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A mixed-methods comparison of classroom context during Food, Health & Choices, a childhood obesity prevention intervention

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Abstract

BACKGROUND—Schools are frequent settings for childhood obesity prevention; however, intervention results are mixed. Classroom context may hold important clues to improving these interventions.

METHODS—We used mixed methods to examine classroom context during a curriculum intervention taught by trained instructors in 5th grade classrooms. We identified classrooms with high and low buy-in using cluster analysis and compared intervention delivery and reception, student energy balance-related behavior, and student perceptions about supports and barriers to energy balance.

RESULTS—Delivery and reception did not differ between the groups. Between-group differences in unhealthy behaviors were smaller at posttest, due to improvement in low buy-in classes. Although student perceptions of supports and barriers to energy balance were similar across groups, students in high buy-in classes indicated food preferences as a support while students in

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Human Subjects Approval Statement

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low buy-in classes indicated food preferences as a barrier. Neighborhood environment emerged as a universal barrier.

CONCLUSIONS—Trained instructors may improve intervention delivery and reception regardless of classroom context. Social norms could explain high levels of unhealthy behavior in low buy-in classes at baseline; improvement at posttest suggests that the curriculum may have motivated change. All children need more strategies and supportive policies to overcome a challenging food environment.

Keywords

childhood obesity; energy balance; mixed methods; nutrition education

Most children attend school and spend a significant amount of time there, including one or two mealtimes daily.¹ Therefore, schools are an ideal setting for nutrition and physical activity interventions because they provide access to children, including those from racial and ethnic minority backgrounds, as well as their families and their communities.^{2–4} As Story et al¹ argue: “Schools have an unparalleled opportunity to promote children’s health by creating an environment in which children eat healthy foods, engage in regular physical activity, and learn lifelong skills for healthy eating and active living.” School-based childhood obesity prevention interventions typically include educational and/or environmental components that aim to improve energy balance-related behaviors (EBRBs), such as fruit and vegetable and junk food consumption as well as physical activity and sedentary behavior.^{5,6}

However, the task of changing schoolchildren’s EBRBs has proven to be complex and challenging. Even well designed, theory-based nutrition and physical activity interventions have mixed results.⁷ Process evaluation has been identified as a strategy to explain intervention results and identify promising aspects to include in future interventions.^{8–10} Most process evaluations examine implementation factors, including fidelity, completion, reception, and satisfaction, and these have been demonstrated to influence results.¹¹ However, nutrition education and physical activity interventions do not exist in a vacuum. The context in which an intervention is delivered is also an important factor to consider when explaining what happened during an intervention. Recently, process evaluations have begun to consider contextual factors in addition to implementation factors. These have included supports and barriers to intervention implementation,¹² intervention adaptations,¹³ community readiness for health promotion efforts,¹⁴ and how teachers influence implementation.¹⁵ In school-based interventions, there are competing demands in the form of other curricula and emphasis on test preparation,¹² as well as the importance and variability of administrator and teacher involvement.¹

Classroom context, sometimes referred to as classroom climate, is influenced by the complex set of relationships, attitudes, and behaviors that exist in different combinations in every classroom.^{16,17} Both teacher practices and group norms have been demonstrated to influence student behavior in the classroom and have been found to have effects on student learning.^{18–20} Notably, student achievement has been found to differ more between

classrooms in a given school than between different schools,²¹ underscoring the influence of classroom context on learning.

Although it has been suggested that teacher buy-in^{1,12} and student behavior²² both influence the success of school-based childhood obesity prevention interventions, these factors have not been explicitly examined in process evaluations. Yet, classroom context, the social norms around nutrition education as represented by teacher and student attitudes and behavior during the lessons, may hold important clues to improving intervention implementation as well as learning and behavioral outcomes. Assuming learning or “reception” of a nutrition curriculum is a prerequisite for the adoption of the behaviors taught or “delivered” in the curriculum, the influence of classroom context on learning becomes relevant in school-based nutrition education just as any other curricular area.

Qualitative and mixed methods are particularly appropriate for evaluating contextual factors because they privilege participant voices, increase viable validity,²³ and allow for a more thorough examination of the phenomenon under study,²⁴ potentially inspiring innovation in intervention planning and evaluation.

We used mixed methods to explore classroom context in a sample of classes participating in *Food, Health & Choices* (FHC), a school-based childhood obesity intervention. We hypothesized that FHC implementation and outcomes, as well as how students perceived the EBRB goals taught during the intervention, would differ by classroom context. To examine this hypothesis, we first identified and described classes with the most and least supportive classroom contexts (ie, “high buy-in” vs. “low buy-in”). Then we compared implementation, outcomes, and student perceptions about EBRBs across these two groups of classes. We hypothesized that when we compared high buy-in and low buy-in classes, high buy in classes would have higher levels of intervention delivery and reception. We also hypothesized that there would be differences in students’ EBRBs. Finally, we examined how self-reported perceptions of supports and barriers might explain differences in high and low buy-in classes. Specifically, we hypothesized that students in low buy-in classes would be less aware of supports and barriers to EBRB adoption and have fewer strategies and supports to overcome implicit barriers. This has implications for the link between educational and health disparities among urban populations.

