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Sustainability via active garden education (SAGE): translating policy to practice in early care and education

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Abstract

BACKGROUND: We describe the development of Sustainability via Active Garden Education (SAGE), an early care and education (ECE) garden-based curriculum developed from a 5-year community partnership to link national health policy guidelines with ECE accreditation standards.

METHODS: National health guidelines and ECE accreditation standards were reviewed, and community advisory board members, ECE staff, and parents provided feedback and support throughout the development of the curriculum. SAGE curriculum components were guided by the Ecologic Model of Physical Activity and Social Cognitive Theory. SWOT analyses were used to refine and revise the curriculum to overcome challenges to implementation.

RESULTS: Twelve one-hour, developmentally appropriate, modularized lessons were created using the garden as a metaphor for human development. Lessons featured songs, simple games, pretend play, modeling and garden activities. Parents were engaged via weekly newsletters with information about activities in the classroom, strategies to improve health habits at home, and free community resources.

CONCLUSIONS: SAGE partnered scientific theory and rigor with community ingenuity and innovation to create a clear translation of policy guidelines to easily implementable practice in a fun and engaging manner.

Keywords

Child; Preschool; Nutrition; Physical Activity; Interventions; CBPR

Promoting the development of healthy habits is a public health and policy priority, as one in 4 US children under 5 years is overweight or obese and physical activity and dietary habits track into adulthood.¹⁻³ The 2011 Institute of Medicine's (IOM) Early Childhood Obesity Prevention Policies Report identified early care and education (ECE) centers as important locations for behavioral intervention as 60% of preschoolers (aged 3-5 years) attend ECECs.⁴ However, there are few evidence based programs that meet IOM guidelines and ECEC standards, are developmentally appropriate and engaging, and have the potential for easy integration into existing ECE resources and curricula.

The complex challenge of childhood obesity requires a multilevel, collaborative strategy for a sustainable solution, warranting an ecologic, dynamic perspective.^{5,6} Community-based participatory research (CBPR) is vital for increasing the relevance and sustainability of health promotion interventions and includes community members and scientists as equal partners in research.⁷ CBPR approaches increase the chances for successful adoption, implementation, and sustainability of prevention strategies.⁸⁻¹⁰ As a more comprehensive approach to science and discovery, CBPR is best couched within an ecologic framework. The Ecologic Model of Physical Activity (EMPA) is a dynamic ecologic systems framework that has been adapted for use with dietary habits and obesity.^{6,11} The EMPA posits that enduring physical and social environmental factors, processes, and linkages at multiple levels of influence directly and indirectly impact behavior change and maintenance, particularly in young children, who are dependent upon their immediate social and physical environment.¹²

Most young children spend a large portion of their waking time in sedentary activities, particularly in structured ECE settings, and do not meet nutrition guidelines.^{12,13} During this period in the life course, food preferences, which influence intake, and interest in a variety of physical and sedentary activities develop with repeated exposure and persist through childhood.^{14,15} Time spent outdoors in garden-related activities may increase physical activity and decrease sedentary time.¹⁶ Garden interventions have been tested in elementary schools, primarily for improving dietary habits, but there has been little focus on early childhood.¹⁷ Gardens vividly illustrate the lifecycle and how plants need nourishment to grow and flourish, providing a metaphor for human development. A garden-based strategy may be particularly appealing for young children, because it uses experiential outdoor activities, that can increase physical activity, and indoor activities, that can foster interest in fruit and vegetables.

Several interventions have endeavored to increase physical activity and promote health in ECE centers, but none were based on IOM guidelines and national ECE accreditation standards.¹⁸ This manuscript describes the development of Sustainability via Active Garden

Education (SAGE), a garden-based intervention to increase physical activity and improve dietary habits. The SAGE curriculum was designed to meet IOM guidelines and ECE accreditation standards and become embedded into the priorities of childcare centers in order to meet their own goals for licensing and engaging families.¹⁹ The SAGE curriculum was the deliverable of CBPR research that focused on sustainable community approaches to prevent and treat obesity across the life course by starting in early childhood.

