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The Selected Proceedings of the 2013 MITESOL Conference
‘Food for Thought’ When Working with Those ‘Hungry for Success’

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Abstract

Current research is investigating the impact of micronutrient deficiency on both learning in general and language learning specifically, in both developed and under-developed countries, in hopes of addressing the learning needs of all children. This paper provides a brief overview of research studies investigating the impact of micronutrients on learning, including immigrant, migrant, and internationally adopted populations; explores some current school programs addressing the growing problem of poor nutritional status and its impact on learning; and concludes with ideas for designing culturally appropriate, healthy meals with readily available ingredients. Students and their families are hungry for success; sometimes, the solution might be on their dinner plates – food for thought for teachers.

Introduction

With all that must be considered when teaching, one rarely thinks of food and its impact on learning. Yet, with technological advances such as functional magnetic resonance imaging (fMRI), the impact of nutritional status on cognition, memory, and learning can now be seen neurologically (Kishiyama, Boyce, Jimenez, Perry, & Knight 2008; Miller, 2005). This has spurred increasing numbers of studies exploring the impact of micronutrient deficiency on both learning in general and language learning specifically, in both developed and under-developed countries (Bryan et al., 2004; Gewa et al., 2009; Spencer, 2008;), in the hope of addressing learning needs in all children. Specific to Teaching English to Speakers of Other Languages (TESOL), Krashen and Brown (2005) discuss an array of external (e.g., parental interaction styles, access to print) and internal (e.g., nutrition, physiology) factors that can impact language proficiency, which, in turn, impacts test performance in reading and math. Though we, as teachers, have little control over much in our students’ lives, we can educate ourselves, our students, and their families on the beneficial and detrimental effects of nutrition on learning, and we can work for greater access to high quality, nutrient dense foods – reasonably priced and Women, Infants, and Children (WIC) supported – at school and in the community. Such help is needed by many immigrants as they adapt to cultural dietary differences (Garcia-Lascurain, Kicklighter, Jonnalagadda, Boudolf, & Duchon, 2006) and by migrant families as well (Leon, 1996; Rochin, Santiago, & Dickey, 1989). Since these are populations that fall under Title III of the Elementary and Secondary Education Act (ESEA), nutrition education might be an option for parent programs in the K-12 settings. (For funding information under ESEA, see Implementing RTI Using Title
In order to help students and their families, however, it is first important to have a basic understanding of several nutritional elements along with an idea of how the brain processes language. Regarding nutrition, a common confusion is that of macronutrient vs. micronutrient. Macronutrients include protein, carbohydrates, and fats, while micronutrients refer to vitamins and minerals. Those at and below the poverty line are often deficient in both macro- and micronutrients. Those of affluence, not surprisingly, have a diet that is macronutrient dense, especially in animal protein; however, their diets are often micronutrient poor (Ells et al., 2008). Yet again, why is this important for teachers? The answer, especially for those with English language learners, is due to the populations we find in our classrooms: immigrant students from lesser developed countries and refugees from countries in turmoil who have experienced extended amounts of time with limited access to high quality diets (Garcia-Lascurain et al., 2006); students from migrant families (Leon, 1996; Rochin, Santiago, & Dickey, 1989); and students from urban centers with low socioeconomic status. These are all populations that may have experienced especially significant micronutrient deficits. In fact, only 14% of U.S. students meet the recommended guidelines for fruit and 20% for vegetables (Story & Neumark-Sztainer, 2005), the very foods that contain vitamins and minerals. It is also important to keep in mind that the least expensive foods, which are also most accessible, are the most micronutrient poor, though often being macro-nutrient (simple carbohydrates and unhealthy fats) dense. This point becomes especially relevant when thinking of recent immigrants who tend to fall into one of two groups: those that try to hold on to their culture through traditional foods which may not be as readily available and, hence, of higher cost, and those that try to acculturate, often under pressure from persuasive commercials on television and other media, to the typical western diet which is now being documented as micronutrient poor. The impact of all of this is happening sight unseen, through the effect on brain development and functioning. Before looking at the studies that explore the impact of micronutrients on cognitive function, it is first important to have a brief tutorial on how the brain functions.