METHODS

Participants and Intervention

A cluster-randomized, controlled efficacy trial of FHC was implemented in 20 urban elementary schools (15 intervention and 5 control) that had on average 86% of students eligible for free/reduced price lunch, 58% Hispanic students, and 30% Black students during 2012–2013. Participants were fifth grade students (N = 1387) with a mean age of 10 years; 51% of the students were male; 19.8% were overweight and 24.8% were obese. Students in 30 of the classes enrolled in the trial received a nutrition curriculum taught by trained FHC instructors and approved by the New York City Department of Education (NYCDOE) to substitute for 2 science units. All classes received 23 45-minute theory-based nutrition lessons taught by trained FHC instructors throughout the school year that centered on 6

EBRBs: Choose more fruits and vegetables, choose more physical activity, choose less sugar sweetened beverages, choose less fast food, choose less processed packaged snacks, and choose less screen time. Social Cognitive Theory- and Self-Determination Theory-based psychosocial mediators of these EBRBs were incorporated into the curriculum, including: outcome expectations, self-efficacy, intention, habit strength, knowledge, autonomy, competence, and goal setting.^{25,26}

Instrumentation

Figure 1 summarizes the data and flow of this sequential explanatory mixed-methods study.²⁴ We used data from several measures to identify and describe high and low buy-in classes.

School context—Data about school characteristics, including percentage of students eligible for free and reduced-price lunch and average English (ELA) and math standardized test scores for the intervention year, were obtained from NYCDOE's publicly available data.²⁷

Classroom context—*Class engagement* and *teacher interest* were calculated based on items from feedback forms completed by FHC instructors after each lesson (N = 611, 89% response rate). Feedback forms were adapted from a validated observation form.²⁸ FHC instructors were trained to use the form and discussed feedback in weekly meetings. *Class engagement* was a mean of student participation (uninvolved, somewhat involved, very involved) and student behavior (major problems, minor problems, no problems), which were significantly correlated ($r = 0.43$, $p < .01$); *Teacher interest* was a mean of classroom teacher participation (uninvolved, somewhat involved, very involved) and classroom teacher attitude (negative, neutral, positive), which were significantly correlated ($r = 0.56$, $p < .01$).²⁹ Although classroom teachers were not required to administer the FHC curriculum because FHC instructors implemented it, we assumed that a teacher's attitude and participation in FHC when the FHC instructor was present represented their supportiveness of the FHC curricular goals.

Delivery—*Completion* was also measured using data from the feedback forms described above and was calculated for each lesson by dividing the number of activities completed by the total number of activities in the lesson.

Reception—Three-fourths of the way through FHC, students who participated in the curriculum (N = 515, 69% response rate) independently completed a lesson activity to assess *recall* of the 6 EBRBs. Students filled in a series of 6 prompts with the FHC EBRB goals (Choose more _____; Choose less _____), as Figure 2 depicts. Student responses were coded (1 = recalled, 0.5 = partial recall, 0 = not recalled) and percent recall was calculated for each student. During the last FHC session, *satisfaction* with the curriculum was measured with a Likert-like survey item administered to students (N = 494, 66% response rate).

EBRBs—Student EBRBs were measured at baseline and post-intervention using the FHC-Q, a validated scale developed for FHC. The FHC-Q includes 45 items about EBRBs intended to determine the weekly frequency and portion size of food eaten as well as the weekly frequency and per session duration of physical activity. Frequency questions are asked with the stem “In the past week, I ate...(or I did...)” and portion size/duration questions are asked with the stem “How much did you usually eat/drink at one time...” or “How long each time did I...” There are 4–14 items for each of the 6 FHC EBRBs. Additional details about the FHC-Q administration and psychometrics are available elsewhere.³⁰ Behavior scales for healthy behavior, unhealthy eating behavior frequency and sedentary behaviors (unhealthy behavior frequency), and unhealthy eating portion size (unhealthy portion size) were calculated using exploratory factor analysis; factor scores were transformed to percentages with a higher score representing more of the behavior. The development of the factor scores is discussed elsewhere.³¹

Supports and barriers—Qualitative (QUAL) data were used to compare contextual factors reported by students in high and low buy-in classes. As part of a lesson activity completed three-fourths of the way through the curriculum, students were asked, in open-ended questions, to describe what supported their adoption of EBRBs and what barriers they had in adopting EBRBs using the form depicted in Figure 2.

Data Analysis

To identify high and low buy-in classes, mean teacher interest and class engagement scores were calculated for each class in SPSS 22 (IBM, 2013). Class engagement for all classes receiving the FHC curriculum ($N = 30$) ranged from 1.81–3.0 (scale 1–3, mean = 2.69 ± 0.28) and teacher interest ranged from 1.53–2.94 (scale 1–3, mean = 2.29 ± 0.35). High and low buy-in classes were identified with a k-means cluster analysis conducted in R (R Core Team, 2013). Ten cluster solutions were examined and a 4-cluster solution was determined to best represent the data. These 4 clusters are depicted in Figure 2: High ($N = 5$), average ($N = 11$), peer ($N = 9$), and low ($N = 5$), buy-in classes. The 2 most distinctly different clusters, high buy-in and low buy-in, were selected for the comparative analysis. To maximize the differences in classroom context, average buy-in and peer buy-in clusters were excluded. QUANT data used to compare high and low buy-in classes included school characteristics, delivery, reception, and EBRBs. These variables were described with group means and standard deviations. Then, to compare high and low buy-in classes, we used 2-tailed independent samples t-tests with 95% confidence intervals.