METHODS

Overview

SAGE grew out of a sizeable and well developed academic-community partnership that has been previously described.^{8,20} This partnership led to the development of a shared agenda focused on childhood obesity prevention. As a next step, we developed the SAGE curriculum as the focus of a 2-year CBPR pilot project that built on the shared agenda. All activities were framed within the EMPA, and an iterative process was used that combined state of the art, published science; extensive partnership experience; and trial and error.^{6,11}

Theory Selection

The EMPA suggests that macro-level ECEC accreditation standards and policies set a favorable climate for improved health at a broad-based population level.^{6,11} At the same time, micro-level environmental settings, like ECE centers or the home, can create opportunities for healthy behaviors. The EMPA also accounts for dynamic linkages or drivers of behavior—the meso-level environment—that might be operationalized by dynamic Social Cognitive Theory (SCT) learning processes that occur during observational learning and mastery experiences that happen within the same setting. These linkages or drivers can transmit behavior changes from one micro-level environment to another. For example, health promotion efforts in ECE centers may produce secondary impacts in the home via exo-level environmental linkages, for example, greater parent awareness and home availability of produce owing to child requests from learning experiences at ECE centers.²¹ Ecologic approaches relying on behavioral strategies that reinforce these existing dynamic exo-level environmental pathways, by engaging parents, are important keys to producing sustainable behavior change in young children.²²

Framing the project within the EMPA, we turned to SCT to specify strategies, techniques and mediators of behavioral outcomes.²³ SCT hypothesizes mediational pathways between the learning experiences to the behavior, such as positive outcome expectations, self-regulation, social norms, and self-efficacy.²⁴ We designed the program to increase positive outcome expectancies for healthy habits through psychoeducation, exposure to opportunities, engaging activities, and fostering positive social norms in the micro-level environment. We aimed to increase self-efficacy for physical activity and eating fruit and vegetables through observational learning, mastery experiences and verbal persuasion and the dynamic meso-level environment activities.²⁵ We promoted development of positive social norms, the exo-level environmental indirect linkages, through connections to parent behavior and home environments.²⁶ We encouraged self-regulation for increasing physical activity and identifying hunger/satiety through self-monitoring and psychoeducation.

Procedure

Community advisory board (CAB).—A CAB comprised of 13 diverse community representatives from the academic-community Partnership was formed and has been previously described.⁸ The CAB met quarterly, or more frequently as needed, to guide the development of the SAGE curriculum, provide feedback on project protocols and materials, and to monitor the timeline and progress of the SAGE project.

Preliminary activities.—Following the directive of the Partnership and CAB, the scientific team sought to identify all relevant background information to create a viable curriculum. The scientific team and CAB reviewed IOM guidelines, existing national diet and physical activity recommendations for young children (Table 1) as well as ECE accreditation standards.^{19,27} Last, the scientific team reviewed research to create a developmentally appropriate protocol to train children on hunger and fullness cues as well as existing garden-based curricula and protocols that might be adapted and integrated for use in SAGE.^{28–32}

The scientific team and one member of the CAB enrolled in a two-part gardening course offered by Urban Harvest, a local community not-for-profit organization (<http://urbanharvest.org/>). The course included classroom based and “hands on” field learning. The team learned how to build and maintain gardens in community and school settings and learned about types of plants that would grow well in different seasons and climates.³³

Curriculum development.—With the guidance and feedback of the CAB, we developed an outline of possible learning objectives, topics and activities that was then reviewed by two early childcare directors. Feedback from directors suggested that it was important to format each session to include materials, learning objectives, procedures for activities, and the relevant accreditation standards from the National Association for the Education of Young Children. The initial draft of the curriculum was developed by team members using an iterative process. Two team members would develop a draft, and two more would make revisions. Following this, the CAB would review and revise the draft. The team reviewed and revised the curriculum during weekly meetings for a 3-month period.

Preparing for implementation.—As the curriculum evolved into its final form for testing, advanced undergraduate and graduate students were trained to deliver the curriculum as demonstration instructors. Instructors received training on early childhood teaching strategies, classroom management, as well as CPR and first aid certification. Instructors were then trained in the curriculum itself, content, songs, games and garden-based activities. Instructors were trained to include teachers from the ECEs as active participants in the curriculum.

Above ground gardens were installed in ECE settings using simple and inexpensive materials, such as cinder blocks, wooden stakes and soil (complete list of materials available from the authors). Location was determined based on principles learned during garden education classes and in consultation with ECE staff.

