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# Bridging the Gaps: Evaluating the Teaching Effectiveness of Graduate Nursing Students in Helping Children in Underserved Schools Learn About Healthy Eating

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## Abstract
The purpose of this quasi-experimental pretest-posttest study was to evaluate the teaching effectiveness of graduate nursing students on children's learning about healthy eating choices. Purposive sampling was used to select 250 predominantly Hispanic 3rd an 4th grade children enrolled in an underserved elementary school located near the Texas-Mexico border. Weekly 45-minute educational activities based on the Creating Healthy Eating Choices for Kids (CHECK) was implemented by nine graduate nursing students for a period of 6 weeks. The MyPlate standardized tests were administered prior to and following the intervention. Results showed a significant improvement on all learning objectives ($p < .001$). The results support the value of a cooperative health initiation as a feasible way of preparing graduate nursing students for promoting population health on healthy eating among children living in an underserved community.

## 1. Background

### 1.1. Need for Study

Within the last decade the primary focus of health care has shifted away from the acute care of individuals towards a model that is focused on population health promotion and disease prevention. Although nutrition is recognized as an important determinant of health in preventing obesity and comorbid health conditions, whether nurses are being adequately trained to address nutrition education on healthy eating for vulnerable populations remains unclear. Considering nurses comprise the largest group of the health professionals and are in a position to adopt and disseminate the best practices for population health promotion that includes healthy eating, there is a greater need for nurse educators to develop a community-based curriculum that provides students with an experiential learning opportunity to identify vulnerable populations at-risk for obesity in non-traditional health care settings, to gather and analyze population-level data, and to take an active role providing evidence-based nutrition education on healthy eating.

## 1.2. At-Risk Population

The association between childhood obesity and various comorbid conditions, such as hypertension, hyperlipidemia, arthritis, diabetes, and sleep apnea, are well documented making obesity a lifelong concern. Despite extensive public attention given to promoting healthy eating as an effective countermeasure to childhood obesity and comorbid health problems, there has been no significant reduction in the overall overweight and obesity rates among children in the United States. According to the Centers for Disease Control and Prevention, during the past 40 years, the obesity rates for children age 6 to 11 has nearly tripled from 5% to 14%, with the highest obesity rates amongst the lower socio-economic groups [1] Data from the U.S. Department of Health and Human Services Office of Minority Health (2014) show that Mexican American children are 1.6 times more likely to be overweight or obese than their non-Hispanic White peers. [2] A report by Arons (2011) [3] on the cost, policies, and framework for the future of children's health for the Children's Hospital Association of Texas (CHAT) also shows, that while the overall obesity rates are high among children, Hispanic children have the highest overweight and obesity rates (47%) compared to non-Hispanic Blacks (26%) and non-Hispanic Whites (23%). Similarly, results from a five-year longitudinal study by Moreno and cohorts (2013) [4] examining the prevalence and prediction of overweight and obesity among 2,317 elementary school students in an Oregon school district found that more than 17.3% were either overweight or obese with the strongest predictor being of Hispanic ethnicity and that Hispanic children were 1.8 times more likely to be overweight or obese compared to non-Hispanic White students.

Although there are many factors that may account for the disparity among Hispanic children, poor food choices and dietary behavior are recognized as key contributors to obesity and comorbid health problems. Results from numerous studies have shown that Hispanic children living in disadvantaged neighborhoods have more unhealthy eating habits compared to their more advantaged counterparts by eating less fruits and vegetables and consuming a significantly higher proportion of sodium, high sugar content foods/beverages, and calorie-dense foods from fat and trans-fat [5, 6, 7]. Likewise, findings from an observational study by Reese and cohorts (2008) [8] comparing students who ate school-prepared lunches to students who brought home-prepared packed lunches on 120 children age 6-11 years discovered that those who ate packed lunches consumed more salt, processed meat and less fruit and vegetables than those who ate the school-prepared meals. Consistent with these findings, data from a study by Reedy and Krebs-Smith (2010),[9] found that of all calories consumed by Mexican American children, more than 40% are from "empty" calories or foods from which the sum of calories were from solid fat and sugars, such as chili con carne, crispy chalupas, chili con queso, enchiladas, whole milk, carbonated beverages, and grain desserts.