QUAL data used to compare high and low buy-in classes included student-reported perceptions of supports and barriers for adopting EBRBs. Students’ descriptions of supports and barriers from all FHC classes were first inductively coded as part of a team-based analysis³² and were managed with NVivo 10 (QSR International, Melbourne Australia, 2013). To compare the supports and barriers reported by students in high versus low buy-in classes, the codes for these students’ responses were grouped into 4 categories: interpersonal, environmental, intrapersonal, and other supports/barriers. Two researchers then independently completed this process and differences in categorization were resolved by consensus. The number of times each code was mentioned were tallied for high and low

buy-in classes and a designation was assigned: extensive (>10 mentions), substantial (5–10 mentions), or limited (<5 mentions) evidence for each code. High and low buy-in classes were then compared on designation and qualitative content of the supports and barriers. Exemplar quotes were chosen to represent how students in high and low buy-in classes perceived each category.

RESULTS

High and low buy-in classes were compared on school characteristics, delivery, reception, and EBRBs (QUANT) as well as supports and barriers (QUAL).

QUANT comparison

School characteristics were similar between high and low buy-in classes. The high buy-in classes had slightly higher mean test scores and lower poverty than low buy-in classes, though these differences were not statistically significant. When high and low buy-in classes were compared, delivery and reception were non-significantly different. For the EBRB subscales, healthy behavior baseline mean scores were significantly higher (ie, more healthy behaviors) for students in low buy-in classes than students in high buy-in classes ($t = -2.3$, $p = .02$), and were no longer significantly different at posttest ($t = 1.7$, $p = .09$). For the unhealthy behavior frequency and unhealthy portion size subscales, mean baseline scores were significantly higher (ie, more unhealthy behavior) for students in low buy-in classes than students in high buy-in classes ($t = -7.2$, $p < .001$; and $t = -5.0$, $p < .001$, respectively). At posttest, the low buy-in group mean scores were lower than baseline, whereas the high buy-in group mean scores did not change; low and high buy-in classes remained significantly different at posttest ($t = -4.2$, $p < .001$; and $t = -2.4$, $p = .02$, respectively). Table 1 summarizes the results of the QUANT comparison.

QUAL comparison

A qualitative comparison of student-reported supports and barriers to maintaining energy balance is presented in Table 2 and summarized below. Responses were examined for similarities and differences between students in high buy-in classes ($N = 94$) and students in low buy-in classes ($N = 90$). Numerical identifiers correspond to classes indicated in Figure 3.

Supports—Students in low and high buy-in classes reported similar interpersonal supports. Mothers were the most frequently mentioned support in both groups, and fathers and family in general were also frequently mentioned. Several students in high buy-in classes mentioned how their teachers, including their FHC instructors, helped them with EBRBs, whereas students in low buy-in classes did not. More differences emerged in the environmental and intrapersonal categories. Students in high buy-in classes mentioned their neighborhood environment frequently, specifically citing parks near their homes and school, for example: “I live near Central Park and I run with my father on Saturdays” (26 - High). On the other hand, students in low buy-in classes did not often mention their neighborhood environment as supportive, and when they did, it typically was in reference to stores that they perceived to sell healthy products, for example, “Veggie stores” (21 - Low). Students in

high buy-in classes mentioned home environments more frequently, suggesting the availability of healthy choices, “A kitchen full of healthy food” (11 - High). The only student in a low buy-in class who elaborated on home environment suggested a strategy for improvement, “Don’t have any snacks in the house” (16 - Low). Preferences reflected another point of departure between students in low and high buy-in classes. Whereas many students reported preferences for fruits and vegetables, as well as physical activity, in the high buy-in classes, few did in the low buy-in classes. As one student put it, “It’s very easy to eat pineapple and grapes, because I really love it” (1 - High). Students in both high and low buy-in classes mentioned self-regulation skills, including policies to limit unhealthy behaviors and increase healthy behaviors, such as, “Keep the TV off until a certain time” (10 - High) and “Create a daily routine of exercises” (22 - Low). Students in both high and low buy-in classrooms indicated that they were motivated by outcome expectations, however, more students in low buy-in classrooms mentioned outcome expectations, like, “When you eat fruits and veggies it could make your brain work better” (30 - Low), and “Junk doesn’t help you function your brain and your body is weak” (15 - Low).

Barriers—Students in both groups only infrequently identified family members as barriers to maintaining energy balance, although siblings were mentioned several times in both groups, particularly as saboteurs, for example, “I always get made fun of by my sister - she puts candy and burgers in my face” (11 - High). Notably, though students in both groups mentioned friends and classmates as barriers, such as, “My friends give me unhealthy things” (16 - Low), evidence of peer social norms as a barrier was limited. Students in both groups identified their neighborhood environment as the most extensive barrier to maintaining energy balance, saying things like, “When I pass a restaurant and I want to go inside and eat” (10 - High) and “Stores with many unhealthy snacks” (15 - Low). Students in high buy-in classes who identified their home environment were somewhat more aware of barriers to energy balance in their home and in their personal failures in upholding their self-regulation skills, but students in both groups were aware of disinhibition, which some referred to as “temptation.” For the most part, the students in high and low buy-in classes seemed to demonstrate a similar level of awareness of barriers. Instead, it seems that external context, especially neighborhood environment, was a universal challenge that most student respondents were aware of by the end of the intervention.

