2016; Kapsidelis, 2017; Crawford, 2016). At the same time, students are staging walkouts of even the self-proclaimed “premier culinary college,” bemoaning declining standards, unfulfilled promises and poor quality of education (Severson, 2008; Moskin & Collins, 2013). In other cases, entire classes of alumni are filing suits claiming that their education has not delivered promised wages, jobs or titles (Trachta, 2010). Chefs and managers report being dissatisfied with many alumni hires—in some cases severing relationships with culinary schools and preferring to recruit and train on their own (Ulla, 2011). Chefs, many of them culinary school graduates themselves, decry the high expense of culinary school and unreasonably high career expectations set by the institutions’ marketing and communications, only to have alumni emerge in relatively low-wage jobs, in roles subject to long hours of evening and holiday work, physical labor, and stressful work environments, where sexual harassment and drug and alcohol abuse are common fixtures; and clear pathways to promotion, especially for women, immigrants and minorities, are not (Jayaraman, 2013). With a median annual salary just over \$21,000 for cooks (Bureau of Labor Statistics), and about double that amount for leadership positions, tens of thousands of dollars of tuition to receive professional education for a low-wage job with few barriers to entry seems farcical (Dixon, 2015). In fact, chef after chef advises that learning from a mentor on the job is as—or more—valuable than formal culinary education (Ulla, 2011).

And yet, each year, tens of thousands of students in the US enroll in one of over 500 accredited culinary schools (educationnews.org). Andress (2016), in a study of value perception of culinary education, lists motivations for students who pursue culinary careers far beyond salary and benefits, including: celebrity status, critical acclaim, customer (guest) satisfaction, business success, prestige, personal satisfaction, and managing employees, all valued attributes in a culinary career. In a survey of 119 culinary school graduates, Andress shows that while

salary and benefits are important to nearly 99% of respondents, who rank it somewhat important, important or very important, highly ranked also are the attributes of customer satisfaction (95%), success of the business where the chef is employed (96%), the prestige of the business (typically a restaurant) (91%), and personal satisfaction and happiness (100%), suggesting that while there may be easier ways to make a living, a culinary arts career holds rewards beyond (or it could be argued—*despite*) the financial. Similarly, while a common trope among culinary educators is to bemoan the starry-eyed students who ostensibly pursue culinary education for the slim prospect of a James Beard Award medal or food television series (Dixon, 2015), 79% of Andress's respondents claim the prospect celebrity status is of no importance or only mild importance.

Far from a new conversation, consider this comment in a *Washington Post* piece on the state of culinary education:

Despite its stature, the C.I.A. [Culinary Institute of America] is undergoing a management crisis. It is caught between the methods of its faculty members, who respect and depend on traditional European methods of training cooks, and the demands of an industry that is enthralled with an automation and fast food. Should young men and women who will soon be working with machines and computer print-outs learn from scratch cooking? Should they absorb the lore and prejudices of Old-World theoreticians? So far, the answer has been yes, but there are pressures to streamline and 'modernize' the program (Rice, 1978).

Note the year of the quote: 1978. By comparison, consider a current quote, from a head of school: "We're constantly looking for new ways and opportunities to grow our school,' said Michael Carmel, head of culinary arts in Charleston. 'It's not necessarily a numbers game, but a quality game. We need to stay current with trends and have to be able to offer our students opportunities'" (Allen, 2017). Culinary education in the US, then, has, for my entire lifetime or longer, been aware of its need to stay current and relevant, if only to make a strong business case to attract and retain students and satisfy employer demand, and ideally, to advance the profession and offer a high-quality education. In this paper, I argue that our field of culinary education would be well-served to look to incorporate improvisation in pedagogy in order to make itself continually relevant to students and employers and stem or reverse the market forces that seem to be pressing more programs into closure and more chefs into taking the position that culinary education is perfectly fine if one has the funding, but not otherwise a worthwhile investment (Ulla, 2011). Keep in mind that the launching point of this paper is US-focused and generalized. To be sure, there are culinary education innovations and there is great teaching happening everywhere. My intent is not to diminish the work of my colleagues but rather to raise a collective opportunity to advance our field.

