THE JOY OF FOOD EDUCATION

A Review on the Impact of Food Education Programs like Edible Schoolyard NYC

Researched and prepared by Natalie Caparelli, Evaluation Intern 2021,
MPH candidate CUNY School of Public Health and Health Policy

Executive Summary

Edible Schoolyard NYC (ESYNYC) and similar organizations address educational resource and health disparities between racial groups stemming from systemic social and economic inequity by supporting children's access to food education. A substantial and rigorous body of scientific evidence supports the numerous benefits of hands-on gardening and cooking programs. Food education programs, such as Edible Schoolyard NYC, promote positive impacts on dietary, academic, and socioemotional outcomes among children and adolescents. ESYNYC is encouraged by the emerging literature exploring program impacts on students' socioemotional learning, and we are working to include more practice to amplify the socioemotional learning impacts of our curricula and programs. Furthermore, ESYNYC is interested in the long-term impact of the program on student's food and environmental justice activism. This outcome has a strong relation to social awareness, one of the five socioemotional competencies. Our internal evaluations are in line with what research has found: that the positive impact of food education interventions, like ESYNYC, are diverse and range from dietary behaviors and habits to socioemotional learning, to encouraging young activists' development.

Introduction

Edible Schoolyard NYC's (ESYNYC) mission is to support edible education for every child in New York City. We partner with New York City public schools to cultivate healthy students and communities through hands-on cooking and gardening education, transforming children's relationship with food. Through our culturally responsive curricula, students, families, school staff, and other community members gain socioemotional competence, skills, and knowledge; and

improve their dietary behaviors, all while enjoying themselves. They also benefit from the improvements, to school culture and physical environment that are facilitated by ESYNYC. Ultimately, our work nurtures healthy school communities where all members can thrive socially, emotionally, academically, and physically.

At ESYNYC, program evaluations show that students who grow and prepare plant-based foods love eating them. For example, in the 2020-21 school year, we found that 96% of students try the food they make in our lessons. Edible education not only sets students up for strong socioemotional competency, healthier habits for life, and supports their growth as activists for a just and healthy food system but supports students' happiness and readiness to learn. When watering the plants, one student exclaimed, "I'm having so, so, so, so much fun!" On the way to class one student sped up and said, "Hurry, we can't waste time. We've got to get to garden class!" Our decade of experience in hands-on food education has shown us a wide array of positive changes that are possible because students are excited and happy to learn in the garden and kitchen classrooms.

The literature supports that hands-on and experiential learning offered by arts and enrichment programs, such as ESYNYC, are the best practices in program delivery that lead to better outcomes, such as socioemotional, behavioral, and dietary outcomes, than traditional academic education.[1] This review uses evidence from scientific literature to describe the outcomes of garden and cooking education and how they help us to achieve our mission to support the holistic health of school communities. First, we review the more frequently researched impacts on diet and academics. Then, we explore our newest outcomes that we are measuring, ones that are also newer to the scientific literature: socioemotional development and related commitment to food justice.

Needs of the Community

Students of some racial and ethnic minorities, especially those of low socioeconomic status, are disproportionately more likely to experience disparities in their education, such as reduced funding and school resources.[2] According to the New York City Department of Education (NYC DOE) data, 73% of students in New York City come from economically disadvantaged backgrounds and 82% identify as students of color.[3] ESYNYC partners with New York City public schools located in low-income communities, especially those areas identified by the NYC Department of Health as having the highest rates of diet-related diseases. 87% of the students enrolled in ESYNYC schools are students of color and 74% come from households with incomes below the federally defined poverty line. According to a 2018 study, nearly half of New York City's students do not receive any external

[1] DeCosta, P., Møller, P., Frøst, M. B., & Olsen, A. (2017). Changing children's eating behaviour-A review of experimental research. *Appetite*, *113*, 327-357.
[2] Why We Can't Have Social and Emotional Learning Without Equity. (2018, July). Retrieved October 11, 2021, from https://drc.casel.org/uploads/sites/3/2019/05/Jagers-Equity-Blog-.pdf.
[3] *DOE data at a glance*. New York City Department of Education. (n.d.). Retrieved December 7, 2021, from https://www.schools.nyc.gov/about-us/reports/doe-data-at-a-glance.

nutrition education programs in school.[4] We work to add resources to historically under-resourced schools by providing full time staff, gardens, cooking classroom maintenance, professional development opportunities, and in school and extracurricular program opportunities for students and the community.

