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Measuring Me: Using nutrition education curriculum activities to teach elementary mathematics

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Introduction

Understanding basic functions of mathematics can greatly improve individuals' future health risk.¹ Numeracy skills help people understand medication prescriptions, nutrition plans, and which treatment option is best for them.² However, one of the largest obstacles health professionals face is patient compliance to interventions; one reason being, lack of mathematical proficiency among the population.^{1,2,3,}

Teachers in K-12 learning environments have the greatest opportunity to lay core foundations in mathematics.⁵ A mastery of mathematics skills such as addition, subtraction, multiplication, division, proportions, and fractions is important for children to learn early to assist them in addressing health issues later in life.^{2, 6} School-based health promotion interventions focusing on nutrition and physical activity can also aid children in making connections between mathematics learned in the classroom and healthy living.⁷ Therefore, the authors developed an introductory activity called *Measuring Me* for the Food Math and Science Teacher Enhancement Resource (FoodMASTER) Initiative (Figure 1) to be used while collecting pre-study anthropometric data for the FoodMASTER study. The educational and developmentally appropriate interactive activity allows students to apply mathematics while becoming familiar with simple anthropometric measurements in the classroom.

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Approval from the Institutional Review Board at East Carolina University was obtained for this study.

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Program Description

FoodMASTER Intermediate is a 3rd–5th grade curriculum that uses food as a tool to integrate nutrition concepts into the standard course of study for math and science.⁶ There are 10 units that make-up the FoodMASTER curriculum, each containing two or three activities (24 activities total). It meets national school standards for mathematics and science education and is also easily adaptable to each state's standards. During the 2009–2010 school year, self-selected teachers in North Carolina (N=18) implemented the *Measuring Me* activity in their 4th grade classrooms as an introduction to FoodMASTER. Researchers from the program visited each classroom in the fall of 2009 to collect pretest data including students' heights, weights, waist circumference, and food frequency. Other pretest data included nutrition, science, and mathematics knowledge, attitudes, and self-efficacy.

Led by program researchers, *Measuring Me* was piloted in classrooms to allow children to become familiar with body measurements and connect abstract numbers to concrete applications such as health. Measurement plays an especially crucial role in helping children to identify relationships among objects.⁵ In using their own height measurement, students are able to identify items that are shorter, taller or the same height as them and make comparisons.⁵ Independent comparisons about other anthropometric measures, such as weight, can also be applied by students. Connecting comparisons students make about length and mass with nutrition and health concepts can be beneficial to improving students' long term health literacy as adults.² In intermediate grades, three core competencies children must learn are standard units of metric and customary measurement; collect, organize, analyze, and report data; and perform standard computations, all of which are included as components of *Measuring Me*.⁵

The Lesson

Like other FoodMASTER activities, *Measuring Me* took one class period (30–45 minutes) to complete and is straightforward enough for teachers to pick-up quickly and implement in their classrooms. Eighteen classrooms and 298 students participated in the activity. *Measuring Me* followed a similar format as other FoodMASTER hands-on lessons. First, elementary student volunteers read a short passage about why health professionals measure height and weight. Next, each student completed the three reading comprehension questions independently and then answers were reviewed as a class.

Subsequently, students participated in *Height Math*, the hands-on component of *Measuring Me*. A demonstration in how to measure height with yardsticks was shown to the class. The class was then divided into teams of 3–4 students to measure each others' height using two yard sticks. The first student removed his/her shoes and stood straight. Limited wall space was available in most classrooms, so students estimated using free-standing heights. A second student held the yard sticks, one on top of the other, and the third student read the height in inches. Students switched roles until everyone in the group had been measured. Heights were recorded after each measurement. Students used individual results within teams to order heights from least to greatest; to calculate the sum, difference between the minimum and maximum height, mean, and median; and to perform several measurement conversions. Anonymous class results were used to make conclusions about students' heights and to determine the class mode for height. The math concepts covered provided teachers with an opportunity to either review topics or introduce the topic for the first time depending on the teacher's curriculum schedule. It also gives teachers an opportunity to discuss the nutrition concept of energy balance and how it relates to anthropometric measures.

Key Points

Overall, students and teachers were highly pleased with the activity. Many students volunteered to read the beginning passages out loud. Using reading comprehension, students were successful in identifying what factors affect growth rate, defining calories, and determining whether height or weight changes more in one day. Comments from children included “This is fun” and “When can we do it again?” Comments like these were randomly expressed by students throughout the activity. Many of the children wanted to measure their height with their shoes on in order to make comparisons between the two heights. Researchers did not record student measurements for comparison against researcher measurements because it was not a research objective. However, students did compare their height measurements as researchers discussed these measurements and their differences with them verbally. At the end of the activity most students demonstrated an increased understanding of reviewed math concepts. Students were able to perform measurement procedures to determine the height of another student using yardsticks. They were also able to communicate verbally to researchers the definition of sum, difference, mean, median, and mode, and how to determine each one when asked as a class at the conclusion of the activity. Through informal interactions with teachers some comments included, “I like how several subjects are combined into one activity to maximize time,” “The kids love doing hands-on activities like this,” and “The application component is excellent.” In fact, the students in one classroom already measured and recorded each other’s heights in a separate activity prior to researchers coming. However, *Measuring Me* took it one step further to introduce new mathematics concepts of mean, median, and mode. The activity established simple foundations of mathematics while beginning to tie in concepts of health. Using *Measuring Me* as an introductory activity for collecting anthropometric measurements in the classroom was feasible and well received by students and teachers.

