Research Journal of Food and Nutrition
Volume 3, Issue 1, 2019, PP 18-27
ISSN 2637-5583

Teachers' Perceptions of Nutrition-Integrated Curriculum and its Impact on Development and Sustainability

Alicia Cooper Stapp, Melinda Wells Valliant, KathyB. Knight, Lindsay Goldthorpe

Department of Teacher Education, University of Mississippi 328 Guyton Hall, University, Department of Nutrition and Hospitality Management, University of Mississippi

***Corresponding Author:** Alicia Cooper Stapp, Department of Teacher Education, University of Mississippi 328 Guyton Hall, University, acstapp@olemiss.edu*

ABSTRACT

Addressing childhood obesity and academic achievement is critical to fostering a healthier generation, but some children may not have support at home that enables them to eat the most nutritious foods. Thus, an integrated standards-based approach to nutrition education in the school setting may provide a sustainable way for children to learn healthy lifelong eating habits while simultaneously making academic gains. However, barriers such as feasibility and teachers' self-efficacy surrounding a nutrition-integrated curriculum may play a pivotal role in the success of such a program. Therefore, this study assessed teachers' perceptions of a nutrition-integrated curriculum through a survey that was administered prior to development of teacher training and curriculum for a nutrition-integrated pilot curriculum entitled Fuel to Learn. While results of the survey provided data to assist the researchers in development of training and the Fuel to Learn curriculum, Chi-Square statistics revealed that there was not a significant relationship between the categorical variables (X^2= .90, p > .05). However, the concerns voiced by the teachers in the survey with respect to nutrition integration were all addressed as part of the training and design of Fuel to Learn. Therefore, we posit that the Fuel to Learn curriculum has the potential for success and sustainability in terms of its' use in the elementary classroom.

Keywords: *nutrition education, perceptions of integrated curriculum, childhood obesity, elementary teachers*

INTRODUCTION

The current trajectory of childhood obesity and academic achievement in the United States are major concerns in the public health and education sectors. On the largest cross-national test (Program for International Student Assessment [PISA]) in science, mathematics, and reading, the United States ranked 40th out of 71 countries [1]. Within the realm of obesity, the Centers for Disease Control and Prevention (CDC) determined that the prevalence of overall obesity in the United States remains high at 39.8%. Moreover, childhood obesity rates remained at 18.5% from 2013-2014 to 2015-2016, indicating no decline [2]. While data varies slightly between age groups, gender, socioeconomic status, and ethnicities, the stark reality is that obesity rates have remained relatively unchanged over the past two decades. Subsequently, it is essential to examine the effects of obesity within the context of children's overall academic, social, and emotional health in school in order to develop possible programs and interventions that may impede the rising tide of childhood obesity.

OBESITY AND DEVELOPMENT

Cognitive

In relation to the effects of obesity on children's cognitive functioning, an overconsumption of energy by children has been found to be maladaptive for brain health [3]. Current research indicates a correlation between children who are obese and lower academic achievement. One study found that a higher body mass index (BMI) for adolescents (ages 14-17) was associated with lower grades [4]. Another study examined 301 sixth and seventh grade students and revealed that children who were overweight had lower mathematics and reading scores than their peers who were not overweight [5]. Furthermore, overweight and obese children (ages 7-9) who had more abdominal fat were found to perform lower on assessments that required hippocampal-dependent memory [6]. An extensive review of the literature by [7] resulted in the revelation of a multitude of

associations between obesity and cognitive health. Future research is needed, however, to distinguish further synergistic relationships between a decrease in obesity and increased cognitive health.

Social-Emotional

Obesity also has an impact on children's social and emotional skill development within the academic setting. Social-emotional development refers to a set of behaviors and/or skills which children acquire that lead to positive social outcomes [8]. The formation of such skills is critical between the ages of 6-11 when children begin developing a sense of identity, as well as an understanding of the social world around them [9]. The development of these vital social skills can be impeded by social mistreatment such as teasing, exclusion and victimization of children who are obese [10-12]. Researchers have identified relationships between obese children, negative social interaction outcomes, and poor academic functioning [13]. In addition to the challenges obese children face to maintain positive social engagement, one study noted that girls who were identified as overweight during primary grades in school were at a much higher risk for social-behavioral issues, and poorer academic performance [14]. Due to the dramatic increase in the number of obese and overweight children in the United States, it is critical to understand the dynamics between childhood obesity, academic achievement, peer social interactions, and development of social-emotional competencies.