In New York City, nearly one in four children is food insecure;[5] almost 275,000 of the 1.1 million public school students are not getting the food that they need to thrive. Food insecurity is not only linked to lack of food but to a reduced consumption of nutrient dense food and fresh produce. Research has shown that consuming a diet high in fruit and vegetables reduces the risk of diet-related disease.[6] Thus, healthy eating in childhood is important for both proper development and prevention of various health conditions. However, according to the CDC, 60% of American children do not eat enough fruit to meet daily nutritional recommendations, while 93% of children do not eat enough vegetables.[7] Research has also found inadequate consumption of fruit and vegetables among adolescents from low socioeconomic backgrounds.[8] Further, poor nutrition has contributed to the rising burden of diet-related diseases in the United States. These include cardiovascular disease, high blood pressure, type 2 diabetes, and cancer.[9]

People of some racial and ethnic minorities, especially individuals with low socioeconomic status (SES), are at disproportionately greater risk for dietary diseases.[10,11] These health disparities between racial groups stem from social and economic inequality due to the systemic racism that permeates the American food system, and not any inherent differences in the bodies of people of different races. Accessing affordable, high-quality, and healthy food is a challenge for many families in low-income neighborhoods of color. Importantly, organizer, farmer, and educator Karen Washington urges us to retire the term "food desert" traditionally used to describe neighborhoods with limited access to healthy foods and teaches

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4 Koch PA, McCarthy JE, Uno C, Gray HL, Simatou G. A is for Apple: The State of Nutrition Education Programs in New York City Schools. Laurie M. Tisch Center for Food, Education & Policy, Program in Nutrition at Teachers College, Columbia University, March 2018.

[5] Gundersen, C., Dewey, A., Kato, M., & Strayer, M. (2019). Map the Meal Gap 2019: A Report on County and Congressional District Food Insecurity and County Food Cost in the United States in 2017. *Feeding America*.

[6] Hung, H. C., Joshipura, K. J., Jiang, R., Hu, F. B., Hunter, D., Smith-Warner, S. A., ... & Willett, W. C. (2004). Fruit and vegetable intake and risk of major chronic disease. *Journal of the National Cancer Institute*, *96*(21), 1577-1584.

[7] Centers for Disease Control and Prevention. (2011). School Health Guidelines to Promote Healthy Eating and Physical Activity. MMWR 2011:60.

[8] Neumark-Sztainer, D., Story, M., Resnick, M. D., & Blum, R. W. (1996). Correlates of inadequate fruit and vegetable consumption among adolescents. *Preventive Medicine: An International Journal Devoted to Practice and Theory*.

[9] Centers for Disease Control and Prevention. (2018, August 13). Adult Obesity Facts | Overweight & Obesity | CDC. Retrieved from https://www.cdc.gov/obesity/data/adult.html

[10] Bilger, M., Kruger, E. J., & Finkelstein, E. A. (2016). Measuring Socioeconomic Inequality in Obesity: Looking Beyond the Obesity Threshold. *Health Economics*, *26*(8), 1052–1066. doi:10.1002/hec.3383

[11] Psaltopoulou, T., Hatzis, G., Papageorgiou, N., Androulakis, E., Briasoulis, A., & Tousoulis, D. (2017). Socioeconomic status and risk factors for cardiovascular disease: impact of dietary mediators. *Hellenic Journal of Cardiology*, *58* (1), 32-42.

us to use the term "food apartheid" to draw attention to the structural racism which affects the distribution of food resources throughout the country. This lack of food access is not a natural phenomenon, but a socio-economic extension of racism. Washington and other food systems experts also emphasize the enormous potential and vibrancy of communities of color, advocating for taking an intersectional approach to addressing dietary disease by looking at the whole food system with an interconnected lens involving multiple aspects of society such as health, education, class, and environment.[12]

ESYNYC and similar organizations address educational resource and health disparities between racial groups stemming from social and economic inequality by supporting children's access to and love of plant-based foods, and their development as food justice advocates[13] in a food environment where they spend much of their time, at school. Children's eating behaviors and attitudes are easiest to influence when they are young.[14] This means that schools play an essential role in helping students learn good eating habits and providing many opportunities for children to eat healthfully.

