Food Pedagogy as an Instructional Resource in a Science Methods Course

by William Medina-Jerez, University of Texas at El Paso; & Lucia Dura, University of Texas at El Paso

Abstract

This article explores the integration of culturally relevant practices and student expertise into lesson planning in a university-level science methods course for preservice elementary teachers (PSETs). The project utilized a conceptual framework that combines food pedagogy and funds of knowledge, modeling an approach to lesson design that PSETs can use in their future classrooms to bring students' worldviews to the forefront of science learning. The article gives an overview of the conceptual framework and the origins of the project. It describes the steps involved in the design, review, and delivery of lessons by PSETs and discusses implications for instructional practices in science teacher education and science learning in elementary schools. The article concludes with a discussion of major outcomes of the use of this framework, as evidenced by PSET pre- and post- project reflections: student-centered curriculum development, increased PSET self-confidence, integrated learning for both PSET and the students, and sustained levels of engagement.

Introduction

> As I grew up in New Mexico, my family would make the long journey from the Southwest to visit *familia* in the Midwest every summer. That ten-hour car ride across mountainous terrain that slowly turned to golden wheat fields was made better by knowing that when we got to the end of the journey in Kansas, we would be met by my *abuelita's* cooking—tacos, enchiladas, *gorditas, arroz, fideo, sopa*; whatever my mother Estella wanted the most, my *abuela* would be cooking. (Creel Falcon, 2018, p.70)

It is no wonder that the "word companion comes from the Latin words Cum Pane, meaning the person you share bread with" (Wooley & Fishbach, 2017, p. 2). Sharing a dish with friends and family during holidays or social gatherings is a commonplace activity for most of us. In addition to sharing food, we also share anecdotes and cherished traditions. We might describe the origin of our dish; perhaps we talk about the person from whom we inherited the recipe, including the secrets and twists that make our dish meaningful and appetizing. This prevalent household practice creates a sense of "*confianza*," community and belonging—in essence, a safe and familiar space (Alvarez, 2017). Beyond that, we argue, the practice of sharing food creates opportunities for learning grounded in everyday life, a sort of 'connected science' context (Bouillion & Gomez, 2001) to foster engaged and inclusive science learning.

The lesson planning approach described in this article originated in '*La Escuelita'* after school program (*Escuelita* is an endearing term for school in Spanish) in a public housing community on the U.S.-Mexico border. In this program, we—as university partners and facilitators—combine food pedagogy (Flowers & Swan, 2012) with Funds of Knowledge (FoK) (Moll, Amanti, Neff, & Gonzales, 1992) to connect with participants in a familiar way to create spaces for meaningful learning. Food pedagogy, as defined by Flowers and Swan (2012), involves the tasks that go into the "growing, shopping for, preparing, cooking, displaying, tasting, eating, and disposing of food by a range of agencies and actors" (p. 426) for teaching and learning. FoK is a framework that assumes students bring more knowledge into the classroom than we think—knowledge from their homes that can be built upon (González, Moll, & Amanti, 2005). Within this combined approach, *La Escuelita* sessions are an invitation to gather and celebrate our collective, food-based cultural capital, which we draw on to co-design and implement asset-based learning activities with elementary school children and their caretakers. Both of these frameworks are especially valuable resources because they lend themselves to bilingual and culturally responsive teaching.

Through these interactions, which occurred in English, Spanish, and Spanglish, we uncovered traditions and understandings of natural processes related to food products used in Mexican culture—the heritage culture of *Escuelita* participants. It's customary for teaching and learning in our border community to occur in mixed languages, e.g., Spanglish, as students are making sense of concepts with their prior knowledge, and that prior knowledge manifests in different linguistic codes (Benavides & Medina-Jerez, 2017). Such is the case of *nixtamalization*, a process for making corn-based foods which a group of mothers and grandmothers explained on the day we prepared tortillas. *Nixtamal* is a word from the Aztec language *Nahuatl* that means unformed corn dough. The dough-making process involves soaking dried corn in *cal*, an alkaline solution that uses calcium hydroxide ($Ca(OH)_2$) as the solute agent. Nixtamalized *masa* has a high calcium content, makes the nutrients in the corn more accessible, and increases the availability of proteins. When taking us and the *Escuelita* participants through the process of nixtamalization in their own language, the *abuelitas*, or community elders, addressed school science concepts like the effect of heat and alkalinity in a chemical reaction; they were able to explain the purpose of cooking dried field corn with *cal.*

