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Outcome Framework for School Garden Program Development and Evaluation: A Delphi Approach

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Abstract

School gardens programs and garden-based education are positioned to become fixtures in educational institutions given recent trends and the national interest in gardens at school sites. Agricultural education professionals have integrated school gardens into core science, social studies, math, and language arts courses as well as agricultural education programs for elementary, middle, and high school curriculum. The literature shows that while there are specific curriculum links being made, school garden programs elicit a multitude of benefits in addition to enhancing student performance. Although the literature outlines an extensive set of impacts that may result from a school garden program, they are grounded in a specific case or intervention. Those who are planning for and evaluating school garden programs are left to make connections based on case study results or intervention trials, which leaves plenty of room for error. We utilized the Delphi approach with a panel of 74 experts to identify consensus on 38 outcomes that should be used to inform program development and evaluation efforts. Agricultural education professionals and other stakeholders connected to school gardens can use the results of this study to provide a solid foundation for an outcome-driven school garden program.

Keywords: Program development, program evaluation, outcomes framework, school gardens

Introduction

School gardens are not a new phenomenon and have been a part of United States school systems since 1890 (Duncan, Collins, Fuhrman, Knauft, & Berle, 2016). Educators originally utilized gardens at school sites to mitigate the perceived negative effects of urban life on their students (Smithsonian Gardens, 2017). They saw school gardens as an opportunity to connect youth to nature and improve their physical health, while teaching students the lessons of responsibility based on the hard work required to garden (Smithsonian Gardens, 2017).

A resurgence of interest in school garden programs came about in the early 1990s that resulted in the development of thousands of gardens on school sites across the country (Duncan, et al., 2016; Williams & Dixon, 2013). These gardens were not only located in urban areas but rural areas as well. School garden programs continue to grow across the country and receive national attention for the breadth of possible impacts from gardening and garden-based education. School

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standards are becoming aligned with newly designed garden curricula as these curricula emerge in schools, districts and state education departments (Williams & Dixon, 2013).

School gardens programs and garden-based education are positioned to become fixtures in educational institutions given recent trends and the national interest in gardens at school sites (Hayden-Smith, 2006; Williams & Dixon, 2013). The literature shows that while there are specific curriculum links being made with science, language arts, mathematics, social studies and writing; school garden programs exhibit a multitude of purposes and benefits. Williams and Dixon (2013) conducted a comprehensive survey of the literature and effectively outlined these purposes to include:

> (a) personal, social, physical, and moral development that also addresses self-concept, self-esteem, and motivation (Bowker & Tearle, 2007; Dirks & Orvis, 2005; Hendren, 1998; O'Brien & Shoemaker, 2006; Robinson & Zajicek, 2005; Sheffield, 1992; Simone, 2003); (b) positive environmental attitude and empathy (Berenguer, 2007; Dirks & Orvis, 2005; Skelly & Zajicek, 1998; Waliczek & Zajicek, 1999); (c) increased food literacy and healthy eating habits (Canaris, 1995; Koch, Waliczek, & Zajicek, 2006; Lineberger & Zajicek, 2000; Morris, Neustadter, & Zidenberg-Cherr, 2001; Parmer, Salisbury-Glennon, Shannon, & Struempler, 2009; P. J. Morgan et al., 2010); and (d) school bonding, parental involvement, and formation of community (Brink & Yost, 2004; Brunotts, 1998; Cutter-Mackenzie, 2009; Mayer-Smith, Bartosh, & Peterat, 2009; Waliczek, Logan, & Zajicek, 2003) (p. 212).

Williams and Dixon's work (2013) along with the work of Berezowitz, Yoder and Schoeller (2015) also found that curriculum connections being made by school gardens enhance academic performance among its students.

Agricultural education professionals engage in school gardening programs in various ways including integration into core science, social studies, math, and language arts courses as well as agricultural education programs for elementary, middle, and high school curriculum (Duncan et al., 2016; Graves, Hughes, & Balgopal, 2016). The success of these programs and the national school garden movement has relied on the support of many sectors and diverse stakeholder groups including farmers, non-profits, school administrators and teachers, parents, business, and food service as well as universities and cooperative extension (Feenstra & Ohmart, 2012). Estimates indicate approximately one in five Extension professionals are involved in school or community gardens (Benson, 2014). Extension professionals and their volunteers may support school garden initiatives by providing horticulture, nutrition, and food safety expertise and instruction (Black, Haynes, Schrock, Duerfeldt, & Litchfield, 2016; Dzubak, Shaw, Strohbehn, & Naeve, 2016). Additionally, farm to school programs connect local farms and schools in an effort to improve student nutrition, support producers, and provide education (Benson, 2014). Extension evaluation specialists may also play a role in guiding impactful school garden planning and evaluation.