**Tutorial**

The brain is divided into two hemispheres, with each hemisphere further divided into four lobes. The temporal lobe is involved in perception of auditory stimuli, an area needed in order to comprehend language. The occipital lobe is responsible for vision, a critical element in highly literate cultures where visual language in the form of reading is needed. An area that is involved with both perception and production of language to a lesser degree is the parietal lobe, while the frontal lobe is where the greatest processing of language, along with higher order critical thinking skills (e.g., higher levels within Bloom’s taxonomy), occurs. The frontal lobes are the seat of what has been termed **executive functions**: “planning, developing strategies, testing hypotheses when problem solving, focusing attention, inhibiting irrelevant stimulation, and collating memories” (Bryan et al., 2004, p. 295-296), the very skills with which teachers are all too familiar as being critical for optimum classroom functioning.

Other areas include the auditory cortex where auditory signals are received, identified, and processed into a form useful for other areas of the brain; the visual cortex where similar processes occur for visual images, again, critical for highly literate
societies; and the motor cortex where signals are sent to the muscles responsible for speech. Two areas specific for language include Broca’s area which focuses on the production aspect, not only organizing patterns of articulation for speech, but controlling aspects of language as well, such as inflectional morphemes and function words; and Wernicke’s area which focuses on perception, including comprehension at the word and sentence levels, along with retrieval of words from the mental lexicon. Connecting these two areas in order to facilitate communication between brain regions is a bundle of nerve fibers termed the arcuate fasciculus, while the angular gyrus transforms visual stimuli into auditory form (and the reverse), a fundamental process needed for reading and writing.

An example of how the above works is that of word production: Wernicke’s area is triggered to interpret and retrieve the needed word from the mental lexicon; the arcuate fasciculus then sends the phonetic data for the word on to Broca’s area where it is interpreted, and then articulatory material is sent on to the motor cortex which is responsible for leading muscle movements in the actual articulation of the word. Similar complex processing sequences occur for perception of a word as well as reading a word. For all of these processes to work, micronutrients are crucial for the development of neurons, their myelination, and their ability to transmit needed information—all in order to understand language, produce language, and think critically.

Review of Literature

Studies investigating the effect of micronutrients on brain functioning are yielding interesting findings. Nutrition has been found to affect 1) the brain’s macrostructure (development of the brain), 2) the brain’s microstructure (myelination of neurons), and 3) the operation of neurotransmitters, all of which can affect brain function (Bryan et al., 2004). A critical period has also been found that occurs within the first two years, though some areas, including the frontal lobes, continue to develop into adulthood (Bryan et al., 2004). In studies, supplementation of vitamins, minerals, and/or essential fatty acids (e.g., iodine, iron, folate, zinc, vitamin B12, selenium, and omega-3 polyunsaturated fatty acids) for at least three months has shown positive results for beneficially impacting nonverbal IQ, cognitive abilities, learning, and behavior, with especially promising results for those with learning disabilities such as dyslexia, attention deficit hyperactivity disorder or symptoms, and autism, as well as those of lower socioeconomic status (SES) (Bryan et al., 2004; Frensham, Bryan, & Parletta, 2012). In addition to various vitamins and minerals noted above, “dietary-derived flavonoids have the potential to improve human memory and neuro-cognitive performance via their ability to protect vulnerable neurons, enhance existing neuronal function and stimulate neuronal regeneration” (Spencer, 2008, p. 238). These flavonoids that impact both learning and memory include: flavonols (e.g., onions, leeks, broccoli); flavones (e.g., parsley, celery); isoflavones (soybeans, soya products); flavanones (citrus, tomatoes); flavanols (green tea, red wine, cocoa); and anthocyanidins (red wine, berry fruits) (Spencer, 2008). The above studies are just a few of the rapidly increasing literature on micronutrients and brain functioning. While waiting for more lab-based information, it can be beneficial to turn to existing studies involving children’s performance in schools. What follows is a brief overview of studies representing different populations: children from rural settings in less-developed countries, internationally adopted children from orphanage settings,
children from developed countries, and children within developed countries, though of lower SES.

