

Qualitative Process Evaluation of the Yéego! Healthy Eating and Gardening Program at
Two Navajo Elementary Schools

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Abstract

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Introduction: School-based health promotion interventions are one approach to reducing population health disparities, but few studies evaluate the implementation process to understand how it produced the outcomes. As part of a larger study to test efficacy, we conducted a qualitative process evaluation of the Yéego! Healthy Eating and Gardening Program, a school-based intervention which aims to promote fresh fruit and vegetable consumption among Navajo elementary school children.

Methods: We collected data through lesson fidelity checklists completed by program intervention staff delivering the lessons and semi-structured interviews with program intervention staff and classroom teachers. We performed content analysis on the combined qualitative data set to identify themes.

Results: We identified several themes related to evidence of fidelity, practices that supported delivery, and lessons learned about delivery. Intervention staff followed similar procedures to prepare for and deliver lessons, but timing, teaching styles, and school-level factors shaped overall implementation fidelity. Teachers and students had positive perceptions of the program, especially lessons that were highly visual, experiential, and connected to Navajo culture and surrounding community. Participants

discussed enhancing the curriculum's usability, narrowing the scope, improving its responsiveness to student experiences, and achieving strong alignment with school curriculum standards.

Conclusion: The program was implemented with moderately high fidelity across contexts, and we identified program areas where modifications could improve engagement, acceptability, efficacy, and sustainability of the program. The study contributes to an evidence base for school-based health interventions to promote healthy eating among Navajo children.

Introduction

School-based health promotion interventions can be an effective approach to reducing population health disparities, in part because schools have long-term contact with children from diverse backgrounds (Brown & Summerbell, 2009; Christian, Evans, Nykjaer, Hancock, & Cade, 2014; Naylor et al., 2015). While successful outcomes of school-based health interventions are well-documented in the literature, few have assessed the implementation process and fidelity of the intervention delivery. Conducting a process evaluation helps researchers contextualize findings and articulate specifically how a program was implemented to produce the observed outcomes. Health promotion literature supports that implementing a program in the same way it was intended improves the likelihood of replicating research outcomes in real-world community settings (Breitenstein et al., 2010; Durlak & DuPre, 2008). A process evaluation therefore plays a valuable role in ensuring evidence-based interventions can be successfully translated and disseminated to improve population health.

One facet of a process evaluation is measuring implementation fidelity, or the degree to which an intervention was delivered as the developers intended (Breitenstein et al., 2010). The level of implementation fidelity informs the relationship between an intervention's unique components and the observed outcomes; achieving high fidelity strengthens the association between the intervention design and the outcomes (Carroll et al., 2007; Gresham, MacMillan, Beebe-Frankenberger, & Bocian, 2000; Horner, Rew, & Torres, 2006). Fidelity can be particularly important in evaluating school-based interventions, due to the variation among teachers, classrooms, schools, and education systems. Understanding how contextual factors interact with implementation fidelity and shape outcomes can support more effective dissemination of school-based health interventions.

Process evaluations have been conducted for a variety of school-based health promotion programs. Such studies regularly report on factors that prevented implementation according to the study protocol. For example, findings from a physical activity intervention described several contextual

challenges to high-fidelity implementation, including role ambiguity in the intervention design, limited time and resources, and teacher absences (Jong et al., 2020). Relative to other school-based health promotion programs, interventions aimed at promoting fruit and vegetable consumption appear to collect process measures less frequently. In one school-based nutrition intervention, researchers observed low implementation fidelity, and they identified that extensive preparation time was a primary reason (Christian et al., 2012). Even when schools received the necessary funding and materials to carry out food-related activities, the preparation involved in setting up the activities made it difficult for teachers to implement them without additional assistance (Christian et al., 2012). Another study in the Netherlands conducted a randomized controlled trial of a nutrition education program for students of low socioeconomic status (Martens, van Assema, Paulussen, Schaalma, & Brug, 2006). The process evaluation assessed the completeness, fidelity, and perceptions of program implementation. The researchers collected data on teaching methods, students' reactions, teachers' perceptions, activities completed, and materials used (Martens et al., 2006). One important finding from Martens et al. (2006) was that student preferences influenced the degree of implementation fidelity. The studies illustrate how factors embedded in the implementation context and delivery process can shape program outcomes in ways that would not be observed through outcomes evaluation alone. Gaining knowledge about factors that limit or facilitate implementation fidelity in a particular intervention can inform modifications that make the program more viable, sustainable, and effective in real-world settings.

The Yéego! Healthy Eating and Gardening Program (Yéego! Program) is a school-based community health intervention which aims to increase fruit and vegetable consumption among Navajo elementary school children. Families on the Navajo Nation face several barriers to accessing fresh fruits and vegetables, putting them at increased risk for developing chronic conditions such as obesity, diabetes, and cardiovascular diseases (Jones et al., 2020; Kumar et al., 2016; Stokes, Ni, & Preston, 2017). The Yéego! Program combines a school garden with a culturally relevant nutrition and gardening

curriculum designed for third- and fourth-grade students. The Yéego! Program was developed by a research team from Diné College, New Mexico State University, and Fred Hutchinson Cancer Research Center, who worked in close collaboration with community leaders in the Navajo Nation to design curriculum content. During the years 2016-2017 the research team piloted the Yéego! Program at Dream Diné Charter School on the Navajo Nation (Ornelas et al., 2021). The program is currently being evaluated in a randomized controlled trial in six elementary schools in the Tsaile and Shiprock regions of the Navajo Nation. One school in each community received the Yéego! Program during the first year of the study, while two schools in each community served as controls.

Literature describing implementation fidelity in school-based interventions to promote fruit and vegetable consumption is lacking. To date, no studies have conducted a process evaluation of a school-based gardening program on the Navajo Nation. In order to develop an understanding of how implementation of the Yéego! Program is associated with the observed outcomes, we conducted a process evaluation at the two intervention schools. Developing an evidence base for how school-based intervention designs contribute to healthy eating behaviors is important to dissemination efforts in diverse settings. While there is not a single way to measure fidelity, the literature suggests using multiple dimensions (i.e., adherence to content, frequency, duration, and coverage) to characterize program implementation and discern relationships between factors that shape fidelity (e.g., quality of delivery and participant responsiveness) (Carroll et al., 2007).

The goal of the present study is to describe implementation fidelity of the Yéego! Program across different contexts. Additionally, it aims to identify aspects of the delivery that could be improved in future evaluation or dissemination of the program. The results will facilitate the interpretation of study outcomes across all of the schools at the end of the randomized controlled trial. They will also aid the research team in making improvements to the Yéego! Program that support teachers across the Navajo Nation to implement the program with high fidelity in diverse community settings.

Methods

Description of Intervention

The Yéego! Program curriculum is comprised of 17 lessons: eight gardening lessons, eight healthy eating lessons, and one combined lesson to conclude the program (Table 1). The program was designed to be delivered during classroom time alongside teachers' other curricula. As illustrated in Figure 1, three schools in the Tsaile area and three schools in the Shiprock area were randomized to either receive the Yéego! Program in the first year of the efficacy study (2019-2020 school year) or the second year (2020-2021 school year). One school in each community received the intervention in the first year of the study. The process evaluation examined implementation fidelity at the two schools that received the intervention in the first year (Site A and Site B).

Table 1

Curriculum Topics in the Yéego! Healthy Eating and Gardening Program

Lesson #	Healthy Eating	Gardening
1	Introduction and Kitchen Safety	Introduction to the Garden
2	Reading a Recipe	Maintaining the Garden
3	Whole Foods and Nutrition	Food Preservation and Seed Saving
4	Eating for Energy	Soil and Compost
5	Fruits and Vegetables	Water in the Garden
6	Traditional Foods and Food Sovereignty	Plant Parts and Life Cycle
7	Healthy Meals and Healthy Families	Native Plants and Navajo Ecology
8	Garden to Table	Getting Ready to Plant in the Garden
9	Garden Celebration (combined lesson)	

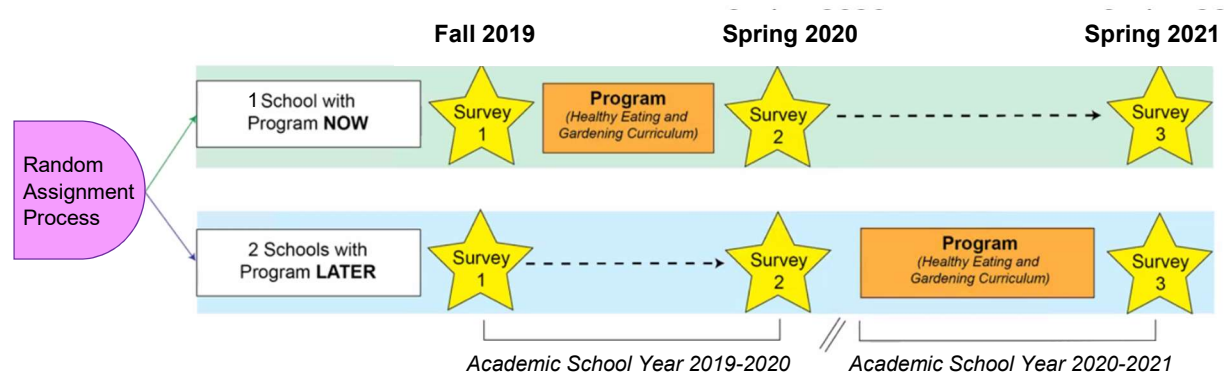


Figure 1. Study design to evaluate the efficacy of the Yéego! Program at three schools in the Shiprock region and three schools in the Tsaile region of the Navajo Nation.