DISCUSSION

In this mixed methods comparison of high and low buy-in classes from the FHC trial, we hypothesized that high buy-in classes would have higher delivery and reception, based on consensus in the field of education that classroom context influences learning. Yet, we found no statistical differences. On the EBRB subscales, we found that at baseline, low buy-in classes had significantly higher scores on all 3 sub-scales (healthy behavior, unhealthy behavior frequency, and unhealthy portion size). Also, whereas high buy-in classes stayed the same on the unhealthy behavior frequency and unhealthy portion size sub-scales at post-test, low buy-in classes reduced their scores on these scales, indicating a positive behavior change. Finally, we found few differences in supports and barriers to maintaining energy balance between students in high and low buy-in classes. The major difference was that

students in high buy-in classes were more likely to indicate food preferences as a support, while students in low buy-in classes were more likely to indicate food preferences as a barrier. Across both groups, interpersonal relationships were seen as generally supportive and neighborhood food environment was seen as a major barrier. In this study, we were able to “zoom-in” on a subset of classes that participated in FHC to both describe and explain intervention delivery, reception, results, and students’ perceptions of EBRBs in different classroom contexts, providing an example of how QUANT and QUAL analyses can be integrated via mixed methods to provide a more comprehensive understanding of intervention outcomes.

Despite lower teacher interest and class engagement being the defining features of classroom context in low buy-in classes, our findings indicate that delivery and reception were not lower in these classes. This may have been due to having trained FHC instructors teaching these lessons, which may have also helped students in low buy-in classes close the gap in unhealthy behavior frequency and unhealthy portion size. The lack of relationship between classroom context and delivery and reception is inconsistent with a previous study that found classroom context predicted delivery and reception.³³

Our findings suggest the urban food environment is detracting from childhood obesity prevention. Although students in both groups recognized how detrimental their neighborhoods were to maintaining energy balance, awareness did not help achieve healthy EBRBs overall. This finding is consistent with a mediation analysis that suggested successful interventions may increase perceived barriers.³⁴ Furthermore, it supports a joint position statement on school nutrition which emphasizes the importance of a coordinated approach to messaging through multiple channels, including school, home, media, and community.³⁵

Our finding that low buy-in classes had significantly worse baseline unhealthy behavior frequency and unhealthy portion size scores suggests that a social norm might exist surrounding unhealthy eating and activity behaviors. Perhaps low buy-in could be attributed to cognitive dissonance;³⁶ if EBRBs are not important to teachers and students in these classes, it may be more difficult to participate in FHC lessons with a positive attitude. On a more optimistic note, the low buy-in classes seemed to close the gap with high buy-in classes over the course of the intervention and had much lower unhealthy behavior frequency and unhealthy portion size scores at posttest. This is consistent with findings of a significant moderating effect of weight status on anthropometric outcomes during a Danish school-based obesity prevention intervention.³⁷ This improvement could indicate a shift in social norms to be more supportive of EBRBs, suggesting that the FHC curriculum was particularly motivating for students in low buy-in classes; this possibility is supported by the substantial mentions of outcome expectations by students in these classes. Although little research has been conducted to examine this phenomenon, one study found greater improvement in family eating patterns among students from high-risk families.³⁸

Strengths and Limitations

This study was subject to several limitations, but also has notable strengths. Feedback forms, which were used to assess classroom context and intervention delivery, were completed by

FHC instructors rather than independent observers. Additionally, feedback forms were not analyzed to account for the time of day that the lesson was taught, which could have contributed to student engagement and teacher interest. However, FHC instructors received pre-intervention training and participated in weekly meetings during which ratings were discussed. Additionally, each FHC instructor taught in several classes, and was therefore exposed to a range of classroom contexts. We did not measure student perceptions of supports and barriers at baseline, therefore it is difficult to assess how much of the awareness of these supports and barriers was due to FHC. Students provided their perceptions of supports and barriers as part of a lesson activity; therefore, it is possible that their responses were subject to social desirability or participant bias. However, the range of responses seems to indicate that students were not hesitant to share difficulties or successes in adopting EBRBs. Furthermore, FHC was designed to take a system-blame rather than an individual-blame approach, further supporting the students to honestly discuss problem-solving approaches to barriers they encountered. We increased the credibility of the analysis and reduced researcher bias by having two researchers independently code the data and resolve disagreements by consensus. The results of this study are not generalizable, as participants were not randomly selected. Statistical tests were conducted with small sample sizes because the data were from a subset of classes; perhaps differences in delivery and reception would have been statistically significant if more classes were included.

A strength of the study is that the mixed methods process evaluation yielded insight from more granular comparisons. This highlighted high completion and satisfaction across classroom contexts as well as similarities in external context barriers, but differences in intrapersonal supports. Rather than simply reporting descriptions of QUANT and QUAL data independently, in this study we purposefully integrated multiple data sources and analyses to include participant voices in the explanation of classroom context's influence on intervention implementation and results, and to address the complexity of school-based interventions.³⁹

Conclusions

In this study, we used mixed-methods to compare classrooms with high and low buy-in based on measures of student engagement and teacher interest. This comparison led to the finding that there were quantitative differences in EBRBs in high and low buy-in classes at baseline and posttest, but no other constructs we measured. A qualitative comparison of student perceptions of supports and barriers to maintaining energy balance uncovered neighborhood environment as a universal barrier, food preferences as a more salient barrier for students in low buy-in classes, and more awareness of the home environment as both a support and barrier among students in high buy-in classes. The examination of study context using participant voices provides a model for future evaluations and offers insight to improve childhood obesity research, practice, and policy.

