

Examining Second Graders' Healthy Food Choices: Through Literacy and Active Learning

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ABSTRACT: The purpose of this study was to investigate the implementation of a nutrition module and activities (*Go, Slow, Whoa*) in a literacy environment through an active learning approach. Second graders (N=85) from diverse socioeconomic status (SES) areas completed the 12-week program. The participants' perceptions of healthy food choices were measured both pre- and post-intervention. Students met for 30 minutes twice a week, to complete 5-lessons from a Coordinated Approach to Child Health (*CATCH*) nutrition module and activities (*Go, Slow, Whoa*). Measures were taken both pre- and post-intervention (*Food Fury Quiz*) to distinguishing between healthy and unhealthy foods (images). There was a statistically significant improvement ($t = 12.16$, $df = 84$, $P = .000$) from pretest ($M = 19.06$, $SD = 3.13$) and posttest ($M = 23.34$, $SD = 0.48$) scores. Administering a healthy food choice curriculum through literacy and active learning provides an alternative approach to improving health knowledge among second grade students.

KEYWORDS: nutrition education, healthy food choices, second graders, *CATCH* nutrition module, *Go, Slow, Whoa* activities

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Background

Childhood obesity is a crucial social problem that affects children's health, resulting in both short- and long-term impacts on the economy.¹ Excess weight in childhood is estimated at \$3 billion per year in direct medical costs.² Obese preschool-aged children are 5 times as likely to become overweight adolescents and 4 times more likely to be obese adults.³ Children who are obese or overweight have a higher risk of developing chronic diseases associated with excessive weight in childhood and in adulthood, including type 2 diabetes, cardiovascular disease, hypertension, stroke, asthma, anxiety, depression, and certain cancers.^{3,4} These statistics have propelled the health and education communities to investigate and promote educational solutions to reverse the current state of childhood obesity.

There are multiple factors contributing to the global rise in children being overweight and obese. Changing lifestyle (more automobiles and less walking, more TV time and less outdoor activities), family environment (food choice and preference), dietary behavior (overeating), activity behavior (lack of physical activities), physical environment (exposure to synthetic chemicals), lack of food knowledge, and poor food literacy effect an increase in weight that may lead to obesity.^{5–9} To combat childhood obesity, interventions such as the Coordinated Approach to Child Health (*CATCH*) have been implemented.¹⁰ *CATCH* is a nationally recognized, evidence-based, physical activity and nutrition curriculum currently employed across the United States.¹⁰ As a behaviorally based, coordinated school health program, the *CATCH* program includes multiple aspects of the school environment, including the classroom (curriculum), nutrition services, and the cafeteria environment. Within the *CATCH* curriculum, students are taught to classify foods using the terminology (*Go, Slow, Whoa*). *Go* foods are generally foods

that are healthy to consume and have a high nutritional value. *Slow* foods should be consumed with caution. *Whoa* foods should rarely be consumed as they lack in nutritional value (catchinfo.org). The *CATCH* program has been found to impact healthy eating and physical activity behaviors.^{7,11}

The purpose of this study was to investigate the implementation of *CATCH* nutrition curriculum module in second grade Language Arts and Science following an active learning approach. It was hypothesized that by implementing *CATCH* nutrition curriculum module and active learning activities (*Go, Slow, Whoa*) in second grade Language Arts and Science classes, students would have increased knowledge of healthy food choices.

Literature review

Schools, language arts, and health literacy. "Health literacy is the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (cdc.gov). Nutbeam¹² encouraged health and education alliances to improve health literacy. Schools have contributed to health literacy through explicit and experiential learning,²⁷ beginning instruction even as young as age 3.¹³ Whereas comprehensive programs inclusive of the whole school community are effective for contributing to overall health literacy,¹⁴ so is classroom-based instruction.^{4,5,15–17} In this study, food knowledge instruction and practice were incorporated into Language Arts (inclusive of reading, writing, and communication) and Science classroom instruction.

