



# Investigating the Value and Impact of Child-Led Garden Programming

Prepared for  
The Children's Garden Project of Canada

In

September 2023

By

Anneka Bosse  
Emily Michetti-Wilson  
Runisan Natheeswaran  
Julia Tikhonov  
Jazz Walia

Contents

Executive Summary ..... 2

Key Terms..... 3

Introduction ..... 4

    Overview..... 4

    Scope..... 4

Methods ..... 5

    Literature Review..... 5

    Surveys..... 6

    Interviews..... 7

Findings ..... 7

    Literature Review Findings: Benefits of gardening programs for children ..... 7

    Survey and Interview Findings: Composting workshop satisfaction ..... 10

Discussion and Recommendations ..... 16

Conclusion ..... 18

Bibliography ..... 19

Appendices ..... 21

    Appendix A: Literature Review Inclusion/Exclusion Criteria and Search Terms .... 21

    Appendix B: Pre and Post Composting Workshop Surveys for Children ..... 23

    Appendix C: Interview Recruitment Email and Interview Guide ..... 26

    Appendix D: Stages of Interview Analysis ..... 30

# Executive Summary

The Children's Garden Project Canada (TCGPC) is a community initiative born out of a passion for gardening and the need for more safe, natural, local outdoor play and leisure activity spaces for kids. It is in its second year of operation and sought the assistance of the McMaster Research Shop to collect data about its programming to make improvements internally and communicate the program's value to stakeholders externally. This report presents the findings from previous academic literature about child-led learning and garden programming and data from pre- and post-workshop surveys with children participants of The Children's Garden's composting workshops, as well as interviews with the teachers of those children.

The literature review findings reveal potential outcomes and benefits of garden programming and child-led learning such as fostering environmental stewardship through exposure to nature, especially when paired with environmental science curricula. Benefits also include improvements to stress and anxiety, the creation of autonomous learning experiences, and increased fruit and vegetable intake among those with access to home or school gardens.

Our evaluation of the composting workshops suggests the workshops have at least a short-term positive impact on children's knowledge of composting and sense of environmental stewardship. Our findings highlight that most students highly enjoyed the workshops overall, and that the hands-on and interactive approach of the workshops is a major strength of the program by promoting deep engagement and excitement among young learners. Future workshops should seek to accommodate diverse learning styles, specifically those who may find it challenging to keep up with the fast pace of the workshops, and provide opportunities for continued learning and connections. Our recommendations for the composting workshops are thus as follows: 1) Continue to take a hands-on learning approach, 2) Accommodate diverse learning needs, and 3) Making connections and providing resources.

# Key Terms

Child-Led Model: A model used in educational programs that offers children the opportunity to select their preferred learning approach and activities. The program's primary objective is to assess how a child approaches a task and adapts to it in their unique way.

Environmental Stewardship: The responsible utilization and preservation of the environment through sustainable methods that increase ecosystem resilience and improve human well-being.

Experiential Learning: A method of learning where students are actively involved and are "learning by doing" while also reflecting on the experience.

Mindfulness: A state of active attention and awareness in the present, while proceeding intentionally without judgment and avoidance.

# Introduction

## Overview

The Children's Garden Project Canada (TCGPC) in Gage Park is described as an imaginative, child-led outdoor experience where children can play, garden, connect with nature and learn about the natural world. It's created, built, planted, maintained, and harvested by children, their families, and Hamilton's inner-city community. It aims to provide a safe, accessible, and barrier-free space where all children ("gardeners in training") grow up to become knowledgeable stewards of the land. TCGPC's mandate is to provide free educational programming that empowers inner city, under-resourced children and families to garden, learn good and healthy practices, and promote participation and well-being within the community. One of the key programs includes workshops for elementary school children to learn about different aspects of composting.

Now in its second year of operation, TCGPC wanted to start collecting data about its programming. The goal of collecting data is to better communicate the value of The Children's Garden's initiatives to stakeholders and to make informed program improvements and decisions. The organization's leadership requested support from the McMaster Research Shop in collecting data about two programming areas: regular drop-in garden programming and composting workshops with elementary school children.

This report will be used internally by the TCGPC team to make program improvements and decisions and externally to communicate the proposed value of the program to stakeholders. Examples of uses include grant applications, funding promotions, media quotes, and annual reports.