Although the aforementioned literature outlines an extensive set of impacts that may result from a school garden program, they are grounded in specific cases or interventions. Those who are planning for and evaluating school garden programs are left to make connections based on case study results or intervention trials, which leaves plenty of room for error (Slavin, 2008). Also one of the challenges in extension programming for school gardens is the need to create a cohesive approach to support diverse programs that are composed differently and have different goals. Educators and other key stakeholders would benefit from a set of outcomes that cover a variety of school garden functions organized in the logical sequence of impacts following program

engagement. By providing such results, educators and support organizations can better plan their programs and understand when and how to collect data to understand their aggregate programmatic impacts (Israel, 2001).

Theoretical Framework

Utilizing principles of backward design (Wiggins & McTighe, 2005), agricultural educators have the opportunity to develop a program theory of change that focuses on mapping out the function of the program and how they lead to desired goals to be achieved (CTC, 2016). This process begins by identifying desired long-term goals and works backwards in identifying all the conditions that must be in place for the goals to occur, providing an outcomes framework (CTC, 2016). The outcomes framework provides the basis for identifying what type of activities will lead to the desired outcomes necessary to achieve the long-term goal and provides additional clarity on the precise link between activities and goal achievement (CTC, 2016). This approach promotes better planning because the activities are linked to a detailed understanding of how change actually happens (CTC, 2016; Rockwell & Bennett, 2004). It also enhances program evaluation as it allows educators to measure progress towards the achievement of longer-term goals that stretch beyond the identification of program outputs (CTC, 2016; Rockwell & Bennett, 2004; Wiggins & McTighe, 2005).

In utilizing the backwards mapping approach, it is important to consider Bennett's Hierarchy that outlines various outcome levels that connect the program activities to the intended long-term goals. Table 1 demonstrates the type of outcomes included in the hierarchy that may be immediate, intermediate or long-term in nature (Rockwell, 2004).

Table 1

The Outcome Types That Would Be Used in a Logic Model for Educational Programs

Immediate	Knowledge, attitudes, skills and aspirations
Intermediate	Behavior change or adoption of best practices
Long-term	Social, economic and environmental conditions

Note. Adapted from "Using Logic Models for Program Development" G. Israel, University of Florida Cooperative Extension Electronic Data Information Source AEC360. Adapted with permission.

Rockwell and Bennett (2004) explained that while immediate outcomes occur directly following engagement in a program activity, intermediate outcomes are expected months or years after program implementation followed by long-term outcomes.

While these concepts are important to consider, agricultural educators must have a specific model to follow that provides additional structure to the aforementioned process. An appropriate model for this case is The Targeting Outcomes of Program (TOP) Model. This model represents a framework commonly used in education that integrates the backwards design approach and Bennett's Hierarchy to focus on outcomes in planning, implementing and evaluating programs (Rockwell & Bennett, 2004). TOP's hierarchy also integrates program evaluation in the program development process allowing educators to target specific outcomes in program development and then to assess the degree to which the outcome targets are reached (Rockwell & Bennett, 2004).

While TOP can be used as a programming guide for a single organization, it also can be used for collaborative programming when agencies, organizations, or institutions focus on a strategic need area (Rockwell & Bennett, 2004). It promotes an outcomes framework and program priorities that are based on the views of stakeholders including teachers, administrators, program leaders, program participants, advisory groups and educational specialists. Rockwell and Bennett (2004) believed it created a collaborative advantage with the creation of synergy between collaborating organizations.

Finally, logic models provide an effective tool for educators to use within the TOP Model when putting together program plans for the development and evaluation of educational programs (Israel, 2001). In the planning phases, the intended outcomes are integrated into a logic model in the form of impact indicators that theoretically would result in the programmer's vision of success (Israel, 2001). These impact indicators should be used to develop program objectives that would guide the overall evaluation framework and associated evaluation tools. When integrating the additional components of a logic model that include process components, the educator is effectively identifying a causal relationship between the program and its intended outcomes otherwise known as the aforementioned program theory of change (Israel, 2001). By organizing the school gardens program in this manner, programs can measure, learn and improve based on intended outcomes and make proactive changes based on the deficiencies along the outcome chain.

Purpose and Objective

While developing a successful and robust school garden program is a complex task, there exists the potential to better inform the development and evaluation of such programs to ensure optimal impact and sustainability. The purpose of the study was to demonstrate the use of a framework for program development and evaluation that stakeholders, including agricultural educators, can adopt in order to show program outcomes. It did so by using an innovative tool, the Delphi technique, which a breadth of stakeholders can adopt. The objective of the study was to identify the most meaningful outcomes (short-term, medium-term, and long-term) that could be included in a program logic model and be utilized to measure the success of such programs. While school garden programs are diverse in size and populations served, this study aims to develop a comprehensive set of indicators that represent multiple types of stakeholders across Florida and integrates divergent needs into a single framework.