All third-grade and fourth-grade classrooms at Sites A and B participated in the Yéego! Program. In total, six classrooms at Site A and five classrooms at Site B participated. The median classroom size at Site A was 15 students in both grade levels. The median third-grade classroom size at Site B was 16 students, and fourth-grade classroom size was 25 students. Fourth-grade classrooms at Site B were the largest in the study. Site characteristics are further described in Table 2.

The curriculum was delivered by a total of five intervention staff (three at Site A and two at Site B) with expertise in agriculture, gardening education, and/or nutrition. Gardening lessons at Site A were delivered by one member of the research team who was Navajo. Healthy Eating lessons at Site A were delivered by two non-Navajo staff from the local Indian Health Services clinic. Gardening lessons and Healthy Eating lessons at Site B were each delivered by one employee of the Diné College agricultural extension office, both of whom were Navajo. While intervention staff had primary responsibility for lesson delivery at the start of implementation, the study intended to gradually transition components of lesson delivery to classroom teachers so that they could learn how to deliver lessons to future classes.

Beginning in Fall 2019, intervention staff delivered lessons every two weeks to each classroom, alternating Healthy Eating lessons with Gardening lessons. Because the COVID-19 pandemic caused

schools to close abruptly in March 2020, neither school was able to complete all of the lessons in the intervention. Site A received 16 of the 17 lessons (94%), and Site B received 14 of the 17 lessons (82%).

An overview of intervention delivery at each site is presented in Table 2.

Table 2

Site Characteristics and Overview of Intervention Delivery

Characteristics	Site A	Site B
Number of 3rd grade classrooms ^a	3	3
Median students per 3rd grade classroom ^a	15	16
Number of 4th grade classrooms ^a	3	2
Median students per 4th grade classroom ^a	15	25
% of students who are American Indian or Alaska Native ^a	81%	96%
% of students who understand Navajo language ^a	40%	59%
<u>Gardening lessons</u>		
Number of intervention staff + (support personnel)	1 (0-1)	1 (0)
Number of lessons delivered	8	6
<u>Healthy Eating lessons</u>		
Number of intervention staff + (support personnel)	2 (0-1)	1 (0-1)
Number of lessons delivered	8	8
<u>Total lessons</u>		
Total number of lessons delivered	16	14
% of intervention completed	94%	82%

^a Includes all classrooms which participated in the randomized controlled trial

Study Design

To evaluate the implementation of the intervention, we conducted semi-structured individual interviews with teachers and intervention staff. We also reviewed fidelity checklists (see Appendix A) that were completed by intervention staff following the delivery of each lesson. Semi-structured interviews were conducted with intervention staff and classroom teachers at Site A and Site B whose classrooms received the intervention. All interviews were conducted in August and September 2020 via the videoconferencing platform, Zoom. Semi-structured interviews were chosen as a data collection

method to gain a deeper understanding of how the intervention was delivered and received at Site A and Site B. The interviewer was a non-Navajo graduate student, who facilitated interviews from her home in Seattle, Washington. Intervention staff and teachers mostly participated in interviews from their homes and places of work in the Navajo Nation. Some participants were no longer working at schools in the Navajo Nation and participated from other locations. The study was approved by Fred Hutchinson Cancer Research Center Institutional Review Board and the Navajo Nation Human Research Review Board (Study #NNR-21.396).

Participant Recruitment

Interview participants included intervention staff who delivered the Yéego! Program at the intervention schools (N=5) and classroom teachers from the schools where the intervention was implemented (N=11). At Site A there were six teachers (three third-grade teachers; three fourth-grade teachers), and at Site B there were five teachers (three third-grade teachers; two fourth-grade teachers).

Recruitment took place at the end of the academic school year in August 2020. All participants were contacted by email and asked to participate in an interview about their experiences delivering the Yéego! Program. Of the 11 teachers who participated in the study, contact information could not be obtained for two of the teachers who were no longer employed at Site B, and they were excluded from the present study.

Data Collection

Fidelity Checklists

Intervention staff were asked to complete a fidelity checklist (see Appendix A) immediately after each lesson they delivered. On the fidelity checklist they reported information such as the number of students in attendance; whether the lesson started and ended on time; whether they had the necessary supplies; and which lesson plan components they covered. Intervention staff often completed a single

fidelity checklist to summarize lesson delivery to two or three consecutive classes. They were able to complete the fidelity checklists electronically or on paper and then provided them to the research team.

Interviews with Intervention Staff and Classroom Teachers

The fidelity checklist was used to inform the creation of two interview guides, one for intervention staff and one for classroom teachers. Interview guides consisted of open-ended questions designed to construct a fuller understanding of factors that shaped program delivery at each school, and identify lessons learned from implementation.

The final interview guide for intervention staff (see Appendix B) included questions about how they prepared for the lessons; challenges to delivering lessons as planned; suggestions for improving the curriculum; interactions with students, teachers, and administrators; and ideas about how to support teachers delivering a future version of the Yéego! Program. The final interview guide for classroom teachers (see Appendix C) included questions about teachers' expectations for the curriculum; their level of involvement in delivering it; perceptions of the curriculum and how students engaged with it; suggestions for improving the curriculum; and the conditions that would enable them to implement the program themselves.

Participants were emailed an overview of each of the lessons to use as a reference during the interview. All participants provided verbal consent to conduct and record the interview in Zoom. All interviews lasted approximately 60 minutes. At the conclusion of each interview with a classroom teacher, the interviewer asked the participant for a mailing address to which they would like a \$30 gift card to be sent as appreciation for their time.

Analysis

The interviewer reviewed all interview recordings and wrote detailed notes on each individual interview. The notes were compiled into a document organized by interview question. We performed content analysis on the interview notes and fidelity checklists altogether to identify consistent themes

within the data. Themes were defined as concepts that occurred more than once, and which specifically related to similarities and differences in program delivery across sites, classrooms, and intervention staff; perceptions of the program; and conditions that would support teachers to deliver a version of the Yéego! Program. We organized preliminary themes into broad categories and refined them over multiple iterations. We then selected salient participant quotations to illustrate the themes. A summary of the findings was shared with the research team and community partners for reflection and feedback.

Results

Participants

All intervention staff agreed to participate in an interview (n=5), and two of the intervention staff who co-facilitated Healthy Eating lessons at Site A participated in a single interview together. Of the nine teachers who were contacted for an interview, eight of the teachers agreed to participate (n=8). Six of the teachers were from Site A (three third-grade teachers; three fourth-grade teachers), and two of the teachers were from Site B (one third-grade teacher; one fourth-grade teacher). One teacher declined to participate. No other demographic data was collected for the purpose of this evaluation.

Themes

We identified several themes between the fidelity checklists, interviews with teachers, and interviews with intervention staff. Themes were organized into three categories: 1) evidence of fidelity, 2) practices supporting delivery, and 3) lessons learned about delivery. Table 3 is an overview of themes identified in each of the three categories. The sections that follow provide a description of each theme and example quotations from teachers and intervention staff.

Table 3

Themes Identified in Data from Teachers and Intervention Staff, Organized by Category

Evidence of Fidelity	Practices Supporting Delivery	Lessons Learned About Delivery
All intervention staff had a preparation routine	Emphasize visual, experiential, and cultural aspects of lessons to maximize student engagement and understanding	The scope of curriculum content is ambitious for the timeframe
All intervention staff used the lesson plan to structure overall delivery, but variations were common	Have at least two people delivering lessons	Improvements could make lessons more inclusive of diverse student needs and life experiences
Teachers and students responded positively to the program	Actively encourage students to connect each lesson to their families and communities	Alignment with school curriculum standards and teacher curricula
Intervention staff and teachers did not co-teach lessons as planned		Role expectations, content expertise, and COVID-19 impeded a transition of lesson delivery from intervention staff to teachers
The timing of individual classes shaped fidelity		Promoting teacher utilization of the curriculum
Level of engagement with the school garden was variable across classrooms		

Evidence of Fidelity

The following six themes summarize the evidence of fidelity and areas of variation across implementation sites, classrooms, and intervention staff who delivered the program.