Looking at school children in rural Kenya, Gewa et al. (2009) were part of the Child Nutrition Kenya Project, a two-year longitudinal, randomized, controlled feeding intervention study. They found that the micronutrients iron, zinc, B12, and riboflavin showed a statistically significant positive relationship with cognitive test scores using Raven’s Matrices, a nonverbal IQ measure. They also found statistically significant positive measures of zinc, B12, and riboflavin on digit span scores which are measures of memory. Thus, supplementation of micronutrients appears promising in the population of children from less developed countries who may not be obtaining the optimum level of micronutrients. Turning to internationally adopted children, Miller (2005) discusses the need for various nutrients in relation to supporting neurotransmitters which, in turn, are important for language development, vocabulary acquisition, cognitive development, and social contact skills, among others. Micronutrient deficiencies are common in children in institutional settings, as well as in less developed countries, and can occur without malnutrition; that is, the macronutrient density may be high, especially refined carbohydrates and fats, yet the micronutrient density may be too low for proper brain growth and functioning, which, then, negatively impacts school functioning and behavior. Miller emphasizes that even with adequate diet later, early micronutrient deficiency can have long-lasting effects.

Though it is not surprising that children might fare poorly in situations where there is limited access to micronutrient-rich diets, it would appear that those children with ready access to an abundance of food in more developed countries would fare better. To investigate this, Ells et al. (2008) conducted a meta-review of published studies that had investigated children in the UK and other developed countries. As is often the case with meta-analyses, due to the differing methodologies and analytical measures across a wide range of studies, they found inconclusive evidence for any detrimental effect of a lack of nutrients on learning. (See Hughes and Bryan [2003], along with Isaacs and Oates [2008], for in-depth discussions of assessment challenges in this line of inquiry.) However, they did find emerging evidence across the studies regarding the importance of fatty acids, an area for further research. Though children in developing countries do not appear to have the same degree of risk as those in lesser-developed countries, this does not hold true for those of lower SES. In a longitudinal study conducted in the UK, Feinstein et al. (2008) found that poorer eating habits at age three years resulted in lower scores on standardized tests taken in later years. This emphasizes Miller’s (2005) caution that early deficiencies may not resolve over time. In the U.S. (Richmond, VA area), Vieweg, Johnston, Lanier, Fernandez, and Pandurangi (2007) also found areas of concern in children grades kindergarten through high school. Not only was there the question of micronutrient poor diets, but children of lower SES were at high risk of developing obesity. This was due to the higher cost of micronutrient dense foods vs. inexpensive refined carbohydrates and fats, as well as the extent to which local groceries carried healthful food choices, an issue of access.

Turning more specifically to second language learners, it can be seen that access to micronutrient-dense diets, both logistically and financially, can be problematic, in addition to the issue of acculturation. As early as the 1980’s, Rochin et al. (1989), in a needs analysis of migrant workers in Michigan, found that nutritional support and
services ranked fourth out of the eleven areas of greatest need. A decade later, Reicks (1996) studied migrant farmworkers, mostly Latino, in Minnesota. He found that although children knew high sugar foods were unhealthy, they did not understand the health risks of high fat foods. Of greater concern was the “lack of economic resources of migrant families to purchase higher priced fruits and vegetables” (p. 2) which is sadly ironic in that it is often migrant workers who ensure that the population as a whole has access to these foods. In Michigan, a study by Leon (1996) found similar results: migrant farmworkers experienced a high prevalence of poverty, poor nutrition, and chronic illness that negatively impacted their children’s ability to succeed in school. Leon also found high obesity rates and high consumption of fats, inexpensive macronutrients useful for energy, but offering little in nutrition. (For further information specific to educating children of migrant workers, see Green, 2003.)