Methods

This statewide study used the Delphi technique to identify key outcomes that should be incorporated in evaluation frameworks across a variety of school garden programs. The Delphi technique is a research-based approach used to solicit, collate, and direct responses to achieve consensus among a group of experts. This approach has been cited as an effective means for structuring group communication so that the process is effective in allowing a group of individuals to address a complex situation (Delp, Thesen, Motiwalla & Seshadri, 1977; Linstone & Turoff, 2002; Warner, 2015). The Delphi technique is frequently used in the educational context to develop consensus for program priorities and objectives that can help guide planning and evaluation efforts of programs (Warner, 2015).

The population for this study consisted of key school garden experts that held various roles in school garden programs across the state of Florida. The group of experts was purposively selected in alignment with best practice for the Delphi technique (Stufflebeam, McCormick, Binkerhoff, & Nelson, 2012). In selecting the expert panel members, an advisory committee was developed that included representatives from state agencies, non-profits, institutions of higher

education and various school systems. The advisory committee utilized a selection framework that was predicated on including a breadth of experience, expertise and perspectives that stemmed from criteria that included years of experience, role(s) within the program, organization type and geographic area.

The advisory committee provided a total of 101 unduplicated nominees. From this list, all potential participants were contacted by the principal investigator via email or telephone to setup a scheduled phone call to provide additional information on the study and solicit their inclusion. Of the 101 potential study participants, 76 responded to initial communication. We chose to solicit a large panel of experts to include in this study to develop a comprehensive research product that integrates the breadth of expertise and roles, organizations, and geographic areas that effectively represents the network of key stakeholders and programs in the state. Only two of the 76 that were reached declined to participate in the study. Those that chose to participate received a copy of the initial question included in the first survey to provide time for thoughtful response.

Data Collection and Analysis

The study used a series of three online surveys, each administered following analysis of the previous survey. All 74 panel members were expected to participate in each round but non-participation did not result in their elimination from the study. The first round of the study used a survey with the open-ended item:

> Please list all of the outcomes that result from a successful school gardens program. Make sure to consider short-term outcomes (changes in knowledge, attitudes, skills and aspirations), medium-term outcomes (behavioral change/adoption of practices) and long-term impacts (societal, economic and environmental) when developing this list.

This item was used to facilitate the development of a comprehensive list of program outcomes based on the panel's experience with school garden programs. In each round of the survey, we asked the respondents to provide demographic information about themselves. This included information regarding the organization type that they represent, the role(s) they hold with the garden or garden program, the geographic region where their work takes place and the number of years of experience they have working with school gardens. To delineate geographic area, we utilized the Florida Extension districts. Both geographic region and roles were multiple response items, so each respondent could provide multiple responses based on their work.

Using the round 1 data, the researchers used a three-step process of content analysis to categorize the responses for developing the second-round survey (Merriam, 2009). Three researchers coded together to develop the initial themes, while an external member reviewed them and provided feedback (Blair, 2015). First, the data was assessed line by line and provided with codes. The responses were then read again multiple times until categories became well-defined. Then the individual categories were examined to create themes based on meaningful relationships with other categories and subcategories. The researchers then used the logic model framework to organize the themes within the short-term, medium-term or long-term outcome levels. The researchers used the logic model as the final step of data organization so that the subsequent surveys would solicit respondent evaluation based on similar outcome levels.

In the second survey, respondents were asked to rate items identified in round one on a seven-point Likert-type scale (1 = *Strongly Agree*, 2 = *Agree*, 3 = *Somewhat Agree*, 4 = *Neither Agree nor Disagree*, 5 = *Somewhat Disagree*, 6 = *Disagree*, 7 = *Strongly Disagree*). The

respondents were asked to frame their level of agreement based on how meaningful they felt it was to include such outcomes in the evaluation of a school garden program to ensure its success. Respondents were also asked to consider feasibility to ensure that school garden educators and other key stakeholders would have the capacity to evaluate such outcomes. The researchers adopted the criteria of at least two-thirds level of the group members identifying strongly agree or agree *a priori* as the common definition of consensus and inclusion into the third survey (Boyd, 2003; Conner et al., 2013; Harder et al., 2010; Shinn et al., 2009).

The third and final survey asked the respondents to identify their level of agreement on the same Likert-type scale with the shortened list of outcomes that achieved consensus in round two. The same definition of consensus was applied to the analysis of round three data. The number of iterations are up to the researchers, and two to four rounds are typically considered appropriate to achieve consensus (Delbecq, Van de Ven, & Gustafson, 1975; Linstone & Turoff, 2002). The design of Delphi studies, including the number of rounds employed, is open to modification by the researchers (Warner, 2015). As the majority of the items achieved consensus following round 3, we decided to conclude the study at this point.

Rigor and Trustworthiness

Multiple measures were used to ensure the credibility of the findings in order to promote research quality (Lincoln & Guba, 1985). Surveys were validated using an expert panel of program evaluators, agricultural and horticultural educators, and state school garden coordinators not included in the study. This panel provided a means for evaluating the content, construct and criterion validity of the surveys (Heal & Twycross, 2015). The instruments were piloted with members of the target audience to ensure it was easy to understand and would produce the intended results of the instrument.