Dietary Impacts

The existing literature cites numerous dietary impacts of school gardening and cooking programs among participating students. Common outcomes reported include changes in knowledge in preparing, cooking, and eating healthier food; improved attitudes and increased preference for plant- based food; increased willingness to try new food; and improved eating behaviors. Participation in school gardening and cooking programs also have been found to increase children's exposure to and ability to identify fruits and vegetables.[15]

When our students grow and cook their own plant-based foods, they express an increased willingness to taste them, tend to enjoy them more, and feel more confident about their cooking ability. For example, over 10 years, we have found that 97% of students try the food they made in our lessons. Additionally, in 2019, we found that 78% of our students reported increased vegetable preference from third to fifth grade. This impact is well expressed by a fifth grader at PS/MS 7, who previously expressed they would not like figs, commented, "These [figs] are my new favorite thing." A study of the FoodCorps' schools found that students participating in hands-on cooking and gardening activities were reported to be eating three times the amount of fruits and vegetables than students who received

[12] Brones, A. (2018, May 7). Karen Washington: It's Not a Food Desert, It's Food Apartheid. *Guernica*. Retrieved from https://www.guernicamag.com/karen-washington-its-not-a-food-desert-its-food-apartheid/

[13] Ralston, Shane. (2012). Educating future generations of community gardeners: A Deweyan challenge.

[14] Scaglioni, S., De Cosmi, V., Ciappolino, V., Parazzini, F., Brambilla, P., & Agostoni, C. (2018). Factors Influencing Children's Eating Behaviours. *Nutrients, 10* (6), 706. doi:10.3390/nu10060706

[15] Kim, H. R., Kim, S. O., & Park, S. A. (2021). The Effects of Horticultural Activity Program on Vegetable Preference of Elementary School Students. International journal of environmental research and public health, 18(15), 8100. https://doi.org/10.3390/ijerph18158100

traditional nutrition education lessons.[16] Similar studies have shown a connection between gardening and positive changes in dietary behaviors at school and home. As willingness and liking are important determinants of consumption among children, these changes in attitudes have been found to impact behaviors of consuming fruits and vegetables and asking for fruits and vegetables at home.[17]

ESYNYC's approach to food education is to provide a creative and interactive experience in the classroom where working with food is fun. At ESYNYC students engage in various hands-on and experiential learning activities. For example, hands-on activities such as cooking the meal have the potential to facilitate dietary behavior change because children are more willing to try and consume food they prepared and cooked themselves.[18] Numerous studies have also found that garden-based nutrition education programs had better outcomes compared to in-classroom nutrition education programs, particularly in fruit and vegetable consumption.[19] These findings have established the value of gardening education as an integral component of nutrition education programs.

Academic Impacts

The positive benefits of school garden and cooking programs extend beyond dietary outcomes to academic achievement. Studies show that school gardens and kitchens are proving to be centers of learning that equip students with knowledge and skills to succeed academically.[20] Several programs have found increases in nutrition,[15,21] science,[16,22] horticultural,[6] and environmental[16] knowledge demonstrated by pre/post testing of students who participated in gardening and cooking lessons.[21] Improved environmental attitudes is another common academic outcome among children who participate in gardening lessons.[16]

These results suggest the potential to help close the "achievement gap".[23] In the U.S., the achievement gap refers to the significant and persistent disparity in academic performance or educational attainment between different groups of

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[16] Koch P, Wolf R, Graziose M, Gray HL, Trent R, and Uno C. FoodCorps: Creating Healthy School Environments. Laurie M. Tisch Center for Food, Education & Policy, Program in Nutrition, Teachers College, Columbia University. February, 2017.

[17] Heim, S., Stang, J., & Ireland, M. (2009). A garden pilot project enhances fruit and vegetable consumption among children. Journal of the American Dietetic Association, 109 (7), 1220-1226.

[18] University of Alberta. (2012, June 27). Kids who cook are hungrier for healthy food choices. *ScienceDaily*. Retrieved April 23, 2019 from www.sciencedaily.com/releases/2012/06/120627103352.htm

[19] Langellotto, G.A., Gupta, A. Gardening Increases Vegetable Consumption in School-aged Children: A Meta-analytical Synthesis. *HortTechnology*. 2012;22(4):430-445.

[20] Hirschi, J.S. (2012). Taking the Common Core Outdoors: School gardens offer lessons beyond science and healthy eating. *Harvard Education Letter*, 28(6).