Traditional Culinary Pedagogy

One of the tensions in culinary education no doubt stems from the fact that, despite its rhetorical label of *arts* (as in culinary arts), the culinary field is a trade traditionally taught in the Western tradition via the apprentice system (Symons, 2000). As a trade or craft, it has much more in common pedagogically with vocational training for skilled trades like plumbing, carpentry, or machining, though it is not lost on commentators that the return-on-investment of vocational training programs (often heavily subsidized by workforce investment boards in the US or union- or company-provided) to the hourly rate of pay (Deveau, 2013), is much more favorable outside of the kitchen, though somewhat inexplicably gutting a fish has more popular culture cache than snaking a drain.

Formal culinary education of the type I consider in this paper has its roots in early 20th Century hotel training. Even the standard curriculum—knife skills, stocks, soups, sauces, followed by fish, meat, vegetables, starches, and baking and pastry, in that order—has its roots in George Auguste Escoffier’s *Le guide culinaire* (1903) the seminal professional cookbook based largely from his time as chef at the Savoy hotel in London. Ironically, Escoffier himself would have been mortified that a century-old book, even his century-old book, would have the longevity to form the canon of professional cooking. Escoffier (1907) begins the preface to the first English translation of the *Guide*, “If the art of cookery in all its branches were not undergoing a process of evolution, and if its canons could be once and forever fixed, as are those of certain scientific operations and mathematical procedures, the present work would have no *raison d’être*” (p. v).

Despite Escoffier’s warning, a canon is precisely what we have in culinary education. The “big three” comprehensive culinary textbooks all have remarkably similar tables of contents, which still, a century later, map loosely to Escoffier’s *Guide* (Miller and Deutsch, 2016).

Table 1. Culinary Curriculum

Labensky, Sarah, Martel, Priscilla, and Hause, Alan, (2015). <i>On Cooking</i> , 5 th Edition, Pearson.	Gisslen, Wayne (2014). <i>Professional Cooking</i> , 8 th Edition, John Wiley & Sons.	The Culinary Institute of America (2012). <i>The Professional Chef</i> , 9 th Edition, John Wiley & Sons.	Escoffier, August, <i>Le Guide Culinaire</i> , 1907, William Heinemann
1. Professionalism	Chapter 1: The Food-Service Industry	Chapter 1: Introduction to the Profession	Fonds de Cuisine
2. Food Safety and Sanitation	Chapter 2: Sanitation and Safety	Chapter 2: Menus and Recipes	The Leading Warm Sauces
3. Menus & Recipes	Chapter 3: Tools and Equipment	Chapter 3: The Basics of Nutrition and Food Science	The Small Compound Sauces

4. Tools & Equipment	Chapter 4: Menus, Recipes, and Cost Management	Chapter 4: Food and Kitchen Safety	Cold Sauces and Compound Butters
5. Knife Skills	Chapter 5: Nutrition	Chapter 5: Equipment Identification	Savory Jellies or Aspics
6. Flavors & Flavorings	Chapter 6: Basic Principles of Cooking and Food Science	Chapter 6: Meat, Poultry, and Game Identification	Court Bouillons and Marinades
7. Dairy Products	Chapter 7: Mise en Place	Chapter 7: Fish and Shellfish Identification	Elementary Preparations
8. Mise en Place	Chapter 8: Stocks and Sauces	Chapter 8: Fruit, Vegetable, and Fresh Herb Identification	The Various Garnishes for Soups
9. Principles of Cooking	Chapter 9: Soups	Chapter 9: Dairy and Egg Purchasing and Identification	Garnishing Preparations for Relevés and Entrees
10. Stocks & Sauces	Chapter 10: Understanding Vegetables	Chapter 10: Dry Goods Identification	Leading Culinary Operations
11. Soups	Chapter 11: Cooking Vegetables	Chapter 11: Mise en Place For Stocks, Sauces, and Soups	Hors d'Oeuvres
12. Principles of Meat Cookery	Chapter 12: Potatoes	Chapter 12: Stocks	Eggs
13. Beef	Chapter 13: Legumes, Grains, Pasta, and Other Starches	Chapter 13: Sauces	Soups
14. Veal	Chapter 14: Cooking Methods for Meat, Poultry, and Fish	Chapter 14: Soups	Fish
15. Lamb	Chapter 15: Understanding Meats and Game	Chapter 15: Mise en Place For Meats, Poultry, Fish, and Shellfish	Meat
16. Pork	Chapter 16: Cooking Meats and Game	Chapter 16: Fabricating Meats, Poultry, and Fish	Poultry and Game
17. Poultry	Chapter 17: Understanding Poultry and Game Birds	Chapter 17: Grilling, Broiling, and Roasting	Roasts and Salads
18. Game	Chapter 18: Cooking Poultry and Game Birds	Chapter 18: Sautéing, Pan Frying, and Deep Frying	Vegetables and Farinacious Products
19. Fish & Shellfish	Chapter 19: Understanding Fish and Shellfish	Chapter 19: Steaming and Submersion Cooking	Savories
20. Eggs & Breakfast	Chapter 20: Cooking Fish and Shellfish	Chapter 20: Braising and Stewing	Entremets (Sweets)
21. Vegetables	Chapter 21: Salad Dressings and Salads	Chapter 21: Mise en Place for Vegetables and Fresh Herbs	Ices and Sherbets