Additionally, a team of experts was engaged in the debriefing process based on their knowledge of program development and evaluation, horticulture, nutrition, education and school gardens. After each step in the analysis process researchers created a memorandum for the team, updating them on the study process and data analysis. The peer debrief team provided guidance throughout the process.

To ensure the dependability of the study a dependability audit trail (Berg, 2004) was constructed based on detailed notes taken throughout the study. This audit trail was then used to conduct an inquiry audit that leveraged the input of external researchers to evaluate the researcher's ability to outline a process for replication. Each auditor was provided detailed notes that outlined the overall research process, the evolution of the process through analysis, and associated thoughts and decisions along the process.

A closely related confirmability audit trail was also constructed in order to authenticate the confirmability of the study. The confirmability audit was conducted at the same time as the dependability audit, requiring the auditors to evaluate whether the data and interpretations made are supported by material in the audit trail, are internally coherent, and represent more than the researchers' biased perspective (Lincoln & Guba, 1985). The audit trails provided detail for how data were collected, how categories were derived, and how decisions were made throughout the inquiry (Merriam, 2009). The audit trail provided an organizational structure to understand the relationship between the conclusions, interpretations, and recommendations by clearly linking to the data sources themselves. Triangulation was also used to increase confirmability (Lincoln & Guba, 1985). The researchers used multiple methods of triangulation including triangulation of

sources and analyst triangulation to help facilitate a deeper understanding of the phenomenon of interest.

Breakdown of Respondent Demographics

Overall, across all 3 rounds, the participants in this study averaged 10 years (M = 10.23, SD = 4.92) of experience working with school garden programs. Table 2 provides a breakdown of the rest of the respondent demographic information per round.

Table 2

A Breakdown of The Participant Demographics Per Round of The Delphi Study Including Organization Type, Role(S) in The Garden and Geographic Area(S) Where Program Takes Place

	Round 1 (n = 64)	Round 2 (n = 56)	Round 3 (n = 60)
	n (%)	n (%)	n (%)
Organization*			
University/Extension	20 (31.3)	18 (34)	18 (30.5)
State Agency	1 (1.6)	1 (1.9)	1 (1.7)
Non-profit	12 (18.8)	9 (17.0)	16 (27.1)
Elementary School	11 (17.2)	10 (18.9)	10 (16.9)
Middle School	5 (7.8)	5 (9.4)	3 (5.1)
High School	1 (1.6)	1 (1.9)	1 (1.7)
School Board/District	5 (7.8)	4 (7.5)	5 (8.5)
Other	9 (14.1)	5 (9.4)	5 (8.5)
Roles			
Administrator	27	18	22
Educator	46	36	35
Professional Development	19	11	10
Garden Team Member	26	12	15
Volunteer	23	10	8
Other	18	10	11

Table 2 (Continued)

A Breakdown of The Participant Demographics Per Round of The Delphi Study Including Organization Type, Role(S) in The Garden and Geographic Area(S) Where Program Takes Place

	Round 1 (n = 64)	Round 2 (n = 56)	Round 3 (n = 60)
	n (%)	n (%)	n (%)
Geographic Area			
Northwest	8	7	8
Northeast	4	5	5
Central	5	6	5
South Central	35	27	29
South	9	5	7
Statewide	3	4	5

Note. Both geographic region and roles were multiple response items, so each respondent may have provide multiple response based on their work and the reason percentages are not provided for these data.

*Denotes the percentage of respondents for each organization type. Percentages are only provided for organization type.

Results

Delphi Results by Round

Round 1

A total of 327 open-ended responses were collected in round one. After we combined responses with the same meaning, there were seventy-seven types of outcomes identified in the first round that included thirty-four immediate outcomes, twenty-six intermediate outcomes and seventeen long-term outcomes. The response rate for this round was 87% (n = 64).

Round 2

Fifty-six of the 74 individuals responded in round two for a 76% response rate. In this round, respondents were asked to rate their level of agreement with the 77 outcomes identified in round one on a seven point Likert-type scale related to the importance of inclusion in the evaluation of school garden programs. Consensus was achieved on 47 outcomes, while the other 30 fell below the two-thirds threshold and were eliminated from further study (see Table 3).

Table 3

Summary of the Delphi Study Round Two Results Showing the Percentage of Participants That Chose Strongly Agree or Agree for the Importance of the Inclusion of Each Item in the Evaluation of School Garden Programs.