Strengths, weaknesses, opportunities and threats.—As each lesson was delivered, one instructor used a checklist to be sure that each piece of content and every activity was completed. After each lesson, implementation team instructors completed a strengths-weaknesses-opportunities-threats (SWOT) analysis to evaluate each lesson. Instructors debriefed at the research team lab within 24 hours after each lesson to complete a SWOT grid.³⁴ SWOT feedback was reviewed by the scientific team and CAB to problem solve weaknesses and threats and capitalize on strengths and opportunities. For example, when an activity such as a song or active game went very well and was very popular (strength), it was integrated into additional lessons (opportunity); when something did not go well (weakness)—perhaps it was too developmentally complex (threat)—it was simplified, changed or replaced. Additional SWOT examples are presented in Table 2. Lessons were then modified based on SWOT feedback for a second set of pilot tests in two additional centers. Modification challenge and solution highlights are presented in Table 3.

RESULTS

Overview of the curriculum.

In SAGE, the garden is a metaphor for human development and promotes physical activity and healthful dietary habits while engaging children in developmentally appropriate cognitive and social activities. Children learn that plants begin as seeds, and with proper care, feeding, watering and environments, they grow into seedlings and mature plants that bear fruit. The innovative curriculum is designed to emphasize these same concepts as important for humans to grow into healthy and strong adults and couches physical activity and nutrition messages in garden themes, illustrated by the actual gardens themselves. The complete curriculum is available from the authors and summarized in Figure 1.

The resulting SAGE curriculum is a garden-based physical activity and nutrition educational program that includes 12 one-hour lessons that can be delivered once or twice a week. The SAGE curriculum is flexible so that breaks may be taken to accommodate holidays, bad weather days, and other breaks in school, for example, testing, field trips, which were common in pilot studies.

Each session included learning objectives, 2–3 active games, 2–3 active songs, an interactive taste test reinforcing hunger and fullness cues, and garden maintenance, for example, watering, weeding, harvesting. All games and songs could be performed indoors (in case of inclement weather) or outdoors. If weather permitted, about half of the games ($N = 7$) were typically conducted outside. Over the course of the curriculum, children learned four songs, and all songs had coordinating upper body and some lower body movements. These four songs were repeated throughout the curriculum to improve learning. Children learned 15 active games, and participated in two science experiments (growing a lima bean from a seed, making colorful celery by placing the stalk in colored water) to demonstrate how plants, like humans, require opportunities for sunshine and water. Taste testing of fruit and vegetables included identifying internal hunger and fullness cues, color identification, counting practice, and smelling, touching and tasting the produce. Children watered the gardens at every session unless it was raining that day, and learned simple gardening skills, for example, weeding, harvesting.

Gardens.

Gardens were installed in 6 ECE centers. Two already had space set aside where previous gardens had been located, but needed substantial renovating. Gardens were located in areas that received full sun. Gardens were sized to be “kid friendly,” so that a child could stand at the side of the garden and reach to the center. Gardens were comprised of cinderblocks that formed a frame around the garden itself. The frame was filled with common garden soil. Climate appropriate fruits, vegetables, and herbs were planted in advance of the curriculum to be available during the pilot tests.

Increasing preference and participation.

The curriculum includes many engaging activities that are focused on increasing preference through exposure to physical activity and fruit and vegetables. Behavior change strategies included role modeling, mastery learning, and verbal persuasion. Through guided practice and examples, children learned how to identify healthy fruit and vegetables and their benefits to bones and muscles. Children also engaged in role playing games where they learned to identify activities that would make them a “couch potato” or sedentary, and activities that would make them a “hopping hopper” or physically active. By modeling instructors through interactive songs, children sang and engaged in motions that encouraged different physical activity movements and reinforced the importance of eating fruit and vegetables for growth and development. Children learned actively how to plant, water, weed, and harvest, as well as to do simple food preparation activities such as washing, cleaning, and sampling fruit and vegetables. Following IOM guidelines, the SAGE curriculum includes many instructor-led, physically active songs and games that increase understanding of concepts such as pantomiming the lifecycle of a plant, acting out the role of the farmer, and playing fruit and vegetable tag. For nutrition themes, children learned that it is important that the plant obtain appropriate nutrition to grow fruit, just as humans have to eat appropriate nutrition to do their daily activities. For example, plants sense when they do not have enough nutrients (as people sense hunger) and plants sense when they do have enough (as people sense fullness). Another example is achieving a balance of nutrients; plants need water, soil, and sunshine just like children need to consume water and a variety of fruit and vegetables to grow strong and healthy.