22. Potatoes, Grains and Pasta	Chapter 22: Sandwiches	Chapter 22: Cooking Vegetables	Drinks and Refreshments
23. Healthy Cooking	Chapter 23: Hors d'Oeuvres	Chapter 23: Cooking Potatoes	Fruit stews and Jams
24. Salads and Salad Dressings	Chapter 24: Breakfast Preparation	Chapter 24: Cooking Grains and Legumes	
25. Fruits	Chapter 25: Dairy and Beverages	Chapter 25: Cooking Pasta and Dumplings	
26. Sandwiches	Chapter 26: Cooking for Vegetarian Diets	Chapter 26: Cooking Eggs	
27. Charcuterie	Chapter 27: Sausages and Cured Foods	Chapter 27: Salad Dressings and Salads	
28. Hors d'Oeuvre and Canapés	Chapter 28: Pâtés, Terrines, and Other Cold Foods	Chapter 28: Sandwiches	
29. Principles of the Bakeshop	Chapter 29: Food Presentation	Chapter 29: Hors d'Oeuvre and Appetizers	
30. Quick Breads	Chapter 30: Bakeshop Production: Basic Principles and Ingredients	Chapter 30 : Charcuterie and Garde Manger	
31. Yeast Breads	Chapter 31: Yeast Products	Chapter 31: Baking Mise en Place	
32. Pies, Pastries and Cookies	Chapter 32: Quick Breads	Chapter 32: Yeast Breads	
33. Cakes and Frostings	Chapter 33: Cakes and Icings	Chapter 33: Pastry Doughs and Batters	
34. Custards, Creams, Frozen Desserts & Sauces	Chapter 34: Cookies	Chapter 34: Custards, Creams, and Mousses	
35. Plate Presentation	Chapter 35: Pies and Pastries	Chapter 35: Fillings, Frostings, and Dessert Sauces	
36. Buffet Presentation	Chapter 36: Creams, Custards, Puddings, Frozen Desserts, and Sauces	Chapter 36: Plated Desserts	

Hotel training differed somewhat from the apprenticeship model used for cooks and other individual tradespeople throughout France and much of Europe in that the sizable numbers gave it a quasi-academy, quasi-military style atmosphere. Where the trainee of one of Escoffier's contemporaries might be one of a couple apprentices at an independent restaurant, learning at the side of the master, large hotels of the Gilded Age had hundreds of cooks and tens of trainees, a group not unlike what we would call a "class," though the most noticeable difference is that it would have been all male. According to Trubek (2000) "The

culinary system Escoffier outlined in the cookbook, which eventually became a manual of proper practice for professionals throughout the twentieth century, was inspired by the elite patrons who frequented his restaurants” (p. 49).

Culinary education in the US in the late 19th and early 20th Century was nearly unrecognizable when compared to the large formal hotel trainings of Europe. First, professional culinary education in this country for hotels and restaurants was performed almost entirely on-the-job until after World War II. Restaurants and hotels of note would import European-trained chefs, trained in the large hotels of Europe. A “cooking school” in the US, before World War II, almost always meant a home economics school for women, such as the famous Boston Cooking School (Shapiro, 1986), which trained women to be cooks in domestic settings or provided education in household management to upper-class women.