Addressing Dietary Behaviors in Children

It is evident that children who are obese face more academic, social-emotional, and health challenges than their non-obese peers at school. Accordingly, factors precipitating this chronic disease must be addressed. One of the major contributors to obesity and other chronic diseases in adolescence and adulthood is poor food choices [15], wherein a balanced diet and moderation in portion control supports healthy development and growth. However, habits surrounding food choices and dietary behaviors are developed in early childhood, so obesity and chronic diseases, and their impact on academic performance can be a result of inadequate nutrient intake at an early age. While some researchers contend that dietary behaviors are a result of conditions at home and dependent upon socioeconomic status, others [16-18] noted that inadequate nutrient intake is also discernible in children who live in affluent populations with access to high quality food at home and at school.

Schools as Change Agents

The best approach to preventing childhood obesity should include input from different intervention areas and from a multitude of diverse groups to be successful [19]. School attendance is required by law in the United States, allowing access to over 95% of children and adolescents for a large portion of their early life. Thus, schools are often the first choice for obesity prevention interventions and can be critical catalysts for change [20]. In its position paper on the prevention and treatment of pediatric obesity [21], the Academy of Nutrition and Dietetics outlined the importance of multilevel approaches that involved consistent messages across various sectors of influence, inclusive of schools.

While many school-based interventions have been successful, most tend to be region specific and susceptible to short-term funding. In addition, it is evident that current teaching methods are not precipitating significant increases in academic achievement, as indicated by national achievement test scores. Despite these barriers, the Institute of Medicine (IOM) previously recommended, as one of their five goals, that schools should be the focal point for obesity prevention [22]. It has also been noted that school curriculum which includes healthy eating, physical activity, and body image is a promising strategy for both obesity prevention and increased academic achievement [23].

Nutrition-Integrated Programs

Educational research indicates that integration as an approach to teaching and learning facilitates real-world application, engagement and increased levels of academic achievement [24]. Thus, connecting nutrition concepts to academic standards within school curricula should be an indisputable pairing to aid the aforementioned inequities. While nutrition education programs across the country aim to educate and reduce food health disparities, there is a deficiency in the literature on school-based curricula that simultaneously merges both nutrition and academic standards together with the intent of developing a sustainable program. Although the research on school-based nutrition education is promising, the need for change is

critical. Schools have the opportunity to play a vital role in positively affecting both the academic achievement and health of the next generation.

Barriers to Nutrition-Integrated Programs

Legislation such as the Healthy Hunger Free Kids Act of 2010 has helped to increase support for child nutrition education programs. However, the federal government does not require states to mandate nutrition education in elementary schools. While some states include health education as part of the daily/weekly curriculum, nutrition remains a small component of most health curricula. Particularly in Mississippi, where the present study occurred, it is policy that elementary school children receive 45 minutes of health education weekly. Nonetheless, health education is not a state tested subject area at the elementary level, so many schools do not address it in their daily curriculum.

Although the current lack of emphasis on nutrition education in schools may be contributed to a lack of legislative mandates, accountability, and teacher training, other factors such as daily barriers at school may be pivotal to implementation. Such barriers include rising academic mandates in tested subject areas, insufficient instructional and planning time, and lack of an appropriate nutrition-integrated curriculum and incentives for teachers to incorporate nutrition education into their daily curriculum [15]. Therefore, it could be contended that a renewed focus which places the emphasis on development of a *standards-based nutrition-integrated* curricula is essential to overcoming the barriers of sustainable nutrition education in the elementary school setting.