The above problems are not confined to the migrant population. Immigrants in general are faced with nutrition problems they had not anticipated. Garcia-Lascurain et al. (2006) argue that the rapid growth of minorities in the U.S., especially with immigrant families adopting new cultural practices including foods, is cause for concern due to a negative impact on their health. Many studies have noted the greater prevalence of obesity among ethnic minorities (Dietz & Gortmaker, 2001; Ogden, Flegal, Carroll, & Johnson, 2002; Popkin & Udry, 1998), which in turn is related to cardiovascular disease and type-2 diabetes, as well as the cascade of other diabetes-associated health diseases (U.S. Department of Health and Human Services, 2001). Garcia-Lascurain et al. further argue that acculturation may lead to the adoption of unhealthy dietary patterns, e.g., high fat diets and low fruit and vegetable consumption, a point supported by Satia-Abouta, Patterson, Neuhouser, & Elder (2002). Because of these concerns, Garcia-Lascurain’s group was involved with the Nutrition Education for New Americans (NENA) refugee afternoon program in tandem with others at Georgia State University. This program attempted to teach third to fifth graders (ages 9-12 years) about nutrition; however, results were mixed as to its success. Future programs might be more successful if the focus were on specific foods, rather than more technical nutrient names; if food images were provided, especially for those students of limited English proficiency; if information were contextualized to sample meals and snacks; and if the period of instruction were increased beyond one 50-minute session (Contento et al., 1995, found that a minimum of 50 hours of instruction is needed in order for change to occur). Sussner, Lindsay, Greaney, and Peterson (2008), though having the same argument as that presented by Garcia-Lascurain’s group, namely that “exposure to obesogenic environments in U.S. may foster development of overweight in immigrants with greater acculturation” (p. 497), examined the situation encountered by immigrant adults in contrast to refugee children. In a program with 51 Latina mothers in Boston, the women, in comparing lifestyles between their native countries and the U.S., were most concerned about the macroculture diet, food quality, and food availability; food and eating practices; breastfeeding practices; and belief systems regarding food and child rearing, among others.

At this time, the literature points to several problems that need to be addressed. First, there are several populations of learners that are at increased risk of experiencing micronutrient deficiencies – currently or in the past (which, remember, exert residual effects) – due to environmental, economic, and political circumstances: recent immigrants, refugees, migrant families, internationally adopted children, and those of
lower SES in general. Second, there is the intertwined problem of retaining the home culture, including dietary patterns, vs. acculturating to the macroculture, including a western diet. Those who seek to hold to the home culture and diet encounter two problems: access to familiar foods, and, if accessible, often the higher cost of such foods, making them economically unfeasible. For those who acculturate to the western diet, there is now the problem of increased refined carbohydrates and fats (macronutrients) with low consumption of critically needed fruits and vegetables (micronutrients), again often due to limited access and/or cost. The question that begs asking, then, is: What can teachers do to help ameliorate these problems?

What Teachers Can Do

There are several ways in which teachers can advocate for increasing the micronutrient density of their students’ diets that, in turn, would have beneficial effects on their learning. Three possible ways include becoming involved in legal mandates at the state level, implementing school nutrition programs, and designing instructional gardens.