Outcomes	Strongly Agree / Agree %
Immediate Outcomes (34)	
Increased knowledge and awareness of where food comes from (foods systems)	92.7
Students exhibit an increased willingness to eat more nutritious foods (i.e. fresh fruits and vegetables)	90.9
Students exhibit increased knowledge about nutrition and understand the importance of eating healthy to promote wellness	87.3
Students exhibit an increase in knowledge of healthy eating habits	87.3
Students demonstrate increased ability to identify various plants and produce (i.e. fruits and vegetables)	85.5
Students demonstrate an increase in knowledge and appreciation for the natural environment	83.6
Increasing knowledge, skills and confidence for planning and carrying out gardening best practices	83.6
Fosters love of gardening among students that increases their enthusiasm for learning	83.3
Increased life skills including leadership, accountability, teamwork/cooperation, social skills, responsibility, focus and patience	80.0
Students demonstrate increased knowledge of the value of a garden	78.2
Increased knowledge and skills through cross curricular integration in topics associated with gardening (i.e. science, technology, engineering math, social sciences, history, language arts, etc.)	74.5
Increased knowledge and skills among teachers for cross-curricular integration at the gardens	74.5
Students demonstrate positive attitudes towards exercise while gardening	70.4
Students demonstrate increased knowledge and appreciation for the hard work associated with gardening	69.1
Students, parents and teachers demonstrate increased knowledge, skills, interest and confidence for growing their own food	69.1

Table 3 (continued)

Summary of the Delphi Study Round Two Results Showing the Percentage of Participants That Chose Strongly Agree or Agree for the Importance of the Inclusion of Each Item in the Evaluation of School Garden Programs.

Outcomes	Strongly Agree / Agree %
Students exhibit an increase in knowledge and appreciation for the value of local food systems (i.e. local foods, local agriculture, local farmers, etc.)	69.1
Families demonstrate increased awareness and interest in home gardening	69.1
Students and teachers exhibit increased knowledge and awareness of food safety practices	67.3
Teachers exhibit increased knowledge for engaging the community (school community and surrounding neighborhoods) in gardening*	61.8
Increased awareness of the idea that gardens cross over the three pillars of wellness: nutrition, emotional well-being and physical activity*	60.0
Increased awareness, skills and interest in careers in food, agricultural, natural resources and human sciences*	60.0
Students demonstrate increased knowledge of how the garden can generate income and provide foods at a lower cost*	56.4
Students demonstrate increased knowledge of the benefits of organic gardening*	56.4
Teachers demonstrate attitudes of fulfillment and enjoyment toward their jobs*	54.5
Students demonstrate increased knowledge and skills for healthy food preparation*	52.8
Students demonstrate increased knowledge in the connection between natural systems and the human body*	49.1
Students demonstrate increased knowledge of societal issues (hunger, poverty, education)*	49.1
Students exhibit increased awareness and knowledge of sustainable communities.*	49.1
Students and staff demonstrate increased skills to deal with stress*	43.6
Students demonstrate increased knowledge of the importance of preparing and eating meals with family, friends and others*	41.8
Students demonstrate increase knowledge of environmental issues at multiple scales (local, state, national, international)*	41.8

Table 3 (continued)

Summary of the Delphi Study Round Two Results Showing the Percentage of Participants That Chose Strongly Agree or Agree for the Importance of the Inclusion of Each Item in the Evaluation of School Garden Programs.

Outcomes	Strongly Agree / Agree %
Students demonstrate increased knowledge of skills related to agribusiness*	38.2
Students demonstrate increased awareness and knowledge of agricultural technology*	32.7
Students demonstrate increased knowledge of fiber production*	16.4
Intermediate Outcomes (26)	
Adults positively engage with students in the garden	81.8
Students, Parents and Teachers make healthier food choices (i.e. expanding palate, eating more fruits and vegetables, trying new healthy foods/drinks)	81.8
Students are more engaged (participate, listen and pay attention to lesson)	80.0
Students engage in nature through outdoor activities	80.0
Students take home produce for cooking/consumption at home	80.0
Increased parent and community engagement in the garden	80.0
Teachers incorporate nutrition education into garden instruction	78.2
Teachers develop and implement garden-based curriculum that leverages real-world application of multiple disciplines (i.e. math, science, history, etc.) and connects to state standards	76.4
Students and staff share healthier options and lifestyles with others	74.5
Administrators designate the garden as an outdoor classroom to be incorporated in the regular school	72.7
Create a plan and structure to collaboratively manage the gardens	72.7
Students increase their physical activity	72.2
Students will protect their environmental by using sustainable gardening practices (water conservation, composting, re-use of materials, etc.)	69.1
School receive donations from local business	69.1

Table 3 (continued)

Summary of the Delphi Study Round Two Results Showing the Percentage of Participants That Chose Strongly Agree or Agree for the Importance of the Inclusion of Each Item in the Evaluation of School Garden Programs.