Children were encouraged to taste test fruit and vegetables to increase exposure and preference. Repeated visual and taste exposure are strong predictors of child food preference and eating.^{35,36} Child food preferences also influence the foods that are available in the home.³⁶ In each SAGE session, children had an opportunity to taste which included smelling, touching and playing with one fruit and two vegetables. Multisensory exposure to fruits and vegetables were encouraged. For example, children learned to recognize the differences in color between dark green and light green vegetables and practice counting, along with other early childhood–appropriate learning experiences.³⁵

The SAGE curriculum was designed to improve mediators of behavior such as outcome expectancies, self-regulation, and self-efficacy for increasing physical activity and identifying hunger/satiety through self-monitoring and psychoeducation.³⁷ Along with garden examples, additional information about recognizing hunger and fullness cues was

included in the curriculum as suggested by IOM guidelines. We used “tummy dolls” to increase self-awareness and monitoring as to whether children sensed that their tummies were “empty,” “full” or “just right,” before a fruit and vegetable taste testing protocol to help children recognize that before they eat, they should monitor their own hunger and fullness, to recognize when to eat, or not eat.³⁸

We promoted *indirect participation*, the exo-level environmental indirect linkages, through connections to parent behavior. We developed weekly SAGE parent newsletters in Spanish and English that were sent home with children to parents or guardians. Newsletters promoted parent engagement in the program as newsletters were used to illustrate key concepts that children were learning in the intervention. Parents and guardians were informed of the concepts their children were learning and curriculum activities, including a description of games and songs that could be practiced in the home, and they received updates on garden activities and the development of the produce in the garden. By distributing recipes that contained the same fruit or vegetables sampled by the children in the ECE, parents and guardians were also encouraged to increase fruit and vegetable exposure and consumption at home. Newsletters were also used to highlight community health and garden related resources such as farmer’s markets and children’s cooking classes.

DISCUSSION

Couched in the EMPA framework and guided by SCT principles, SAGE curriculum promoted behavior change incorporating multiple levels of environment. Partnering structural changes in the micro-level environment, with time-tested individual-level behavior change strategies and linking them systematically to additional micro-level environments has been rarely done in ECE interventions, and may help to promote sustainability of both the organizational curriculum and individual behavior changes. Implementation of programming in ECE settings is not sufficient alone, and future strategies should continue to include support for structural changes in the ECE environment to help promote sustainable change.

In what has been described as the ‘education zeitgeist’ (for example, *No Child Left Behind*), ECE accreditation policies have focused mainly on educational standards with little attention to physical health and nutrition education.¹⁵ The use of the ECE based garden as an easy to understand metaphor for healthy lifestyle habits and human development differs from other school based garden curricula that teach children about insects and more technical information on the plant life cycle. Future implementation efforts should consider holistic strategies such as SAGE for enhancing early learning opportunities. Children gained hands-on experience with garden maintenance like weeding, feeding, watering, and harvesting produce. These garden interactions allowed children to conceptually and literally grasp the importance of physical activity, health eating, environment, and water intake in order grow and develop into healthy adults. This provided an additional opportunity to reinforce health concepts and provided a visual demonstration of human growth.

The SAGE curriculum featured a well-balanced combination of structured and unstructured physical activity opportunities. Most physical activity during the ECE day is done during free play and many structured activities within preschool classrooms may even promote

sedentary behavior. The SAGE curriculum included a set of structured activities that were active and engaging, providing both learning and physical activity opportunities that encouraged children to meet physical activity recommendations outside of structured physical education time. SAGE included songs and games that could be conducted inside or outside, which helped to overcome barriers such as limited classroom space, lower or higher than expected attendance, or inclement weather. Curriculum that provides flexibility may be important for enhancing consistent implementation in future programming across a diverse array of settings.