Kindig et al¹⁸ espoused an intersection between print and health literacies. As print literacy increases, health literacy has



greater potential to grow and improve. Health promotion and nutrition education can provide a natural connection with Language Arts instruction. Applebee et al¹⁴ concluded that Language Arts discussion-based activities and approaches have supported students' understanding and internalization for independent discussions and engagement with others. In this study, the Language Arts and Science classes were the context for the *Go, Slow, Whoa* content. An active learning instructional approach was pursued in that students would be active in constructing their own knowledge about health literacies, behaviors, and outcomes. Furthermore, a discussion-based approach to health and nutrition was conducted with the students weekly to promote nutrition reflection and extend nutrition topics into Language Arts. A cross-curricular approach to health and nutrition in primary school was identified as a supported factor in Dudley et al's (2015) meta-analysis of teaching strategies and approaches for healthy eating.

Images and food. Images (drawings and photos) have been an integral part of nutrition education and promotion. From documenting food consumption, identifying food choices, and developing food knowledge, photos and illustrations are a known learning aid in food literacy. To develop food awareness and promote healthy food consumption, children and adolescents have captured and analyzed their own photos of food that they consumed using cameras, phones, and other mobile devices.¹⁹ Reflective analysis of the photos of food was used to increase food knowledge. Furthermore, photos taken by youth have been incorporated into electronic food journal diaries to measure micro and macro nutrients.²⁰

Photos, illustrations, and images have been incorporated into various nutrition programs to build food knowledge and efficacy related to healthy food identification. One common illustration includes the *Choose My Plate* graphic from the United States Department of Agriculture. The image of the plate with the proportion of food groups provides a visual depiction of a healthy diet. In prior research, children were able to distinguish between healthy and unhealthy foods and stated food preferences (Sigman-Grant, 2014). Children as young as preschool have been able to recognize foods with greater nutritional value than others after repetitively viewing photographs of 18 foods. These preschoolers were able to categorize the foods in the photos as go, slow, or whoa.²¹ Likewise, the *Food Fury* quizzes incorporated in this study included the artist-rendered illustrations of food that were demonstrated throughout the *Go, Slow, Whoa* curriculum. Students observed and participated in active learning activities with these illustrations. The objective was for students to be able to accurately indicate whether the illustration of common foods represented a go, slow, or whoa food based on their nutritional content. In addition, a reflective approach of hand-drawn images depicted by the participants was 1 of 2 instructional approaches to promote an increase of children's food knowledge in this study.²²

Caregivers and nutrition. Children's food choices are made and/or influenced by caregivers whether in familial, educational, or child care contexts. However, caregivers are not limited to family, as many children spend much of their day in preschool and daycare programs. Preschool and daycare staff and teachers are important stakeholders in children's nutrition and health promotion. A phenomenological study of 8 preschool staff members' perceptions of health and nutrition yielded these key discoveries: the staff (a) had an interest in improving children's health; (b) valued the effects of physical activity; (c) desired to have a health specialist for the children; and (d) held misconceptions about nutrition. The influence and the passion of educators toward children's adequate and appropriate nutrition can be realized in an integrated curriculum.²² Caregivers make and influence many of children's food choices, and the need to educate children in making healthy food choices is pivotal for long-term health.

CATCH nutrition with the go, slow, whoa food activities. Third grade students (n = 65) who participated in a *CATCH* program, which included the *Go, Slow, Whoa* module, increased fruit and vegetable consumption behavior and nutrition knowledge after 2 nutrition classes and a farm tour.²³ Conversely, there have been mixed results with the *Go, Slow, Whoa* program implemented in 56 schools (n = 5106). After completing the program, students were tracked for 2 years. Elementary students' consumption of fatty foods decreased, physical education increased, but cholesterol and blood pressure did not change.²⁴ *Go, Slow, Whoa* lessons, along with a cafeteria-based intervention (labeling the foods by the *Go, Slow, Whoa* colors of red, yellow, and green), in elementary grades K-8 correlated with a decrease in the sugar and fatty food purchases. Of participating teachers teaching in the program, only 22% of the teachers thought that the *Go, Slow, Whoa* lesson influenced the students' food consumption behavior. However, the cafeteria purchases for fatty and sugary food did indeed decrease.²⁵