Measuring Me is written at a 4th grade level and includes math concepts appropriate for 4th grade, but it could serve as a guide for other researchers or educators to adapt and use with younger or older students. It is suggested teachers be involved in teaching the lesson in order to maintain better classroom management, as this was the main challenge for researchers. In the few classrooms where time was an issue, modifications were made in these circumstances to shorten the activity. Teachers could easily lead this lesson for future school health program initiatives.

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References

1. Rothman RL, Montori VM, Cherrington A, Pignone MP. Perspective: the role of numeracy in health care. *J Health Comm.* 2008; 13(6):583–595.
2. Reyna VF, Brainerd CJ. The importance of mathematics in health and human judgment: numeracy, risk communication, and medical decision making. *Learn & Ind Dif.* 2007; 17(2):147–159.
3. Kutner, M.; Greenberg, E.; Baer, J. A First Look at the Literacy of America’s Adults in the 21st Century (NCES 2006-470). Washington, D.C: US Government Printing Office; 2005.
4. Nelson W, Reyna VF, Fagerlin A, Lipkus I, Peters E. Clinical implications of numeracy: theory and practice. *Annals Behav Med.* 2008; 35(3):261–274.

5. Public schools of North Carolina, State Board of Education, Department of Public Instruction. [Accessed March 15, 2011.] Standard course of study. Available at: <http://ncpublicschools.org/curriculum/mathematics/scos/2003/k-8/19intermediategrades>
6. Geist EA, Duffrin DW, Overholt SM. Eating up mathematics. *Teaching Children Mathematics*. 2011; 17(9):568–572.
7. Shilts MK, Lamp C, Horowitz M, Townsend MS. Pilot study: EatFit impacts sixth graders' academic performance on achievement of mathematics and English education standards. *J Nutr Educ Behav*. 2009; 41(2):127–131. [PubMed: 19304258]

Student Name: _____

Measuring Me

Did you know heights and weights are recorded to keep track of how fast you grow?

Your family, genes, eating habits and exercise habits play a role in how much and how fast your height and weight change. Doctors and nurses measure and track your height and weight to determine if you are growing at a healthy rate. If your growth seems too fast or too slow, your doctor may check for illness or ask you to change your eating habits and exercise habits. Your best weight and height is unique to you and depends on your genes and body type.

To maintain a healthy body weight and grow to your maximum height, you need to eat a balanced diet. Your body uses energy from food called calories to help you play, learn and grow. The calories you eat should equal the calories your body uses. Eating too many calories can cause you to gain too much weight. Eating too few calories can make you too tired to play and learn and can slow your growth.

Did you know your weight goes up and down throughout the day depending on a variety of factors? Eating food, drinking water, sweating and using the bathroom can all cause small changes in your weight. Your height doesn't change as much in one day. However, you do shrink some during the day due to gravity and stretch back out at night while you sleep. As you get older, your growth slows and stops when you reach adulthood. If you look around, you will notice that not everyone is the same height and weight and that's okay. Your genes, eating habits and exercise habits determine your unique height and weight.

People Quiz

In the reading, circle three things that play a role in how much and how fast you grow.

Draw a box around the word in the reading that means energy from food.

Does your height or your weight change more times in one day? (Circle one)

Height	Weight
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FoodMASTER | Intermediate Supplemental Activity

Student Name: _____

SCIENTIFIC INQUIRY: Height Math

Your group will need:

- 1. ~~stationery~~ or two yard sticks (the class can share)
- 1. calculator

1. Make a hypothesis about how many people in the class are taller than you. (Fill in the blank below.)
1. hypothesize or guess that _____ people in the class are taller than me.
2. Take off your shoes. Have your teacher and a partner measure your height.
- My height is: _____ cm or _____ ft and _____ inches
3. Record the height of each classmate in the My Class Height Facts table. Was your hypothesis right? (Circle one.)
- Yes No
- If not, how many people are taller than you? _____
4. Order or list the students in your class from tallest to shortest. (You may use a separate sheet of paper.)
- How tall is the tallest person in your class? _____
- How short is the shortest person in your class? _____
- What is the difference in height between the tallest and shortest person? _____
- What is the median height? _____
- What is the mode? _____
- What is the sum of all the heights? _____
- What is the average (mean) height of the class? _____

FoodMASTER | Intermediate Supplemental Activity

Figure 1.
Measuring Me activity sheets.