Integrated Curricula as a Theoretical Framework for Sustainable Nutrition Education

Based on educational theory that supports integrated curriculum, teaching nutrition through an integrated approach in the classroom may make for a more contextualized and meaningful understanding of food behaviors for children. Thus, making dietary changes more apt to occur. Accordingly, to develop a sustainable standards-based nutrition education program, this study sought to address the current barriers to nutrition education found in schools through the theoretical underpinnings of an integrated approach to teaching and learning. An integrated approach enabled the researchers to address a lack of academic content, time constraints and a developmentally appropriate curriculum commonly associated with nutrition education programs, while also addressing teachers' perceptions of a nutrition-integrated curriculum.

Through integration, the fourth-grade *Fuel to Learn* curriculum weaves together standards in mathematics, English language arts, and nutrition, enabling students to learn in real world contexts. One of the positive effects of using integrated methods is that multiple perspectives lead to a more integrated knowledge base [25]. With an integrated knowledge base, students are able to make meaning of and deeper connections to the content, which in turn increases academic achievement [26]. Within the *Fuel to Learn* framework, nutrition is not an *add on* to the curriculum. Thus, the barrier of time is automatically addressed since academic and nutrition standards are met simultaneously. As a standards-based curriculum, *Fuel to Learn* is also developmentally appropriate in both age and context of learning for elementary students.

Overall, the *Fuel to Learn* curriculum aims to provide a meaningful and sustainable nutrition-integrated program wherein children are afforded the opportunity to make gains in both academics and health. However, in order to design such a curriculum, it was imperative to capture teachers' perceptions of a nutrition-integrated curriculum prior to development of the training and curriculum in order to address any deficiencies noted in teachers' pedagogical perceptions as indicated by the survey results. Thus, the following research questions guided this phase of the study:

- What are teachers' perceptions of pedagogy as it relates to a standards-based nutrition-integrated curriculum?
- Based on teachers' perceptions of a nutrition-integrated curriculum, how can an effective training and curriculum be developed to address potential barriers and promote successful implementation?

Methodology

Sample and Procedure

Administrative support for pre-implementation (phase I), implementation (phase II), and

evaluation (phase III) of the *Fuel to Learn* project was obtained prior to the first phase of the study through the University's Institutional Review Board and (when existing) the review boards of the school districts involved approved the research protocol and associated activities.

During the first phase of the *Fuel to Learn* study, a survey research design was utilized to address the research questions. Survey research enabled the researchers to collect data from 9 fourth-grade teachers at three elementary schools in Northwest Mississippi through a response to a set of questions [27]. A Likert-type survey was administered as a means of determining teachers' perceptions of a nutrition-integrated curriculum prior to training and implementation of the pilot curriculum. The survey was an adaptation of work from [32] who originally created the survey to obtain insight into the integration of science, technology, engineering, and mathematics (STEM) within teachers' classrooms.

The researchers adapted the quesionnaire in order to identify teachers' perceptions of a nutrition-integrated curriculum through the categories of integration of nutrition content, design, and cooperative learning. Residing within those categories were five subscales — perceived relevance, anxiety, self-efficacy, enjoyment, and perceived difficulty. In all, there were fifteen total statements on the survey, with each of the five subscales having three associated statements (See Appendix A).

The survey was administered one time prior to development of the curriculum, training on the pilot curriculum, and implementation. Thus, it is considered cross-sectional, as data from the survey were only collected at one point in time to make inferences about the population of interest — teachers [28]. Using this type of design was appropriate because it assisted the researchers in gathering information about the behaviors and beliefs of a particular group of people related to a specific topic [29]. In particular, the researchers were able to obtain relevant information related to teachers' perceptions of a nutrition-integrated curriculum regarding perceived relevance, perceived difficulty, anxiety, self-efficacy, and enjoyment. Data from the survey provided insight into the teachers' perceived deficiencies and possible barriers regarding implementation of a nutrition-integrated curriculum. This enabled the researchers to develop both a training and curriculum that fit the needs of the teachers in order to encourage both effective implementation of the nutrition-integrated pilot curriculum and provide insight into future plights of the curriculum.