IMPLICATIONS FOR SCHOOL HEALTH

In the FHC curriculum intervention studied here, delivery, reception, and student perceptions of supports and barriers were not particularly different in high and low buy-in classrooms.

Despite a less supportive context, students in low buy-in classes still got the curriculum as intended, possibly because FHC instructors taught the curriculum. All classroom teachers received and were compensated for a daylong professional development session on FHC, yet differences in buy-in remained. Although training is likely a prerequisite to ensure the success of childhood obesity prevention interventions,³⁵ there must be other factors that contribute to buy-in. This finding has implications for intervention scalability and sustainability. The students who experienced the most benefit from the FHC intervention were those in low buy-in classes; without FHC instructors implementing it, it is distinctly possible that less of the intervention may have been delivered, which could have influenced behavioral outcomes. It is important that researchers and practitioners continue to explore how to engage teachers as essential partners in childhood obesity prevention via policy, professional development, and social norms.

Even after receiving an extensive childhood obesity prevention intervention, students in both high and low buy-in classes perceived their neighborhood environments as a significant barrier to maintaining energy balance. In urban areas, unhealthy retail is ubiquitous.⁴⁰ Educators must redouble their efforts to both motivate children and provide them with strategies to overcome a challenging food environment. This likely requires partnership with families⁴¹ and communities.³ Policy-based solutions to this problem should also be pursued, including reducing preferential zoning for fast food outlets, improving corner store inventory, and even regulating snack food ingredients.

Finally, by using mixed methods to compare a subset of classes from FHC, we uncovered a promising pattern in student EBRBs, suggesting that low buy-in classes may be part of communities that are unaware of the influences of their external context, but make positive behavioral changes when they participate in a high-quality childhood obesity prevention intervention. This underscores the importance of providing nutrition education in schools as a way of reaching children who may not otherwise be motivated to choose healthy EBRBs.

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References

1. Story M, Nannery MS, Schwartz MB. Schools and Obesity Prevention: Creating school environments and policies to promote healthy eating and physical activity. *Milbank Q.* 2009; 87(1): 71–100. [PubMed: 19298416]
2. Flynn MAT, McNeil DA, Maloff B, Mutasingwa D, Wu M, Ford C, et al. Reducing obesity and related chronic disease risk in children and youth: a synthesis of evidence with 'best practice' recommendations. *Obes Rev.* 2006; 7(s1):7–66. [PubMed: 16371076]
3. Foster GD, Sherman S, Borradaile KE, Grundy KM, Vander Veur SS, Nachmani J, et al. A policy-based school intervention to prevent overweight and obesity. *Pediatrics.* 2008; 121(4):e794–e802. [PubMed: 18381508]