All Intervention Staff Had a Preparation Routine. All intervention staff had some form of preparation routine before each lesson. Preparation generally included reviewing the lesson plan, communicating with the teachers about the plan by phone or email, and purchasing and preparing materials needed for the lesson. Three of the five intervention staff said they rehearsed the lesson aloud, and two of those intervention staff (both Gardening staff) also had prior experience delivering the Yéego! Program in a school. Intervention staff emphasized the importance of preparing for the lesson

“early and proactively” in order to complete lessons within the timeframe. Overall, intervention staff estimated spending between 2 hours to 8 hours preparing for each lesson.

All Intervention Staff Used the Lesson Plan to Structure Overall Delivery, but Variations Were Common. All intervention staff relied on the lesson plan to guide content delivery and time management, and they described their approach as trying to follow the lesson plan as closely as possible for every classroom. However, all staff discussed some degree of content omission from the curriculum as it was planned, either in anticipation or as a result of not having sufficient time to cover all material. Occasionally, intervention staff made changes to the lesson format after delivering it to the first classroom. For example, Site A Healthy Eating staff found that having students construct a vegetable wrap took too much time in the first lesson, and in subsequent lessons the intervention staff constructed the wraps for the students.

Intervention staff also had different teaching styles and commonly adapted lesson delivery to increase student engagement, facilitate comprehension, and stay within the time limitations. As one of the intervention staff at Site A described their approach:

We had to adapt the curriculum a little bit to the kids. . . . I would look at the curriculum and go okay, I want this one to be, like, more of a Q&A interactive discussion, so the kids are more engaged. So, how do I need to take the points and transform them into questions so that the kids can understand it more? (Intervention Staff, Site A)

Similarly, one of the Site B intervention staff indicated they used the lesson introduction script only as a guide. They chose to emphasize beginning each lesson as a traditional teaching, and they often spoke with students in Navajo language to help keep their attention. One of the teachers at Site B connected students’ engagement with lessons to “the approach each instructor took to teaching.” They described the Gardening staff as more interactive and at-ease in the large classroom setting and the Healthy Eating staff as more distant. They perceived the latter teaching style to be a reason that “some of the students

kind of lost interest.” Likewise, a teacher at Site A commented that “there were differences” between Gardening and Healthy Eating teaching styles and strategies, but “both styles, both strategies worked.”

Key elements of every lesson were generally present across sites, but they were not always implemented with consistency. One example of this was the use of student journals, which were intended to be used for review and reflection at the conclusion of every lesson. Journals were more regularly integrated into the lessons at Site A than at Site B, but even with regular use, one teacher at Site A noted that there was not enough consistency in how students were instructed to use them, which limited their effectiveness. Journal activities were more often the responsibility of teachers than of intervention staff at Site B.

Teachers and Students Responded Positively to the Program. Overall, teachers expressed positive views of the program, and their students’ enthusiasm and engagement strongly shaped their perceptions. When asked about their initial reactions to the program, most teachers at Site A expressed excitement about the content. One teacher at each of the sites expressed nervousness or hesitancy about additional work and planning time. The teacher at Site B stated:

When I first got it I was like, ‘I already have a lot to do, I don’t want to do this.’ But seeing how [the students] responded to it, in the little time they were able to do it, they seemed to really like it. (Teacher, Site B)

They expressed that while the program “was a bit of a hassle,” they appreciated how much their students enjoyed and connected with the lessons. Teachers also emphasized their appreciation of the ways that Navajo culture was tied into the curriculum. One of the teachers at Site A concluded that the program “really did inspire a sense of pride” among students. They added:

The ability of the Yéego! Program in certain lessons to have the kids feel . . . their culture, history, and families were something worth studying—something worth exploring and

understanding . . . it was an absolute joy to witness for me and really built on the kids' strengths.

(Teacher, Site A)

Intervention staff and teachers at Site A indicated that students always knew when it was “Yéego! day” and recognized the alternating pattern between Gardening and Healthy Eating lessons. Students were very excited when intervention staff arrived at the school. The lesson pattern at Site B was slightly less consistent, but students regularly asked at the end of each lesson when the next one would be. Intervention staff at both sites described generally high participation among students. It was common to have some students in the classrooms who did not want to participate, but in general, students were wanting to learn, participate, and contribute their own knowledge to the lesson.

One teacher at Site B observed their students to be more engaged in Gardening lessons than in Healthy Eating lessons, but teachers at Site A had mixed views of what engaged their students most. Some Site A teachers said that students were equally engaged in both sets of lessons, some said they enjoyed the Gardening content and activities more, and some said students were most excited about snacks during the Healthy Eating lessons but less interested in the content. As one of the Site A teachers described, “They loved being able to try foods, but I don’t think that they were really engaged with learning about, like, why it was a healthy option.”

Intervention Staff and Teachers Did Not Co-Teach Lessons as Planned. The implementation process was intended to be a gradual transition of lesson responsibilities from intervention staff to teachers, but the transition did not occur in any of the classrooms at either site. All of the teachers assisted intervention staff by managing the classroom and monitoring students throughout the lessons, but only about half of the teachers at each site got more involved. Teachers at each site supported intervention staff by assisting with the activities, reading stories, distributing materials, and providing individualized support to students. They also made efforts to incorporate material from the Yéego!

Program lessons into their other curricula, but overall, intervention staff and teachers did not get to a point of co-teaching the Yéego! Program lessons.

At both sites, the level of teacher involvement was variable across classrooms, and overall it was lower than expected. Healthy Eating staff noted that teachers became more involved in the snack and traditional food portions of lessons. Intervention staff at Site A noted that, in general, third-grade teachers more proactively engaged with the lessons than fourth-grade teachers; they offered more interaction and participated in the activities with the students. One of the intervention staff at Site B observed that only one or two teachers actually engaged in some of the lessons, and other teachers tended to use the lesson time to catch up on their own work. They tried to encourage participation by talking with the teachers before class about what they would cover, asking for help on certain portions, and asking teachers questions during lessons. This helped engage teachers in some of the activities, but they had the general sense that teachers were waiting “for us to come in and do the teaching.” The other intervention staff at Site B expressed that they “really didn’t want to have the teachers involved too much” because they understood the teachers were busy. Intervention staff appeared to have varied expectations for teachers’ involvement in lesson delivery.

The Timing of Individual Classes Shaped Fidelity. The school schedules dictated when Yéego! Program lessons were delivered to each classroom. The school schedule at Site A supported a regularly occurring lesson time for each classroom, whereas the school schedule at Site B required lesson delivery times to change often. When and in which order classrooms received each of the lessons appeared to have implications for fidelity. Staff at both sites noted variations in lesson duration based on whether teachers had strict cut-off times or if the class schedule allowed for them to provide additional time to finish a lesson. Certain time slots made it particularly challenging to deliver lessons with a high degree of fidelity. For example, the time slot immediately prior to lunch always had a strict cut-off time, and the time slot immediately following recess required extra time for students to transition into the lesson.

Additionally, back-to-back classes posed a challenge to starting and finishing each lesson on time. Healthy Eating intervention staff at both sites typically had classes that were scheduled back-to-back; sometimes this resulted in intervention staff asking classroom teachers to finish final elements of the lesson with their students while they transitioned to the next classroom. Gardening intervention staff at Site B also had some back-to-back classes, which resulted in consecutive classes starting and ending a few minutes late, often due to cleanup needs.

The order in which classrooms received a particular lesson also appeared to shape fidelity. All intervention staff indicated that they tried to keep lesson delivery consistent across all classrooms, but intervention staff at Site A also noted that repetition tended to improve time management and allowed them to work out the “kinks” in their delivery process. One of the intervention staff expressed: “I always felt bad for the first class of the first lesson, because it was always just, like, a test, kind of . . . learning time management, learning, like, how to best plan and deliver the lesson.” Likewise, one of the intervention staff at Site B expressed: “The beginning was a little bit difficult, but towards the middle . . . I was able to catch on and to actually go by the time schedules [in the protocol].” In general, lessons at Site A were delivered to the third-grade classrooms followed by the fourth-grade classrooms. At Site B, the order changed frequently, but more than half the lessons were similarly delivered to the third-grade classrooms followed by the fourth-grade classrooms.