Healthy eating that includes eating more vegetables and fruits and less foods high in fats, sodium, and sugar is widely accepted as an effective countermeasure to childhood obesity, however, a few studies suggest that social, cultural, and economic determinants of health influence the control that children have over their food choices [10, 11]. Results from a qualitative study exploring the risk factors for being overweight and obese among 30 Mexican migrant parents indicate a number of factors that may contribute to the increased incidence of childhood overweight and obesity among this group: nutritional deficiencies and food insecurity prior to migration, adaptation to U.S. lifestyles, and a cultural tendency to value being overweight as a sign of greater health and higher socioeconomic status [12] Data from a cross-sectional study by Hernández-Valero and cohorts (2012) [13] comparing the obesity risk and origin of country among 1,717 Mexican-Americans, Mexican immigrant and Mexican children and adolescents showed that Mexican-American and Mexican immigrants were more likely to be obese than their Mexican peers. Given that Mexican-American children are a population with a significant high risk for obesity and comorbid health problems underscores the need to explore ways to help them learn the importance of making healthy food choices.

## 1.3. Non-traditional Health Care Setting

The prevention of obesity and comorbid health problems involves building a solid foundation for developing healthy eating habits in childhood. Schools are a natural setting for providing children with information about healthy eating as a way of preventing obesity. A school-based nutrition education curriculum can help children to become nutritionally literate in the sense that they can learn how to make healthy food choices and develop healthy eating habits for themselves and others [14, 15, 16] While the role of elementary school-based nutrition education is considered important in shaping children's food choices and ultimately their health, teaching nutrition and dietary behavior is often constrained by limited time and resources. Data from 106 respondents to a cross-sectional survey exploring facilitators, barriers, and teacher preferences on improving nutrition education in elementary schools revealed that while 97% perceived nutrition education as important to very important, they identified competing academic expectations (52%), lack of available time for nutrition curriculum (48%), and lack of suitable curricula (36%) as the primary barriers to implementing a nutrition education program [17] Additionally, while the Coordinated Approach to Child Health (CATCH), a comprehensive elementary school-based program focusing on environmental influences to increase physical activity and healthy eating, has been shown to stem the rate of increases in overweight boys and girls, the implementation (hiring and training staff) and intervention cost (time spent) estimated at $44,039. [18] may be prohibitive in underserved schools with limited spending budgets.

While school-based interventions aimed towards improving healthy eating, as a major determinant to combatting obesity, have shown to have some positive effects on children, isolation and limited school resources may preclude devoting sufficient time and attention to nutrition education in rural underserved settings. [6, 19] Results from a study by Howland and cohorts (2010) [20] evaluating the effectiveness of an integrated nutrition education approach, *The Food, Math, and Science Teaching Enhancement Resource Initiative,* on 204 third grade students in three rural counties showed that the curriculum did not affect the dietary intake of these students, suggesting that the prevalence of poor dietary intake requires more nutritional education and interventions for these students.

### 1.4. Significance of Study

Given the ubiquity of the problem with childhood obesity as an important determinant of social health in underserved communities, there has been a growing emphasis on reorganizing health care delivery centered on the needs of a population rather than focusing on the acute care needs of individuals. In this light, now is the time to expand and develop new roles for nurses in promoting population health in non-traditional settings. In a report to the Secretary of the U.S. Department of Health and Human Services (2010), the National Advisory Council on Nurse Education [21] recommended that Congress provide funding to develop a more comprehensive public health care infrastructure that included health promotion initiatives in underserved socioeconomically disadvantaged communities. However, while nutrition is recognized as an essential focal area of health promotion, the nursing literature on how nurse educators can forge important partnerships between key stakeholders to address the school-based nutrition education needs of children from communities where significant disparities in health and disease exist is lacking. Additionally, while nurses are often in key positions to provide population nutrition education on healthy eating to children attending underserved schools, to date, there is a poverty of evidence on how to best integrate a nutrition education curriculum to improve the education and training of graduate nursing students for the betterment of population health. Therefore, a study that considers the importance of involving key stakeholders, the significance of developing graduate nursing students as leaders in guiding members of socioeconomically disadvantaged communities towards healthy eating, and the need to help bridge the gaps in nutrition education among predominately Hispanic children living in rural south Texas is well-worth pursuing.