Data Analysis

The first step of data analysis included deriving a mean for the three statements within each of the five sub-scales. Means for each of the fifteen survey questions were determined by finding the midpoint of the number of respondents, then identifying where the midpoint fell within the cumulative number of responses and subtracting the midpoint of respondents by the cumulative number of respondents by that number. The sum was then divided by the total number of respondents and that outcome was added to where the midpoint of the scale met the midpoint of the cumulative responses. These statistics were generated in order to provide a summary about the sample and the measures derived from the analysis [30]. The standard deviation for all five subscales was also determined. All statistics were then presented alongside graphic representations and became the foundation for successive data analysis [30]. Patterns that were identified within the histograms enabled a simplistic interpretation of the data. This was followed by chi-square statistical analysis to determine if there was a relationship between the the three categorical variables and the five subscales.

Results

Teachers' Perceptions of Integration

Survey item numbers 1, 4, 7, 10, and 13 addressed teachers' perceptions of a nutrition integrated curriculum as it related to perceived difficulty, perceived relevance, anxiety, self-efficacy, and enjoyment. Results for questions in the integration category of the survey revealed that a majority of teachers, as determined by the weighted means of questions one (3.77) and four (3.66), perceived aligning academic and nutrition standards as a challenge, while enjoyment of aligning content was determined to be neutral (3.00). However, a majority of teachers (3.66) did perceive that linking all subject areas increases all students' understanding in all areas (See Table I).

Table I.. *Mean scores of survey items (integration)*

Survey Item (Integration)	Mean Score

1. I think teachers find it difficult to align the core standards with nutrition standards (perceived difficulty)	3.77
4. I find it stressful to align content with other non-academic standards such as nutrition (anxiety)	3.66
7. I feel capable of aligning content I teach with nutrition standards (self-efficacy)	3.54
10. I like aligning content I teach with other non-academic areas (enjoyment)	3.00
13. Linking nutrition, mathematics, and ELA standards increases students' understanding of all subject areas (perceived relevance)	3.66

Teachers' Perceptions of Collaborative Learning

Within the category of cooperative learning as it related to integrated learning were questions 3, 6, 9, 12, and 15. The weighted mean (3.88) of question twelve revealed that teachers like ensuring that all students are involved in integrated learning when teaching and findings indicate that on average (2.88), teachers do not find it stressful to ensure that all students are involved in integrated learning. Similar to results in the first category, a majority of teachers indicated a high level of perceived relevance (3.77) in relation to students acquiring real world skills when participating in an integrated learning environment. Lastly, a majority of teachers perceived it to be difficult to ensure that all students are involved in an integrated learning environment (3.77) (See Table II).

Table II. *Mean scores of survey items (cooperative learning)*

Survey Item (Cooperative Learning)	Mean Score
3. I think teachers find it hard to ensure that all students are actively involved in an integrated learning environment. (perceived difficulty)	3.77
6. I find it stressful ensure that all students are actively involved in integrated learning. (anxiety)	2.88
9. I feel capable of ensuring that all students are actively involved in integrated learning. (self-efficacy)	3.66
12. I like ensuring that all students are actively involved in integrated learning. (enjoyment)	3.88
15. Students acquire real world skills by working in hands on integrated lessons. (perceived relevance)	3.77

Teachers' Perceptions of Curriculum Design

The last category of survey items included statements related to the design of an integrated curriculum. Results indicated that teachers, on average, enjoy teaching a class where students are involved in an integrated learning environment (4.55). Teachers also perceived an integrated design to help students in acquiring real world skills (3.88). However, the weighted mean revealed that on average, teachers perceived it to be difficult to teach a class wherein students are involved in a integrated learning environment (3.77) (See Table III).

Table III. *Mean scores of survey items (design)*

Survey Item (Design)	Mean Score
2. I think teachers find it hard to teach a class in which students are involved in an integrated learning environment. (perceived difficulty	3.77
5. I find it stressful to teach a class in which students are involved in integrated learning (anxiety)	2.00
8. I feel capable of teaching a class in which students are involved in integrated learning (self-efficacy)	3.77
11. I like teaching a class where students are involved in integrated learning (enjoyment)	4.5
14. An integrated design helps students to develop real world skills (perceived relevance)	3.88

The standard deviation was also determined, based on the mean for each of the five subscales. While the average responses to individual statements provided insight into specific barriers regarding nutrition-integrated curriculum, the standard deviation (*SD*) for the responses to statements in each subscale contributed to an understanding of the dispersion within each of the data sets. Perceived difficuly (*SD* = 0) and self-efficacy (*SD* = .08) indicated the smallest standard deviation, while perceived relevancy (*SD* = .1)

anxiety (*SD* = .46), and enjoyment (*SD* = .75) revealed a slightly higher standard deviation.