Level of Engagement With the School Garden Was Variable Across Classrooms. At both schools, the gardens were still being constructed at the time lessons began. However, Site A had a secondary garden plot that students were able to utilize during early lessons while Site B did not yet have a garden. Teachers at both sites expected that students would be able to engage with the school garden more than they did. They expressed that students enjoyed spending time in the garden, but that opportunities for hands-on learning were limited, especially for the larger classrooms. Fourth-grade

classrooms at Site B were the largest with 25 students in each (Table 2), and teachers and intervention staff agreed that the garden space and number of tools available worked better for smaller groups.

All of the classrooms at each site shared one communal garden plot, which made it difficult to ensure all students could equally participate in the gardening activities. Responsibilities for garden care between lessons were intended to be shared among all classrooms, but at Site B only one of the classrooms participated in ongoing garden maintenance. One of the intervention staff described how this resulted in one classroom at Site B having a higher level of engagement with the garden than the other classrooms at Site B:

They kind of got a little bit more than the other classes. . . . They've seen the action, they've been seeing stuff growing, they've seen how the watering is going, how weeds are coming out, and how the maintenance portion, how the tools needs to be put back, so they kind of had a better idea of how that works, I think. (Intervention Staff, Site B)

Teachers at both sites as well as intervention staff suggested that student engagement with the garden might be improved if each classroom had responsibility for a small section of the garden space, rather than all classrooms sharing one larger plot.

Practices Supporting Delivery

The following three themes summarize practices which teachers and intervention staff indicated should be sustained and/or enhanced in future implementation and iterations of the curriculum.

Example quotations illustrating each theme are provided in Table 4.

Emphasize Visual, Experiential, and Cultural Aspects of Lessons to Maximize Student Engagement and Understanding. Intervention staff and teachers consistently described students as being most engaged with lesson content that was highly visual, hands-on, and had tangible connections to students' life experiences, people in their community, and Navajo culture (Table 4). Teachers noted the emphasis on Navajo cultural aspects as being one of the program's biggest strengths. Cultural

aspects resonated with students, and teachers appreciated the ways in which culture was tied into lessons in appropriate and engaging ways. One of the teachers described how cultural elements enhanced students' learning:

I have a lot of kids who are really interested in planting and . . . anything in their traditional backgrounds, so I would say anything that they can either build or make, or can be tied in with, like, a traditional story really went over super well. Because like, the more connections they can make to their own lives would just be, like, a lot stronger for them. (Teacher, Site A)

Students especially enjoyed activities that engaged their senses. Preparing and eating food were consistently discussed as highly engaging lesson aspects, as was time spent in the school garden, where students “could get dirty and plant things.” A teacher described how students reacted after tasting the pickled vegetables they made, which smelled strongly of vinegar:

[The students] finally took a bite into it . . . and they were just amazed! Like, just hearing that and just seeing their faces, just, surprised—it was kind of like a magical moment for them. . . .

Those activities were a lot of fun for the students. (Teacher, Site B)

Teachers suggested that incorporating more of the types of foods that students were growing in the garden and integrating the snacks they would be eating into the lesson content would enhance experiential aspects of the Healthy Eating lessons.

Teachers noted that a number of abstract concepts were presented in the lessons, which are generally difficult for students in this age group to comprehend. Some of the abstract concepts they noted were nutrients, proteins, plant health, and food sovereignty. Plant health, for example, was too abstract because it is “something that's unfamiliar to kids if they have never planted before. It's either, like, dead or alive” (Teacher, Site A). Teachers stressed the importance of experiences that help translate abstract concepts into concrete understandings, which some lessons accomplished better than others and which the school garden facilitated. Teachers suggested using more videos in lieu of didactic

modalities to explain foundational concepts and build background knowledge, indicating that it is hard for students to stay engaged with didactic content. One teacher recommended that all lessons be built around a strong, experiential anchoring activity. One example of a successful anchoring activity was in a lesson about the water cycle and how plants transport water; students put celery stalks in food-colored water and periodically observed the color progressing upward toward the leaves. As one of the intervention staff described: “They wanted to take the celery experiment home. . . . I think that resonated with them—was actually seeing the phloem and everything, the process. It was great for them.”

Have At Least Two People Delivering Lessons. Intervention staff preferred having additional support in delivering the lessons. Healthy Eating staff at Site A always had at least two people delivering the lesson and sometimes had three people. They expressed that having two people share the food preparation and class instruction responsibilities made it possible to deliver lessons as intended. Healthy Eating staff at Site B and Gardening staff at Site A occasionally had additional personnel support and expressed a strong preference for having assistance, especially because it helped with time management.

Teachers, likewise, observed benefits of having multiple people deliver the Yéego! Program lessons, specifically as it related to classroom management and capacity to prepare for lessons (Table 4). They also proposed some possible strategies for meeting personnel support needs. One teacher at Site A suggested team teaching as a way to monitor their students, prepare foods, and deliver the lesson content as intended. It would alleviate some of the burden of preparation, since teachers could take turns delivering the lesson content. One teacher at Site B suggested inviting parents to be involved with lesson delivery, as they might be able to supervise students while the teacher focuses on instruction.

Actively Encourage Students to Connect Each Lesson to Their Families and Communities. Students responded positively to being able to connect lessons to their personal lives and experiences.

There were two key ways that the curriculum facilitated this: It incorporated culturally familiar elements that prompted associations with family and community members, and it used activities which students could bring home—or easily replicate at home—with family.

Intervention staff noted that students were more engaged “when topics relate to surrounding areas” and when they could form connections between lesson content and people in their community (Table 4). One teacher suggested that a shortcoming of the curriculum was that it did not provide opportunities for teachers to supplement their own cultural knowledge as well as farming and gardening practices. Some teachers felt that the Yéego! Program should more effectively bridge the gap between students and their families, since parents or other family members are usually making food decisions in the house. An important facilitator in bridging students’ learning to their family members was using activities that students were excited to bring home and show to their families, or that they could recreate at home. One of the intervention staff (Site A) stated that students often asked questions about how they could do certain activities at home, noting “they always want to show their parents what they’re doing, and they get super excited.” Overall, lesson aspects that bridged classroom learning to students’ families were important, as they enhanced the curriculum’s connectedness to family and community.

Table 4

Example Quotations for Themes Identified as “Practices Supporting Delivery”

Emphasize visual, experiential, and cultural aspects of lessons to maximize student engagement and understanding
<p>“Everything needs to be experiential, or hands-on, have a visual support with it. Lecturing to 3rd graders who are learning English is just going to be in one ear and out the other.” (Teacher, Site A)</p> <p>“What [the students] <i>really</i> enjoyed was going out to the garden and checking out the different plants that they were talking about.” (Teacher, Site B)</p> <p>“The kids LOVED [the guest speaker]. Obviously her background in teaching and Diné language was a huge plus, but the kids were excited to count and share their Diné vocabulary with her. We made blue corn pancakes together, and the kids really enjoyed watching the whole process. Many of the kids wanted copies of the recipes to take home to their parents.” (Intervention Staff, Site A)</p>
Have at least two people delivering lessons
<p>“One person would sit there, organize chopping, while the other one gave the lesson. Now, if one person was in charge of that then everything would have to be already prepared before they came into the classroom.” (Teacher, Site A)</p> <p>“It would be great if we could team teach. . . . I mean, maybe other teachers would have other ideas, but if we were to be doing it all ourself, I would almost be tempted to reach out and get, uh, get some partners here.” (Teacher, Site A)</p>
Actively encourage students to connect each lesson to their families and communities
<p>“There was a recipe given, which was shared with all the students, and I think out of my 17 students, three of the students actually used the recipe at home and shared that their family made it.” (Teacher, Site A)</p> <p>“I think one of the coolest things was when the kids, like, started being able to ask the questions that were actually important to them and like, ‘Oh my gosh, like I bought that at the flea market’ or whatever or, ‘My grandma makes those pancakes,’ just kind of like, making connections that feel real to them. So I thought that was really good.” (Teacher, Site A)</p> <p>“They had good discussion . . . about growing their own food, too. Because I remember they talked about . . . how they, or their neighbors, or their family grow corn and some of the traditional foods.” (Intervention Staff, Site A)</p>

Lessons Learned About Delivery

The following five themes summarize lessons learned about intervention delivery. The themes indicate areas to be considered in future iterations of the curriculum. Example quotations illustrating each theme are provided in Table 5.