Research questions

Knowing that students can benefit from nutrition education and intervention programs and the importance of caregivers (educators) in developing nutrition promotion among children, the following research questions were considered for this study:

Research question 1. What are the differences in second grade students' knowledge of healthy foods and food choices before and after the implementation of the *CATCH* nutrition module embedded with *Go, Slow, Whoa* with literacy activities as measured by the *Food Fury Quiz*?

Research question 2. What are the differences in second grade students' knowledge, by age and sex, of healthy foods after completing the 12-week program of the *CATCH* nutrition curriculum (*Go, Slow, Whoa*) and with literacy activities as measured by the *Food Fury Quiz*?

Table 1. Participants by ethnicity.

| ETHNICITY | N | PERCENTAGE | AGE | N | PERCENTAGE |
|-----------------------------|----|------------|--------|----|------------|
| White | 54 | 66.7 | 7 | 55 | 66.7 |
| Black/African American | 8 | 9.9 | 8 | 30 | 35.3 |
| Hispanic | 17 | 21.0 | | | |
| European | 1 | 1.2 | | | |
| Asian | 1 | 1.2 | | | |
| Total | 81 | 100.0 | | | |
| Not identified ^a | 4 | | | | |
| <i>Total</i> | 85 | | | | |
| | | | SEX | N | PERCENTAGE |
| | | | Female | 42 | 49.4 |
| | | | Male | 43 | 50.6 |

^aSome students did not indicate their ethnicity.

Methods

The nutrition and health intervention was implemented twice a week at the second grade level during core class (English Language Arts and Science) instruction. During the 12-week intervention, 5 lesson plans were adopted and taught from the *CATCH* nutrition module (*Go, Slow, Whoa*). During the intervention, students were instructed to identify the difference between go, slow, and whoa foods through an active learning approach that included learning games. Teachers incorporated *Go, Slow, Whoa* flashcards and *MyPlate* activities as active learning tools to foster the practice of identifying healthy foods. After the activities, students participated in reflection. Lessons and activities were 30 minutes in length and occurred twice a week. The students were not being passive recipients of food knowledge, instead were actively engaged in constructing their own knowledge about food.

Participants

Participants were second grade students at 1 school in a central town located in a metropolitan area in a southeastern state in the United States. The students represented socioeconomic status (SES) diversity consistent with the region. A convenience sampling was used to capture participants' perceptions of healthy food choices. Out of 106 students enrolled in the second grade, 85 participants (80%) completed this study. Those who did not complete the intervention due to absenteeism or being pulled out of class for other reasons were not considered in the results. Although the students were assigned to multiple classes in the school, they did not attend the intervention as a single class each week but rather multiple classes were randomly intermingled at the direction of the school based on the school schedule. Out of 85 students, 81 (95%) completed the demographic question. Demographic data provided relevant information about the ethnicity and age of students who attended the school in this study (Table 1).

Instruments

A pretest and a posttest were conducted using the *Food Fury Quiz*. Both the pretest and posttest included 31 questions. Each test item depicted a full-color line drawing of a food item for a total of 31 images. Each food item was followed by the words go, slow, and whoa. The instructions for the quiz advised participants to circle the word that best described the health characteristic of the food item. If the food depicted was the least healthy option, then the participant would circle the item as slow. Conversely, a healthy option like plain broccoli would be identified as a go food.

Prior to the onset of the program and at the conclusion of the intervention during week 12, researchers administered a *Food Fury Quiz* to evaluate students' knowledge about healthy food choices. The purpose of the pretest and posttest was to determine whether any changes occurred from the beginning to the end of the intervention. The *Food Fury* pretest and posttest were adopted from *Health Games Research*.