Given our success with the *Escuelita* program in fostering learning around home knowledge over the last seven years, we hypothesized that combining food pedagogy with FoK in the college classroom would give Preservice Elementary Teachers (PSETs) the opportunity to both learn and design in culturally relevant ways (Ladson-Billings, 1995; Ladson-Billings, 2014; Mensah, 2011; Nieto, 2004). Ladson-Billings (1995) outlined three criteria for culturally relevant teaching: "(a) students must experience academic success; (b) students must develop and/or maintain cultural competence; and (c) students must develop a critical consciousness through which they challenge the status quo of the current social order" (p. 160). Our aim was to expose PSETs first-hand to lessons that are culturally relevant, i.e.,

“affirming, validating, and connected to their interests and backgrounds” (Mensah, 2011, p. 297). Ideally, they would go on to replicate culturally relevant science teaching in their professional careers. To accomplish this goal, Author 1 used this conceptual framework in the design of a 5E Lesson in the methods course. In the sections that follow, we present the conceptual underpinnings that support the lesson project; we also offer an outline of the lesson design and implementation tasks, and end highlighting the main outcomes of the lesson project.

Conceptual Framework: Food and Culture as Instructional Resources

Since food is an aspect of everyone’s life, it is not only interesting to learn *about* food as the topic engages a wide variety of people and contexts. As the *nixtamalization* example in the introduction illustrates, it is also interesting to learn *through* food. Yet despite food being ubiquitous, it functions within social, economic, and political systems (Swan & Flowers, 2015). Often, food pedagogies are fraught with unacknowledged ideologies and asymmetries of power in the name of healthy eating. Messages with strong assumptions about what is good vs bad are conveyed within an array of formal and informal pedagogical activities, i.e., cooking classes, nutrition workshops, and social marketing campaigns. In these contexts, the focus on physical health tend to assume that people who make “bad” choices do so out of lack of knowledge, which creates a culture of shame and “underestimate[s] the agency of targeted ‘learners’” (Swan & Flowers, 2015, p. 3). Thus, when undertaking food pedagogy projects, informed, critical perspectives are crucial. For food pedagogies to be transformative, not just superficial teaching tools, it is important to question and make sense of assumptions from both the facilitators’ and the participants’ perspectives. This likely plays out in different ways for different communities. In our experience with the *Escuelita*, the FoK framework (Moll, Amanti, Neff & Gonzalez, 1992) has proven pivotal as it helps us put participants’ needs and interests above our own.

As educators employed in a university, we have access to knowledge, experiences, and privileges that *Escuelita* participants do not. Because of this, it comes naturally for us to want to share this knowledge and experiences through *Escuelita* programming. For example, we might have an idea about nutrition, such as the Michelle Obama nutrition plate that we may want to convey. Taking a FoK approach does not mean we don’t share valuable tools, but the “external” tool or “best practice” is not where we begin. Instead, we would ask participants to tell us about the foods that make them feel good. We would then engage in an inquiry into these foods and why they make us feel good, or different conceptions of feeling good. And of course, we would bring food to share that makes us, the facilitators, “feel good.” In this sense, we believe food can facilitate conversations rooted in respect for the wholeness of the children in our educational settings. We demonstrate this respect by shifting our assumptions about expertise in two ways. First, we believe the locus of expertise is precisely in the “learners,” and second, we frame knowledge in such a way that what counts as knowledge is extricated from everyday activities. As Windschitl (2006) put it, “many students, especially

those most marginalized by the way science is delivered in classrooms, have hidden funds of knowledge about all kinds of natural phenomena or technology that teachers never take advantage of" (p. 355). While cultural capital, i.e., a person's material and symbolic assets (Bourdieu, 1985), does not in itself lead to social mobility, we have observed in *La Escuelita,* it can be leveraged in a way that promotes self-awareness and improved confidence for learning. Ultimately, our conversations might end with a tool like the nutrition plate, but only after recognizing generational and cultural knowledge. This, we posit, enables participants to position themselves as contributors, not just as receivers.