## Scope

To explore the value of The Children's Garden's programs, we developed the following research questions:

1. What does recent academic literature say, if anything, about the benefits of gardening programs (or gardening, generally) for children?

Specific impacts of interests include:

- Improved well-being
- Increased sense of environmental stewardship and valuing the environment

2. What does recent academic literature say, if anything, about the benefits of (garden) programming that is child-led? A specific outcome of interest is “sense of ownership.”
3. To what extent are students and teachers satisfied with the organization’s composting workshops? This will include participants’ perspectives on:
  - Gaining knowledge of composting
  - Workshop content and structure (including the child-led model)
  - Quality of instruction
  - Development of environmental stewardship

Using these research questions, we explored previous academic literature about child-led learning and garden programming to provide evidence that supports TCGPC’s aims and mission. We also analyzed data from pre- and post-workshop surveys with children participants of The Children’s Garden’s composting workshops, as well as interviews with the teachers of those children.

## Methods

### Literature Review

We conducted a literature review with two areas of focus: academic literature reviewing the benefits of gardening programs for children and the benefits of child-led garden programming with respect to well-being and environmental stewardship.

#### *Data Sources and Search Strategy*

To gather relevant academic literature, we used two key data sources: Google Scholar and the McMaster library database. We incorporated a combination of search terms to comprehensively cover the topics of interest. We used the Boolean operator "AND" to combine key terms. The selected methodology ensured a comprehensive and systematic approach to gathering relevant literature addressing the research questions (See Appendix A for a full list of search terms).

#### *Inclusion and Exclusion Criteria*

We included articles published within the last 15 years, with a focus on children aged 3 to 12 years as the primary participant group. The selected studies primarily concentrated on gardening or gardening programs as central interventions or activities. We included studies if they measured well-being outcomes, including emotional well-

being, mental health, self-esteem, social development, resilience, and overall quality of life. We considered specific populations, such as children with disabilities, psychiatric disorders, or particular medical conditions, if they met additional criteria. In addition, we included studies if they explored the effects of gardening on environmental attitudes, knowledge, awareness, conservation behaviors, or sustainability-related outcomes. We included research conducted in Canada, the U.S., or countries with similar social, political, and economic contexts, and studies published in English.

### *Selection Process*

The research process involved a systematic and rigorous selection process. Initially, we identified potential studies through electronic searches conducted on the McMaster library database and Google Scholar. We removed duplicates from the total records identified. Subsequently, we screened titles and abstracts against the established inclusion and exclusion criteria. If articles met these criteria, we underwent a more detailed assessment through full-text reading, during which we excluded those failing to align with specific requirements. Furthermore, we examined the reference lists of included studies to identify any additional relevant sources that might have been missed.

### *Surveys*

The Research Shop Coordinator and TCGPC community partners collaborated to develop pre- and post-workshop surveys. The TCGPC team distributed paper copies of the surveys to the children who attended their composting workshops on Monday evenings in May of 2023. They distributed the pre-workshop survey on the day of the first workshop and the post-workshop survey on the day of the final workshop (out of three workshops in total). Participants completed a total of 45 readable pre-surveys and 73 post-surveys. Once the TCGPC team gave the research team the surveys, we put the survey data into an Excel spreadsheet. Both the pre- and post-workshop surveys included a space for the participants to write their name and their teacher's name so that the surveys could be compared. However, the missing data from the pre-workshop surveys made it difficult to make any direct comparisons, so the names were not considered during the analysis.

We analyzed the survey data using descriptive statistics for the multiple-choice responses and thematic analysis for the short answer responses. The short answer responses included some drawings done by the children, which were interpreted by the research team for meaning.

A limitation of the surveys is that they were completed outdoors with washable markers on paper. Due to rain during the first composting workshop, some data from the pre-surveys washed away and resulted in some unreadable data.

## Interviews

To address research question 3, we conducted three interviews with teachers who had attended the composting workshops. We contacted interviewees by email (See Appendix C for interview recruitment email) with the help of the TCGPC. Participants chose whether their interview was held over the phone or through Zoom.

We developed an interview guide with questions related to each of the themes of interest in research question 3 (See Appendix C for full interview guide). Once the transcripts were completed, two members of the research team thematically analyzed the data using a codebook (See Appendix D for details about the stages of analysis).