Chi-Square Test of Independence

Further analysis was conducted through a Chi-Square test of independence to determine if there was a significant relationship between the variables. Results of the statistical analysis revealed that the relationships between the sub-scales across all three categories were not statistically significant ($X^2 = 1.2$, $p = .9$). Thus, it could be concluded that the teachers' survey responses indicated no association between the design, cooperative learning, and integration within a curriculum and its impact on teachers' perceptions of difficulty, relevance, anxiety, self-efficacy, and enjoyment.

DISCUSSION

This study investigated fourth-grade teachers' perceptions of nutrition-integrated curriculum using cross-sectional data collected prior to training and implementation of the curriculum. Areas assessed included teachers' enjoyment, self-efficacy, perceived difficulty, perceived relevance and anxiety in relation to a nutrition-integrated curriculum. Although there were no significant associations between the design, cooperative learning, integration within a curriculum and its impact on teachers' perceptions of difficulty, relevance, anxiety, self-efficacy and enjoyment, there were notable findings that suggest the *Fuel to Learn* curriculum has the potential to eliminate the most common barriers to nutrition education implementation in an academic setting.

A majority of teachers perceived aligning the academic standards with nutrition information as a challenge. Other research has reported that with the increased focus on standardized testing, there has been a reduction in the time that teachers can spend on subjects that are not tested [31-33]. The *Fuel to Learn* curriculum eliminates this barrier, as the curriculum has integrated nutrition into the subjects that are included in standardized testing. The researchers also sought to integrate the most commonly taught fourth-grade standards in mathematics and language arts within the *Fuel to Learn* curriculum to address teachers' concerns with alignment of appropriate standards as it relates to integrated curriculum. Additionally, previous research reports that a common barrier to providing nutrition education was a lack of instructional time [34]. Integrating nutrition education into tested subjects eliminates this potential barrier. The majority of teachers also felt that linking subject areas will increase students' understanding of all other subject areas. Thus, to drive this point home during the training we addressed the research that clearly demonstrates the significant effect of integrated learning, specifically with nutrition content on student's cognition, social-emotional wellbeing, and overall health.

When asked about their perceptions of cooperative learning as it relates to integrated curricula, the majority of teachers reported that having all students involved was not stressful. Additionally, teachers perceptions of integrated learning leading to real-world application were positive. The *Fuel to Learn* curriculum was designed with classroom activities that engage each student and involve integrated real-world application in order to provide students with nutrition information as they learn math and/or language arts skills. These characteristics of the curriculum aim to increase teachers' willingness to implement the *Fuel to Learn* curriculum while addressing the barrier of not being aligned with standards or applicable to learning in the calssroom.

Teachers also reported that they enjoy integrated learning, that an integrated design helps in skill development, but that it is difficult to teach integrated learning in the classroom. Previous research has reported that teachers consider cost of the curricula and resources a barrier to including nutrition as an integrated component in the classroom [34]. The *Fuel to Learn* curriculum is available online and includes all of the ancillary materials that teachers need to use it and thus, the difficulty of incorporation has been eliminated. As aforementioned, this curriculum is designed so that each student will complete the activities, thus engaging all students. In addition to classroom activities, the *Fuel to Learn* curriculum provides teachers with links to short videos featuring collegiate athletes that reinforce the nutrition messages that are being taught. These videos were included to provide the teachers a way to offer the students an alternative voice regarding the importance of these key nutrition messages and thus enhance student engagement. In conclusion, the findings indicate that the *Fuel to Learn* curriculum presents a positive approach to an integrated nutrition education program in fourth-grade

classrooms by addressing the potential barriers noted in the curriculum integration survey. The concerns that were voiced by teachers prior to training and use of the curriculum were all addressed within the training and curriculum design.