### 1.5. Purpose of Study

The purpose of this quasi-experimental study was to examine the value of a graduate nursing student-directed culturally sensitive approach to nutrition education for healthy eating on predominately Hispanic third and fourth grade students attending an elementary school in an underserved socioeconomically disadvantaged community. Specifically, the researchers in this study addressed the following research question: Will third and fourth grade students attending nutrition education classes implemented by graduate nursing students demonstrate an increased nutrition knowledge on healthy eating?

## 2. Method

### 2.1. Nurse-led Cooperative Health Initiative

To reduce or eliminate the health risk disparities among this subgroup of vulnerable children where resources for nutrition education for healthy eating are limited, the graduate nursing educators took a leading role in forging a cooperative health initiative that involved partnering with key stakeholders in the development and implementation of a nutrition education program on healthy eating. In addition to the university school of nursing graduate nursing educators, the key stakeholders included the community leaders, the elementary school administration, the elementary educators, the university leaders and members of the university border health office. The overarching objectives for this cooperate health initiative were (1) to provide graduate nursing students with an experiential learning opportunity to integrate research, teaching, practice, and service for a rural underserved community where resources for nutrition education for children on healthy eating are limited; and, (2) to enhance graduate nursing students' understanding of important concepts to population health promotion school-based nutrition educational program that is aligned with the current federal nutrition recommendations for healthy eating.

### 2.2. The Treatment Variable

Following the ethics of the university IRB and the nursing code of ethics, the nursing faculty and cohorts from the university's border health office developed a nutrition education program based on the best evidence on healthy eating. Considering learning may be best achieved through hands-on and interactive activities, they designed the *Creating Healthy Eating Choices for Kids (CHECK),* a two-part nutrition education curriculum*:* (1) classroom nutrition education, and, (2) school-based gardening. The classroom sessions were grounded on the standardized nutrition education model *The Serving up MyPlate: a Yummy Curriculum,* a broadly accepted program aimed towards helping children in making healthier food choices and balancing food consumption with physical activity. [22] School-based gardening, as an experiential learning approach, was incorporated to reinforce the children's classroom learning in identifying and making healthy foods choices (Palmer, et al, 2009) [23]. The *CHECK* program consisted of four main learning modules: (1) identifying food groups, (2) creating a balanced plate, (3) learning portion sizes and measurements, and (4) reading nutrition labels. Prior to implementation, the graduate nursing students participating in this study were provided with specific

instructions about the *CHECK* program and a lesson plan to guide their weekly activities.

## 2.3. Participants

The nine graduate nursing students enrolled in Advanced Rural Health Nursing formed a group of three. Prior to implementing the CHECK nutrition curriculum, each group was to become familiar with the most current recommended nutrition guidelines to ensure that the messages and materials delivered were consistent with the program's goals and based on the best evidence for helping children learn about healthy eating.

## 2.4. Design and Sample

A pretest-posttest only design was used to measure the teaching effectiveness delivered by the graduate nursing students on the children's learning. A purposive sampling method was used to select 120 third grade students and 130 fourth grade students attending an elementary school in a small rural community near the Texas-Mexico Border. The student population reflected that of the community with more than 97 percent identifying themselves as Hispanic and 83 percent considering themselves as economically disadvantaged. The third and fourth grade students were divided into groups of about 40 students according to their homeroom assignment.

## 2.5. Implementation

Pender's Health Promotion Model [24] and Kolb's Experiential Learning Model [25] guided the graduate student's curriculum delivery. Each group of children received a weekly 45- minute session on healthy eating delivered by a group of three graduate nursing students for a period of 6 weeks. In addition to the 45- minute classroom sessions, all the children (N = 250) participated in the planting of various vegetables and fruits.

Stressing the importance of healthy eating, the graduate nursing students used pictures of objects to provide visual demonstrations for each of the four curriculum models. In the first two teaching modules on identifying food groups and creating a balanced diet, the children were provided with a picture of a plate that was sectioned into 4 separate parts with an attached circle, which simply illustrated the amount of food from the five basic food groups needed for making healthy food choices essential for the development of strong bodies and minds. Proteins (meat and beans) and whole grain foods were shown in equal fourths on the plate, while fruits and vegetables were divided in a slightly different way, which allowed for more vegetables than fruits. The attached circle represented dairy products. As they learned about identifying food groups, the children were asked to draw or write their healthy food choices that represented each food group in the appropriate section on their plates. Throughout each learning session, the graduate nursing students led a discussion about healthy foods that would help them grow and learn and encouraged the children to express their thoughts and ideas as they created their healthy food plates. The third teaching module was directed towards teaching students about portion sizes and measurement equivalents by using their hands as well as pictures of common objects, such as a tennis ball or a computer mouse. The final module was directed towards teaching children how to read food labels illustrated by various samples of common foods. The learning activity included identifying important nutrition facts, such as serving size, calories per serving, calories from fat, total fat, carbohydrate, dietary fiber, protein and sugars. Children also had the opportunity to reinforce their learning by playing nutrition bingo and nutrition jeopardy.