[21] Dirks, A. E., & Orvis, K. (2005). An evaluation of the junior master gardener program in third grade classrooms. *HortTechnology, 15* (3), 443-447

[22] Klemmer, C. D., Waliczek, T. M., & Zajicek, J. M. (2005). Growing minds: The effect of a school gardening program on the science achievement of elementary students. *HortTechnology*, 15(3),448-452.

[23] Ray, R., Fisher, D. R., & Fisher-Maltese, C. (2016). SCHOOL GARDENS IN THE CITY: Does Environmental Equity Help Close the Achievement Gap?. *Du Bois Review: Social Science Research on Race, 13(2), 379-396.*

students, such as those from higher income and lower income households.[24] One study found that students who attend schools with gardens are more likely to perform at the proficient or advanced levels on standardized tests.[18] By creating more environmental equity by building school gardens, academic achievement improved.

In addition, changes in academic attitudes have been observed, such as increased interest and enjoyment of school[16,25,] academic engagement[16], and positive attitude toward school.[16] In a study of a seed to table program, participating children expressed enthusiasm and growing confidence at school. Many frequently described how they looked forward to kitchen and garden days and how the addition of the program improved their school environment.[16]

One of our primary outcomes is that our students connect their work in the kitchen and garden to their core academics. For example, ESYNYC teachers found that second grade students demonstrated strong understanding of plant life cycles and needs. They also noted that learning reflection exercises worked best immediately after doing garden tasks. A Department of Education teacher at one of our sites commented, "[Garden class] is exactly what they need because we've talked about it in class, but they haven't gotten to really practice it. And we have been learning subtraction and now [in garden class] they're practicing the new subtraction strategy they learned yesterday."

Importance of Socioemotional Learning

In recent years, there has been an expansion on the amount of research on programs supporting Socioemotional or social emotional learning (SEL) in schools and the positive outcomes linked to socioemotional development. SEL refers to the process through which people understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions.[26] Research has shown that the implementation of SEL programs in school classrooms results in improved social and emotional skills, attitudes, behavior, and academic performance among students.[27] The Collaborative for Academic, Social, and Emotional Learning (CASEL), offers the seminal framework for evidence-based SEL strategies, and outlines the five core SEL competencies: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making.[28] Social

[24] Great School Partnership. (2013, December 19). Achievement Gap Definition. Retrieved from https://www.edglossary.org/achievement-gap/

[25] Block, K., Gibbs, L., Staiger, P. K., Gold, L., Johnson, B., Macfarlane, S., ... & Townsend, M. (2012). Growing community: the impact of the Stephanie Alexander Kitchen Garden Program on the social and learning environment in primary schools. *Health Education & Behavior*, *39*(4), 419-432.

[26] Collaborative for Academic, Social, and Emotional Learning. (2019). What is SEL?. Retrieved February 18, 2019, from https://casel.org/what-is-sel/

[27] Ellis Hurd, Kathleen Brinegar & Lisa Harrison (2021) Equity-based social emotional learning (SEL): A critical lens for moving forward, Middle School Journal, 52:3, 2-3, DOI: 10.1080/00940771.2021.1893994

[28] *What is the CASEL Framework?* CASEL. (2021, October 11). Retrieved December 9, 2021, from https://casel.org/fundamentals-of-sel/what-is-the-casel-framework/#interactive-casel-wheel.

competence can be defined as the ability to successfully and appropriately select and carry out interpersonal goals.[29]

Children who lack strong socioemotional competency are more likely to engage in defiant or risky behaviors.[30] Thus, the importance of SEL lies in the positive impacts it can have on a child's development. The implementation of SEL programs in early childhood education classrooms often results in an increase of competency in the five elements outlined by the CASEL framework. Research has shown that socioemotional competency is not only teachable in a school setting, but that the development of socioemotional competence gives children the power to apply the knowledge, skills, and attitudes necessary for understanding and managing emotions, feeling, and expressing empathy, setting and achieving goals, cultivating relationships, and making responsible decisions.[31]

Socioemotional learning outcomes, outlined in detail below, are associated with arts and enrichment programs such as ESYNYC. Arts and enrichment programs implemented into early childhood education, have been shown to increase students' persistence, leadership, collaboration, creative thinking, problem solving, motivation and empathy.[32] Furthermore, research supports that students who engage in arts and enrichment programs express increased levels of happiness, interest, and pride in their work at school.[33]

ESYNYC believes that socio-emotional growth is one of the most important outcomes of our work. Our formative evaluations, observations, and a decade of anecdotal evidence from staff, students, and family members tell us that students gain confidence, practice empathy and teamwork, and see themselves as leaders thanks to our programming. For example, a staff member at one of our sites observed, "I've seen the older kids take on the younger kids and guide them to the salad bar and teach them, like, 'This is lettuce, and this is beans, and these are tomatoes' and sit with them, and talk to them and be the role models we've been wanting them to be for so long."

