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# How Mathematics Teachers Can Help Curb Childhood Obesity

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# How Mathematics Teachers Can Help Curb Childhood Obesity

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Do you ever wonder how, as a mathematics teacher, you can help curb the alarming rise in obesity rates in children in the United States? According to the USDA, one-third of American children and two-thirds of American adults are now classified as "overweight" or "obese" (USDA, 2012). In a previous article, we described ways that mathematics teachers could incorporate instruction on nutrition as an interesting real life health context in which to teach mathematical concepts (Joram, Dobie, & Davidson, 2009). In this paper, we examine the relationship between mathematics and nutrition education from a different angle, and examine ways in which mathematics teachers can use explorations of mathematical concepts to promote the development of skills that are essential for combatting childhood obesity.

One cautionary note is that because of the incidence of eating disorders in school-aged populations (Dixey, 1996), we suggest that efforts to reduce overweight and obesity in school-aged children should focus on developing healthy eating and exercise habits, rather than on body weight or caloric intake. We also suggest that comparisons among students should never be made based on students' weight or caloric intake because this could lead to embarrassment, and may inadvertently increase the likelihood of an excessive, unhealthy focus on calorie reduction.

## *Measurement and Estimation for Portion Control*

Many researchers and policy makers agree that a major contributor to the rising rates of obesity in the United States is the larger portion sizes of food that people have gradually become accustomed to. An interesting line of research demonstrates that people will eat more when food is presented in certain ways (Wansink, 2006); for example, when serving sizes are larger, plates are bigger, or when presented with a diverse set of foods such as in a buffet. Because people's perceptions of portion sizes are easily influenced by these kinds of environmental factors, they are vulnerable to efforts of marketers to increase food consumption. To combat this growing influence, we need to strengthen students' ability to regulate portion sizes for themselves so they are less vulnerable to marketers' efforts to increase their food consumption beyond healthy portion sizes. That is, students need to be able to both recognize what an appropriate portion size is as well as estimate how much a given portion exceeds that size; skills that can be developed through a variety of measurement estimation activities.

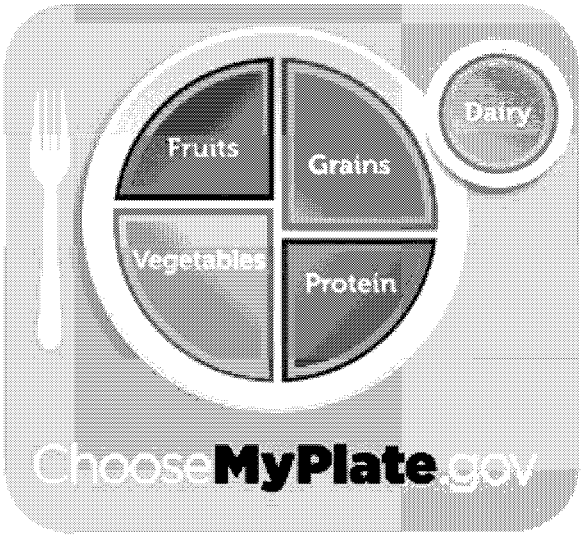
Students need to develop a sense of typical, appropriate portion sizes that they can use as reference points, in order to be able to regulate portion sizes for themselves (see USDA, 2003 for a list of portion-size benchmarks for different types of food). Activities designed to help students develop a sense of appropriate portion-size benchmarks can be as simple as collecting and comparing their predictions of appropriate portion sizes to established benchmarks. The ChooseMyPlate.gov

website suggests the following activity to become familiar with how appropriate portion sizes look: "Measure a fixed amount of some foods and drinks to see what they look like in your glasses and plates. For example, measure 1 cup of juice to see what 1 cup of liquid looks like in your favorite glass" (USDA, 2011). Students might be surprised to see how little one cup is when compared to typical sizes of drinks that they purchase.

More complex estimation activities might include showing students "Super-sized" portions and asking them to predict how much bigger the Super-sized portion is than the benchmark portion size. These kinds of activities can be utilized throughout the elementary math curriculum as well as at higher grade levels.