The Next Generation Science Standards (NGSS Lead States, 2013) suggest five areas that offer opportunities to help students, especially those from under-represented groups, learn science and language (literacy, language support, classroom discourse, home language, and home culture connection strategies). Of these areas, the last two clearly align with the food pedagogy/FoK-based lesson project in the methods course. For educators, this means acknowledging that students have a great range of prior understandings and experiences with nature that they employ while making sense of scientific phenomena. Additionally, as noted by Mensah (2011) promoting culturally relevant teaching in teacher preparation programs is foundational in preparing PSETs to honor FoK as an instructional resource in urban schools. In this course project, our intention was to guide PSETs in the process of employing their own and community-based knowledge about traditional Mexican recipes as contextual scaffolds for science learning.

Lesson Preparation and Delivery

Each semester, our science methods course holds a science learning event on our university campus that is intended to give PSETs an opportunity to deliver their lessons to a group of children—mostly ELLs from the *Escuelita* afterschool program. Our university is located in a large binational metropolitan area, and we share the border with a Mexican city with a population of approximately 1.7 million inhabitants. The majority (80%) of the students enrolled in our university, and for that matter in our education programs, are Latinx of Mexican descent. Many of our students are first-generation college students, and largely resource-poor. A number of them reside on the Mexican side of the international border and commute to the university campus daily or weekly or have completed their K-12 education in Mexico.

The science methods course consisted of 27 PSETs (25 females, 2 males) in their senior year and their concentrations were on Bilingual and Early Childhood Education. The majority of the PSETs (25 out of 27) were of Mexican descent; the other two were Caucasian. Our methods class is a 16-week course that meets once a week for 2 hours and 50 minutes. PSETs take this course at the end of their training program before the student teaching semester. In this methods course we devoted the first 12 weeks to the exploration of food

and other concepts such as art, nature of science, and reading and writing in science as instructional tools, and to the exploration of lesson design. The PSETs delivered their lesson in week 13 and then worked on lesson revision and reflection during the last two weeks.

Table 1 (Click on image to enlarge)

Phases Involved in the Planning of the Lesson

Week	Topic	Activity	Objective
1	Introductions	Food Pedagogy I: The Bagel Face	Introduce Food Pedagogy and Funds of Knowledge as anchor concepts of lesson planning
2	Basic and integrated inquiry skills	Popcorn inquiry activities	Practice scientific habits of mind
3	Lesson plan format	Reviewing science curricula and drafting a lesson plan	Gain insights on the structure of a 5E lesson built around a food recipe
4	Views about science teaching and learning	Impressionist Tales/Science teaching philosophy	Articulate views and beliefs about science teaching and learning
5-7	Science inquiry skills through familiar recipes	Exploring the oxidation of bananas and guacamole	Use heritage and recipes to explore and understand science content and scientific skills
8	Lesson plan outline	Food Pedagogy II: Mini potluck	Produce the first draft lesson plan
9	Reading and writing in science	Examination of trade books and practice with writing formats (science poetry, scripts, cartoons)	Explore creative venues for science integration with other subjects
10	Lesson plan review	Merit presentations	Assess the content of lesson plans
11-12	Lesson plan review	Peer review within class and with PSTs from other university	Assess the content of lesson plans
13	Lesson plan delivery	Science education event on campus	Test the lesson plan with a student audience
14	Reflection on lesson delivery	Journal entry	Reflect on lesson design and delivery
16	Lesson plan submission		

Week 1. First Class Meeting: The Bagel Face and Introductions

The purpose of this activity was two-fold: to use food as a vehicle for introductions, and to capitalize on PSETs' expertise on traditional recipes as the guiding principle of their 5E lesson projects. On this day, the class began with the students enjoying some food samples and using food ingredients as the platform for introductions. Next, a picture of a bagel face produced in our afterschool program was projected on the screen, which would be used as an example of the bagel face task. The PSETs were then prompted to think of a meaningful person for whom they want to show appreciation and tell a story using half of a bagel and other ingredients. First, they sketched out their bagel face on a sheet of paper, and then proceeded to assemble the face using the bagel and the available ingredients for the facial features and expressions.

After working on this task for about 10 minutes, we began the introductions. As the course instructor (Author 1), I went first. I gave a short speech on my grandmother's life, I introduced myself and mentioned some key points about my academic background. Next, as the students went around doing their introductions, I tallied the family members mentioned in their presentations. At the end, the most popular individuals mentioned in the introductions were the grandmothers, mothers, daughters and sons, and grandfathers (in this order), and uncovered some emotions associated with traditional food recipes. The students shared their appreciation for that family member who had supported them throughout their lives or the person who encouraged them to return to school to complete their college education. At the

end of the first class meeting I asked my PSETs to think of a dish that is symbolic of their family culinary traditions and that, in their view, could be used as the context for the teaching and learning of a science concept in an elementary classroom (Lesson outline, week 8).