A limitation is that we only conducted three interviews. However, this is out of five possible teachers who attended the workshops. We faced time constraints in scheduling and completing the interviews before the end of the school year in June. Additionally, each of the three completed interviews was conducted by different research team members. This could result in a differing emphasis and focus on each aspect of the interview guide.

## Findings

The findings of this report are divided into two main sections: 1) findings from a literature review assessing research questions 1 and 2, and 2) findings from the interview and survey data evaluating the composting workshops as per RQ3 (See *Scope* for full description of questions).

### Literature Review Findings: Benefits of gardening programs for children

This section is focused on literature review findings for research question 1 to examine the benefits of children's gardening programs for children's well-being and environmental stewardship, as well as the benefits of the child-led model specifically. In our search, we also discovered literature link gardening programs to educational enrichment, which although outside the original scope of our study thought might be of interest to the community partner, and so we included these findings as well.



## **Improved Well-Being**

In the studies we reviewed, a recurring theme is the potential positive impact of nature interaction on mental health outcomes. Tillmann et al. (2018) conducted a systematic review that revealed a notable connection between children and teenagers' interactions with nature and improvements in mental health, including stress reduction, resilience, and overall mental well-being. A longitudinal study from Harvey et al. (2020) reinforces the connection between nature and mental health, demonstrating immediate mood enhancement and long-term well-being improvements from nature-based outdoor learning. They also found significant short-term mood improvement over the course of an hour-long nature activity, averaged over 21 weeks. Children with lower initial connection to nature scores showed greater improvement in well-being, while there was no significant change for those with higher initial connection scores (Harvey et al., 2020).

Another area related to well-being is the potential nutritional benefits of garden programming. Skelton et al. (2020) reviewed evidence that gardening programs and home gardens are related to increased fruit and vegetable intake, and concurrently healthier weights in children. Similarly, Savoie-Roskos et al. (2017) outline that children exposed to gardening tend to consume more fruits and vegetables, are more adventurous in trying new foods, and are better at maintaining healthy body weights over time. Ohly et al. (2016) also found quantitative evidence for nutritional impacts, such as increased preference for fruits and vegetables. However, many of these studies relied on self-reported fruit and vegetable intake/ nutritional behaviours, which could have skewed the results (e.g., due to social desirability bias).

## **Environmental Stewardship**

Several studies we reviewed suggest school gardens can contribute to environmental awareness and pro-environmental attitudes. For instance, Alexander and Grannum (2022) highlights lessons learned firsthand by a school nurse with direct experience working with a school garden program. Through collaborating with an environmental science course, students were able to enrich their environmental science education by applying what they learned in the classroom to the garden. Other studies have reinforced that the hands-on, experiential learning that garden-based education provides not only cultivates learners' curiosity but importantly, nurtures their relationship with the natural world, fostering pro-environmental stewardship behaviours (Brynjegard, 2001; Kuo et al., 2019; Rios & Brewer, 2014).

## **Additional Benefit of Gardening for Children: Educational Enrichment**

Alexander and Grannum (2022) identified school gardens as catalysts for enhancing academic performance and promoting attendance, particularly among older children. Using school gardens as educational tools has shown to facilitate cross-curricular integration of subjects such as science, food, and nutrition (Burt et al., 2017), thereby diversifying and enriching the learning environment. Academically, studies have reported that children involved in gardening frequently perform better on math, literacy, and science assessments (Ray et al., 2016). This finding aligns with Harvey et al. (2020), who highlight how nature-based outdoor learning positively impacts academic attainment and well-being. Furthermore, Ohly et al. (2016) proposed a dynamic feedback loop model, emphasizing how enjoyment, engagement, and motivation fostered by school gardening contribute to comprehensive educational and well-being outcomes. These results emphasize the cooperative relationship between engagement with nature and educational advancement.

Researchers have also found an association between garden programming, self-reported learning, and school connectedness. In a study conducted by Lohr et al. (2022), the experiences of third-, fourth-, and fifth-grade elementary school children in their school garden were analyzed. The researchers found that one in three students (33%) stated that they were learning a variety of subjects such as ecology and healthy habits while participating in the school gardening activities (Lohr et al., 2022). About 2 of every 10 students (18%) also reported feelings of school connectedness, often in conjunction with self-reported learning after participating in these activities (Lohr et al., 2022). They described pride in their school and a sense of connection to their teachers and peers.