Katherine Angell and Frances Roth invoked Escoffier’s *Guide* as the foundational curriculum when they formed The New Haven Restaurant Institute to take advantage of GI Bill funds and help returning World War II veterans start a career. Their school later became the Restaurant Institute of Connecticut and, in 1951, was renamed the Culinary Institute of America (CIA). As the first professional culinary school in the US—professional reads: male—CIA was a trendsetter and influencer of the 500-plus professional culinary education and training programs that followed in the US (US Department of Education, 2014).

Most of these programs not only developed curriculum consistent with Escoffier’s outline, as discussed above, but a familiar pedagogy as well, the roots of which are still evident in the introductory modules of the big three in Table 1. First, consistent with Escoffier’s *brigade de cuisine* and Angell and Roth’s military student body, there is a strong emphasis on discipline and order. There is education about the uniform, its history and the need to keep it—and the kitchen—pristine, key in the professionalization of the chef and a growing awareness of—and emphasis on—food safety. Students are taught the ultimate authority of the chef and apart from important safety commands like, “*Chaud*” or “Hot behind,” learn “*Oui, chef!*” or “Yes, chef!” as the response that a command has been heard. Consistent with the authority of the chef, teaching is done primarily by demonstration and replication. I demonstrate a hollandaise. You repeat. If yours looks and tastes like mine, good! If not, keep trying. Now you know how to make a hollandaise. By the time you’ve been exposed to a few hundred recipes, you will reenter the world a culinary school graduate. Even advanced culinary courses are taught in this vein: I show you how to make an elegant salad topped with a seared scallop and a cardamom cracker. You repeat, but perhaps rather than being served for the chef-instructor’s critique, it is served to a guest in a school dining room. A final exam may be to show that you can cook without the demonstration: make a proper sole *meuniere* from memory. Later in the curriculum, students typically have some freedom to create within defined parameters.

For example, students may be taught the ratio and technique for a basic vinaigrette and then have the license to flavor it as they choose (cf. Brough, 2008).

Improvisation in Art and Culinary Arts

Despite its insistence on being called culinary *arts*, the improvisational and creative aspects of arts education are not prominent features of most culinary arts education in the US. There is little studio space per se where a student is to create a project (dish, menu, buffet) of their own invention. Students are sometimes given latitude to flavor dishes or plate them (arrange them visually on the plate) as they wish, though even then there are often given guidelines such as defined flavor principles or defined plating styles like B.U.F.F. (Balance, Unity, Focal Point, Flow) (Deutsch, 2011; Sikorski, 2013). Similar to Heble and Laver's (2016) observation that, "Improvisation has long been an uncomfortable subject for music educators" (p. 1), so has it been in culinary education. Despite the explosion of creative food reality shows, work exploring culinary creativity by Questlove (2016) and others, and a renewed focus on culinary creativity via documentary series like *The Mind of a Chef*, improvisation in the kitchen is often seen as a failure of planning (which the editors of this issue categorize as "cobbling together" or "on the hoof") rather than sophisticated culinary arts, to be taught by mastering technique. In that way, "the perfect croissant," is of much greater value to a culinary educator than, "a new approach to the croissant." Improvisation is seen as something skilled advanced chefs can do, once they have "paid their dues," in the decades of their development.

To be sure, there is value in learning through replication and mimicking the masters, in fine and performing arts and in culinary arts as well. I have a good means of cutting an onion that I learned from a mentor. It is the best way I know. I should share it with my students rather than giving them a knife and an onion and saying, "Learn through project-based inquiry." As a counter argument, however, consider a fine arts or even a commercial crafts program based *solely* in replication. Copying the masters is important, but the expectation is that there will always be studio space for creativity and innovation in the arts—so it should be in culinary arts. As new discoveries, technologies, and improvements are made and understood, this evidence-base should inform our practice.

For a good example along these lines, consider Harold McGee's (1990) foolproof recipe for notoriously finicky *sauce hollandaise*, where cold butter, egg yolks and lemon juice are simply, slowly, and successfully whisked together directly on a flame as compared to the classic but cumbersome double boiler method as practiced by Escoffier, learned by thousands of culinary students each year. To do the traditional method properly and easily, a cook would need four hands: one to hold the pan, one to hold the bowl atop the double boiler, one to whisk, and one to slowly pour butter. As it is, it's become a rite of passage,

where a successful hollandaise becomes as much a feat of coordination as scientific understanding of warm emulsified sauce or a culinary accomplishment to a novice culinarian. Fittingly, Escoffier (1907) himself writes, in his recipe for hollandaise, “Experience alone—the fruit of long practice—can teach the various devices which enable the skilled chef to obtain different results from the same kind and quality of material” (p. 23). He knew that surely there must be a better—easier, more reliable, more predictable—way to make the emulsion than the standard technique of the time. I attended culinary school in 1995 and, while McGee’s recipe had been published three years prior, and his seminal *On Food and Cooking* (1984) was in use as a core text, there was no mention of alternative methods.