Weeks 2-7. Inquiry Skills in the Context of a 5E Lesson

Between the first (Bagel Face in week 1) and the second food-based sessions (Mini-potluck in week 8), each 5E lesson group—which consisted of 3-4 PSETs, examined lesson plan samples and practiced writing 5E phases. In preparation for the lesson design, and through instructor- and PSET-led sessions, we played the role of teachers and learners in activities centered on the use of food recipes as the vehicle to uncover students' prior knowledge and emotions linked to traditional food recipes. We also addressed the science concepts involved in cooking techniques such as chemical and physical properties and changes. Since for ELLs science can imply added cognitive demands, almost like learning a third or a fourth language, we propose that authentic activities like the one described in this article can be used as a productive approach to lessen the emotional load associated with the challenges they face in school science.

We focused on three major activities during these weeks: First, we blended inquiry skills and other school subjects. This happened during the popcorn activity in week two. To highlight the role of corn in the Mexican culture, we read *The Popcorn Book* (DePaola, 1978), which allowed us to draw on some scientific, geographical, and historical concepts associated with the use of corn in our diet. In the inquiry activities generated from this book, we made observations on unpopped and popped kernels, investigated the relationship between moisture content and popping rates; we also read nutritional labels on popcorn bags, and observed and learned about plant life cycles. These activities served as the context for the practice of basic and integrated inquiry skills (e.g., observing, inferring, and gathering data). Second, we read Bybee's (2014) 5E Model while designing the 5E lesson. A 5E Lesson plan consists of five phases: Engage, Explore, Explain, Elaborate and Evaluate. This task entailed the identification of the pertinent science education standards, their proper citation, and the formulation of learning objectives and activities that would allow students to master content and skills in each lesson phase. One activity we explored was the "Holy Moly Guacamole!" We started with the PSETs volunteering their family recipe for guacamole and the best strategy to keep it from oxidizing (Engage). Then, we formulated and tested hypotheses based on the observations we made in the classroom and from those home practices shared in class (Explore). This lesson addressed standards that included mixtures as well as properties and changes of matter. We gathered quantitative and qualitative data on the browning process. Findings were shared (Explain) in relation to each test. We also tested the same strategies in other food items (e.g., bananas) (Elaborate).

The other major project implemented in this segment of the semester was the writing of Impressionist Tales (Van Maanen, 1998; Bryan &Tippins, 2005). These are 1-page autobiographical statements of a relevant prior science learning episode. These stories were

intended to give PSETs an opportunity to reflect on how specific past science learning experiences have impacted their current views and, possibly, attitudes towards the teaching and learning of science. The role of the Impressionist Tales was to serve as the foundation of the science teaching philosophy essay the PSETs drafted and revised later in the semester.

Week 8. Outlining the Lesson Plan: A Mini-Potluck

On this day we shared food samples with classmates sitting at each table. We started by describing the food items we brought—I shared coffee and cheesy bread. The food items sparked conversations about the name of the recipe, its origin, and the reason for their choice. I emphasized that the goal of this class meeting was to produce a 5E lesson outline using one recipe shared at the table. Using an outline template (Appendix A), each lesson team identified the pertinent standards, learning objectives, vocabulary instructional approach, and the roles that both the student and the teacher play in each 5E phase. Examples of the food samples shared on this day included tortillas, peanut marzipan, and chili salsa. In the discussions that ensued during this class meeting, PSETs referred to these recipes as food items that go beyond their nutritional value; they described them as key elements of their family and community traditions, including the 'ritual' involved in the preparation and sharing of the dish.

Week 9. Reading and Writing in Science

In this class meeting we examined trade books related to the content and skills in the lessons. For instance, we read books like "Magda's Tortillas," "Adelita and the Veggie Cousins," and "The Seven Blind Mice." In these books we found stories that portray the practice of science as a human endeavor that values team effort and as an activity available to people from diverse backgrounds. We also practiced writing our own stories (i.e., Eco mysteries).