Teaching and learning in the school garden can make a valuable contribution to children's social, academic, and emotional development. A study conducted by Passy (2012), researchers analyzed how schools use their gardens and the effect that schools believed the garden had on their students' learning. They analyzed the extent of the student's involvement with the garden through interviews with teachers, parents, and students (Passy, 2012). 10 random primary schools were selected randomly from a database that considered geographical location, levels of deprivation, size of school and student attainment levels. Each school was visited twice, with the school's motivation for using the garden being analyzed on the first visit and the impact of the school garden on the children's learning being analyzed on the second visit (Passy, 2012). 37 adults and 43 children were interviewed on the first visit, and 34 adults and 44 pupils were interviewed on the second, although most members of staff were interviewed on both visits (Passy, 2012). The results strongly supported the idea that learning in the school

garden can make a very valuable contribution to the children but found that using the school gardens as an area for learning is often disrupted by national policy that recommends outside learning experiences but fails to promote an environment in which teachers have the freedom to do so (Passy, 2012). While there is already a fair amount of research that has been conducted about the benefits of garden programming that is child-led, more research is necessary to further explore the benefits and encourage policymakers to provide funding for more of these opportunities.

### **Benefits of child-led programming**

Recent academic literature highlights the benefits of child-led programming, which scholars loosely refer to as programming where children take an active leadership role in learning and tasks. One such study, conducted by MacDonald and Breunig (2018), investigated the merits of “inquiry-based” learning in outdoor classroom settings for kindergarten children. Inquiry-based learning strongly aligns with the idea of child-led programming by centering a child’s “questions, observations, and interpretations of the world” as the primary method of instruction with teachers helping to facilitate these experiences. The participant sample was from an elementary school that has three all day inquiry-based kindergarten classrooms (MacDonald & Breunig, 2018). The participants included twelve kindergarten students (ages 4 & 5, with four from each classroom) and three teachers (one from each classroom). Data was collected by interviewing both the teacher and kindergarten participants (MacDonald & Breunig, 2018). MacDonald and Breunig (2018) found that an inquiry-based learning approach supported connections between students and their surroundings, empowered students to be part of a more democratic learning process, and fostered connections between peers who supported each other’s learning.

In another study, Arnott (2018) observed preschool children ages 3-5 over a nine-month period as they participated in a child-led kindergarten program. The theoretical orientation to this research was that a child’s world is often presented to them as ‘ready-made’ by adults, restricting children’s creativity and reducing their agency. This study found that child-led learning enhanced the autonomy of learners and increased their negotiation tactics and socio-emotional self-regulation. It also found that engaging in “free play” helps children develop their own unique peer culture (Arnott, 2018).

### **Survey and Interview Findings: Composting workshop satisfaction**

This section presents findings from the survey and interview data, organized by research question 3’s evaluation criteria: gaining knowledge of composting, workshop content and structure, quality of instruction, and development of environmental

stewardship. We added an “Other benefits and insights” section to account for useful and relevant findings and feedback which did not strictly fit within the research scope.

## **Gaining Knowledge of Composting**

### *Knowledge Acquisition*

The pre-workshop survey indicated a diverse initial knowledge of composting among the children (N=44, 100%). Specifically, 9 children (20%) reported having no prior knowledge of composting, 21 children (48%) admitted to knowing a little, while 14 children (32%) expressed considerable understanding. Following the workshops, the survey data revealed an encouraging shift in the children's responses (N=72, 100%)<sup>1</sup>. A total of 26 children (36%) reported a significant increase in their knowledge of composting, 41 children (57%) reported a moderate knowledge gain. A small minority of 4 children (6%) felt no change, while one child (1%) was uncertain.