While we are clear that socioemotional development is already a strong outcome of ESYNYC programs, we are committed to increasing our positive impact and understanding the complex ways food education can support youth

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[29] Langellotto, G.A., Gupta, A. Gardening Increases Vegetable Consumption in School-aged Children: A Meta-analytical Synthesis. *HortTechnology*. 2012;22(4):430-445

[30] Carter, D. (2016). A Nature-Based Social-Emotional Approach to Supporting Young Children's Holistic Development in Classrooms with and without Walls: The Social-Emotional and Environmental Education Development (SEED) Framework.

[31] Weissberg, R. P. (2019). Promoting the social and emotional learning of millions of school children. *Perspectives on Psychological Science*, *14*(1), 65–69. https://doi.org/10.1177/1745691618817756

[32] Stevenson, L., Lemón, C. J., & Reclosado, T. (n.d.). Community-Based Afterschool and Summer Arts Education Programs: Positive Impact on Youth and Community Development. Expanding Minds and Opportunities. Retrieved from https://www.expandinglearning.org/expandingminds/article/community-based-afterschool-and-summer-arts-education-programs-positive.

[33] Brown, E. D., & Sax, K. L. (2013). Arts Enrichment and Emotion Expression and Regulation for Young Children at Risk. Early Childhood Research Quarterly, 28, 337-346. Retrieved from http://digitalcommons.wcupa.edu/psych_facpub/1

development by further investing in SEL training and evaluation. The most effective SEL programs provide professional development and training for teachers on how to better implement SEL into classroom instruction.[34] For this reason, ESYNYC is currently implementing new teacher training on these competencies and building more intentional socioemotional learning support into our programs. We are also investigating the impact of these changes with new SEL evaluation tools and look forward to sharing results in 2022.

Socioemotional Learning Impacts

Although literature that supports SEL is new in the public health field, there is an increasing amount of research outlining the positive impacts that SEL can have on youth development. The participation in hands-on school cooking and gardening programs have great potential to support the utilization and retention of SEL skills during a child's most critical developmental years. The next sections present the evidence on food education programs' ability to support youth development in each of the core SEL competencies.

Self-awareness

Self-awareness refers to one's ability to understand their own emotions, thoughts, and values.[29] Furthermore, self-awareness can display itself in the form of self-efficacy and self-understanding. Students who successfully execute and complete tasks and responsibilities develop stronger self-efficacy and self-understanding.[35] In a study of a gardening education program, students exhibited a positive development in attitudes, beliefs, values, and self-perceptions.36 Similarly students at ESYNYC have frequently expressed their self-confidence and pride in their work. One student, during one of ESYNYC's lessons exclaimed, "I'm so good at this!" Another shared "I think my mom would be proud of me for bringing her flowers and being so gentle with the plants. I'm proud of myself." The administrator of one ESYNYC site shared in an interview that "I think that it's built student confidence, student's ability to really, you know, speak more confidently about themselves, about their own ideas, their learning. I've seen it firsthand with specific students that started interacting with the Green Room in sixth grade and were just really shy and didn't have the confidence to speak. And now they're our number one tour guides for the school. And they lead our visitors around and they are advocating for not only the school and the program, but for themselves. And they speak up for themselves, their classmates, their friends, not just for Edible, but for

[34] McCormick, M. P., Cappella, E., O'Connor, E. "E., & McClowry, S. G. (2015). Social-Emotional Learning and Academic Achievement: Using Causal Methods to Explore Classroom-Level Mechanisms. *AERA Open*. https://doi.org/10.1177/2332858415603959

[35] Schusler, T. M., & Krasny, M. E. (2010). Environmental action as context for youth development. *The Journal of Environmental Education*, *41*(4), 208-223.

[36] Pollin S and Retzlaff-Fürst C (2021) The School Garden: A Social and Emotional Place. Front. Psychol. 12:567720. doi: 10.3389/fpsyg.2021.567720

changes they want to see at our school for changes they want to see in the community and for themselves."