Weeks 10-12. Lesson Presentation, Review, and Delivery

On the day of the presentation, each group used a short PowerPoint presentation to convey the merits of their 5E lesson to their peers. After their presentation, each group received feedback from their classmates and the instructor. The feedback provided each group with considerations for possible modifications before submitting the lesson for a formal peer-review exercise. We conducted internal and external reviews of the lesson drafts. First, within our science methods class, and then with a group of pre-service teachers in a science methods course from another university. We used a lesson checklist as the tool to conduct this review (See Appendix B).

Week 13. Science Lesson Delivery

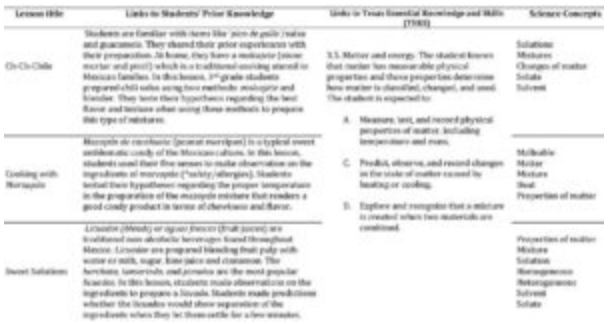
On the day of the science learning event, we worked with 20 third grade ELLs. Table 2 below includes samples of lessons delivered on this day. This table highlights the key elements in the early stages of the lesson planning: the food-related Funds of Knowledge, the pertinent

standards, and the science content. For instance, the Sweet Solutions lesson revolved around the case of traditional juices that allow the students to (a) prepare mixtures and (b) observe heterogeneous and homogeneous solutions once the juice settles and reveals two phases or none. This is a common occurrence with some natural juices.

We divided the science learning event into two segments: lesson delivery and lesson observation. In the first half of the event three PSET groups delivered their lessons while the other groups observed and provided feedback on their classmates' lessons. We switched roles in the second half. Due to the time we had available (45 minutes per lesson), which mirrors a typical class period in a school setting, the lesson delivery focused on four 5E phases (Engage, Explore, Explain, and Evaluate). We agreed on the following lesson timeline: Engage, 5 minutes; Explore, 25 minutes; and Explain, 15 minutes. The Evaluation phase took place from start to finish. Prior to the day of the event, we asked families about food allergies associated with the handling and consumption of food products used in the lessons. We also asked the participating students to wear gloves while handling food ingredients and to observe the 'no eating during the lesson' rule.

Table 2 (Click on image to enlarge)

Examples of Lesson Topics



Week 14. Reflecting on the Lesson Design and Delivery

On the first class meeting, the PSETs answered a General Information Questionnaire (GIQ). In it, one item asked them to share a definition of food pedagogy. They addressed the same question in their journals on the day they taught their lessons, three weeks before the end of the course. At the beginning of the semester, the PSETs offered brief and varying definitions of this concept. Although they highlighted food pedagogy as a medium to teach science content, there was uncertainty in their accounts about the implementation of this methodology. A rationale for these assumptions could be in the novelty of this lesson design exercise—creating a science lesson from scratch with a focus on a food recipe. Our PSETs were well-versed in the composition and preparation of the dish, but the difficulty seemed to be in contextualizing a food recipe as a science learning scaffold.

Discussion

Food pedagogy was the primary guiding concept in the design and delivery of the lesson plan project. The FoK framework was subsumed under food pedagogy based on the assumption that the purpose of using food was to enable a focus on cultural value, or culturally relevant teaching in leveraging learning about science. At the beginning of the course, the majority of PSETs viewed food pedagogy as an item to be acquired: *"*stuff we have to learn about food…food the body needs and why it is good or bad.*"* A small handful of PSETs provided a more contextualized viewpoint, such as "a strategy to connect science content and culture in a meaningful way.*"* At the beginning of the semester, the average response to "What is your view on using food pedagogy as an approach to the teaching of science in elementary schools?" was 13 words long. The average response increased to 179 words—a difference of 166 words. The differences in vocabulary usage of terms related to food pedagogy and culturally relevant teaching between the beginning and the end of the semester can be seen in Table 3.