This particular breakdown Hegarty (2004) attributes to culinary education’s lack of a research base. He identifies four paradigms chef-instructors use to justify their practices: (1) tradition (the way we do things), (2) prejudice (how I like it done), (3) dogma (this is the only way) and (4) ideology (this is what is done by the current orthodoxy aka, in 2018, the hipster, bearded, tattooed chef).

The net effect of this type of traditional culinary pedagogy is generally positive: respectful, hard-working cooks who channel their desires to learning from chefs in hopes of one day becoming one. So what is the problem? We produce good soldiers and even some generals, but no one who can talk their way out of the conflict altogether. We produce skilled technicians who can replicate a menu with efficiency and consistency but who struggle to adapt when the unexpected happens—a missing delivery, many more guests than forecasted, a problem with the gas or electric, as in the examples that open this essay. And in the foodservice industry, the unexpected always happens.

In *Culinary Improvisation* (Deutsch, 2011), Cricket Azima wrote a case study of how deep understanding of food and cooking principles can help a chef solve problems and improvise in the kitchen for precisely those instances when the unexpected happens. In a case study of accomplished pastry chef Lei Shishak, Azima gives two instances of creative problem solving:

Crème anglaise takes about 20 minutes to properly make and then at least another 20-30 to cool. It is a vanilla custard sauce. When Shishak saw her supply of prepared crème anglaise was running low in the middle of a busy service, she pulled some ice cream from the freezer and left it out on the counter-top, garnering her some quizzical looks. But of course melted vanilla ice cream is the same thing as crème anglaise, and by thinking creatively, she kept up with the demanding diner service without hesitation.

Some recipes call for softened butter. The butter was still too cold to use so Shishak grated it on a cheese grater, increasing its surface area exponentially, allowing it to soften within minutes rather than over an hour longer.

To me, both examples exemplify how progressive culinary educators want culi-

nary students to think—not simply blindly following a recipe but understanding food, cooking and food science to adapt and improvise when needed. These are the types of skills, if developed in culinary school, which might make it “worth it.” Does anyone really want to hire a pastry cook who stands idly waiting for butter to come to room temperature? I was amazed to receive a scathing comment from a peer reviewer on *Culinary Improvisation*. He took issue with the Shishak case specifically. We authors are, he said, celebrating poor planning and a poorly organized kitchen. Rather than teaching students to improvise, he suggested, we needed to focus on the planning that would prevent the problems from happening in the first place. I see that perspective but also have worked in enough kitchens to know that there is no perfectly planned day, just as there is no perfectly planned performance in the arts—a technical glitch, a missed cue, an obnoxious audience member, a horribly timed cellphone ring, an external distraction like a security scare or siren, and so on, necessitate that performers be able to adapt—and it is perhaps truer no place more than in the kitchen.

Can Improvisation Make Culinary Education Relevant?

Clearly one of the concerns of the cranky reviewer was that the problem that a creative and “on the hoof” solution solved was preventable in the first place. But in our dysfunctional food system there are many problems without a clear solution. I submit that there might be a hierarchy of culinary improvisation situations, where, put simply, one benefits from not following a rote recipe, but moves through unknown, unclear space in order to find the best path forward. Like the *Culinary Improvisation* reviewer felt, some instances of improvisation (let’s call these lower level culinary improvisations) might be unnecessary; others are key to enhanced understanding or pushing our craft to its limits. In the following paragraphs, I will illustrate specific examples of this hierarchy.