The Scope of Curriculum Content Is Ambitious for the Timeframe. Nearly all of the teachers and intervention staff indicated that time was a challenge to completing the curriculum as planned. Most intervention staff expressed that it was difficult to cover all of the expected content in the allotted time for each lesson, and they often felt rushed. Healthy Eating staff at Site A stated that they preemptively condensed lesson content when they anticipated running out of time. Lessons were designed to take 45 minutes, but most of the time they took longer. Gardening lessons at Site B frequently ended 5-10 minutes late, and Gardening lessons at Site A usually ended 5-15 minutes late, with some lessons lasting longer than 1 hour. Healthy Eating lessons at both sites generally stayed within 45-50 minutes. Intervention staff frequently started lessons a few minutes late due to setup needs, staff arriving late, students needing time to transition into the lesson, or students' prior activities running late. There were occasions at both schools when activities had to be shortened, and one of the intervention staff noted that activities generally took longer for third-grade classes than for fourth-grade classes. In some cases, students were not able to finish activities they had started. One teacher (Site A) stated there was never enough time in the lesson for students to fully write out the recipes that they took home.

One teacher specifically suggested narrowing the scope of the curriculum, both in terms of the amount of content in individual lessons and in terms of the breadth of learning goals for students (Table 5). They felt strongly that content delivery was “too much, too fast” and that students would benefit from more space for deductive reasoning and asking questions that help them deepen their understanding. While only one teacher gave this particular feedback, multiple teachers expressed that it

might not be possible to deliver the lessons as planned in any less than 1 hour—and that 1 hour is the maximum amount of time they can spend on any class. Some teachers suggested that keeping the lessons to 45 minutes or less would make it easier for students to stay focused, and it would leave time for setup, cleanup, and students to transition and settle from their previous class or activity.

Improvements Could Make Lessons More Inclusive of Diverse Student Needs and Life

Experiences. Teachers and intervention staff both pointed to ways in which some lessons were not adequately responsive to students' lived experiences. Certain aspects of Healthy Eating lessons, in particular, need to be more responsive to different family and household structures as well as the realities of food insecurity and being low-income. One teacher at Site A stated that the Healthy Eating lessons were less culturally responsive than the Gardening lessons. They felt that the Healthy Eating content expressed judgment about certain forms of calories, and they included foods which students cannot typically access (Table 5). They suggested greater emphasis on traditional foods and less expensive foods. Site A Healthy Eating intervention staff felt similarly about some of the content. In talking about the benefits of eating together as a family, they found it difficult to lead a discussion that was sensitive to levels of food insecurity within the community. They also noted that many students do not have control over the timing and content of their meals at home. The intervention staff suggested that "using examples . . . from school lunch or school breakfast may be easier," more inclusive, and more resonant for students.

Third- and fourth-grade teachers at both sites generally felt that lesson content was suitable for the grade level, but students in Site A classrooms had diverse learning needs that were not always met. Many students were English-Language Learners and/or low-literacy learners. To support their learning needs, the curriculum should provide more explicit structure for the activities. It should also utilize much more descriptive visual content, especially colorful photos and videos, to support students' comprehension of abstract concepts and non-visual lesson components. Third-grade students were also

in various stages of fine motor skills development, which impacted their ability to engage with lesson elements that involved writing, using scissors, or cutting food with a knife. For example, whereas one of the fourth-grade teachers always expected students to write more in their journals than what was instructed by the lesson plan, one of the third-grade teachers stated:

Some of our kids can't write a sentence yet, so it would take us a very long time to have the kids taking notes. So I felt like that skill was a bit over their heads, which kind of limited us from being able to fully engage with the lesson. (Teacher, Site A)

To improve inclusiveness of lessons for students with limited fine motor skills, teachers recommended sentence stems for writing activities; more explicit instruction on how to hold a knife; using a softer object like a banana to practice knife skills; and using pre-cut worksheets rather than having students cut out the pieces. They also noted that pre-cut worksheets would aid in reducing the overall length of the lesson. Other learning supports that students needed which the curriculum did not provide were: word banks to help with spelling; time dedicated to introducing vocabulary; explicit written and verbal instructions at the beginning of every activity; and flexibility within the lesson plan to provide extra time for students to complete activities.

Finally, a few teachers across both sites spoke to a need for the curriculum to be built on “a more realistic understanding of what the kids already know and what they don't know” in order for it to be responsive to diverse community contexts. One teacher at Site B stated that “for students who don't necessarily garden, who don't grow up on the farm, they don't really understand the life that's going on,” and that made it difficult to understand abstract concepts related to plant life and gardening. A teacher at Site A indicated that, even though students live in an area considered to be a farming community, the specific area where the school is located is not very connected to the farming community due to the harsh landscape. They suggested that while the gardening lessons emphasized culture, it could be more relevant to talk about gardening in containers or raised beds at home, since

families may not have the resources to prepare the ground for planting in their area. Additionally, the curriculum could leave space to add lessons that directly help meet students' needs, such as cooking for parents with diabetes or sanitizing water for drinking (Table 5).

Alignment With School Curriculum Standards and Teacher Curricula. Teachers are more inclined to teach a particular curriculum if it has strong alignment with the learning standards in their state. Teachers had varying perceptions of how well Yéego! Program lessons supported the learning outcomes and standards at their respective schools. Overall, teachers suggested that Yéego! Program lessons best supported standards for science, Navajo culture, and a few elements of health education and English language arts. However, it lacked sufficient depth and individualized support that is needed to meet standards for reading, writing, and math. Teachers appreciated having a science curriculum, given that they did not have state-established science standards at the time.

Teachers wanted a more explicit structure around student work expectations, in order to align the Yéego! Program curriculum with learning standards in their lesson plans. Multiple teachers recommended developing a "student edition" of the curriculum, or a student workbook that contains all of the handouts in the order students will use them; explicit step-by-step written instructions for every activity; descriptive visuals and colorful pictures; vocabulary words and word banks; and a table of contents. A student workbook would give teachers foresight about how students will engage with the curriculum and how learning standards will be met, and it would also give students more ownership of their learning. More explicit structure would also help teachers integrate the Yéego! Program curriculum with the other topics they teach, facilitating stronger support of learning standards in general. Many teachers at both schools worked to merge Yéego! Program lessons with their existing lessons throughout the program (Table 5). One of the teachers suggested it would be helpful to provide concrete strategies and ideas for small activities that would help teachers integrate the Yéego! Program

lessons with other content areas. This would also help keep students engaged in the Gardening and Healthy Eating content during the time between Yéego! Program lessons.

Role Expectations, Content Expertise, and COVID-19 Impeded a Transition of Lesson Delivery from Intervention Staff to Teachers. Three factors posed barriers to intervention staff and teachers co-teaching the lessons: variable role expectations, insufficient content expertise, and onset of the COVID-19 pandemic. Four of the teachers at Site A expressed an understanding that the intervention was planned to gradually transition lesson delivery responsibilities from the intervention staff to the teachers, but the other four teachers across both sites either did not perceive lesson delivery as part of their role or did not have enough clarity on what their role was intended to be (Table 5). Teachers who expressed an understanding of the transition also tended to be more engaged in helping with the lessons. One teacher at each of the sites expressed that they did not feel they had the expertise needed to teach the curriculum, nor the time to sufficiently prepare and understand the content (Table 5). One of the teachers distinguished between knowing how to garden and being able to do it in practice; their lack of gardening experience prevented them from engaging more with the lessons (Table 5). Lastly, neither of the sites were able to finish the curriculum due to schools closing at the onset of the COVID-19 pandemic, and two of the teachers indicated this as a primary reason for not fully transitioning lesson delivery responsibilities.

Promoting Teacher Utilization of the Curriculum. Teachers expressed that limited time and money are significant barriers to delivering the Yéego! Program independently. They noted that the curriculum requires a large quantity of materials for which they would need access to funding. They expressed concerns about the amount of preparation time required to purchase and prepare fresh fruits and vegetables, secure activity materials, and research and understand the lesson content. All of the materials that intervention staff needed to deliver lessons with fidelity, teachers would also need. Intervention staff expressed similar concerns about the preparation time and money required, as well as

concern about how easily teachers could carry out lessons with limited gardening knowledge and without additional support (Table 5). Without sufficient funds and time to prepare, lessons would not be carried out as intended.

Teachers also discussed enhancing the curriculum’s usability, or the degree to which it can be easily understood and implemented with minimal preparation. Teachers indicated that the easier something is to use right away, the more likely they are to actually use it. Key features that teachers noted could enhance usability of the Yéego! Program included: a student workbook that makes clear what the student work expectations are; videos that model exactly how to teach each of the lessons; and a well-organized online interface. When asked about whether training would be helpful, two teachers described a preference for watching someone model how to teach each lesson, two teachers did not feel training would be needed, and other teachers felt that a limited amount of training on lesson content would be helpful, including cultural elements for teachers who are non-Navajo.