Table 3 (Click on image to enlarge)

Food Pedagogy Terminology Usage at Two Times During the Semester (Chronological identifiers: b – beginning of course; e – end of course)

Food Pedagogy Codes	Code Frequency and Chronological Order	Usage Examples
1.Diversity and Culture	4b, 14e	*Students can learn from each other and their cultures.*
2. Engaged Learning	1b, 25e	*Using food pedagogy is a good way to keep children engaged.*
3. Students as Persons	0b,4e	*Using food pedagogy, the teacher can also get background information about the students.*
4. Teaching/Vocabulary	0b, 8e	*We implemented a hands-on activity where the students learned Tier 3 vocabulary.*
5. Teaching/Prior Knowledge	0b, 6e	*It also helps you activate the students' prior knowledge on the subject.*
6. Instructional Tool	14b, 13e	*It allows students to better understand the content based off of something they are already familiar with.*
7. Learning/Hands-on	0b, 6e	*I think it is a must for the student to have hands-on activities and Tier 3 words.*
8. Cooperative Learning	0b, 3e	*All was done in a way that each student from the group contributed and did not feel left out.*
9. Learning/Ownership	0b, 5e	*Food pedagogy invites teachers to value students' cultural background by letting them take full ownership of their own learning.*
10. Inquiry Skills	0b, 3e	*The students commented that they now knew what a hypothesis was and how by doing a simple observation and activity like ours they were able to understand it.*
11. Familiar Concept	3b, 27e	*Students were engaged in the discussion about chocolate and were able to relate back to their family and culture.*
12. Lesson/Cross-curricular connections	1b, 3e	*The teacher can cover many aspects of the school curriculum when designing a lesson based on food pedagogy.*
13. Lesson/Activities/Real World	1b, 9e	*In my opinion, by using this approach students will learn best because they will be able to connect what they learned in class with their real life.*
14. Lesson/Activities/Creativity	0b, 3e	*Working with food to teach a concept allows the children to develop skills to understand science in a fun and creative way.*
15. Lesson/Standards	0b, 2e	*The planning was also very fun; it made me realize how easy it is to plan something that the students can relate to while covering the TEKS [standards].*

The terms included in Table 3 are explicitly about lesson planning and delivery from a culturally relevant teaching perspective. Additionally, two recurring themes came up in PSET end-of-semester reflective papers:

1. A more nuanced or deepened understanding of food pedagogy as an instructional framework for lesson planning. PSETs generally viewed it as favorable, but were also able to recognize some key challenges in its implementation.
2. An increased command of instructional strategies that PSETs expressed they would be comfortable in implementing in their own classrooms.

These themes are discussed in greater detail in the following paragraphs.

By the end of this course, not only did our PSETs allude to the benefits of food pedagogy as an instructional context that supports meaningful learning but also to the connection with FoK. They also weighed student ownership of knowledge and highlighted the use of food pedagogy as a tool for teachers to get to know their students as persons and in turn make connections between school science and activities in everyday life. For this group of PSETs, the lesson design exercise was initially "frustrating and hard" because of the amount of ideas they had at their disposal. We believe that modeling the use of the 5E Model in the context of a food-based learning activities (guacamole and banana browning, investigating with popcorn) provided a good dose of guidance and clarity in regards to the lesson design process; it also worked as a template for the identification of the connections between the science content in the standards and the dish under exploration. "At first, it seemed to be a difficult task because we had so much stuff to choose from, but with the help of the 5Es everything came down to place.*"* For instance, the discussion of the different ways the students and their families prepare a good *licuado* or guacamole became great conversation starters during the Engage phase of the lesson. Additionally, the PSETs realized that students' expertise and prior knowledge with the recipe was useful while observing and measuring properties of matter in the Explore phase. When sharing their lesson during the merit presentation class, this same group argued the importance of integrating students' FoK as a framework for lesson planning.

When examining the descriptors highlighted the most in the end-of-the-semester reflections, we noticed that familiarity was the most common theme. PESTs indicated that "this is an important condition if we want to make science a worth learning experience to our students." One PSET recognized that this familiarity produced 'usable' knowledge, one that the students were able to use in the context of their home and community. One PSET put it as follows: "Students were engaged in the discussion about chocolate and were able to relate back to their family and culture…they used the scientific vocabulary as if it were everyday language." Being familiar with a concept or process enhances the learning of content in the school curriculum. Gallard (1992) reminds us that "learning is a result of the students making sense of the world they live in" (p.2). This outcome was also noted by some PSETs in the feedback they received from their own students: "It was very gratifying when they told us thank you because they had never quite understood about observations and hypotheses*."* Yet another student shared his intentions to go home and *"*teach his mom how to prepare a heterogeneous salsa*."* The authentic quality of the lessons may have given the PSETs a fresh perspective on science as an activity that can become culturally-relevant to the students. It was also an invitation to value, as expressed by a PSET, students' cultural background and to "transform science into an interesting subject area for all students*."*