First, as the reviewer suggested, there is culinary improvisation to solve “emergencies.” This is the emphasis of much of the *Culinary Improvisation* textbook and both graduates and employers report that this is a valuable skill. In the textbook, this is taught through exercises based on the concept of theater games, process-oriented activities that encourage the learner to develop skills in specific scenarios. Here are a few where culinary improvisation would be of great benefit:

You have a fish entrée planned and ordered 280 6-ounce fillets for a banquet entrée. Unfortunately only 200 arrived and your vendor can’t get the remainder on short notice. Rework the dish and plating to deal with the shortage so the guests don’t notice.

You have the ingredients for a multi-course a la carte menu when—the power goes out. Rework the ingredient set to make it work without heat.

While conventional culinary education wisdom would have only accomplished and experienced chefs solve these problems from their experienced frame of reference, students can and should be taught the challenge of thinking through scenarios like these, pushing their higher-level thinking, culinary knowledge, and creativity.

The next category would be culinary improvisation for creativity and boundary-pushing. Similar to a jazz solo that becomes legendary, expanding the borders of the genre, so too can improvisation push cuisine to the limits of its previously tacitly understood borders.

You proposed a 5-course seated tasting menu for a catered event. The client loves it but the venue can't accommodate a seated dinner. Convert the elements to passed/hand-held items, preserving the essence of the menu items.

Cook something that communicates a mood without words. How can the food—the dish—speak. If art is a representation of emotion, use food to make art; culinary art.

This category has become *de riguer* on food television shows and can yield new advances in the art of cuisine.

Here it becomes important to define the parameters and goals. As one of the anonymous peer reviewers of this essay pointed out, “What would a theory or set of principles look like for improvising in the culinary arts? How can you avoid a free-for-all (curry flavor in ratatouille)? And how do students not fall into the ‘Jamie Oliver trap,’ where, for instance, to a foreigner, chorizo might look like a perfectly reasonable addition to paella but not to a Spanish chef?” In those cases, the goals are paramount—is the goal to honor traditional cuisine (ratatouille, paella) in the same way one performs a classical music piece with the subtlest of liberties and expression? Perfectly acceptable. Or is the goal, indeed, to challenge paradigms? In which case, why not a curried ratatouille? Or a fried crispy one? Or deconstructed, amalgamated, spherified, gelatinized, or semi-freddo? And I, for one, cannot think of any savory dish that cannot benefit from the addition of chorizo. The question is as much one of labeling, appropriation, and tradition as gustation. Paella purists might be similarly off-put when I practice a cello solo on my tuba—there is simply too small a repertoire for tuba solos and chorizo-infused dishes alike.

The third category in the hierarchy is improvisation for problem solving. This category, culinary educators increasingly admit is of prominent importance:

Here is a menu. You have a guest who is gluten-free and dairy-free. Fix it, preserving the integrity of the menu, and the timing, so your guest does not feel singled out.

New labeling requirements are coming. Rework your children's menu to include a full serving of vegetables or fruit in each item.

The ultimate category of culinary improvisation, I would argue, is one that can address systemic problems. For centuries, the height of culinary arts has been the flawless execution of technique to make a recognizable dish. Further, that dish is expected to have ingredient components of similar flawlessness. And to be sure, it is difficult to do. But it is more challenging, I submit, to use ingredients prioritized for other values such as cost and/or sustainability, and to use them for an even greater purpose than fine cuisine—such as a more just, equitable and sustainable food system. As a simple example, nearly half of the produce produced in the US is wasted, anywhere along the food chain from farms that plow under surplus produce because of a price dip, to a cargo ship carrying overripe produce because it was at sea longer than scheduled due to inclement weather, to grocery stores and buffets, intentionally over-supplied to look abundant, to post-consumer plate waste (O'Donnell et al., 2015). To discard food unnecessarily both disrespects and disregards the substantial resources—water, labor, fossil fuels, land—that went into its production, but also uses resources and produces greenhouse gases in its discard trip to the compost bin or—worse—landfill. For many chefs, cooking a gorgeous piece of fish to the perfect doneness and arranging it artfully on the plate represents the height of culinary arts. I would argue that picking through the compost bin in the kitchen, and making something tasty, healthy and affordable with cauliflower cores, apple peels, broccoli stems, mushroom stems, or radish tops represents the true culinary artistry. Following a prescribed course is rigid and anachronistic in this dynamic and trying time.