Partnership with ECE directors and staff was vital for creating a curriculum that fit each center's needs and allowed individual centers to make adjustments to their own space, scheduling needs, ECE food and physical activity policies and existing curriculum to enhance the potential for sustainability. As a result, SAGE was developed to use developmentally appropriate concepts and activities, including simple games, memorable songs as well as teaching devices such as modeling and pretend play in order to deliver concepts in a manner that was effortless for preschoolers to understand. The emphasis on developmental appropriateness also made the curriculum easy to teach for instructors. Lessons in the curriculum were modularized to help overcome the unexpected barriers of field trips or other unexpected schedule changes. As well, staff members were often aware of children's family dynamics outside the school that impact translation of materials and concepts to the home, which would be important to capitalize on for high rates of adoption and translation of health behaviors from ECE centers to homes.

Limitations

SAGE was the result of a long and complex, evolving community partnership. Developing projects takes time and resources; thus, although the final product is low cost to deliver, it was costly to develop. In addition, although SAGE has shown great promise in demonstration projects, it has not yet been tested by large, randomized controlled trials to determine efficacy or longer term health and achievement outcomes. Future studies are needed that test SAGE in larger samples under more diverse environmental conditions.

Conclusions

SAGE presents a theoretically guided, age-appropriate, easy to implement, inexpensive and fun curriculum with potential for sustainability, successfully aligning national guidelines with ECE accreditation standards to address an important public health issue. Garden installations were made from simple and inexpensive materials and maintenance was easy, suggesting that these kinds of activities could be easily implemented by community partners, parents or interested center staff. In most cases, SAGE gardens and lessons were easy to integrate into existing ECE center resources. SAGE provides a feasible strategy that may help children to meet physical activity guidelines, improve interest and access to fresh fruit and vegetables, and increase understanding of internal hunger and fullness cues in the ECE setting pragmatically translating national policy into practice.

IMPLICATIONS FOR SCHOOL HEALTH

There is a need for improved curricula and ECE environments that are guided by federal standards to promote physical activity and nutrition and that meet accreditation standards. Curricula must be easy to implement, low resource intensive, supported by the ECE environment, and engaging for children and families. SAGE provides such a strategy that meets these requirements by enhancing the ECE environment and adding theoretically guided curricula. SAGE has been favorably received by ECE staff, children and community. SAGE can help to improve health and wellbeing in early childhood, which has been shown to contribute to learning and achievement outcomes throughout the lifespan.

Human Subjects Approval Statement

All procedures and materials used throughout the SAGE project were approved by the Committee for the Protection of Human Subjects at the University of Houston and the Internal Review Board at Arizona State University. All participants completed informed consent (parents) or assent (children), and all protocols were conducted in compliance with the Helsinki Accord to preserve inalienable human rights. No animals were used in this study.