Looking first to legal mandates, California is a state leading the way with a declared belief that “Nutrition is an essential building block for student success” (California Department of Education, 2009, para. 1) as evidenced by its 1995 Garden in Every School Initiative. Since this goal was formally stated, California has passed several bills exemplifying its commitment to the interface of education, activity, and food through school gardens: Assembly Bill 1014, Instructional School Gardens (1999); Senate Bill 19, Pupil Health, Nutrition, and Achievement Act (2001) which identified school gardens as a way to increase student consumption of fruits and vegetables; Assembly Bill 1634, Nutrition Education (2002), which supported school gardens as best practice; and Assembly Bill 1535, California Instructional School Garden Program (2006), which authorized the California Department of Education to award $15 million in grants with the purpose to promote, develop, and sustain instructional school gardens. Six years later, Hazzard, Moreno, Beall, and Zidenberg-Cherr (2012) conducted a study to evaluate the success of this last bill. They found that less than 40% of the schools receiving an award were able to achieve all of their predicted goals, and almost 38% of recipient schools were negatively impacted by the California budget deficit in their ability to carry out their proposed school garden. Thus, schools reported problems in implementation due to 1) the budget shortfall of the state, and 2) insufficiency of the grant award amount. It is important, though, to keep in mind that between the passage of the bill in 2006 and the evaluation of its potential success, the U.S. went through a significant recession, with the state of California being especially negatively impacted. Even through this difficult economic time, many programs across the state were successful, though at a less than predicted level. In order to address both potential state shortfalls as well as additional funding needed in order to meet all goals, Hazzard et al. suggest supplementing state funds with grants from private companies. An example would be Youth Garden Grants from The National Gardening Association in partnership with Home Depot. This would decrease the inherent risks of relying on only one funding source especially in turbulent economic times. The situation in Michigan is less clear and does not appear to have the prominence nor priority that nutrition and instructional school gardens have in California. Michigan House Bill 4180 (2011) considers requiring instruction regarding diet and health to students in grades 3-12, while House Bill 5655
(2012) charges the Department of Education to develop and maintain a nutrition and physical activity best practices database. Note that while both of these have been referred to the Committee on Education, neither come close to what California advocates.

A second way that teachers can advocate for better micronutrient nutrition for their students is by implementing curricular nutrition programs. One such program is The Nutrition Detectives Program, developed by Katz (2006, 2008) and reported in Katz et al. (2011)\(^5\). Almost twelve hundred students in Missouri, grades 2-4, were divided into intervention and control groups. The intervention groups received four mini-lessons in the fall and one in winter, for a total of less than two hours of instruction. The goals were to read food labels, detect marketing deceptions, and identify and choose healthful foods. Results of this study indicated that the children in the intervention groups had significant improvement in nutrition label literacy; however, their own total caloric, sodium, and sugar intakes did not decrease, nor did their body mass index change. In other words, students did not transfer nutrition label literacy into actual application to their own eating patterns. Once again, it can be seen that short periods of instruction and time do not result in needed change. A “quick fix” is not possible when trying to counteract media marketing and macrocultural dietary patterns. Other in-school programs that may be of interest include CATCH (Perry et al., 1997), Planet Health (Gormaker et al., 1999), and We Can (Nansel et al., 2008). Alternatively, nutrition programs could be interwoven into the regular curriculum or even have their own curriculum in order to address the need for long-term instruction to affect permanent change in dietary patterns. Repeated information throughout other curricular areas may be more beneficial at the elementary level, whereas at the high school level specific classes in nutrition, along the lines of resurrected and modernized home economics classes for all students, might have the greatest impact long-term.