Even children in kindergarten and first grade can use their emerging knowledge of benchmark fractions to enhance healthy eating habits: For example, the new "Choose MyPlate" (USDA, 2011) which replaces the "Food Guide Pyramid" suggests that about half the plate should be filled with vegetables and grains (see below), and students in the early elementary grades can draw on their knowledge of benchmark fractions such as a half and a quarter to comprehend these new guidelines.

Students also require practice at estimating the volume of foods that are irregular in shape, with reference to appropriate portion sizes. Real world food estimation often involves the spatial transformation of objects in such a way that they are compatible with standard measuring units or benchmarks. For example, estimating an appropriate portion size of meat, often referred to as about the size of a deck of cards (USDA, 2003), may involve mentally and then physically partitioning a large steak. Teaching measurement and measurement estimation in a way that focuses on conceptual understanding of units is likely to increase students' "measurement sense" (Joram, 2003), which should lead to an enhanced ability to estimate and mentally transform irregular shaped foods. Recent research on spatial reasoning has also demonstrated that such visual manipulations can be enhanced through playing games such as Tetris (Newcombe, 2010).




### *Applied Computation for Healthier Eating*

Students' developing knowledge of computation can be applied to key areas thought to combat obesity, for example, reducing sugar consumption. According to the American Heart Association, children and adults consume far too much sugar daily; the AHA recommends that instead of the 22 teaspoons of sugar an American adult typically consumes, women should eat only 5 teaspoons (20 gms), men 9 teaspoons (36 gms), and children only 3 teaspoons or 12 grams per day (AHA, 2012). Given that a single container of flavored yogurt might have 22 grams of sugar, this is a daunting challenge!

Teachers can begin by asking students to keep track of and calculate how much sugar they consume daily. They will need to locate the number of grams of sugar on a food label,

and record it for each food eaten on a chart. Because the information on a nutritional label may be given per serving, students will have to figure out how many servings there are per container and multiply the grams of sugar per serving by the number of servings per container to find out how much they consume if they eat or drink the entire container. For example, a bottle of Vitamin Water contains 2.5 servings, where 8 fluid oz is considered to be a serving, with 13 gms of sugar per serving. Therefore, an entire bottle of Vitamin Water contains 32.5 gms of sugar.

Once students have recorded their daily sugar consumption for about a week, they can begin to calculate the average grams of sugar they each consume daily, and track the major sources of sugar, for example soft drinks. This may seem like a relatively simple task, but learning to read food labels helps develop health literacy, and computing the average grams of sugar consumed overall, as well as for subgroups of different food types, draws on students' knowledge of computation and statistics. This activity would be suitable for students in upper elementary grades, and middle school teachers could go further mathematically with this activity, pooling students' data to create a class average and standard deviation and comparing these to national statistics and to the amounts of sugar recommended by health agencies such as the American Heart Association.

### *Graphing for Heightened Awareness of Eating Habits*

Graphing the data described above would permit extrapolations to be made; projecting how much sugar on average a student in the class would eat over one year, and comparing it to another trajectory representing just a small reduction in sugar consumption by each student every day. Reflecting on these data may give students insight into why the USDA recommends drinking water, instead of soda which may contain the equivalent of 12 packets of sugar in a single drink (USDA, 2011).

A class project, suitable for middle or high school students, might involve asking each student to try to consume less sugar per day over a set period of time, and then graphing those data. Classes in the same grade could compete to see which has the greatest reduction in sugar consumption over an established period, for example, one month. The class with the greatest negative slope, meaning the biggest reduction in sugar, wins!

Even more complex class projects could be developed; for example the MyPlate.gov website (USDA, 2011) describes the "3 Ps" of eating on a budget: "Plan, Purchase, Prepare." The website describes general guidelines and tips for eating more healthy foods on a tight budget, and students could plan menus for families with different monthly budgets. This would be a complex and authentic task, which would allow students to flex their mathematical muscles to increase both their health and financial literacy. Again, groups of students could compete to develop the most appealing, healthy, and economical menus that are then judged by a panel of peers.

The activities described above are inherently mathematical, and help students develop their facility with mathematical and statistical concepts, number sense, and health and financial literacy. Mathematics teachers can take satisfaction in knowing that they are better preparing students to make informed choices about their lifestyle which will hopefully lead to more healthy eating and exercise habits.

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