Table 5

Example Quotations for Themes Identified as “Lessons Learned About Delivery”

The scope of curriculum content is ambitious for the timeframe
<p>“I honestly think that the content should be, like, way scaled back. . . . By the end of the semester, I feel like it's so much more important that the kids have a really deep understanding of like a couple topics, maybe even one topic, but it's just such an ambitious curriculum. . . . I honestly think it's way too much for the amount of time that we had with it.” (Teacher, Site A)</p>
<p>“And there were times, yeah, that we had to kind of rush through things and finish up because it was time for them to switch to another classroom. . . . So that was probably our biggest thing, is that getting everything done within the 45 minutes to an hour timeframe before my class had to move on to go to do something else.” (Teacher, Site A)</p>
<p>“We need more time for these activities because sometimes we had to cut out the last activity, even though it was 10 minutes; 10 minutes in third-grade time is way different than fourth-grade time.” (Intervention Staff, Site A)</p>

Improvements could make lessons more inclusive of diverse student needs and life experiences

“One major blind spot that I perceived—and I know that other teachers did, too—was the reality that a lot of kids have food insecurity. . . . For kids who are poor, calories are calories.” (Teacher, Site A)

“I have kids with behaviors. I have kids who need me to do, you know, scaffolding with them, like visual supports and things like that. So a lot of things take a really long time in elementary school, and I, I don't necessarily get the impression that, like, the curriculum was set up with that in mind.” (Teacher, Site A)

“Add other things that could help the kids in that area, you know, with their needs. . . . Some of them are cooking, they're cooking for the parents, they're helping out, they're taking care of their parents, that kind of thing.” (Teacher, Site A)

Alignment with school curriculum standards and teacher curricula

“It didn't go against what we were doing. I would say to truly support [standards], we would have to incorporate math, we would have to incorporate more reading type of things, but it was mostly just science. . . . I would say the Gardening lessons did a really good job to our cultural standards, though. . . . I thought that was great because that's a challenge for us.” (Teacher, Site A)

“We adjusted our standards to correlate with the Yéego gardening standard. So, whatever standard they were teaching that day from Diné College, we correlated that with our standard, and we made it fit into ELA, math, social studies, science.” (Teacher, Site A)

“Kind of like making dough, you're putting everything together and you're making bread and tortilla, and it came out just right. Because when we did that, it kept reinforcing the healthy eating and then it tied in with our standards, and it worked out well. We had to be creative, actually. We had to sit down and plan our lessons before the people from Diné College came over to teach. We planned ahead first.” (Teacher, Site B)

Role expectations, content expertise, and COVID-19 impeded a transition of lesson delivery from intervention staff to teachers

“So they did tell us, like, they told us from the get-go, ‘We're providing this lesson because the end goal is that we do this for the year, and that you pick it up and continue it after seeing the modeling.’ . . . I knew that I wasn't to check out; this wasn't, you know, a guest speaker time. This was a time that I'm bringing in a guest speaker from the community to present something, but we work together.” (Teacher, Site A)

“They told us it was going to be . . . a gradual release for us, like they would be taking more of the burden in the beginning for teaching, and then at the end we would be. Honestly, just with all the other stuff that I had to do, it was an unrealistic expectation, I think, of all the teachers to have all the necessary, like, preparation and just, like, an understanding of the content—like I do not know how to garden . . . I don't know that much about nutrition in the way that they were teaching it.” (Teacher, Site A)

“We weren't told that we would be teaching any of the lessons, no, um, we were just there to support and just to be, be helpful wherever needed.” (Teacher, Site A)

“Because I really didn’t know what was going on, I was merely just going to facilitate—or monitor students, and then kind of just learn along with them, because I didn’t really know what was going to happen.” (Teacher, Site B)

“They said that the further we got along they were going to, I guess like, branch off where we would help take over the lessons, but that, that never really happened because of COVID.” (Teacher, Site A)

“I only know the theoretics of actually gardening, but to actually implement it—and I think that’s one of the things that I had a problem with with the whole Yéego! Gardening thing and why I kind of stepped back from the whole process, also, because in general I don’t really know too much about gardening itself. . . . And when I was speaking with [another teacher] last year I asked her too, I was like, ‘Are you a big gardener?’ She gardened a little but not too—I don’t think she gardened *that much* to really be able to teach it, I think is what she said? So both of us were still really not at ease with teaching gardening, because we didn’t feel like we were up to, up to par with it.” (Teacher, Site B)

Promoting teacher utilization of the curriculum

“I think this curriculum would be great for any teacher on the Navajo Nation to follow. I think that they would need a lot of assistance in the way that it is right now to be able to do it on their own.” (Teacher, Site A)

“I probably wouldn’t have done it without [the intervention staff]. I don’t think this is doable, like, alone. Only because the money makes things possible, and thoughts, ideas, coming from people are very helpful.” (Teacher, Site B)

“I would really need to find resources to bring in all that material so that they can do the hands-on activities.” (Teacher, Site A)

“What would worry me a lot is the two people components. . . . The snack prep, I think that would be a huge barrier, just to go out and purchase the food, and whose funds are they going to use, and then the time to actually get it I think would be one of the biggest struggles. But I think food is the necessary part, too, right?” (Intervention Staff, Site A)

“Teachers that have no clue about ag[riculture] and farming, it would be a little bit hard for them to kind of, actually teach this, I think.” (Intervention Staff, Site B)

Discussion

To our knowledge, this is the first study to evaluate implementation fidelity of a school-based gardening program on the Navajo Nation. Our results indicate that the program was delivered with a moderately high degree of fidelity across contexts, though variations based on time constraints and stylistic differences were common. One key difference across classrooms was in the level of engagement with the garden. In addition, our findings illuminate a number of areas to consider for improvement. While teachers and students were highly receptive to the Yéego! Program, teachers were hesitant about delivering it independently, and some aspects hindered student engagement. Evidence from this process evaluation supports strengthening program elements that are visual, experiential, and connected to Navajo culture and community. At the same time, it promotes narrowing the scope of the curriculum, modifying delivery methods to meet learning needs, enhancing the relevance of content to students, and pursuing stronger alignment with core curriculum learning standards.

Our results indicated several ways to enhance student engagement, including strengthening the experiential, visual, and cultural lesson elements. Other approaches, such as more didactic delivery methods, often did not meet students' learning needs. Further, content that lacked relevance to students' lived experiences detracted from their engagement with the lesson, which is consistent with prior research (Carroll et al., 2007). Previous evaluations of school-based health promotion interventions have found that teachers' satisfaction with the program was shaped by their students' enthusiasm about the content and activities; teachers tended to omit content if they anticipated their students would not be enthusiastic about it (Martens et al., 2006). Since implementing a program in the same way it was intended increases the likelihood of achieving research outcomes in real-world settings (Breitenstein et al., 2010; Durlak & DuPre, 2008), it is important to consider how program elements that are not highly engaging to students might have implications for implementation fidelity in future dissemination efforts. Improvements to procedures, delivery methods, and content relevance would

promote greater engagement among more students and facilitate achieving program outcomes on a larger scale.

Overall, the Yéego! Program was implemented as planned at both sites, but we observed variances in fidelity which could have implications for the efficacy of this intervention. In particular, the intensity of experiential program components varied across contexts, and content adaptations occurred due to time limitations. Previous research has found that time limitations are a common reason for content adaptation and omission (Hill, Maucione, & Hood, 2007). Narrowing the scope of the curriculum and increasing the intensity of experiential components could improve implementation fidelity and effectiveness of the intervention in the Navajo Nation. Participants noted that the intervention attempted to deliver too much content relative to the timeframe, and more time should be allotted to hands-on learning experiences, especially in the garden. Prior school-based studies have demonstrated that active participation in hands-on gardening activities throughout the entire plant growth process is important to the efficacy of gardening programs to increase healthy eating behaviors (Davis, Spaniol, & Somerset, 2015; Heim, Stang, & Ireland, 2009). Experiential learning through planting, maintaining, harvesting, and preparing foods promotes a sense of ownership and pride among students that supports the success of gardening programs (Heim et al., 2009; Ozer, 2007). In the Yéego! Program, students' level of active participation in the garden depended on the timing of their school garden construction, classroom size, and teachers' coordination of garden maintenance responsibilities. Increasing the intensity of gardening activities would give students more opportunities to practice the skills, knowledge, and behaviors taught in the curriculum. These changes would also strengthen the intervention's theoretical underpinnings in Social Cognitive Theory. Intensifying experiential components and decreasing the scope may also enhance the program's effectiveness (Breitenstein et al., 2010; Cheadle et al., 2012; Durlak & DuPre, 2008).