Outcomes	Strongly Agree / Agree %
Students and teachers conduct gardening and food preparation practices in accordance with proper food safety	69.1
Students and teachers encourage family members to garden at home	67.3
New partnerships formed with school district, youth organizations, farmer, businesses, state/local government, non-profits, community stakeholders*	63.6
Students, Teachers and Parents purchase more local whole foods and less processed foods*	63.6
Increased incorporation of garden produce at school (i.e. school cafeterias)*	63.6
Students are more engaged within their families and communities*	61.8
Students decrease sedentary behaviors (i.e. decrease in watching television)*	58.2
Students use their personal journal to record plant observation for writing practice and creative expression*	58.2
Elementary and middle school partner with local high school so there is a continuation in programming*	52.7
Students attend more classes*	48.1
Gardens are funded specifically to grow food for the lunchroom*	29.1
Long-term Outcomes (17)	
Increase in the number of school, community and home gardens	87.3
Sustainable school gardens (sustained for multiple years)	83.6
Increased access to fresh fruits and vegetables	83.3
Improved quality of outdoor school environment	83.3
Students and teachers become environmental stewards	78.2
Increase in the number of partnerships for school gardens	78.2
Students are connected to nature and their food	74.1

Table 3 (continued)

Summary of the Delphi Study Round Two Results Showing the Percentage of Participants That Chose Strongly Agree or Agree for the Importance of the Inclusion of Each Item in the Evaluation of School Garden Programs.

Outcomes	Strongly Agree / Agree %
Complete school program that provides a continuum of education from elementary through post-secondary	74.1
A productive edible garden that provides produce for students to bring home	72.7
Future generations participate in sustainable agricultural practices	70.9
Healthier garden participants (physical and mental health)	70.9
Increased quantity and variety of Florida grown foods served in cafeterias*	63.6
Students are more successful in school (i.e. increase in standardized test scores)*	60.0
Increase in sustainable local foods systems that strengthen local economies and promote financial security*	52.7
Safer, more resilient communities*	51.9
Peace in school*	36.4

*These items did not achieve consensus and were removed for round 3

The outcomes with the highest level of agreement in the immediate outcomes range centered on food systems, nutrition and wellness, horticulture and attitudes toward gardening, and the natural environment. The outcomes with the highest level of agreement in the medium-term range were predominately focused on students sharing knowledge about gardening, parents and community members engaging in gardening with youth, making healthier food choices, engagement with instruction and engagement in outdoor activities. The outcomes with the highest level of agreement in the long-term outcomes range included an increase in the total number of gardens (school, community and backyard), increased sustainability of the gardens, increased healthy food access, improved quality of outdoor school environment, the increase in environmental stewards and the increase in the number of partnership for school gardens.

Respondents exhibited variance that school gardens should be developed and evaluated based on their ability to increase the agribusiness knowledge and skills of their participants along with increasing their knowledge of larger scale environmental issues. Respondents felt, that in the intermediate, success should not be evaluated based on the gardens ability to be funded to grow food for the lunchroom, its ability to promote increase students' attendance and its ability to create partnerships for the development of a program continuum. Additionally, respondents varied on their perspective that school gardens should be developed and evaluated based on their ability to create larger scale, positive economic and social conditions related to strengthening local economies and providing financial security, creating safer and more resilient communities and creating peace in school.

Round 3

In round three, consensus was achieved on 38 of the shortened list of 47 items that fell within the definition of consensus based on the responses from round two (see Table 4). Panel members were asked to go through the same exercise as in round two in an attempt to capture any potential changes in perception based on the shortened list. Sixty of the 74 panel members responded in this round for an 81.8% response rate.

Table 4

Summary of The Delphi Study Round Three Results Showing the Percentage of Participants That Chose Strongly Agree or Agree for the Importance of the Inclusion of Each Item in the Evaluation of School Garden Programs.

Outcome	Strongly Agree / Agree %
Immediate Outcomes (18)	
Increased knowledge and awareness of where food comes from (foods systems)	94.9
Students exhibit an increase in knowledge of healthy eating habits	86.4
Fosters love of gardening among students that increases their enthusiasm for learning	86.4
Students exhibit increased knowledge about nutrition and understand the importance of eating healthy to promote wellness	84.7
Increased life skills including leadership, accountability, teamwork/cooperation, social skills, responsibility, focus and patience.	84.7
Students exhibit an increased willingness to eat more nutritious foods (i.e. fresh fruits and vegetables)	83.1
Increased knowledge and skills among teachers for cross-curricular integration at the gardens	83.1
Students, parents and teachers demonstrate increased knowledge, skills, interest and confidence for growing their own food.	81.4
Students demonstrate increased ability to identify various plants and produce (i.e. fruits and vegetables)	81.4
Students demonstrate an increase in knowledge and appreciation for the natural environment	81.4

Table 4 (Continued)

Summary of The Delphi Study Round Three Results Showing the Percentage of Participants That Chose Strongly Agree or Agree for the Importance of the Inclusion of Each Item in the Evaluation of School Garden Programs.