Occurring after completion of the classroom learning modules, the second part of the *CHECK* curriculum involved introducing community gardening strategies to help facilitate the children's classroom learning and to connect them with the source of their food. Teaching strategies utilized by the graduate nursing students immediately prior to the children's participation in the planting of healthy foods included the reading of *Tops and Bottoms,* a charming story for children about planting and harvesting crops, and viewing a short video on gardening. The children under the supervision of the teaching staff, members of the Future Farmers of America (FFA), and the graduate nursing students were then given the opportunity to plant various vegetables (tomatoes, cucumbers, lettuce, broccoli, corn, green onions, and herbs) and fruits (melons and strawberries) on two small school-based above-ground gardens.

The *MyPlate* standardized tests for 3$^{rd}$ and 4$^{th}$ graders, a widely accepted testing method, was administered by the graduate nursing students. The *MyPlate* test was divided into four separate test units with each representing a learning module. The first test unit consisted of a picture of a plate where the children were to write or draw their healthy food choices in the appropriate section. The second test unit asked the children to list five each of fruits, grains, vegetables, and proteins. The third test unit involved having children match five pictured items with the appropriate serving size. The fourth test unit ask the children to match hand pictures with the best measurement/size and to fill-in-the blank of five items on reading the picture of a food label. Prior to the implementation of the intervention, the children were given the complete *MyPlate* test. To measure the teaching effectiveness by the graduate nursing students on the children's post intervention nutrition knowledge on healthy eating, the *MyPlate* tests were administered at two points in time, with the first one week following completion of the teaching modules 1 & 2 and the second one week following the teaching modules 3 & 4.

## 2.6. Analytic Strategy

Each module consisted of 5 questions with a maximum score of 100%. Data from children completing both the pretest and posttest *MyPlate* standardized tests were collected and quantitatively analyzed using SPSS version 1.

## 3. Result

The *CHECK* program measured knowledge increase in the four curriculum modules on third and fourth grade students completing both the pretest and posttest *MyPlate* tests. For the first module: Identifying food groups ($3^{rd}$ grade N = 111; $4^{th}$ grade N = 113), chi square values ($X^2$ = 101.1 for $3^{rd}$ grade; $X^2$ = 60.2 for $4^{th}$ grade) showed significant ($p < .001$) differences between the pretest and posttest revealing an increase in knowledge of the food groups. In the second module: Creating a balanced plate ($3^{rd}$ grade N = 111; $4^{th}$ grade N = 115), chi square values ($X^2$ = 16.6 for $3^{rd}$ grade; $X^2$ = 15.9 for $4^{th}$ grade) showed significant ($p < .001$) increases for both $3^{rd}$ and $4^{th}$ graders. To determine differences in knowledge gained for portion size, the measurement activity, and the nutrition label lesson, t-test were conducted. In the third module: Measuring portion size, the $3^{rd}$ grade (N = 110) mean scores revealed a significant ($p < .001$) difference between pretest and posttest scores (35.4 vs. 58.6. respectively) on measuring portion size. The $4^{th}$ grade (N = 114) mean scores also revealed a significant difference between the pretest and posttest scores (38.8 vs. 72.4. respectively) on the measurement activity. On the final module: Reading a nutrition label, the $3^{rd}$ grade (N = 110) mean scores showed a significant ($p < .001$) difference between the pretest and posttest scores (60.3 vs. 81.2, respectively). The $4^{th}$ grade (N = 114) mean scores (63.1 vs. 89.6, respectively) also showed a significant difference between the pretest and posttest scores. These results indicate that the children significantly increased their knowledge of the subject matter and support the hypothesis that graduate nursing students can be effective in teaching healthy eating to third and fourth grade students attending an underserved elementary school.