The long-term goal of the Yéego! Program is for teachers to be able to implement the curriculum independently. However, our findings suggested that we may need to further address barriers in order to achieve long-term sustainability. Barriers included insufficient alignment with curriculum learning standards, and limited usability of the program with respect to teachers' content knowledge and confidence, time required to deliver lessons, and availability of funding. Our findings are not surprising given that other school-based health interventions have identified similar barriers to sustainable implementation (Auld, Romaniello, Heimendinger, Hambidge, & Hambidge, 1999; Block et al., 2012; Christian et al., 2014; Day, Sahota, & Christian, 2019; Hazzard, Moreno, Beall, & Zidenberg-Cherr, 2011; Ohly et al., 2016; Passy, Morris, & Reed, 2010). Furthermore, the time required to implement procedures and confidence in one's ability to teach the material strongly influence teachers' decisions to deliver curricula (Han & Weiss, 2005; Martens, Peterson, Witt, & Cirone, 1986; Rauscher, Casteel, Bush, & Myers, 2015). Strong curriculum integration can reduce the amount of time required to deliver programs, but preparation time may still be a significant challenge, especially for teachers who do not have foundational content knowledge. Studies indicate that more intensive training can support teachers' confidence and ability to deliver lessons with fidelity (Baranowski et al., 2000; Day et al., 2019), but teachers in the present study had mixed opinions on training approaches. Some teachers preferred having access to videos that model exactly how to deliver each lesson. Other school garden programs use community volunteers—including parents and grandparents—as well as specialists from local organizations to assist with garden maintenance and lesson delivery (Ohly et al., 2016).

Our findings indicate that the Yéego! Program worked well as a science curriculum and supported Navajo culture learning standards, but its alignment with broader learning standards was not as strong. Our study provided strong evidence that the Yéego! Program needs improved alignment with learning standards and integration with teachers' existing curricula. Several studies indicate that strong curriculum integration aids both the feasibility and sustainability of high-fidelity implementation (Day et

al., 2019; Huys et al., 2019; Reynolds et al., 2000; Rosecrans et al., 2008). Findings from a school-based study by Day et al. (2019) found that teachers are more likely to prioritize implementation if they can incorporate the program activities into their teaching plans, rather than adding a separate program to their existing curriculum. One way this could be achieved is by delivering nutrition-related content through a range of other subject areas (Day et al., 2019). Other studies suggest that integrating gardening activities throughout the broader curriculum can maximize learning opportunities, support successful implementation of school-based gardening programs, and have a positive impact on fruit and vegetable consumption (Christian et al., 2014; Ohly et al., 2016). Other studies have noted the importance of involving teachers in the development of program activities and their linkages to the curriculum. Future studies should involve teachers in refining the curriculum.

Study Strengths and Limitations

A number of strengths and limitations of this study should be noted. The study was supported by an interprofessional research team with a history of strong partnership with the Navajo Nation. Collaboration with the research team greatly facilitated development of the interview guides. The study used self-report methods for data collection, which was a time- and cost-effective alternative to observational methods. A limitation of using self-report methods in fidelity research is the potential for self-desirability bias, which could result in over-estimation of fidelity. Additionally, the level of detail reported in the fidelity checklists was inconsistent, which posed a barrier to forming conclusions about site differences and adherence to specific curriculum components. Participants may also have experienced recall bias due to the time that elapsed between the lessons and the interviews.

Implications and Recommendations

As the first study to evaluate the implementation process of a school-based gardening program on the Navajo Nation, our study contributes to an evidence base for effective delivery of school-based interventions to promote fruit and vegetable consumption among Navajo youth. Our findings will help

us better understand the results from the efficacy trial of the Yéego! Program. We also identified various ways to modify the Yéego! Program to make it more usable, acceptable, and effective. By improving the program in these ways, we expect future evaluation and dissemination efforts to be more successful.

Our findings revealed several implementation components which worked well in practice, as well as components which require modification to support high-fidelity implementation in the future. To support teachers in delivering the Yéego! Program, we specifically recommend the following changes:

- 1) ***Narrow the scope and make learning objectives more appropriate to the timeframe:*** The curriculum should focus on a small number of learning objectives, and lessons should be deliverable in 45 minutes or less, plus setup and cleanup time.
- 2) ***Reduce preparation time and make the curriculum more immediately usable:*** Key features that teachers noted could enhance usability of the Yéego! Program included a student workbook that makes clear what the student work expectations are; videos that model how to teach each of the lessons; and a well-organized online interface.
- 3) ***Reduce or offset costs associated with program materials:*** Make more of the activities team-based to reduce the quantity of materials needed. Foster relationships with community members, businesses, and organizations, who may donate time and resources to the program.
- 4) ***Support capacity of teachers to deliver lessons:*** Findings indicated that this curriculum is best delivered by two or more people. Team teaching might alleviate some of the burden of preparation across participating teachers. Invite parents to be involved with lesson delivery; parents can supervise students while the teacher focuses on instruction. Involve community members, parents, and grandparents to help with classroom management and bring into the classroom a diversity of skills, knowledge, and experiences.
- 5) ***Achieve stronger alignment with learning standards:*** Findings indicated that the curriculum was best suited for science and Navajo culture learning standards. A key action step is to create

a student workbook. The student workbook should contain all of the handouts in the order students will use them, explicit step-by-step written instructions for every activity, descriptive visuals and colorful pictures, vocabulary words and word banks, and a table of contents.

Collaborate with teachers on the Navajo Nation to refine program activities and plan linkages to the core curriculum. Provide teachers with example lesson plans that illustrate how gardening and healthy eating activities can be incorporated into the broader curriculum.

- 6) ***Maximize program relevance and level of engagement from teachers and students:*** Continue to emphasize visual, experiential, and Navajo cultural aspects of lessons, and reconsider how didactic content can be delivered. For example, replace didactic content with videos to explain foundational concepts and build background knowledge. Increase students' active participation in the garden by assigning each classroom their own section of the garden. Increase the intensity of hands-on gardening and healthy eating activities, from planting seeds to harvesting and preparing foods. Make space in the curriculum for teachers, students, and other community members to contribute their own knowledge to the lessons, as this helps students to connect content to their own lives and communities.

Conclusion

The process evaluation for the Yéego! Program aimed to describe implementation fidelity across different contexts, and identify program elements that could be improved. Based on qualitative analysis of the delivery of the Yéego! Program at two schools on the Navajo Nation, we concluded that the program was implemented with moderately high fidelity across contexts and noted areas that should be considered in the interpretation of study outcomes. The findings will also inform future research to improve healthy eating among elementary school children across the Navajo Nation.

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Appendix A

Fidelity Checklist

Lesson:

<input type="checkbox"/> Lesson 1: Introduction to the Garden	<input type="checkbox"/> Lesson 6: Plant Parts and Life Cycle
<input type="checkbox"/> Lesson 2: Maintaining the Garden	<input type="checkbox"/> Lesson 7: Native Plants and Navajo Ecology
<input type="checkbox"/> Lesson 3: Food Preservation and Seed Saving	<input type="checkbox"/> Lesson 8: Pollination
<input type="checkbox"/> Lesson 4: Soil and Compost	<input type="checkbox"/> Lesson 9: Getting Ready to Plan in the Garden
<input type="checkbox"/> Lesson 5: Water in the Garden	<input type="checkbox"/> Lesson 10: Traditional Growing Practices

1. Date	
2. Time of Class:	
3. Site (School, grade, teacher name)	
4. Length of Class:	
5. Number of Students in Attendance:	
6. Interventionist(s) Present:	
7. Supplies Needed/Purchased:	
8. Were the main elements of the lesson covered? Please explain.	
9. Did the lesson start and end on time? Please describe timing of lesson.	
10. Did you have all the supplies you needed?	
11. Did the students enjoy the lesson?	
12. Provide a summary of how the lesson went overall.	

Appendix B

Interview Guide for Intervention Staff

[FOLLOW INTERVIEW VERBAL CONSENT SCRIPT TO CONSENT THE STAFF TO PARTICIPATE IN THE INTERVIEW.]

[ONCE PARTICIPANT COMPLETES VERBAL CONSENT – PROCEED WITH INTERVIEW GUIDE.]

- START RECORDING -

1. QUESTIONS: INTERVENTION DELIVERY

I'll start by asking some questions that will guide us through your typical process for delivering a [gardening/healthy eating] lesson.