In this project, PSETs had to grapple with a unique instructional resource, the design of a lesson intended to bridge home and school science. This aspect of the project may have contributed to the initial uncertainty and struggle of translating an everyday chore into a science learning activity. PSETs found it challenging to identify and map out the connections

between the tasks involved in the recipe and the science content from the standards. As in all learning activities, we noticed that among our PSETs, there were varying degrees of understanding and commitment, especially given the fact that they had never ventured into this kind of curricular design. One might attribute this difficulty to the limited science content knowledge among elementary preservice teachers (Hanuscin, Lee, & Akerson, 2011). Some observations in the feedback received during the peer-review exercises highlighted this issue. Yet another reason for the initial skepticism may be associated with the concept of collateral learning—boxing of school science and home as separate areas of knowledge (Jegede, 1994). It is possible that this coping mechanism fed into their perception of school science as an activity confined to school settings. Despite the challenges and difficulties PSETs expressed, the design and review of their 5E lessons, coupled with the discussion and practice of food-based activities throughout the semester, enabled PSETs to carve their way through the design and delivery of a culture and food-based science lesson. One PSET summarized her experience in the following way: “Even though the planning of the lesson was difficult for us because at first we did not understand the whole process; the delivery was a great teaching experience.”

Final Remarks

In this article, we outlined a methodology that prompted a group of PSETs to take a critical look at their FoK as a valuable instructional resource. This project produced three major outcomes that in our view support the positive impact of a food pedagogy-FoK approach in the design of science lessons. First, in the area of curriculum design, the PSETs witnessed and practiced the translation of an everyday, and culturally-relevant food-based practice into learning activities that promote science learning. PSETs highlighted the importance of combining food-based pedagogical activities with informed, critical approaches that promote self-awareness, such as FoK. Second, through hands-on and collaborative work in which PSETs acted as experts, they became more aware of the value of their own FoK and those of their students. We submit that the experiential lesson design exercises in the science methods class were essential in enabling PSETs to understand what it means for the locus of expertise to be with the “learners.” The brunch on the first day, the mini-potluck, and the exploration of staple recipes in the classroom provided an entry point for engaging PSETs in the lesson design project. Third, the focus on everyday food preparation seemed to have enhanced the level of confidence among PSETs not only during the planning period but also, and most importantly, during the delivery stage. This is an important learning outcome in our course since most of our PSETs, as reported in their GIQ, do not perceive science as one of their favorite subjects. In this lesson project we noticed that as they became fully immersed in the design process, PSETs took an active role in choreographing the science learning experiences of their students. We use the term choreography to highlight the level of congruence and coordination in the tasks that went into the preparation and delivery of the lesson. We take this as an important gain because if PSETs’ perception of science learning change, they may become more enthusiastic advocates of science in their own classrooms.

In the larger education context, this is of paramount interest because teachers can potentially influence students' attitudes toward science, especially in elementary grade levels, a prime period of the schooling process (Hammond & Brandt, 2004; Steinberg, Wyner, Borman, & Salame, 2015).

We focused our lesson project on a single aspect of the students' FoK in our community: foods we prepare at home. In other regions, educators and instructors can find relevant traditions to build upon in their science lessons and science methods courses. For example, other thematic foci might include traditional industries such as dairy, or crops that are important elements in the agricultural vocations in the local community and students' families. Through activities of this sort, we encourage PSETs to serve as role models for their students with whom they share the same language and traditions. In our view, that familiarity will facilitate the use of culturally relevant practices like the one described in this article. Food is a system of communication; it gives voice to "traditionally muted people—people not part of the political, economic, or intellectual elite, especially women" (Abarca, 2006, p. 116). Finally, based on our experiences using food pedagogy, first in *La Escuelita* afterschool program, and now in the science methods course, we feel confident that this instructional approach is useful in assisting PSETs discern their own actions and views about the richness and relevance of their heritage in academic settings, and in regards to bridging the gap between community-based knowledge and school science with activities that begin with the knowledge, experiences, and traditions students bring to the classroom.