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Session	Topic	Learning Content	Active Games	Songs	National Guidelines	NAEYC Standards
1	Where does my food come from?	- Plant life cycle - - Importance of fruit and vegetables	- Fruit and vegetable card tag - Play red apple, green apple (like red light, green light)	- Oh, do you eat your vegetables - Seedling song	- Early childhood obesity prevention policies (IOM)	2.A.08, 2.A.11, 2.A.12, 2.D.02, 2.D.07, 2.G.02, 2.G.05, 2.G.06, 2.G.08, 2.K.01
2	Nutrients for growth	- Elements needed for plants to grow - Nutrients and physical activity to health and growth	- Plant race - Healthy vs. Unhealthy	- Seedling song	- Dietary guidelines for Americans, 2010 (USDA) - Early childhood obesity prevention policies (IOM)	2.A.08, 2.A.10, 2.A.11, 2.A.12, 2.B.05, 2.D.02, 2.D.07, 2.G.02, 2.G.06, 2.G.08, 2.K.01, 5.A.06
3	I don't want to be a couch potato!	- Eating fruits and vegetables for health and strong muscles and bones	- Healthy vs. Unhealthy - Gardener says	- Seedling song - Exercise when we Rhyme	- Physical activity for Americans-Active children and adolescents (U.S. DHHS) - The importance of physical activity (USDA) - Early childhood obesity prevention policies (IOM)	2.A.08, 2.A.10, 2.A.11, 2.A.12, 2.B.05, 2.C.04, 2.D.02, 2.D.07, 2.G.06, 2.K.01 - Health standard 5.A.06
4	It's a watery world	- Importance of water: how much is in our body and how much we need to drink - Humans and plants need water to live	- Gardener says - Plant splash relay	- Seedling song	- Meeting the daily fluid needs (CDC) - Early childhood obesity prevention policies (IOM)	2.A.08, 2.A.10, 2.A.11, 2.A.12, 2.D.02, 2.D.03, 2.D.07, 2.E.05, 2.G.02, 2.G.05, 2.G.06, 2.G.08, 2.J.05, 2.K.01, 5.A.06
5	Chart the growth	- The plant growth process from seedling, to fruit, to harvest.	- Plant splash relay - Read Pumpkin, Pumpkin - Follow the leader	- Seedling song - Head, shoulders, knees and toes	- 2000 CDC' growth charts for the US: Methods and Development (CDC) - Facts about child development	2.A.08, 2.A.10, 2.A.11, 2.A.12, 2.B.05, 2.D.02, 2.D.07, 2.E.05,
6	Hungry humans, hungry plants	- Feeling hungry: choosing healthy food - Healthy eating and physical activity to grow big and strong	- Awesome appetites - Plant race	- Head, shoulders, knees and toes - Seedling song	(CDC) - Preschooler development (Medline) - Early childhood prevention policies (IOM) - Obesity prevention policies (IOM)	2.F.02, 2.G.02, 2.G.05, 2.G.06, 2.G.08
7	Am I hungry or full?	- Hunger and fullness - Learning how to avoid feeling too full	- Guess which tummy - Awesome appetites - Slug or hopper	- Seedling song	- Dietary guidelines for Americans, 2010 (USDA) - Vegetable health benefits and nutrients (USDA MyPlate) - Early childhood obesity prevention policies (IOM)	2.A.08, 2.A.10, 2.A.11, 2.A.12, 2.B.05, 2.D.02, 2.D.03, 2.D.07, 2.E.05, 2.F.03, 2.J.05, 2.K.01, 5.A.06
8	Eating to make my body strong!	- Review concepts of hunger and fullness - Eating different fruits and vegetables to make our bodies grow strong	- Slug or hopper - Awesome appetites - Follow the leader	- Seedling song - Head, shoulders, knees, and toes	- Dietary guidelines for Americans, 2010 (USDA) - Vegetable health benefits and nutrients (USDA MyPlate) - Early childhood obesity prevention policies (IOM)	2.A.08, 2.A.10, 2.A.11, 2.A.12, 2.B.05, 2.D.02, 2.D.03, 2.D.07, 2.E.05, 2.F.03, 2.J.05, 2.K.01, 5.A.06
9	Being active in the garden!	- Gardening for physical activity - Plant growth	- Gardener says - Plant, plant, weed	- Head, shoulders, knees, toes - Seedling song	- Physical activity for children (CDC) - Early childhood obesity prevention policies (IOM)	2.A.08, 2.A.10, 2.A.11, 2.A.12, 2.B.05, 2.C.04, 2.D.02, 2.D.07, 2.G.06, 2.K.01, 5.A.06
10	Nutrients to stay healthy	- Eating fruits and vegetables to grow big and strong	- Plant, plant, weed - Read apple, green apple	- Head, shoulders, knees, toes - Seedling song	- Dietary guidelines for Americans, 2010 (USDA) - Early childhood (USDA) - Obesity prevention policies (IOM)	2.A.08, 2.A.10, 2.A.11, 2.A.12, 2.D.02, 2.D.07, 2.E.05, 2.G.06, 2.G.08, 2.J.05
11	Time to harvest!	- Learning how to harvest the garden	- Peter Picker - Memory - Gardener says	- Seedling song	- Obesity prevention policies (IOM)	2.K.01, 5.A.06
12	Garden Party	This lesson is a review of previously learned content.	- Exercise while we rhyme - Plant, plant, weed - Red apple, green apple - Slug or hopper - Feed me - Gardener says - Peter Picker	- Head, shoulders, knees, toes - Seedling song	- Obesity prevention policies (IOM)	2.A.08, 2.A.10, 2.A.11, 2.A.12, 2.B.05, 2.C.04, 2.D.02, 2.D.03, 2.D.07, 2.G.02, 2.G.06, 2.G.08, 2.K.01, 5.A.06

Figure 1.
Overview of SAGE Curriculum Topics, Content, Guidelines and Standards

Table 1.