4. McGuire S. Reports from agencies. 2012. Accelerating progress in obesity prevention: solving the weight of the nation. *Adv Nutr.* 2012; 3(5):708–709. [PubMed: 22983849]
5. Singh A, Paw M, Brug J, van Mechelen W. Short-term effects of school-based weight gain prevention among adolescents. *Arch Pediatr & Adolesc Med.* 2007; 161(6):565–571. [PubMed: 17548761]
6. Yildirim M, Van Stralen MM, Chinapaw MJM, Brug J, Mechelen W, Twisk JW, et al. For whom and under what circumstances do school-based energy balance behavior interventions work? Systematic review on moderators. *Int J Pediatr Obes.* 2011; 6(2):e46–e57. [PubMed: 21651421]
7. Brown T, Summerbell C. Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: an update to the obesity guidance produced by the National Institute for Health and Clinical Excellence. *Obes Rev.* 2009; 10(1):110–141. [PubMed: 18673306]
8. Khambalia AZ, Dickinson S, Hardy LL, Gill T, Baur LA. A synthesis of existing systematic reviews and meta-analyses of school-based behavioural interventions for controlling and preventing obesity. *Obes Rev.* 2011; 13(3):214–233. [PubMed: 22070186]
9. Bleich SN, Segal J, Wu Y, Wilson R, Wang Y. Systematic review of community-based childhood obesity prevention studies. *Pediatrics.* 2013; 132(1):e201–e210. [PubMed: 23753099]
10. Waters E, de Silva Sanigorski A, Hall B, Brown T, Campbell KJ, Gao Y, et al. Interventions for preventing obesity in children. *Cochrane Database Syst Rev.* 2011; 12:1–212.
11. Durlak JA, DuPre EP. Implementation matters: a review of research on the influence of implementation on program outcomes and the factors affecting implementation. *Am J Community Psychol.* 2008; 41(3–4):327–350. [PubMed: 18322790]
12. Greaney ML, Hardwick CK, Spadano-Gasbarro JL, Mezgebu S, Horan CM, Schlotterbeck S, et al. Implementing a multicomponent school-based obesity prevention intervention: a qualitative study. *J Nutr Educ Behav.* 2014; 46(6):576–582. [PubMed: 24878150]
13. Richards Z, Kostadinov I, Jones M, Richard L, Cargo M. Assessing implementation fidelity and adaptation in a community-based childhood obesity prevention intervention. *Health Educ Res.* 2014; 29(6):918–932. [PubMed: 25214513]
14. Ehlers DK, Huberty JL, Beseler CL. Changes in community readiness among key school stakeholders after Ready for Recess. *Health Educ Res.* 2013; 28(6):943–953. [PubMed: 24045411]
15. Lee H, Contento IR, Koch P. Using a systematic conceptual model for a process evaluation of a middle school obesity risk-reduction nutrition curriculum intervention: Choice, Control & Change. *J Nutr Educ Behav.* 2013; 45(2):126–136. [PubMed: 23321021]
16. Koth CW, Bradshaw CP, Leaf PJ. A multilevel study of predictors of student perceptions of school climate: the effect of classroom-level factors. *J Educ Psychol.* 2008; 100(1):96–104.
17. Montague M, Rinaldi C. Classroom dynamics and children at risk: a followup. *Learn Disabil Q.* 2001; 24(2):75.
18. Kikas E, Peets K, Hodges EVE. Collective student characteristics alter the effects of teaching practices on academic outcomes. *J Appl Dev Psychol.* 2014; 35(4):273–283.
19. Goldhaber D. The mystery of good teaching. *Education Next.* 2002; 2(1):50–55.
20. Odden A, Borman G, Fermanich M. Assessing teacher, classroom, and school effects, including fiscal effects. *Peabody J Educ.* 2004; 79(4):4–32.
21. Rivkin SG, Hanushek EA, Kain JF. Teachers, Schools, and Academic Achievement. *Econometrica.* 2005; 73(2):417–458.
22. Venditti EM, Giles C, Firrell LS, Zeveloff AD, Hirst K, Marcus MD. Interactive learning activities for the middle school classroom to promote healthy energy balance and decrease diabetes risk in the HEALTHY primary prevention trial. *Health Promot Pract.* 2014; 15(1):55–62. [PubMed: 23271717]
23. Chen HT. The bottom-up approach to integrative validity: a new perspective for program evaluation. *Eval Program Plann.* 2010; 33(3):205–214. [PubMed: 19931908]
24. Hesse-Biber, SN. *Mixed Methods Research: Merging Theory with Practice.* New York, NY: Guilford Press; 2010.
25. Bandura A. Social cognitive theory: an agentic perspective. *Annu Rev Psychol.* 2001; 52(1):1–26. [PubMed: 11148297]

26. Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *Am Psychol*. 2000; 55(1):68–78. [PubMed: 11392867]
27. New York City Department of Education. [Accessed September 3, 2016] Progress Report 2007–2013. Available at: <http://schools.nyc.gov/Accountability/tools/report/default.htm>
28. Contento IR, Koch PA, Lee H, Calabrese-Barton A. Adolescents demonstrate improvement in obesity risk behaviors after completion of Choice, Control & Change, a curriculum addressing personal agency and autonomous motivation. *J Am Diet Assoc*. 2010; 110(12):1830–1839. [PubMed: 21111093]
29. Burgermaster M, Koch P, Lee H, Mull L, Contento IR, Paul R. Food, Health & Choices (FHC): teacher engagement related to student reception in curriculum intervention, but not wellness. *J Nutr Educ Behav*. 2014; 46(4):S175.
30. Gray HL, Koch PA, Contento IR, Bandelli LN, Ang I, Di Noia J. Validity and reliability of behavior and theory-based psychosocial determinants measures, using audience response system technology in urban upper-elementary schoolchildren. *J Nutr Educ Behav*. 2016; 48(7):437–452. [PubMed: 27142929]
31. Burgermaster M, Gray HL, Tipton E, Contento I, Koch P. Testing an integrated model of program implementation: the Food, Health & Choices school-based childhood obesity prevention intervention process evaluation. *Prev Sci*. 2017; 18(1):71–82. [PubMed: 27921200]
32. Burgermaster, M. Food, Health & Choices Implementation and Context: The Case for a Comprehensive Approach to Process Evaluation in School-based Childhood Obesity Prevention Trials. [dissertation]. New York, NY: Columbia University; 2015.
33. Gray HL, Contento IR, Koch PA. Linking implementation process to intervention outcomes in a middle school obesity prevention curriculum, 'Choice, Control and Change'. *Health Educ Res*. 2015; 30(2):248–261. [PubMed: 25700557]
34. van Stralen MM, Yildirim M, Velde SJt, Brug J, van Mechelen W, Chinapaw MJM. What works in school-based energy balance behaviour interventions and what does not? A systematic review of mediating mechanisms. *Int J Obes Relat Metab Disord*. 2011; 35(10):1251–1265.
35. Briggs M. Position of the American Dietetic Association, School Nutrition Association, and Society for Nutrition Education: comprehensive school nutrition services. *J Am Diet Assoc*. 2010; 110(11):1738–1749. [PubMed: 21061737]
36. Festinger L. Cognitive dissonance. *Sci Am*. 1962; 207(4):93–107. [PubMed: 13892642]
37. Klakk H, Chinapaw M, Heidemann M, Andersen L, Wedderkopp N. Effect of four additional physical education lessons on body composition in children aged 8–13 years – a prospective study during two school years. *BMC Pediatr*. 2013; 13(1):170. [PubMed: 24131778]
38. Marcus C, Nyberg G, Nordenfelt A, Karpmyr M, Kowalski J, Ekelund U. A 4-year, cluster-randomized, controlled childhood obesity prevention study: STOPP. *Int J Obes Relat Metab Disord*. 2009; 33(4):408–417.
39. Pommier J, Guével M-R, Jourdan D. Evaluation of health promotion in schools: a realistic evaluation approach using mixed methods. *BMC Public Health*. 2010; 10(1):43. [PubMed: 20109202]
40. Neckerman KM, Bader MD, Richards CA, Purciel M, Quinn JW, Thomas JS, et al. Disparities in the food environments of New York City public schools. *Am J Prev Med*. 2010; 39(3):195–202. [PubMed: 20709250]
41. Patrick H, Nicklas TA. A review of family and social determinants of children's eating patterns and diet quality. *J Am Coll Nutr*. 2005; 24(2):83–92. [PubMed: 15798074]