Supplemental Files

Appendix-A.pdf
Appendix-B.pdf

References

Abarca, M. (2006). *Voices in the kitchen: views of food and the world from working-class Mexican and Mexican-American women*. College Station, TX: Texas A&M University Press.

Alvarez, S. (2017). Community Literacies en Confianza: Learning from Bilingual After-School Programs. Urbana, Illinois: NCTE.

Benavides, R., & Medina-Jerez, W. (2017). *No Puedo*, I don't get it: Assisting Spanglish-speaking students in the science classroom. *The Science Teacher,* 84(4), 30-35.

Bouillion, L. M. & Gomez, L. M. (2001). Connecting school and community with science learning: Real world problems and school community partnerships as contextual scaffolds. *Journal of Research in Science Teaching,* 38, 878-898.

Bryan, L. A., Tippins, D. J. (2005). The Monets, Van Goghs, and Renoirs of science education: Writing impressionist tales as a strategy for facilitating prospective teachers' reflections on science experiences. *Journal of Science Teacher Education,* 16, 227-239.

Bybee, R. W. (2014). The 5E instructional model: Personal reflections and contemporary implications. *Science & Children,* 51(8), 10-13.

Creel Falcon, K. (2018). Friday night tacos: Exploring Midwestern borderlands through familial women's oral histories. *The Journal of Mujeres Activas en Letras y Cambio Social*, 17(2), 66-93.

DePaola, T. (1978). *The popcorn book*. Holiday House.

Flowers, R., & Swan, E. (2012). Introduction: Why food? Why pedagogy? Why adult education? *Australian Journal of Adult Learning*. 52, 419-430.

Gallard, A. J. (1992). Creating a multicultural learning environment in science classrooms. *F. Lawrenz, K. Cochran, J. Krajcik & P. Simpson, Research matters…To the science teacher*, 51-58.

Gonzalez, N., Moll, L. C., & Amanti, C. (Eds.). (2005). Funds of knowledge (1st ed. Vol. 2009 Reprint). New York: Routledge.

Hammond, L., & Brandt, C. B. (2004). Science and cultural process: Defining an anthropological approach to science education. *Studies in Science Education* 40, 1- 47.

Hanuscin, D. L., Lee, M. H., & Akerson, V. L. (2011). Elementary teachers' pedagogical content knowledge for teaching the nature of science. *Science Education*, *95*, 145-167.

Jegede, O. (1994). *Traditional Cosmology and Collateral Learning in Non-Western Science Classrooms.* Research and Evaluation Unit Distance Education Center. University of Southern Queensland. Toowoomba, Qld 4350, Australia.

Ladson-Billings, G. (1995). But that's just good teaching! The case for culturally relevant pedagogy. *Theory into Practice, 34*, 159-165.

Ladson-Billings, G. (2014). Culturally relevant pedagogy 2.0: aka the remix. *Harvard Educational Review*, *84*, 74-84.

Mensah, F. M. (2011). A case for culturally relevant teaching in science education and lessons learned for teacher education. *The Journal of Negro Education*, 80, 296-309.

Moll, L. C., Amanti, C., Neff, D., & Gonzalez, N. (1992). Funds of knowledge for teaching: Using a qualitative approach to connect homes and classrooms. *Theory Into Practice*, 31, 132-141.

NGSS Lead States. (2013). *Next generation science standards*. *For states, by states.* Washington, DC: National Academy Press.

Nieto, S. (2004). *Affirming diversity: The sociopolitical context of multicultural education* (4th ed.). Boston, MA: Allyn and Bacon

Steinberg, R., Wyner, Y., Borman, G., & Salame, I. L. (2015). Targeted courses in inquiry science for future elementary school teachers. *Journal of College Science Teaching,* 44(6), 51-56.

Swan, E. & Flowers, R. (2015). Clearing up the table: Food pedagogies and environmental education—contributions, challenges and future agendas. *Australian Journal of Environmental Education*, 31(1), 146-164.

Van Maanen, J. (1998). *Tales of the field: On writing ethnography.* Chicago: University of Chicago Press.

Windschitl, M. (2006). Why we can't talk to one another about science education reform. Phi *Delta Kappan, 87*, 349-355.

Woolley, K., & Fishbach, A. (2017). A recipe for friendship: similar food consumption promotes trust and cooperation. *Journal of Consumer Psychology*, *27*(1), 1-10.