### *Confidence in Applying Skills*

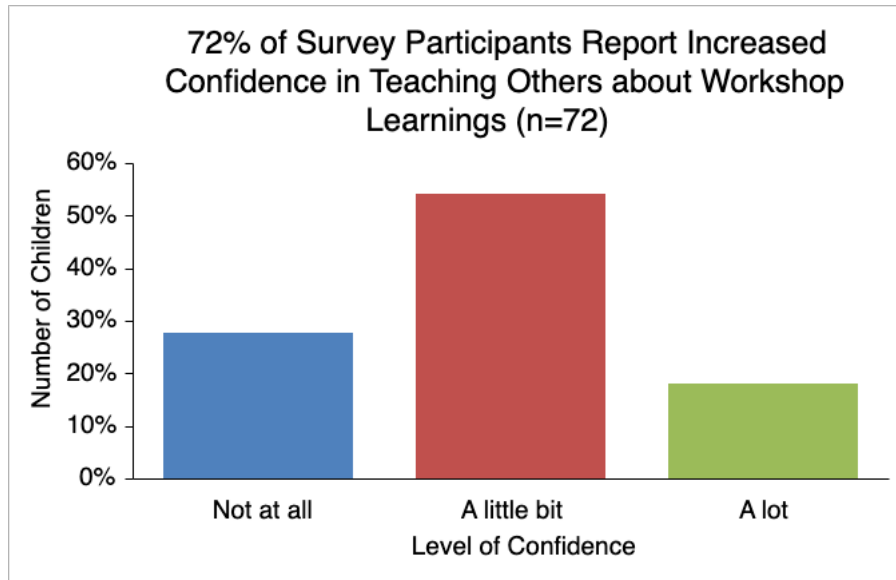
Interview participants expressed a noticeable improvement in children's confidence in applying their composting skills. As the workshops progressed, one teacher observed, "the students became more confident in their composting skills. They were able to complete the activities" (Interview 3). Another teacher commented, "Kids [are] getting more confident being hands-on in the garden, starting to do bigger jobs" (Interview 2). This suggests that the practical and interactive format of the workshops did not only enhance the children's knowledge but also instilled a sense of competence and independence, allowing them to undertake more significant tasks.

### *Confidence in Teaching Others*

In terms of confidence to impart their newly acquired composting knowledge to others, the survey responses (N=72, 100%) were positive. The survey data revealed that 72% of children reported increased confidence in teaching others about workshop learnings. This was further exemplified in one interview participant's remark that the children were telling their parents about workshops and using the take-home component of the workshops (the seed balls) to spark these conversations (Interview 1).

---

<sup>1</sup> The number of respondents to the post-workshop surveys is larger than the pre-workshop survey because of lost data from markers being washed away in the rain during the first composting workshop.



**Figure 2: A bar graph illustrating the level of confidence among survey participants in teaching others about their workshop learnings.** The graph displays three confidence levels: "Not at all," "A little bit," and "A lot."

### *Retention and Recollection*

Notably, in the post-workshop surveys, many children demonstrated their ability to retain and recall the knowledge they gained during the workshops. For instance, students recalled specific items like banana peels and apple scraps they intended to compost more often because of the workshops.

Supporting this observation, a teacher shared, "[...] I did little Kahoot quizzes with the kids when they got back just to see what we hung on to. They really understood about soil being alive, how there's microorganisms which exist in the soil, and a good soil is one that has living components in it" (Interview 3). This indicates the retainment and recall of knowledge immediately following the workshops.

### **Workshop content and structure**

#### *Hands-on and Independent Learning*

In the post-workshop survey, 23 students (29%) selected hands-on learning as their preferred method of learning. The interview data further supported this preference, as teachers and educational staff echoed these sentiments. One teacher noted that the children "really enjoyed digging in the dirt looking for worms" (Interview 3). Another

participant stated, "Anything that they could use their hands for, they were really all about" (Interview 3).

Along with hands-on learning, the interview participants reflected on the child-led model by mentioning a sense of independent exploration the workshops evoked. One teacher shared, "When [the children] were able to actually function somewhat independently with their learning, I feel like that was the most interesting for them" (Interview 3). This engagement was also noted in activities that allowed students to create something. One teacher stated, "Any of the really hands-on things that they could create were definitely the ones they liked the most" (Interview 1).

### *Games and Activities*

Of the 79 child responses to the post-workshop survey, 37 (47%) expressed a preference for learning through games. The interview data provided additional insights into these activities. The teachers remarked on the high level of engagement seen in students during game-based activities like the relay race and digging for worms. One teacher shared, "The game not only made learning fun but also reinforced the key concepts in a memorable way" (Interview 2).

### **Quality of instruction**

Despite being less preferred when compared to hands-on and game-based learning, learning from teachers was a valued method among 9 of 79 children (11%). Interview data showed that workshop facilitators played a pivotal role in guiding children's learning, with one teacher explaining, "When we had the chance to explain the composting process in detail, students could see the broader environmental picture, which made their hands-on activities more meaningful" (Interview 2).