We have also observed that our programming is an opportunity for students to connect to their feelings and improve their self-understanding. One shared after making tacos in cooking class, "It was so good! Everyone in the house was amazed by the sauce! If I was having a sad day, I would cook this." A middle school student shared "this classroom always brings up my mood." An ESYNYC staff member described another time that cooking lesson gave students room to explore their feelings, "Our third grade class had a spontaneous conversation about how they were feeling about going into fourth grade: things they are excited for, afraid of, nervous about, what they were proud about this year, etc. It was nice that we were able to make a safe space for their feelings!" Similarly, working with a group of second graders in the cafeteria about what they were eating led to a discussion about regulating feelings. When one student revealed they were feeling sad, others chimed in with support and advice, such as "When I'm sad I hug my teacher."

Self-management

Self-management is one's ability to manage emotions, thoughts and behaviors effectively in different situations and to achieve one's goals.[29] Within self-management lies the ability to exhibit self-discipline and self-motivation, personal and collective agency, and goal setting behaviors.[29] A study investigating the outcomes linked to after school enrichment programs found that students exhibited intermediate and long-term improvements in misconduct and risky behaviors.[37] A similar study concluded that participation in arts programs yielded reductions in alcohol consumptions, substance abuse, and sexual activity in adolescence.[38] In a study of at risk youth participating in an enrichment program, outcomes included increased negative emotion regulation.[39] Participation in arts and enrichment programs can also result in increased motivation, persistence and empathy.[32] We have observed this is ESYNYC programing often. For example, during one lesson, when asked what they learned, one student answered, "to keep trying no matter what gets in your way."

Social awareness

Social awareness refers to the ability to understand the perspective of and empathize with others, including those of differing backgrounds, cultures, and

[37] Lowe Vandell, D., Reisner, E. R., & Pierce, K. M. (2007). Outcomes Linked to High-Quality Afterschool Programs: Longitudinal Findings from the Study of Promising Afterschool Programs.
[38] Elpus, K. (2013). Arts education and positive youth development: Cognitive, behavioral, and social outcomes of adolescents who study the arts. National Endowment for the Arts.
[39] Brown, E. D., & Sax, K. L. (2013). Arts Enrichment and Emotion Expression and Regulation for Young Children at Risk. Early Childhood Research Quarterly, 28, 337-346. Retrieved from http://digitalcommons.wcupa.edu/psych_facpub/1

contexts.[29] A study analyzing the impacts of garden and farm education found that participating students exhibited and increased care for self, family, and community.[40] Students participating in an outdoor enrichment program had increased peer support, compassion, and mutual commitment to one another.[41] Through social awareness, students are able to learn social and emotional competencies with an equity frame, promoting cultural awareness and acceptance in students.

We have found many opportunities to support students' acceptance and empathy for others with different cultural backgrounds in ESYNYC programming. For example, during a lesson on Pakistani food, we did a reading, watched a video, and made chutney. After watching the video, a student said: "I like that [the narrator] was promoting a culture that was different than his own. And when he went to the restaurant to try the food he was polite and open to trying it even if it was new for him" then at the end of class when we tasted the chutney the student said "It's a little strange for me because it's a new food, but I still like it." During a lesson, where students were sharing their favorite fruits and vegetables, one student exhibited social awareness when saying, "I really like hearing what my friends like to eat." A 2019 ESYNYC school staff survey showed that 77% of teachers observed their students working well with people who are different than them.

Caring for oneself and environment, leadership development, and an understanding of one's role to support personal and community well-being tie into both SEL social awareness and youth food justice activism. New research has examined impacts of food education programs on the development of students' commitment to food and environmental justice. School garden programs have been found to strengthen student civic engagement, promote leadership and volunteerism, and mobilize students as activists committed to social justice and environmental stewardship.[42] Environmental education affords youth opportunities to develop responsibility and agency, engage in reflection, and participate in community environmental action, preparing them to be change agents and responsible citizens.[43] Similarly, students in a school garden program report an increased sense of agency, or the ability to make a difference, to protect the environment.[44] Garden-based service-learning has the potential to educate

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[40] McQueen, Shannon C., "Empowering Students to Care: An Edible Garden and Farm Education Approach" (2015). Electronic Theses and Dissertations. 424.

[41] Orson CN, McGovern G, Larson RW. How challenges and peers contribute to social-emotional learning in outdoor adventure education programs. J Adolesc. 2020 Jun;81:7-18. doi: 10.1016/j.adolescence.2020.02.014. Epub 2020 Apr 2. PMID: 32247894.