Finally, school garden programs can offer students opportunities to engage first-hand with nutritional concepts, health, environmental issues, and sustainability. Thomas Dewey, years ago, stated “All you really need for education is a library and a garden” (as cited in Harrison, 2008/2009, p. 24). An interesting instructional garden program, especially for teachers of second language learners, is Green Thumbs Growing Kids, taking place in downtown Toronto, Canada. In this program, classroom teachers do not have full responsibility to implement the program; instead, special garden instructors, in teams of two, run formal and informal gardening workshops both within the schools and the surrounding communities. Children help grow the food, harvest it, make school lunches, compost leftovers from lunch trays, and then supplement the garden beds with finished compost. In other words, the students see and participate in the full nutrient cycle, as well as learn from lesson plans that link nutrition to topics across the full curriculum. There are other benefits to this program that also offers summer programs, family service programs, and youth leadership and employment programs. For example, in a one-square-kilometer city block surrounding a school, recent immigrants represented over 100 countries and over 160 languages. Harrison (2008/2009) states that, for these families, the program breaks down social barriers, addresses food insecurity, makes culturally significant foods available, provides access to healthy activities within walking distance of families’ homes, and offers practice with English, all while addressing the root causes of obesity and increasing micronutrient density in their diets.
From Toronto to California (once again), Chef Alice Waters has long been known for her work with the Slow Food and Edible Education movements. The Slow Food movement seeks to preserve traditional and local foods, with an emphasis on sustainability, and is now active in 150 countries. This movement is important for many reasons, but most relevant for issues being discussed here, foods that are grown and harvested locally are much fresher and have not lost their nutrient density which occurs when there are time lags due to harvesting, packing, transport across country, distributing, unpacking, and finally shelving for the consumer. Local food systems are also more accessible to students; for example, small farmers are often open to students visiting their farms as well as to sharing knowledge with teachers for instructional school gardens. In addition to Slow Foods, Waters started the first Edible Education program at Martin Luther King Middle School in Berkeley, California. This program is interactive and multisensory and formed the foundation upon which First Lady Michelle Obama’s White House Garden was based. A key concept is “food as part of everyday life” (Waters, 2008), not as a separate nutrition or food science class, but interwoven into every part of every day, including school gardens. Additionally, Waters feels it is a very important paradigm shift to focus on what students can eat rather than a “don’t eat this, don’t eat that” mentality. Her work has spread across classrooms throughout the country via The Edible Schoolyard Project, an email newsletter rich with ideas detailing what other teachers and schools are doing across the U.S. and beyond.

So far, it can be seen that ideas on nutrition—primarily those of fruit and vegetable consumption, the foods highest in micronutrients—are moving in the right direction. First Lady Michelle Obama’s book, American Grown: The Story of the White House Kitchen Garden and Gardens Across America, has brought the importance of childhood nutrition and edible education to prominence at the national level. Here in the state of Michigan, Beeler’s Tasting and Touring Michigan’s Homegrown Food is bringing recognition to the slow food movement. More local still, in Grand Rapids, as in many locales across the state, seasonal and year-round farmers markets are flourishing, including those that accept supplemental nutrition assistance program (SNAP) vouchers.

Finally, in addition to becoming involved in legal mandates at the state level, implementing school nutrition programs, and designing instructional gardens, teachers can also help their students’ families through menu modification. More specifically, teachers can help families adapt the traditional food of their home culture using readily available ingredients (that are within WIC guidelines, if applicable) with high micronutrient density at manageable cost. For families that qualify, it should be noted that foods on the WIC approved list include fruits and vegetables, whole grain items such as brown rice, protein-rich legumes, and peanut butter. Organic versions of these foods qualify as well; however, white potatoes, due to their low nutrient load, are banned. It is also interesting to note that WIC guidelines include statements acknowledging both the increased cultural diversity of its participants as well as the national epidemic of obesity. As noted in the introduction, these parent education programs on menu modification for optimized health and learning might qualify under Title I and Title III of the ESEA and could conceivably involve the entire family, educating both students and parents together.

The overall goals of menu modification are: first, to keep true to culturally appropriate meals and second, to counteract the pull of a micronutrient-poor western diet. Specific goals include 1) increasing micronutrient density, 2) keeping protein
(macronutrient) level high, though perhaps relying more heavily on vegetable source protein, and 3) keeping fat (macronutrient) level low and using “good” fats (e.g., use of olive oil, avocados, and peanut butter made simply with ground peanuts and salt) in preference to other oils, butter, and lard.