Encouraging culinary improvisation demands a new politics—a more egalitarian kitchen classroom where the students' ideas, questions, and challenges to authority are welcomed and valued. As the editors helpfully suggested, in challenging the pervasive paradigms in culinary education, we challenge the very nature of culinary education, helping trainees achieve agency, encouraged to think for themselves rather than learning through mimicry. This type of learning challenges the power dynamic of the quasi-military, instructor as *chef* (literally “chief”) sage, and empowers students to own more of their learning.

While that shift of power can be energizing for students, it can be threatening to employers and educators more comfortable with being in a position of authority. Even as simple a relaxation as creating a studio space—allowing students to try things, burn them, discard, start over, and learn from that experience, can be harrowing for a passionate culinary educator who loves food, hates to see it wasted, and wants students to do right by her or his expertise in how food should be “correctly” handled. This is indeed one of the most challenging aspects of reforming culinary education and, I and others like Hegarty (2004) suspect, its biggest and longest standing obstacle. It also challenges culinary educators to teach improvisationally—differentiating instruction to the diversity of

learners, individualizing feedback based on the energy, ideas, and creativity the learner brings to the kitchen.

Drexel Food Lab

The Drexel Food Lab was launched in 2014 as an interdisciplinary research group that engages students by linking with non-profit partners and food manufacturers to solve real-world problems in the areas of recipe and product development. There are three baskets of activity. The lab uses a Robin Hood approach where resources garnered in the first basket, Industry Projects, support Good Food projects (the second basket) and our own product development for tech transfer (the third). Industry clients range from small producers to multi-nationals. Good food projects are pro-bono or grant-funded.

In many culinary programs, research means histories, ethnographies or other analyses of food employing any number of methods. And that's good and important. But culinary research can be kitchen-based, employing the very culinary skills we know and love while improving health, the environment, and presenting opportunities for economic development. And it starts with improvisation, not recipes. Some current projects in our lab:

Working with a physician who runs a free clinic in a socioeconomically disadvantaged neighborhood, she tells us she is fed up with nutrition education that is out of touch with the real lives of her patients. They need fiber but will not get them from cooking brown rice and kale after working long days. We developed a cookie for her with 4 grams of fiber, masked by delicious ginger and spice flavors. She now gives cookies instead of prescriptions, saving her patients and insurers money in the process.

Working with the World Wildlife Federation and the US Environmental Protection Agency, most fish sold in supermarkets in the US, even in coastal areas, and especially over the 3,000 miles in between is defrosted from frozen. The perception among consumers is that refrigerated, thawed fish is preferable to frozen, where from a freshness, food safety, cost, and waste perspective, the reverse is true. Unsold fish cannot be refrozen and is often discarded day's end. We developed recipes that educate consumers to cook-from-frozen, saving stores labor and shrink in the process and yielding a better dish at home.

Working with cancer patients, students develop recipes for a non-profit called Cook for Your Life! that are not only sensitive to the nutritional needs of cancer patients (familiar ground for a dietitian) but which also take into account changing sensory thresholds, side effects of treatment and lifestyle issues like fatigue, which are less common considerations.

Conclusion

By focusing on systemic improvement to our global food system, culinary education can make itself relevant. To do so, faculty need to structure opportunities for students to learn not only to follow recipes, but to challenge, ask questions, create, problem-solve, and express themselves. In short, they need to improvise. Doing so, as we see in the arts, will create revenue through entrepreneurship and technology transfer, do good through creating expressive beauty and improved systems design, and push the field to the *avant garde*. This, in turn, can make culinary education relevant by not simply training cooking technicians to follow recipes, but true culinary artists, culinary researchers, culinary engineers, and others who have the technical skills of cooks but the orientation of a professional. As in the arts, this *avant garde* should not be created by established millionaires, as often happens in the case of celebrity chefs, but by young energetic paradigm-challengers, working at the peak of their creativity and the trough of what they have to lose by taking a risk.

All of the projects mentioned above have a few common threads I would argue are essential to the culinary education of the future:

Students and faculty collaborating with industry and advocates to improve our food system.

Students building connections for careers beyond the traditional fine dining restaurant environment.

Students and faculty working to improve the health, sustainability and economic development of our food system.

Students improvising — making mistakes, having wins and losses; not just following recipes.

To return to Andress's (2016) study, these projects are key in providing the prestige and job satisfaction chefs cite as important. These elements need to work together, all in the service of changing a culture of "Oui chef!" to "Why, chef?"

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