Outcome	Strongly Agree / Agree %
Increasing knowledge, skills and confidence for planning and carrying out gardening best practices	81.4
Students demonstrate increased knowledge of the value of a garden	81.4
Increased knowledge and skills through cross curricular integration in topics associated with gardening (i.e. science, technology, engineering math, social sciences, history, language arts, etc.)	79.7
Students exhibit an increase in knowledge and appreciation for the value of local food systems (i.e. local foods, local agriculture, local farmers, etc.)	69.5
Families demonstrate increased awareness and interest in home gardening*	64.4
Students demonstrate increased knowledge and appreciation for the hard work associated with gardening*	64.4
Students demonstrate positive attitudes towards exercising while gardening*	59.3
Students and teachers exhibit increased knowledge and awareness of food safety practices*	55.9
Intermediate Outcomes (17)	
Students engage in nature through outdoor activities	86.4
Students are more engaged (participate, listen and pay attention to lesson)	78.0
Students share knowledge about gardening	76.3
Adults positively engage with students in garden	76.3
Students, parents and teachers make healthier food choices (i.e. expanding palate, eating more fruits and vegetables, trying new healthy foods/drinks)	76.3
Teachers incorporate nutrition education into garden instruction	74.6
Create a plan and structure to collaboratively manage the gardens	74.6

Table 4 (Continued)

Summary of The Delphi Study Round Three Results Showing the Percentage of Participants That Chose Strongly Agree or Agree for the Importance of the Inclusion of Each Item in the Evaluation of School Garden Programs.

Outcome	Strongly Agree / Agree %
Students will protect their environment by using sustainable gardening practices (water conservation, composting, re-use of materials, etc.)	74.6
Teachers develop and implement garden-based curriculum that leverages real-world application of multiple disciplines (i.e. math, science, history, etc.) that connects to state standards.	72.9
Students increase their physical activity	72.9
Increased parent and community engagement in the garden	72.4
Students take home produce for cooking/consumption at home	71.2
Administrators designate the garden as an outdoor classroom to be incorporated in the regular school	69.5
School receives donations from local business*	66.1
Students and teachers gardening and food preparation practices in accordance with proper food safety practices*	65.5
Students and staff share healthier options and lifestyles with others*	64.4
Students and teachers encourage family members to garden at home*	54.2
Long-term Outcomes (12)	
Improved quality of outdoor school environment	83.1
Increased access to fresh fruits and vegetables	79.3
Sustainable school gardens (sustained for multiple years)	78.0
Students are connected to nature and their food	78.0
Healthier garden participants (physical and mental health)	76.3
Increase in the number of school, community and home gardens	74.6
Students and teachers become environmental stewards	74.6

Table 4 (Continued)

Summary of The Delphi Study Round Three Results Showing the Percentage of Participants That Chose Strongly Agree or Agree for the Importance of the Inclusion of Each Item in the Evaluation of School Garden Programs.

Outcome	Strongly Agree / Agree %
Increase in the number of partnerships for school gardens	74.6
A productive edible garden that provides produce for students to bring home	69.5
Future generations participate in sustainable agricultural practices	69.5
Complete school program that provides a continuum of education from elementary through post-secondary*	59.3

*These items did not achieve consensus

Four of the nine outcomes that did not maintain consensus resided in the immediate outcomes range related to awareness and interest for gardening at home, increased knowledge and appreciation for the hard work associated with gardening, positive attitudes towards exercising while gardening and knowledge of food safety practices. An additional four of the nine outcomes that did not maintain consensus resided in the intermediate outcomes range related to the schools receiving donations from local business, utilizing best practices related to food safety, sharing healthier options and lifestyles and encouraging family members to garden at home. Finally, only one of the nine outcomes that did not maintain consensus resided in the long-term range and related to creating the condition where there exists a complete school program that provides a continuum of education from elementary through post-secondary.

Conclusions

Utilizing the Delphi technique proved to be a useful approach in gaining the input of a diverse panel of key experts in the identification of set of agreed outcomes that are essential to school gardens. The panel reached consensus on 14 immediate outcomes, 13 intermediate outcomes and 11 long-term outcomes. The panel viewed increasing the students' knowledge of food systems, increasing their engagement in nature through outdoor activities and increasing the quality of the outdoor school environment as top priorities for school gardens. Since the panel of experts represented the diversity of stakeholders involved in community gardens across the state, it provided a comprehensive and holistic lens to the Delphi technique that included varied interests, expertise and perspectives.

This process shows how a network of key stakeholders that exist in the context of school gardens can work together to develop an outcome-driven program. In addition, this model provides a basis for identifying a program's performance measures because components that are important enough to include in a logic model should also be the focus for performance measurement (Israel, 2001). It is important to take the results of this study into consideration when planning or refining a school garden program but should not be viewed as a panacea as local needs should be integrated into planning decisions. The results have the potential to inform a comprehensive framework for

school garden program development and evaluation that agricultural educators, extension faculty and staff, and other school garden key stakeholders, can adopt and implement to consistently demonstrate positive program outcomes across geographic regions.

Implications and Recommendations

Agricultural education professionals and other stakeholders connected to school gardens can use the results of this study to provide a solid foundation for an outcome-driven school garden program. This study provided additional rigor and evidence than can be transferred from a specific case or intervention strategy, by bringing a diverse group of experts to help to inform these efforts across the state of Florida and beyond. Their input can be integrated within backward design approach and help streamline the review process for new school garden educators looking to create their own program, or existing stakeholders looking towards program refinement.