Thus, we contend that by utilizing feedback from teachers prior to training and development of the *Fuel to Learn* curriculum, we have eliminated many of the potential barriers to implementation by creating a nutrition-integrated curriculum that is accessible, feasible, and sustainable within the context of a school setting.

LIMITATIONS

There were five primary survey limitations. First, a convenience sample was used to select participants for this study. The impact of this is that the willingness of teachers to participate creates a bias that may affect outcomes and skew findings toward success. Second, teachers who completed the survey had varying levels of experience which could have a bearing on survey responses.

Third, the survey was only administered to a unitary grade level of teachers, which limits the demographics of the sample group. Fourth, the participants were only recruited from three schools in the geographical area of northern Mississippi, which limits regional and cultural diversity. Finally, the sample size only consisted of nine fourth-grade teachers.

These last three limitations directly affect the ability for the survey results to be generalized to other educators outside of these sample constraints. In other words, expanding the level of grades studied, the geographical area of the study and the number of survey participants, one might not only refine the granularity of the data collected, but also confirm or deny assumptions drawn from the original study.

FUTURE RESEARCH

Future research initiatives on the *Fuel to Learn* curriculum include a follow up survey to teachers after incorporating the curriculum in their classrooms to determine whether the use of the curriculum is a barrier to its adoption. In addition, investigating the changes in Body Mass Index z-scores, nutrition knowledge's and attitudes of students who were in classrooms that utilized the *Fuel to Learn* curriculum compared to a group of students in classrooms that did not utilize the curriculum is important to determine if information in the curriculum results in an increase in nutrition knowledge and whether that knowledge can be put into meaningful behaviors that have the potential to improve the health of children.

CONCLUSIONS

In summary, the present study sought to address potential barriers of nutrition-integrated curricula through administration of a survey prior to training on and implementation of the *Fuel to Learn* curriculum. While the need for addressing childhood obesity is critical in the United States, there is a deficiency in proven *nutrition-integrated* programs that support the health and academics of children. Taking into consideration the needs and perceptions of teachers prior to development and implementation through this survey research study, *Fuel to Learn* hopes to successfully address the critical barriers, so as to provide a feasible and accessible way for children to receive daily/weekly nutrition education. It is the hope that a successful year of piloting *Fuel to Learn* will lead to future policy regarding the statewide adoption of a fully integrated and sustainable nutrition education curriculum that is accessible to elementary educators via an online platform and complements the already mandated state standards.

FUNDING

This work was supported by The Mississippi Center for Obesity Research.

BIBLIOGRAPHY

[1] Organization for Economic Cooperation and Development [OECD]. Program for International Student Assessment [PISA], 2015. Available at: http://www.oecd.org/pisa/pisa-2015-results-in-focus.pdf. [Accessed: 15 September 2018.]

[2] Hales CM, Carroll MD, Fryar CD, Ogden, CL. Prevalence of obesity among adults and youth: United States, 2015-2016 . NCHS data brief, no 288. Hyatsville, MD: National Center for Health Statistics, 2017 Oct. Available at: https://www.cdc.gov/nchs/data/databriefs/db288.pdf. [Accessed: 4 September 2018.]

[3] Vaynman S, Ying Z, Wu A, Gomez-Pinilla, F. Coupling energy metabolism with a mechanism

to support brain-derived neurotrophic factor-mediated synaptic plasticity. Neuroscience. 2006 January 1; 139(4):1221–34.

[4] Sabia JJ. The effect of body weight on adolescent academic performance. Southern Economic Journal.2007 April 1:871-900.

[5] Shore SM, Sachs ML, Lidicker JR, Brett SN, Wright AR, Libonati JR. Decreased scholastic achievement in overweight middle school students. Obesity.2008 Jul; 16(7):1535-8.

[6] Khan, NA, Baym CL, Monti, JM, Raine LB, Drollette ES, Scudder MR, Moore RD, Kramer AF, Hillman CH, Cohen NJ. Central adiposity is negatively associated with hippocampal-dependent relational memory among overweight and obese children.The Journal of pediatrics. 2015 Feb 1; 166(2):302-8.