[42] Roche, E., Conner, D., Kolodinsky, J. M., Buckwalter, E., Berlin, L., & Powers, A. (2012). Social cognitive theory as a framework for considering farm to school programming.

[43] Chawla, L., & Cushing, D. F. (2007). Education for strategic environmental behavior. *Environmental Education Research*, *13*(4), 437-452.

[44] Cutter-Mackenzie, A. (2009). Multicultural School Gardens: Creating Engaging Garden Spaces in Learning about Language, Culture, and Environment. *Canadian Journal of Environmental Education*, 14.

students about social justice and civic engagement and personally mobilize and drive them toward positive social change.[45]

Following a lesson on climate change, students were asked to write down what they learned. Students responded with "I realized that climate change is affecting more than just polar bears. It's affecting other country's too.", and "I learned that climate change is a very big problem for people living near the water, and we need to solve climate change to help save coastal cities across the world." and "I learned that because of climate change, many parts of Nigeria are turning into deserts. Many people have had to leave their villages. So, we need to think about the serious problems that our activities lead to and try to change something. We should take care of our planet, not destroy it." These responses show that, through the lessons taught by ESYNYC, students are understanding larger issues and expressing a commitment to food and environmental justice.

Relationship skills

Relationship skills is defined as the ability to establish and maintain health and supportive relationships and effectively navigate interactions with diverse individuals and groups.[29] The outcomes of associated with arts and enrichment programs include an improvement in social skills[36,46] and interpersonal behavior.[36] Furthermore, students display positive changes in leadership, collaboration, creative thinking, and problem solving.[39] ESYNYC's school staff survey in 2019 indicated that over 87% of the teachers observed their students working well in groups of their peers during our lessons. An anecdotal example of this During a gardening lesson, a group of students were working together to pull an especially tough weed. The students worked together and then one of them exclaimed, "We did it with teamwork!" A school staff member interviewed for an ESYNYC evaluation shared that "They start trying to take over and be leaders in their own group and say and recognize when someone's doing what they shouldn't be doing or recognizing someone is making an error and able to correct them in a polite manner."

Responsible decision-making

Responsible decision-making is the ability of an individual to make caring and constructive choices about personal behaviors and social interactions.[29] Moreover, responsible decision-making includes identifying solutions to problems and recognizing the importance of critical thinking skills. Students in after school and summer arts enrichment programs displayed improved problem-solving skills and

[45] Aftandilian, D., & Dart, L. (2013). Using garden-based service-learning to work toward food justice, better educate students, and strengthen campus-community ties. *Journal of Community Engagement and Scholarship*, 6(1), 55.

[46] Mason, M. J. & Chuang, S. (2001). Culturally-based after-school arts programming for low-income urban children: Adaptive and preventive effects. The Journal of Primary Prevention. 22(1), 45-54.

an increased understanding of how their actions impact their peers and community.[39] Another aspect of this competency is trying new things, which we have seen students do daily in our garden and kitchen classrooms. For example, one remarked "This is my first time cooking. My mom is going to be so proud of me!" Students also often share about the excitement of getting to try handling the worms in the compost bin for the first time. One said "I can't believe I'm actually facing my biggest fear! [worms] I'm so proud of myself that I touched 5 worms! My mom isn't gonna believe this!"

Summary

A substantial and rigorous body of evidence supports the numerous benefits of hands-on gardening and cooking programs. Food education programs, such as ESYNYC, promote positive impacts on dietary, academic, and socioemotional outcomes among children and adolescents. ESYNYC is encouraged by the emerging literature exploring program impacts on students' socioemotional learning, and we are working to include more practice to amplify the socioemotional learning impacts of our curricula and programs. Furthermore, ESYNYC is interested in the long-term impact of the program on student's food and environmental justice activism, an outcome that has a strong relation to social awareness, one of the five socioemotional competencies. Our internal evaluations are in line with what research has found: that the positive impact of food education interventions, like ESYNYC, are diverse and range from dietary behaviors and habits to socioemotional learning, to encouraging young activists' development. Due to the complex and nuanced nature of socioemotional learning and development, ESYNYC will continue to use a mixed methods approach (combining qualitative and quantitative program evaluation data), informed by literature, to better understand the range of outcomes observed. ESYNYC looks forward to continuing to learn about the impacts of socioemotional learning on our students and sharing those learnings with our stakeholders.

Find links to the citations in this paper and many more related to food-education's impact in our research brief sheet.