Using some sample Latino menus as an example while keeping in mind the goals just mentioned, which of the following are more micronutrient dense: green tomatillo cream-based sauce, guacamole, sweet potato salsa, or tomato salsa? A cream-based salsa is typically heavy in fat, a problem of the western diet, so can be eliminated. Guacamole, though also containing a high fat content, would be considered a “good” fat, so it is better than the cream-based salsa. The first goal, though, is to increase the micronutrient density. Both sweet potatoes and tomatoes are micronutrient dense, so these would be the better choices. Moving to a main course, for example chicken and rice burritos, what could be done to increase the micronutrient density, maintain protein (macronutrient), and decrease fat (macronutrient)? The ingredient list includes the following: long grain rice, vegetable oil, onion, ground cloves, tomatoes, chicken breasts, cheese, sour cream, flour tortillas, salt, and oregano. In order to increase micronutrient density, brown rice—which is richer in B vitamins—could be substituted for the more usual white rice while other vegetables, for example shredded carrots or squash, could be added in as well. Additionally, whole grain wheat or corn tortillas, instead of white flour ones, would also increase the micronutrient density. To keep the protein level high while also keeping the cost down, protein-rich legumes, for example black turtle or pinto beans, could be substituted for the more expensive chicken. For the third goal—lowering the fat content—the amount of cheese used could shift from that of major ingredient to that of garnish, and the sour cream could be substituted with plain Greek yogurt. Finally, for dessert, which of the following best meets the three goals: churros, sopaipillas, rice pudding, garbanzo cake, or seasonal fruit? Pastry type desserts are typically high in fat and sugar and low in micronutrients, so churros and sopaipillas would not be the best choice. Rice pudding, while possibly high in calcium, is likely to be high in sugar and micronutrient-poor white rice. Garbanzo cake would be a good choice for those trying to increase protein levels with non-meat sources, but it may also be high in sugar and fat. Seasonal fruit would be the best choice to meet all three goals; it is also a choice where children could be involved by cutting the fruit into shapes and forming into pictures, thus increasing their involvement and likelihood of eating. The above is just a sampling of how typical food patterns might be modified to increase micronutrient density, stay true to culturally appropriate meals, and decrease the more negative aspects of the western diet.

**Conclusion**

Teachers rarely think about food and its impact on learning, yet with recent advances in the ability to monitor the functioning of the brain, it is becoming all too clear that nutrition, especially micronutrients, is crucially important in cognition, learning, and motivation. This is true for all students but especially those who are of limited SES, including recent immigrants, migrant workers, and refugees. These populations may not only have experienced limited access to high quality food in the recent past, they also may be grappling with issues of acculturation, including the pull of a nutrient-poor western diet. Teachers can help their students and their students’ families by becoming involved in pro-nutrition state legislation, incorporating nutrition information across the curriculum, advocating for instructional school gardens, and helping families maintain

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culturally based eating patterns while increasing the micronutrient load and decreasing the pull of the less desirable elements of a western diet. Students and their families are hungry for success; sometimes the solution might be on their dinner plates – food for thought for teachers.

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References


Footnotes

1, 2 These titles were thought of several years ago; however, upon commencing research, it was found that others had also used them: Spencer (2008) in *Food for Thought* and a Scottish government report (2008) entitled *Hungry for Success: Further Food for Thought*.

3 Material throughout the tutorial is taken from Bergmann, Hall, & Ross (2007) unless otherwise noted.

4 In this author’s view, an area ripe for exploration would be the investigation of brain activation in Broca’s area in children with Specific Language Impairment (SLI), a language learning disorder that primarily affects the ability to process the morphological elements of language. This is especially important in the ESL learner as features of SLI map onto typical second language learning characteristics, thus causing confusion.

5 It should be noted that potential bias exists in this study as the leading investigator is also the marketer of the program.

6 Slow Food U.S.: [www.slowfoodusa.org](http://www.slowfoodusa.org); International: [www.slowfood.com](http://www.slowfood.com)

7 The Edible Schoolyard Project: [www.edibleschoolyard.org](http://www.edibleschoolyard.org)