Figure 1.
Mixed Methods Study Flow

Note.

FHC=Food, Health & Choices Nutrition Science Curriculum Intervention,
QUANT=Quantitative, QUAL=Qualitative, NYCDOE=New York City Department of
Education

Lesson 17 Lesson Activity

Nourishing Ourselves

Aim: To bring together everything we've learned

Do Now: Complete the below questions to think about what you have learned

What are our Food, Health & Choices Choose MORE Goals?

1. Choose more _____

2. Choose more _____

What are our Food, Health & Choices Choose LESS Goals?

1. Choose less _____

2. Choose less _____

3. Choose less _____

4. Choose less _____

Lesson 17 Lesson Activity (continued)

Supports

What MAKES IT EASY for you to sustain just right balance? List any people, places, things, personality traits that you think are helping you make the choose more and choose less goal healthy habits

Barriers

What MAKES IT HARD for you to sustain just right balance? List any people, places, things, personality traits that you think are making it difficult for you to make the choose more and choose less goal healthy habits

What else do you want to learn to help you make the choose more and choose less goal into habits?

LESSON 17: NOURISHING OURSELVES JANUARY 2018

UNIT 5: SUSTAINING JUST RIGHT

S-100

Figure 2.
Lesson Activity Used to Collect Data about Student Recall of Food, Health & Choices (FHC) Energy Balance-related Behavior (EBRB) Goals and Supports and Barriers to Following These Goals

Figure 3.

Relationship between Teacher Interest and Class Engagement During the Food, Health & Choices (FHC) Curriculum by Cluster

Note.

FHC= *Food, Health & Choices* Nutrition Science Curriculum Intervention. Each classroom is represented by a number. Clusters calculated using k-means, represented by rectangles (clusters included in comparative analysis) and ovals (clusters not included in comparative analysis). Class engagement and teacher interest data are from feedback forms (N=611) and are scored on 1–3 scale. Class engagement is the mean of student participation and student behavior for each class; teacher interest is the mean of teacher participation and teacher attitude for each class.

Table 1

Quantitative Description and Comparison of High Buy-in and Low Buy-in Classes from Food, Health & Choices (FHC)

	Mean±SD	
	High Buy-in (school N = 4; class N = 5)	Low Buy-in (school N = 3; class N = 5)
<i>School Context</i>		
% Free and Reduced Lunch	84.4±29.0	95.1±4.8
Mean English Language Arts Test Score (min=1, max=4)	2.63±0.4	2.46±0.1
Mean Math Test Score (min=1, max=4)	3.24±0.4	2.76±0.1
<i>Classroom Context</i>		
Teacher Interest (min=1, max=3)	2.8±0.14	2.0±0.19 ^{***}
Class Engagement (min=1, max=3)	2.9±0.13	2.3±0.28 ^{**}
<i>Delivery</i>		
% Lesson Completion	94.7±5.1	90.8±4.9
<i>Reception</i>		
Satisfaction(min=1, max=5)	3.97±0.98	3.86±0.98
% Recall	62±22	57±25
<i>Energy balance related behavior</i>		
Healthy behavior pre	52.19±0.13	55.20±0.12 [*]
Healthy behavior post	53.01±0.11	54.94±0.10
Unhealthy behavior frequency pre	55.97±0.17	69.92±0.15 ^{***}
Unhealthy behavior frequency post	55.84±0.15	63.80±0.15 ^{***}
Unhealthy portion size pre	59.56±0.19	70.22±0.15 ^{***}
Unhealthy portion size post	59.97±0.16	64.55±0.13 [*]

Note: All data are on a 100-point scale except where indicated. Calculated school, class, and group means are reported as mean±standard deviation; EBRB=Energy Balance Related Behavior; EBRB scales established using exploratory factor analysis: HB=healthy behavior, Unhealthy behavior frequency=unhealthy eating behavior frequency and sedentary behavior, Unhealthy portion size=unhealthy eating behavior portion size; higher score indicates more of the indicated behavior.