When planning for school garden initiatives, agricultural education professionals and school garden stakeholders should consider the findings of this study. The immediate, intermediate, and long-term outcomes can be used to design the structure of a school garden, formal and informal curriculum for students, and can serve as a guide for school garden evaluation. These outcomes may also be used as framework for grant-seeking activities and to assist with demonstrating accountability to funders (Rockwell & Bennett, 2004). We recommend those associated with school garden programs consult this list and select the most important and relevant outcomes for their local context and students' needs.

A good starting place in using these findings may be to consider the outcomes that received the highest level of agreement as they are likely to be the most universal among school garden programs. In the short-term, school gardens should increase knowledge of food systems of healthy eating while nurturing a love of gardening among students. Medium-term, school gardens should promote connection to nature, more engaged students, and sharing of gardening information. In the long-term, school gardens should result in better outdoor environments, improved access to healthy produce, and sustained school gardening programs.

This study goes beyond providing desired results that are simply related to learning outcomes and are expanded to include behavior change, adoption of best practices and the creation of long-term conditions. This expansion holds promise for those that intend to achieve far reaching impacts, which is necessary for program accountability and public support (Williams & Dixon, 2013). Integrating the results of this study using the backward design into a program logic model ensures that results may provide a valuable contribution towards an educators' program theory of change (Israel, 2001) and potentially clarify points where evaluation tools are needed in addition to provide additional clarity in the development and selection of instructional strategies (Wiggins & McTighe, 2005).

Agriculture educators have the opportunity to use our results or the results of their own Delphi study to work in collaboration with their support network to outline a corresponding outcomes framework using the logic model (Israel, 2001; Rockwell & Bennett, 2004). Figure 1 provides a basic example of a casual chain of outcomes organized within the logic model and outlined in terms of the backwards design principles of the TOP Model.

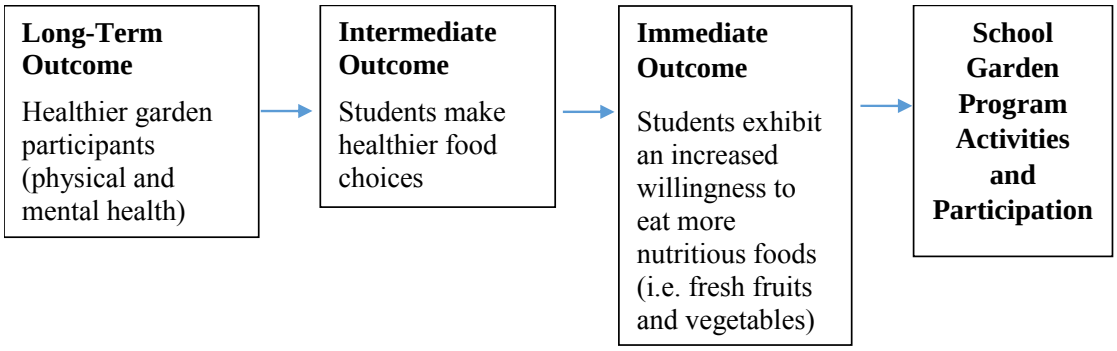

Figure 1. Outcome Results of the Delphi Study Outlined in Terms Backwards Design Using Bennett's Hierarchy within the TOP Model Organized for a Program Logic Model

Within the example, the educator's long-term vision for success includes the outcome of developing healthier garden participants. This program theory of change demonstrates that to achieve that long-term outcome, students must make healthier food choices predicated on the program's ability to positively influence their willingness to eat more nutritious foods. Since the results of this study were organized similarly to a logic model, agricultural educators or support organizations tasked with developing garden activities may better understand how to influence participants' knowledge, attitudes, skills, and aspirations necessary to achieve behavior change or the adoption of best practices (Israel, 2001). While the example in Figure 1 provides the casual chain of outcomes, it is also important to develop a set of associated measurable impact indicators for evaluating program success. Possible impact indicators for the above example may include: lowering body mass index, reducing occurrences of obesity, reducing occurrences of diabetes, and decreased use of related medication to name a few.

With the presented structure, those responsible for evaluating program performance can better understand when to administer evaluative tools and how they should be structured (Israel, 2001). The hierarchy of outcomes not only maps what evaluation should measure but also provides a timeline of expected results to inform appropriate timing for administering evaluation tools. So for instance, the example above outlines an immediate outcome related to increasing the students' willingness to eat more nutritious foods. As a result, agricultural educators need to develop and administer tools directly following student engagement with the related activity to evaluate its ability to achieve the intended outcome. Additionally, follow up instruments or mechanisms would need to be developed to measure intermediate or long-term outcomes that are expected either months or years following implementation. It is important to understand this dynamic to effectively align evaluation with the appropriate timing of outcomes (Israel, 2001). Regardless of whether the agricultural educator is responsible for evaluating these outcomes or a support organization is leading such an effort, it is important that they understand these principles to serve as an effective resource in utilizing evaluation data to make programmatic decisions (Rockwell & Bennett, 2004).

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