Procedure

Researchers implemented the proven *CATCH* nutrition module (*Go, Slow, Whoa*) during core content curriculum. The *CATCH* nutrition module includes a stoplight module to break foods out into 3 groups: go, slow, and whoa foods. Foods that are whoa foods equate to a red light, slow foods a yellow light, and go foods reflect a green light. The goal for everyone is to eat more go foods than slow foods and to eat whoa foods in very small amounts. "Go" describes foods that are whole grain, unprocessed fruits and vegetables, low in fat, contain no added sugar, and can be eaten daily. "Slow" describes foods that are slightly processed and may have some added salt, fat, or sugar. "Whoa" describes foods that are high in fat and sugar. Furthermore, the nuances of food preparation were considered. A go food would be fresh or frozen green beans. A slow green bean would be canned green beans. Finally, a slow green

Table 3. Univariate test and the effect of sex.

| DEPENDENT VARIABLE | | DF | MEAN SQUARE | F | SIG. |
|--------------------|----------|----|-------------|-------|-------|
| POSQuiz | Contrast | 1 | 0.959 | 4.282 | 0.042 |
| | Error | 81 | 0.224 | | |
| PREQuiz | Contrast | 1 | 6.773 | 0.677 | 0.413 |
| | Error | 81 | 10.002 | | |

Research question 1

What are the differences in second grade students' knowledge of healthy foods and food choices before and after the implementation of the *CATCH* nutrition module embedded with *Go, Slow, Whoa* with literacy activities?

The results indicated a statistically significant difference ($t = -12.162$, $df = 84$, $P < .001$; Table 3) between pretest ($M = 19.06$, $SD = 3.13$) and posttest ($M = 23.34$, $SD = 0.48$) scores.

Research question 2

“What are the differences in second grade students' knowledge, by age and sex, of healthy foods after completing 12-week program of the *CATCH* nutrition curriculum (*Go, Slow, Whoa*) with literacy activities?”

Pretest and posttest of the *Go, Slow, Whoa Food Fury* test were conducted on the participants ($N = 85$), which included 42 girls and 43 boys between the ages of 7 and 8 years. A 2×2 factorial analysis tested the effects of sex and age on pretest and posttest scores. Results show that there was a significant effect for the factor of sex on the posttest scores ($F_{(1,81)} = 4.28$, $P = .042$; see Table 4).

In addition, the results show marginal differences in mean scores in the pretest and posttest between the 2 ages, that is, 7 and 8 years, as well as between sexes. On the pretest, 7-year-old boys had a mean score of 19.56. This increased to a 23.44 mean score on the posttest. Female mean scores for the same age group were slightly lower on both the pretest and posttest, $M = 18.83$ and $M = 23.27$, respectively. There was similar difference in mean scores produced by the 8-year old participants (see Table 4). These statistics were analyzed using a 95% confidence interval.

Discussion

In this study, the *Go, Slow, Whoa* messaging embedded in active language literacy activities contributed to an increase in participants' identification of healthier food choices as was evidenced by the increase in the mean scores between the pretest and the posttest. The intervention supported the increase in second grade children's knowledge and awareness of healthier foods, a precursor to making healthy food choices.³⁰ These statistically significant findings support the existing literature

Table 4. Pretest and posttest scores for each age by sex.

| DEPENDENT VARIABLE | AGE | SEX | MEAN |
|--------------------|-----|--------|--------|
| POSQuiz | 7 | Female | 23.267 |
| | | Male | 23.440 |
| | 8 | Female | 23.167 |
| | | Male | 23.444 |
| PREQuiz | 7 | Female | 18.833 |
| | | Male | 19.560 |
| | 8 | Female | 18.583 |
| | | Male | 19.056 |

regarding the effectiveness of *Go, Slow, Whoa* activities among second graders (Research question 1). Likewise, the study reinforced previous findings regarding the integration of additional active literacy learning activities to support the *Go, Slow, Whoa* classification to promote students' knowledge of healthy foods and healthy food choices.^{10,22}