Significance for 2-tailed independent samples t-tests between high buy-in and low buy-in classes 95% CI indicated:

*
p < .05,

**
p < .01,

p < .001

Table 2
Comparison of Student-reported Supports and Barriers to Energy Balance in High and Low Buy-in Classes during *Food, Health & Choices*

Codes			Examples	
Categories	Supports	High Buy-in	Low Buy-in	Low Buy-in
Interpersonal (people)	Mom	E	E	"My family eats processed snacks and they eat it all so all I have to eat is healthy snacks in my house" (22)
	Dad	E	S	
	Family/Parents	S	S	"My mom only buys organic and makes great foods" (26)
	Brother	L	L	"My mom and dad make me choose more health" (5)
	Sister	L	L	"The kids at recess that are playing help me choose good things because they are getting exercise without knowing" (11)
	Niece	L	--	
	Grandma	--	L	"My grandma helps me by making vegetables and making me eat it" (16)
	Aunt	--	L	"Some people make it easy, like a doctor that helps you" (30)
	Friends	L	L	
	Classmates	L	--	
Environmental (places)	FHC instructor	L	--	
	Teacher	L	--	
	Doctor	L	L	
	Neighborhood	E	L	"Having a fruit market across the street from your house" (22)
	Home	S	L	
Intrapersonal (motivation and skills)	Other homes	--	L	"Don't have any snack in the house" (16)
	School	L	L	"Salad bar in school" (30)
				"I get more physical activity at school" (10)
	Preferences	E	L	"Because if I taste FV a lot I will get used to the taste" (22)
	Self-regulation	S	S	
	Outcome expectations	L	S	"I like to stay away from package snacks is that I put them somewhere else" (21)
	Self-efficacy	L	L	"I write notes in my iPod, sticky notes" (30)
	Skills	L	--	
	Habit	--	L	"I think that the salad bar help[s] me to think in math time" (30)
	Knowledge	--	L	

Codes						Examples	
Categories	Supports	High Buy-in		Low Buy-in		Low Buy-in	
		High Buy-in	Low Buy-in	High Buy-in	Low Buy-in	Low Buy-in	
Other supports (things)	Being energetic	L	--	--	--	"I do not want to be obese" (22)	
	Self-care	L	--	--	--		
	Being a vegetarian	--	L	--	L		
	Not being stubborn	--	L	--	L		
	Water	S	S	--	S	"Drink more water" (various)	
	Organized activity	S	L	--	L	"Going to my basketball practice and doing laps and push-ups and running around with the basketball" (16)	
	Breakfast	S	L	--	L	"By eating breakfast" (5)	
	Sleep	L	--	--	--	"Also have a solid night sleep" (5)	
	Active video games	L	--	--	--	"I go to McDonald's with my mom on Thursdays and eat breakfast" (22)	
	Pedometer	L	--	--	--	"Walking up stairs" (22)	
Environmental (places)	Bikes	L	--	--	--		
	Incidental activity	--	L	--	L		
Categories	Barriers	High Buy-in		Low Buy-in		Examples	
		High Buy-in	Low Buy-in	High Buy-in	Low Buy-in	Low Buy-in	
Interpersonal (people)	Mom	L	--	--	--	"My dad gives me lots of fast food" (22)	
	Dad	L	L	--	L	"My little brother gets money to buy candy and eats it in my face" (15)	
	Family/Parents	L	L	--	L		
	Brother	--	L	--	L	"My cousin bring home fries with ketchup and sometimes candy and I couldn't help myself" (15)	
	Sister	S	L	--	L		
	Cousins	L	L	--	L	"Sometimes people after school say they are going to McDonald's and they ask me if I want to come and I say yes" (21)	
	Aunts	--	L	--	L		
	Friends	L	L	--	L		
	Teacher	L	--	--	--		
	Community	--	L	--	L		
Environmental (places)	Neighborhood	E	E	--	E	"I live right across the street from a pizza place" (26)	
	Home	S	L	--	L	"Because I have a lot of fast food area in my surroundings" (10)	
						"I live in NYC where there is fast food places everywhere, so it is hard to resist" (16)	

Codes			Examples	
Categories	Barriers	High Buy-in	Low Buy-in	Low Buy-in
Intrapersonal (motivation and skills)	Other homes	--	L	"At my cousin's house, I like playing the games he got" (16)
	School	L	--	"Television in my room" (26)
	Information	L	L	"There's not that much vegetables in my house" (26)
	Season/Weather	L	--	"In school the chicken fingers are so tasty but they are filled with grease" (11)
				"Watching food commercials" (11)
				"In the winter it is hard for me to go out because it is cold" (26)
	Preferences	S	E	"Some vegetables are so bad looking like the spinach is hard to try" (30)
	Habit	S	S	"Some vegetables are so bad looking like the spinach is hard to try" (30)
	Disinhibition	S	S	"Some vegetables are so bad looking like the spinach is hard to try" (30)
	Self-regulation	S	L	"Having spending money so you can buy some candy from the corner store" (21)
Other barriers (things)	Laziness/Fatigue	L	L	"The thing that makes it hard for me is that running really fast because my asthma" (21)
	Health condition	L	L	"Seeing people eat yummy food" (22)
	Cues to action	L	L	"Sometimes I get home late and my mom has no time to cook" (21)
	Satiety perceptions	L	--	
	Time	L	L	
	Nothing	L	L	
	Sleep	L	--	
	Cars	L	--	

Note: E=Extensive evidence (>10 mentions); S=Substantial evidence (5–10 mentions); L=Limited evidence (<5 mentions); Numbers refer to the specific classrooms identified in Figure 3. Comparison between classes with high FHC buy-in (class n=5; student n=94) and low FHC buy-in (class n=5; student n=90).