[7] Burkhalter TM, Hillman CH. A Narrative Review of Physical Activity, Nutrition, and Obesity to Cognition and Scholastic Performance across the Human Lifespan–. Advances in Nutrition. 2011 Mar 3; 2(2):201S-6S.

[8] Fisher K, Hirsh-Pasek K, Golinkoff RM, Singer DG, Berk L. Playing Around in School: Implications for Learning and Educational Policy. Oxford Handbooks Online. 2010.

[9] Weisner TS, Collins WA. Development During Middle Childhood. Washington, DC: National Academies Press. 1984.

[10] Crosnoe R, Muller C. Body mass index, academic achievement, and school context: examining the educational experiences of adolescents at risk of obesity. *Journal of Health and Social Behavior*. 2004 Dec; 45(4):393–407.

[11] Dietz WH. Health consequences of obesity in youth: childhood predictors of adult disease. Pediatrics.1998 Mar 1; 101(Supplement 2):518–25.

[12] Hayden-Wade HA, Stein RI, Ghaderi A, Saelens BS, Zabinski MF, Wilfley DE. Prevalence, characteristics, and correlates of teasing experiences among overweight children vs. non-overweight peers. Obesity Research. 2005 Aug; 13(8):1381-92.

[13] Busch V, Loyen A, Lodder M, Schrijvers AJ, van Yperen TA, de Leeuw JR . The effects of adolescent health-related behavior on academic performance: a systematic review of the longitudinal evidence. Review of Educational Research.2014 Jun; 84(2): 245-74.

[14] Datar A, Sturm R. Childhood overweight and elementary school outcomes. International Journal of Obesity. 2006 Sep; 30(9):1449–60.

[15] Perera T, Frei S, Frei B, Wong SS, Bobe G. Improving Nutrition Education in U.S. Elementary Schools: Challenges and Opportunities. Journal of Education and Practice. 2015; 6(30):41-50.

[16] Frei S, Frei B, Bobe G. Low Vitamin D Status and Inadequate Nutrient Intakes of Elementary School Children in a Highly Educated Pacific Northwest Community. Journal of Extension. 2014 Aug; 52(4):n4.

[17] Haack SA, Byker CJ. Recent population adherence to and knowledge of United States federal nutrition guidelines, 1992-2013: a systematic review. Nutrition Reviews. 2014 Oct 1; 72(10):613-26.

[18] Krebs-Smith, SM, Guenther PM, Subar AF, Kirkpartick SI, Dodd KW.. Americans do not meet federal dietary recommendations. The Journal of Nutrition. 2010 Aug 11;140(10):1832-8.

[19] Owens S, Lambert L, McDonough S,Green K, Loftin M. Feasibility of a home-delivered internet obesity prevention program for fourth-grade students. Pediatric Exercise Science. 2009 Aug; 21(3):279-90.

[20] Sidentop DL. National plan for physical activity: Education Sector. Journal of Physical Activity and Health. 2009 Nov 6;(s2):S168 - 80.

[21] Hoelscher DM, Kirk S, Ritchie L, Cunningham-Sabo L, Academy Positions Committee.. Position of the Academy of Nutrition and Dietetics: Interventions for the prevention and treatment of pediatric overweight and obesity. Journal of the Academy of Nutrition and Dietetics.2013 Oct 1; 113(10):1375–94.

[22] Committee on Accelerating Progress in Obesity Prevention. Accelerating Progress in Obesity Prevention: solving the weight of the nation.National Academies Press; 2012 May 30.

[23] Waters E, de Silva-Sanigorski A, Buford BJ, Brown T, Campbell KJ, Gao Y, Armstrong R, Prosser L, Summerball CD. Interventions for preventing obesity in children.The Cochrane Library.. 2011 Dec 7.

[24] Carmichael T, LaPierre Y. Interdisciplinary Learning Works: The Results of a Comprehensive Assessment of Students and Student Learning Outcomes in an Integrative Learning Community. Issues in Interdisciplinary Studies. 2014; 32:53-78.