Regarding research question 2, there was a statistically significant difference by sex: boys scored slightly higher than girls on both the pretest and the posttest as evidenced by mean scores. The mean differences between boys and girls were slight. Although boys in the study of³⁰ had the greatest gains after participating in an experiential nutrition education program, this was not the case in this study. Boys scored slightly higher than girls at the onset of the study and maintained a higher mean score at the conclusion. However, the study did not indicate a statistically significant mean difference when considering the participants' ages. Those who were older did have greater scores on both the pretest and the posttest. Perhaps, this finding may be attributed to the older students having more prior food experiences because of their age.

The current intervention supported the study hypothesis that the *CATCH* module and *Go, Slow, Whoa* activities integrated into Language Arts and Science instruction and activities can increase students' ability to identify and classify images by nutritional value. However, these results may have been realized even if the instruction and active learning strategies were implemented in a different core academic class. The design of this study was to provide integrated nutrition

instruction and it does confirm prior research by Dudley et al (2015) that a cross-curricular approach and multiple teaching strategies can support health and nutrition education in primary school.

Limitations

Limitations to this study included the curriculum itself. Students were familiar with the *Go, Slow, Whoa* food picture set and were not assessed on other pictures. Furthermore, the *Food Fury* test does not include photographs, but rather simplified drawings of food; therefore, the transfer of knowledge from drawings of foods to photographic imagery or the actual food on a plate is unclear. The intervention described in this study included students drawing and labeling their own images of food similarly to the investigation of Heidelberger and Smith¹⁹ whereby students took and labeled food pictures. The inclusion of identifying and classifying daily foods consumed may have provided additional transfer of learning. However, this separate strategy was not tested. Future investigations could be expanded to include photos of images and the foods themselves. An additional limitation is that the study was conducted at 1 school, servicing 1 grade. In the future, this could be addressed by conducting the same study with the same activities over multiple sites with multiple grades.

Implications

Implications from the findings of this study can inform childhood education researchers, educators, and schools about increasing efforts to promote knowledge of healthy food choices. Health promotion and nutrition intervention programs can be operationalized in core curricular subjects like Language Arts and Science. Furthermore, the instructional approaches of active and reflective learning supported how the lessons were taught. In the active learning approach, students did more than look at images. Students interacted, created, and labeled their own images with the go, slow, and whoa terminology. In the reflection approach, students discussed their food choices at school and were encouraged to discuss these choices at home. Implications from this study for educators include nutrition education that includes active and reflective approaches can be integrated into multiple content areas. As the United States and the world continue to battle childhood obesity, integrating nutritional education into the core curriculum areas warrants consideration. Furthermore, partnering with caregivers, such as educators, about ways to integrate health promotion and nutrition knowledge may provide additional support for children in increasing their health and nutrition awareness and knowledge.

Conclusions

Nutrition and health awareness and intervention programs can have positive impacts on children's eating behaviors and

contribute to increased health and nutrition awareness which may lead to the increase in students consuming healthier foods. The importance of healthier food consumption had been linked to lower obesity rates and healthier lifestyles.²⁶ The *CATCH* nutrition module and *Go, Slow, Whoa* with embedded literacy activities provided an increase in knowledge of healthier food choices at a young age. Knowledge of healthier options can help children to engage in better eating habits when they have opportunities to choose their own food.



Author Contributions

ELO designed the study, collected and analyzed data, and contributed to writing, LOC contributed to the writing of the manuscript and interpretation of the data, critical review of the manuscript, completed all revisions, and was the corresponding author. SJ conducted the initial statistical analysis.

Ethical Approval

All research activities involving human subjects were reviewed by the UCF Institutional Review Board under IRB # SBE-15-11594.

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