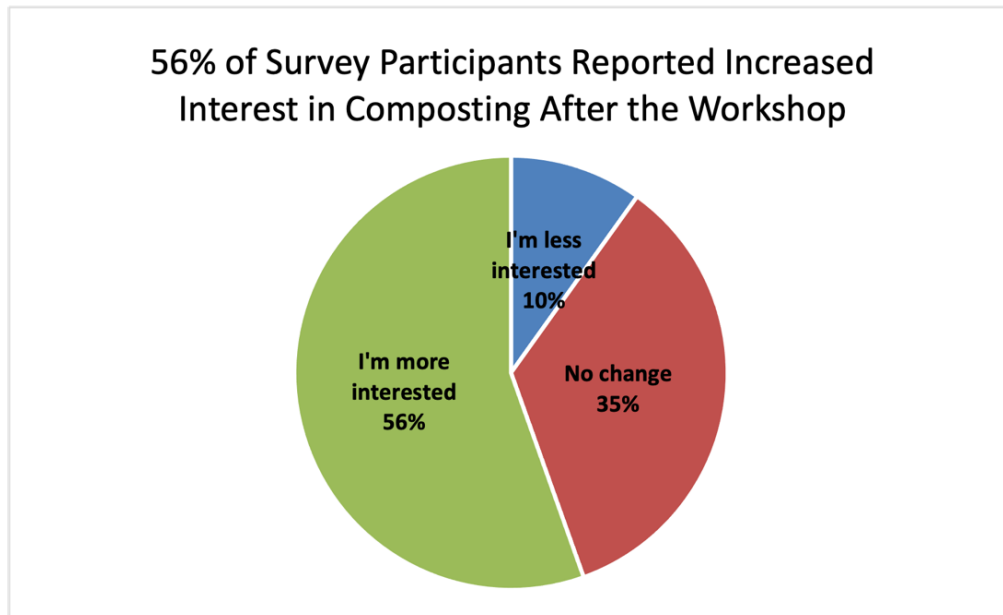
### **Development of environmental stewardship**

#### *Mindfulness: developing an intentional relationship with the natural environment*

"These workshops bring attention to the things that are all around us, that we don't realize are so important." (Interview 3)

The collected interview and survey data demonstrated the workshops' impact on developing children's awareness of and relationship with the natural environment. In the post-workshop survey short answer responses, many of the children notably demonstrated increased attention to the complexity of the natural world (e.g., how many critters live in the soil, how the worms support the soil, and how the soil supports the

plants). Also, over half of the participants who responded to Q7 of the post-workshop survey regarding what they would do differently at home that they had learned from the workshop shared a resolve to be more intentional with their approach to waste (e.g., recycle/compost more, sort the garbage better, put compost in the garden).



**Figure 1: A pie chart displaying the results of the post-survey that participants completed after the workshop.** This graph is divided into three sections: I'm more interested, I'm less interested, and no change. Each section has its own respective colour and label with the percentage of participants that voted in that category.

An interviewed teacher noted how the workshops reinforced the message that “your actions matter” (Interview 2). There was also an emphasis on the workshops’ potential to teach children about what it means to be part of a community and the utility of nurturing an intentional relationship with the land. The same participant shared an interest in seeing conversations about community be facilitated more explicitly with the kids prior to the workshops. This teacher also noted the utility of providing kids with resources they could use to continue developing an intentional relationship with the land once the workshops are over. Although there were some resources given at the composting workshops, such as the take-home seed balls, the teacher suggests including more take-home resources in future workshops.

*Sparking the foundation for positive environmental action and stewardship*

“I think that's the main benefit to of these workshops is that they provide a great base to continue learning [...]” (Interview 3)

Interviewed teachers noted the impact the workshops had on sparking children's interest in environmental issues and activism. Upon returning to the classroom setting, one interview participant noted that children felt more empowered to engage in the environmental initiatives going on at their school. They shared, "It really helps spark that adventurousness to go in and say okay, well, what more can I do about this?" (Interview 3).