[25] Lipson MY, Valencia SW, Wixson KK, Peters CW. Integration and thematic teaching:

integration to improve teaching and learning. Language Arts. 1993 Apr 1; 70(4):252-64.

[26] Fang Z, Wei Y. Improving middle school students' science literacy through reading infusion. The Journal of Educational Research. 2010 Apr 15; 103(4):262-73.

[27] Check J, Schutt RK. Research Methods in Education. Sage Publications; 2011 Oct 27.

[28] Creswell JW. Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research. Upper Saddle, NJ: Merrill; 2005.

[29] Thibaut L, Knipprath H, Dehaene W,Depaepe F. How school contexts and personal factors relate toteachers' attitudes toward teaching integrated STEM. International Journal of Technology and Design Education. 2018 Sep 1; 28(3):631-51.

[30] Trochim W. The Research Methods Knowledge Base. Mason, OH: Thomson Custom Publishing; 2000.

[31] Smith JM, Kovacs PE. The impact of standard-based reform on teachers: the case of "No Child Left Behind." Teachers and Teaching: theory and practice.2011 Apr 1; 17(2):201-25.

[32] Pederson PV. What is measured is treasured: The impact of No Child Left Behind Act on nonassessed subjects. The Clearing House: A Journal of Educational Strategies, Issues and Ideas. 2007 Jul 1; 80(6):287-91.

[33] Knight KB, Cole JW, Dodd M, Oakley CB. Eating Good and Moving Like We Should: A Consideration for Registered Dietitians in Schools. International Journal of School Health.2017; 4(2).

[34] Jones AM, Zidenberg-Cherr S. Exploring nutrition education resources and barriers, and nutrition knowledge in teachers in California. Journal of Nutrition Education and Behavior. 2015 Mar 1; 47(2):162-9.

APPENDIX A

Teachers Perceptions of a Nutrition-Integrated Curriculum					
	Completely Disagree(1)	Disagree (2)	Neutral (3)	Agree Completely (4)	Disagree (5)
I think teachers find it difficult to align the core standards with health/nutrition standards. (PD-Integration)					
I think teachers find it hard to teach a class in which students are involved in an integrated learning environment. (PD-Design)					
I think teachers find it hard to ensure that all studentsare actively involved during integrated learning.(PD-cooperative learning)					
I find it stressful to align content of my course with other non-academic standards such as health/nutrition (A-Integration)					
I find it stressful to teach a class in which students are involved in integrated learning. (A-Design)					
I find it stressful to ensure that all students are actively involved in integrated learning. (A-Cooperative Learning)					
I feel capable to align content of my course with that of health/nutrition standards. (SE-Integration)					
I feel capable to teach a class in which students are involved in integrated learning. (SE-Design)					
I feel capable to ensure that all students are actively involved in the integrated learning process. (SE-Cooperative Learning).					
I like aligning content of my course with that of other non-academic areas. (E-Integration)					
I like teaching a class in which students are involved in integrated learning. (E-Design)					
I like ensuring that all students are actively involved in integrated learning. (E-Cooperative Learning)					
Linking nutrition, mathematics, and ELA standards increases students' understanding of all subject areas. (PR-Integration)					

An integrated design helps students to develop real world skills. (PR-Design)					
Students acquire real world skills by working in hands on integrated lessons. (PR-Cooperative Learning)					

Codes: *Perceived Relevancy (PR), Perceived Difficulty (PD), Enjoyment (E), Self-Efficacy (SE), Anxiety (A)*

Adapted from: Thibaut, L., Knipprath, H., Deheane, W., & Depaepe, F. (2017). Retrieved from https://hiva.kuleuven.be/nl/backupoud/docs/working-papers/HIVA_WP2017_Lieve_Thibaut.pdf

Citation: *Alicia Cooper Stapp, Melinda Wells Valliant, KathyB. Knight, Lindsay Goldthorpe," Teachers' Perceptions of Nutrition-Integrated Curriculum and its Impact on Development and Sustainability", Research Journal of Food and Nutrition, vol. 3, no. 1, pp. 18-27. 2019.*

Copyright: *© 2019 Alicia Cooper Stapp, This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.*