## 4. Discussion

The results of the *CHECK* program delivered by graduate nursing students are consistent with other school-based nutrition programs in that the children demonstrated an increase in nutrition knowledge after the program. In each of the four lessons, the children were able to show improved knowledge each week. Lessons one and two provided a basic understanding of food groups and how to create a balanced meal. Both third and fourth grade students showed significant improvement in categorizing foods according to food groups with fourth grade students scoring higher than third graders. Similar results were observed at the end of lesson two which focused on creating balanced meals by identifying healthy foods. Learning about portion sizes and how to measure portions during lesson three proved to be more difficult for children in both grade levels. However, fourth grade students scored higher at the end of the lesson compared to third graders. The greatest learning occurred during lesson four which involved reading nutrition labels. While fourth grade students scored significantly higher in reading nutrition labels at the end of the program, third grade students were just as proficient in identifying important nutrition facts, such as serving size, calories per serving, calories from fat, total fat, carbohydrates, dietary fiber, protein, and sugars. At the end of lesson four, children in both grade levels were able to correctly identify healthy food choices from unhealthy ones through their interpretation of nutrition labels. There are several factors limiting the generalizability, however, the results from this study suggest that student learning on nutrition can be enhanced through weekly interactive activities provided by graduate nursing students. Consistent with the Texas Essential Knowledge and Skills for Health Education (Texas Education Agency, 2015), [26] the data indicate that the fourth grade may be considered the ideal level where most learning about nutritional health occurs.

Through connecting graduate nursing students with hands-on experiences at the community level, they were able to integrate research with practice and recognize the important role they could play as positive contributors to the promotion of health in a non-traditional health setting. Additionally, although more controlled studies are needed, the findings from this study are promising and support the assumption a cooperative health initiative between schools of nursing and key community stakeholders may help bridge the gaps in nutrition education among predominately Hispanic children living in rural south Texas. A major strength of this study is the willingness of graduate nurse educators in taking a leading role in joining forces with key stakeholders, such as community leaders, school administrators, school educators and the university leaders, to explore outside sources to create a positive learning environment for graduate nursing students in their endeavor to enhance children's nutrition knowledge on healthy eating.

## 5. Conclusion

Childhood obesity and unhealthy eating are problems not just for the school system, but also for the community at large. While addressing childhood obesity among children living in rural underserved communities is complex and multifaceted, one must appreciate the impact of creating a university academic partnership with a local school district who share the same goals of promoting healthy eating for these children. The *CHECK* program highlights the important role of nurses in providing guidance on healthy eating. Moreover, it is an example of how nurse educators can lead the way in joining forces with community leaders and elementary school teachers to help bridge the gaps in school-based nutrition education among underserved children while simultaneously providing their students with an experiential learning opportunity to integrate research, teaching, practice, and service. The positive outcomes of this collaborative school-based educational nutrition program add to the science of nursing education and may offer a step forward in turning the tide on childhood obesity. While this study focused on the effectiveness of graduate nursing students in delivering nutrition education on healthy eating to third and fourth grade students residing in an underserved area within the Texas-Mexico border region, these findings can be used to guide future research, school policy, and other cooperative

health initiatives led by nursing academicians for other underserved socioeconomically disadvantaged communities in promoting population healthy lifestyle practices.

Finally, given that nutrition is a recognized important determinant of health related to the overall health and well-being of individuals, effectively addressing lifestyle recommendations necessitates ensuring that graduate nursing students are adequately trained in providing nutrition education to diverse groups in non-traditional health settings. Improving the delivery of nutrition education on healthy eating requires aligning recommended nutrition practices by professional experts, current federal dietary guidelines, and the core competencies for graduate nursing education with the cultural values and food beliefs, dietary habits, living conditions, nutrition knowledge, and age of targeted populations.

## 6. Future Research

Clearly more research is needed examining the best methods for integrating graduate level nutrition education designed to improve the education and training of advanced practice nurses for the benefit of population health. Also, more research in collaborative health initiatives involving nurse academicians and key stakeholders in addressing population health is needed to determine the best evidence for addressing the unique health concerns for disadvantaged groups across a life's continuum. Additionally, more studies are needed to evaluate the effectiveness of teams of graduate students from different health disciplines in reducing unhealthy lifestyles for underserved populations.

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