Physical activity, nutrition and early childhood guidelines and policies reviewed for inclusion in the SAGE curriculum

Physical Activity		Nutrition		Early Childhood
Early childhood prevention policies, Institute of Medicine		Early childhood prevention policies, Institute of Medicine		Facts about child development: Preschooler development (CDC/ Medline)
<ul style="list-style-type: none"> At least 15 minutes of physical activity every hour. Daily outdoor time for physical activity. Developmentally appropriate structured and unstructured physical activity. Integrating physical activity into social and cognitive developmental activities Increasing access to places and spaces that help promote physical activity Helping adults be active with children 		<ul style="list-style-type: none"> Exposure to an environment that helps promote eating a variety foods. Raise awareness of internal hunger and fullness cues Train caregivers on how to encourage and support these behaviors. 		<ul style="list-style-type: none"> Become more skilled at running, jumping, early throwing, and kicking Understand size relationships Counts to 10 The child should display initiative, curiosity, the desire to explore, and enjoyment without feeling guilty or inhibited The child should begin to develop social skills such as taking turns.
Physical activity for Americans-Active children and adolescents (U.S. DHHS)		Dietary Guidelines for Americans, 2010 (USDA)		
Children and adolescents should do 60 minutes or more of physical activity. Most of the activity should be moderate- or vigorous-intensity aerobic physical activity. Aerobic activities are those in which young people rhythmically move their large muscles. Running, hopping, skipping, jumping rope, swimming, dancing, and bicycling are all examples of aerobic activities.		<ul style="list-style-type: none"> Increase fruit and vegetable intake Eat a variety of vegetables, especially dark-green and red and orange vegetables and beans and peas Increase physical activity and reduce time spent in sedentary behaviors 		
The importance of physical activity (USDA)		Vegetable health benefits and nutrients (USDA MyPlate)		
Children should engage in regular physical activity, especially aerobic activities that make you breathe harder and make your heart beat faster.		<ul style="list-style-type: none"> Eating a diet rich in vegetables and fruits as part of an overall healthy diet may reduce risk for heart disease, including heart attack and stroke. Eating a diet rich in some vegetables and fruits as part of an overall healthy diet may protect against certain types of cancers. Diets rich in foods containing fiber, such as some vegetables and fruits, may reduce the risk of heart disease, obesity, and type 2 diabetes. 		
Physical activity for children (CDC)		Daily fluid needs (CDC)		
		<ul style="list-style-type: none"> Choose water over sugary beverages 		

Physical Activity	Nutrition	Early Childhood
<ul style="list-style-type: none">• Children and adolescents should do 60 minutes (1 hour) or more of physical activity each day.• Encourage your child to participate in activities that are age-appropriate, enjoyable and offer variety! Just make sure your child or adolescent is doing three types of physical activity: aerobic, muscle strengthening, and bone strengthening.	<ul style="list-style-type: none">• Know where the water fountains are at your school	

Table 2.

Examples of weekly SWOT feedback from SAGE instructors.