1. For a typical lesson, how did you prepare before the class? How much time did this usually take?
2. What did you do once you arrived in the classroom? [PROBE: set up materials, review lesson plan, talk to teacher or students]
3. How did you start the lesson? [PROBE: follow introduction script, review the previous lesson]
4. Can you describe how you guided the class through an activity and [garden work/making a snack]? If it's helpful you can think about a specific lesson you led, or look at the Yéego lesson summary. [PROBE: did you model how to do it first or describe how to do it and help as needed]
5. How did you conclude the class? [PROBE: exit ticket, how they used their journals]
 - a. Is there anything else you want to add about your process?
6. Do you feel like your delivery of a lesson changed with repetition or with each class that you did it in? Can you describe that a bit more?
7. Throughout the lesson, how did you manage your time? [PROBE: how much did you use the suggested times in the lesson plan]
 - a. Were there days when you would run out of time? What would happen? [PROBE: did you finish the lesson, did anything have to be cut short, did you have to leave things out]

2. QUESTIONS: CURRICULUM

Now I want to talk a little bit about the Yéego! curriculum. For these questions you'll want to have the Yéego lesson summary in front of you.

8. What are your overall thoughts about the Yéego! curriculum and how it worked in your classes?
 - a. What topics or activities worked especially well? [PROBE: differences between classrooms or between 3rd and 4th graders, what did students seem to enjoy the most, what resonated with them, what seemed impactful]
 - b. What topics or activities did not go very well? [PROBE: differences between classrooms or between 3rd and 4th graders, was there anything going on that made it difficult to do certain lessons, lessons that students didn't seem interested in]
 - c. Did you experience challenges to carrying out any of the lessons or activities as planned? How did you address them? [PROBE: classroom setting, other environmental factors, content knowledge, necessary materials/resources]
 - d. Were there ever ways in which you had to adjust the lessons to better meet students' needs? Can you give an example?
 - e. Were there times when you did not have the supplies you needed to carry out the lesson as planned? How did you move forward?

9. Do you have any comments about the garden itself? Did it support students' learning about gardening and healthy eating? Can you describe how you felt it supported their learning?
10. What was your favorite part of the curriculum to teach? Why?
11. Do you have comments on how to improve the curriculum or make it work better in the future? [PROBE: timing/spacing of the sessions, changes to the student worksheets, other topics that would you like to see added, topics you think should be taught differently, what additional support is needed, more of a certain format/less of others]
12. How well did the lesson materials you were given help you teach the lessons? Would additional support have been useful? [PROBE: type of support, how much, support for specific lessons]
13. How confident and prepared did you feel teaching the lessons? Can you describe that more?
 - a. Is there anything that would have made you feel more prepared?

5. QUESTIONS: STUDENTS, TEACHERS, AND ADMINISTRATORS

This last set of questions will focus on your interactions with students, teachers, and administrators in the program and what suggestions you might have for supporting teachers to deliver the program in the future.

14. What were your observations of how the school principal received the Yéego! program at [Nizhoni / Canyon de Chelly]? [PROBE: how did they support or not, how much did you interact, did reception seem to change over time]
15. Can you describe your experience working with the teachers? [PROBE: their role during the lessons, whether their role changed over time]
 - a. Were there any specific ways you tried to encourage teachers to participate in the lessons? [PROBE: how successful]
 - b. If you were to deliver this program again, do you have ideas about how teachers could be more involved in the program?
16. Thinking about the classes you worked with, how would you generally describe the classroom environment? [PROBE: differences between 3rd and 4th graders, differences between classrooms, how much control teacher had over the classroom, combining classes and teaching them together]
17. How would you describe students' participation in the lessons?
 - a. Did you have specific ways of encouraging participation among students?
 - b. Were there any times when it was particularly challenging to get students to participate? [PROBE: was there something going on, were they disinterested in the lesson]
 - c. How well did you feel you were able to respond to students' questions and comments?
18. If teachers were going to use this curriculum on their own, what do you think they would need? [PROBE: administrator support, curriculum materials, training, physical supplies, books]

6. CLOSING STATEMENT

That completes the interview. Do you have any final thoughts that you would like to share?

- STOP RECORDING -

7. ADMINISTRATIVE DETAILS

I have stopped the recording of our conversation. Thank you for taking the time to speak with me today.

If you find you have any questions later on, please feel free to send me an email.

Appendix C

Interview Guide for Classroom Teachers

[FOLLOW INTERVIEW VERBAL CONSENT SCRIPT TO CONSENT THE TEACHER TO PARTICIPATE IN THE INTERVIEW.]

[ONCE PARTICIPANT COMPLETES VERBAL CONSENT – PROCEED WITH INTERVIEW GUIDE.]

- START RECORDING -

1. QUESTIONS

I'll start by asking some questions about your expectations prior to starting the Yéego! Healthy Eating & Gardening Program.

1. Thinking back to last year when you first heard about the Yéego! program, what do you remember being your initial thoughts or reactions to it? [PROBE: reactions to content, thoughts about how it would fit into your classes, desire or lack of to do it, how you thought students would respond]
2. What expectations did you have for your role or level of involvement in the gardening and healthy eating lessons?
 - a. How did your expectations compare with the way lessons actually went in the classroom? [PROBES: if different, why do you think it turned out that way, did you wish to have more or less involvement, what type of involvement did you want to have]

Now I'll ask a few questions about your perceptions of the curriculum. For these questions it may be helpful to now pull up the second document you have, called "Yéego lesson summary," which gives a quick overview of what each of the lessons consisted of.

3. What are your overall thoughts about the Yéego! curriculum and how it worked in your classes?
 - a. What topics or activities worked especially well? [PROBE: what did students seem to enjoy the most]
 - b. What topics or activities did not go very well? [PROBE: was there anything going on that made it difficult to do certain lessons, lessons that students didn't seem interested in]
 - c. How appropriate was the content for the grade level?
4. The curriculum had two parts: healthy eating and gardening. Did you notice any differences in how the eating and gardening lessons were taught? Were there any differences in how your students responded to the two?
5. Do you have comments on how to improve the curriculum or make it work better? [PROBE: changes to any of the student worksheets/handouts, other topics that would you like to see added, topics you think should be taught differently]
6. How well did the Yéego! curriculum support learning outcomes and standards for your school? [PROBE: what learning outcomes for your curriculum did it support well, what learning outcomes could it do a better job of supporting]
7. Another part of the program was the garden itself. What did you think of the garden that was built at your school? Did it support students' learning about gardening and healthy eating?

Over time we hope to make the Yéego! curriculum available to other schools in Navajo Nation, and my last set of questions will focus on how to support teachers who want to offer it in their schools.

8. If Yéego! were being implemented in another school, what do you think is important for teachers to know ahead of time?
 - a. Is there anything else you wish you would have known before starting it at your school?

9. Imagine that you are going to teach the Yéego! curriculum to a class on your own. If you are given a binder with the lesson plans and activity instructions, what additional resources or support would you need in order to make it a success?
 - a. Would training be useful? How much and in what format? [PROBE: online vs. in-person, group vs. individual, one longer training vs. multiple small trainings between lessons]
 - b. Is there anything that would make it easier for teachers to do the activities in the classroom?
 - c. If all of this was provided, would there still be barriers to being able to teach this curriculum on your own? What would those be? [PROBE: personal barriers, school-related or systemic barriers]
 - d. Do you have continuing education requirements that this curriculum could help you meet?
10. In terms of timing, do you have a preference for time of year to teach the curriculum? [PROBE: would you do it with the growing season or does a different time of year work better]
 - a. How many lessons would you want to teach per month?
 - b. How much time do you want to spend on each lesson?
11. If you were going to recommend the Yéego! program to a teacher in another school, what would you say?
12. If you were going to advise a teacher in another school not to do the Yéego! program, what would you say? [PROBE: based on their answer, maybe revisit past questions—5, 6, 9c]
13. What would be the best way to make the curriculum available and accessible to teachers? [PROBE: through the school district, through the teachers, through the principal]

2. CLOSING STATEMENT

That completes the interview. Do you have any final thoughts that you would like to share?

- STOP RECORDING -

3. ADMINISTRATIVE DETAILS

Thank you for taking the time to speak with me today. I have stopped the recording of our conversation.

In the next two weeks we will mail you a \$30 monetary gift to reimburse you for your time. Could you please tell me the mailing address for where you would like your gift card to be sent? **[REPEAT ADDRESS TO MAKE SURE IT IS CORRECT]**

Thank you again, and if you find you have any questions later on, please feel free to send me an email.