Strengths	Weaknesses	Opportunities	Threats
1. We are receiving strong support from our teachers. They are engaging with us in all aspects of the curriculum and the garden.	Some of the games are harder to play with large our large class size. Many of the children are having to wait to take turns and it is hard to keep everyone organized.	Once all children receive their fruit or vegetable, ask them to hold it in the air and chant, "Fruit and vegetables are the best!" This encourages them to wait till all students are ready to try the fruit and vegetables and allows us to deliver the mindful eating questions.	The teachers at our center would like to teach the children politeness and are requiring every child to try the fruit and vegetables. We want to be careful not to be forceful in introducing new fruit and vegetables. We will talk to them about appropriate things to say during tastings.
2. The kids are very engaged in the garden. They enjoy watering and weeding and looking for new produce. They are really showing ownership of the garden.	Some of the children have complained that it is too hot outside and are reluctant to fully engage in some of the more active games.	For some of the games we divide the class into teams of two and they really enjoy competing to be the winner and showing us how fast they are.	Next week, our class will be absent for vacation Bible school. We need to request an updated schedule of activities and field trips from your teachers.
3. Our use of pre-existing planters at the center really spreads the garden out, increasing the amount of physical activity that children get as they water the planters.	There is some confusion among the children between the full and just right tummy dolls.	The director offered to let us use the recreation room instead of the classroom where we will have more room to move around.	Some children with behavioral issues are impacting the experience of their classmates. We need to work with the teachers on classroom management, so that we can effectively deliver the curriculum to all children.
4. The children were so enthusiastic to receive their gardening gloves. They did not want to take them off and had a great time watering and interacting with the garden using their gloves.	It takes a long time to fill up water cans for all of the children. We don't want them to stand around waiting so we will begin filling up the watering cans before the lesson begins.	The kids really engage in the activities that include acting and role playing. Incorporate more acting and role playing in concepts that the children may have a harder time understanding.	When other classrooms are on the playground, it can be a distraction to the SAGE class.
5. Singing is the most requested activity. The children repeatedly ask for the "Seedling song" and "Head, knees, and shoulders" song.	Some of the movements like the "squat walk" are too difficult for some of the children in our class, so we are having to modify the game.	Talk to the kids about what they had for breakfasts, snack time, or lunch. They are always really eager to share and this gives you an opportunity to talk to them about whether their meal was healthy and if it made them feel hungry, just okay, or full.	With all of the toys, classroom materials, and snack tables, it is sometimes hard to have all the room we need in order to play some of our really active games.

Table 3.

Successes, challenges, and solutions to various components of the SAGE curriculum.

	Successes	Challenges	Solutions
Learning Objectives	The use of books, flashcards, and picture boards were great, age appropriate ways to communicate learning objectives.	Some objectives were difficult for all of the children in the class to grasp.	The use of modeling, pretend play, and examples were implemented to improve understanding. Instructors also used repetition increase understanding.
Games	Games were interactive and engaging. Instructors reported that the children were receptive and excited to play most games. The games were aligned with learning objectives and helped to reinforce new concepts that were taught in the classroom.	Some games were harder to play with larger class sizes (over 15 students). Some students did not have the motor skills for some of the movements.	To accommodate large class sizes, some games were played outdoors or in recreation rooms with more space. Also, games were modified to accommodate more students. For example, instead of a large circle, the instructors lined the children up in rows like a field of corn.
Songs	Singing was consistently a highlight across all centers. The songs were the most requested activity. The songs were interactive and taught new words and concepts.	There were no weaknesses reported for song activities. Some instructors reported that there was too much repetition of some songs.	To encourage more use of songs, instructors led the children through the songs as they watered the garden.
Garden Activities	The children enjoyed the hands-on activities in the garden. Children were eager to harvest new produce, water the garden, and put their hands in the dirt.	The gardens did not produce fruit and vegetables to observe or harvest on a weekly basis, which made the garden less engaging for some children.	In order to keep children engaged in the garden, despite not having produce to harvest, instructors lead the children through a series of sensory activities. Instructors asked children to smell herbs, touch the leaves to see if they were smooth or rough, and feel the soil to see if it was hydrated or dry.
fruit and vegetables Tasting	Having fruits and vegetables to taste at every lesson was exciting for the children. They looked forward to the tastings as a treat. By the end of the program, instructors reported that children were more willing to try new fruit and vegetables.	Because of the excitement surrounding the tastings, the children would eat their piece of fruit and vegetables before the instructor had the opportunity to lead the children through mindful eating questions to raise awareness of hunger and fullness cues.	Instructors asked the children to wait till everyone had received a piece of fruit or vegetable before holding it in the air and chanting as a class, "Fruits and vegetables are the best!" This stopped the children from eating the fruit or vegetable before the instructor could deliver the mindful eating questions.
Hunger & Fullness	The children enjoyed the dolls and all classes even named their dolls. The dolls allowed the children to visualize hunger and fullness.	Some children had difficulty distinguishing between the 'just okay' and the 'full' tummy.	Instructors used pretend play and provided the children with many examples to improve understanding.