## **Other benefits and insights**

### *Accommodating and supporting children's diverse learning needs*

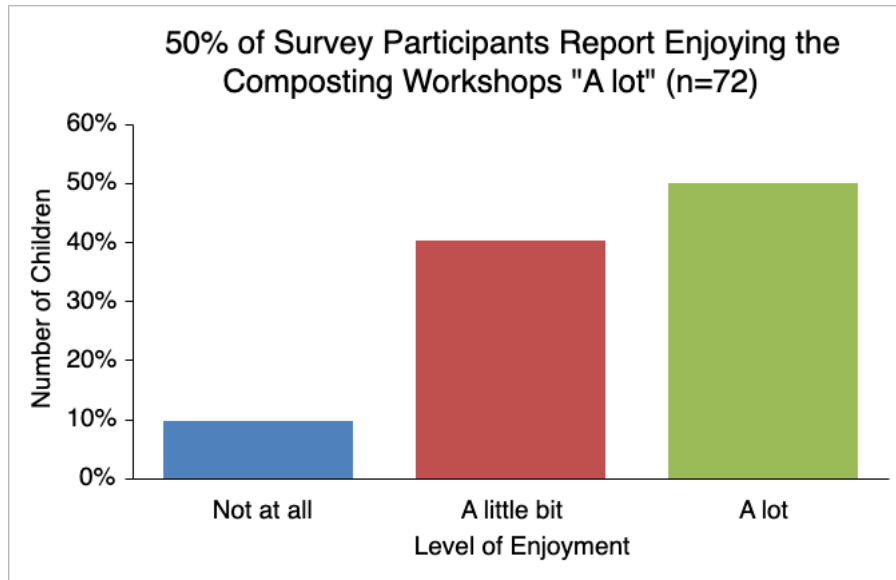
Throughout the interview and survey results, we received feedback relating to accommodating and supporting the diverse learning needs of the children. Two interview participants shared that the smaller group sizes were beneficial for children's learning and engagement. Another interview participant noted that these workshops tended to be more challenging for certain learners due to the fast-paced nature and the high degree of stimulation of the workshops. This participant shared that the supports that children have in the classroom setting are "stripped away" in field settings, and so "having this understanding that there might be kids who want to be off to the side" could benefit these kids' ability to learn and engage (Interview 2).

One respondent from the post-workshop survey indicated that they would like there to be "more rules around touching/damaging others' work" as well as an "enforcement of rules for [the] relay race" which indicated the need for more structure. Related to inclement weather, an interview participant noted that it is challenging for kids to learn and engage on rainy days or hot days. They stated, "In order for kids to get the most out of the workshops they might need some kind of weather protection."

### *Enjoyment of Workshops*

Out of 72 respondents (N=72, 100%), 50% of survey participants reported enjoying the composting workshops "a lot", with 40% reporting enjoying the workshops "a little bit" and 10% "not at all". Data from the interviews consistently referenced children's enjoyment of the hands-on, interactive components, such as making seed balls, digging for worms, and engaging in the relay race. One teacher noted that "[t]he joy and excitement were palpable when they competed to sort waste correctly" (Interview 2).





**Figure 3: A bar graph depicting the level of enjoyment among survey participants regarding the composting workshops.** The graph presents three levels of enjoyment: "Not at all," "A little bit," and "A lot."

## Discussion and Recommendations

Our literature review findings and evaluation of the composting program point to the benefits of child-led and experiential garden programming in environmental education. The preference for hands-on activities and games among participants reinforces the importance of tangible, interactive learning experiences. This method of learning seemed to facilitate knowledge retention and also create an appreciation for nature. These findings support the research conducted by MacDonald and Breunig (2018), which explain how children's connections to nature and academic content can be facilitated by outdoor schoolyard learning. The emphasis on independent exploration in the teacher interviews adds to this notion, suggesting that when children are given the freedom to explore independently, their learning experiences are enriched.

The observed positive shift in students' perceived knowledge about composting post-workshop, including their recall of this knowledge, indicates the short-term effectiveness of the workshops in teaching children about composting. The willingness and confidence expressed by students to share their new knowledge with peers and family members further highlights the workshop's impact. We cannot say for certain, however, whether these short-term impacts translate into longer-term impacts since we only assessed knowledge retention immediately following the workshops.

The data also illuminated the composting workshops' role in improving environmental awareness among participants. This enhanced awareness, characterized by an increased understanding of the natural world's complexity and a commitment to better waste management practices, could support future environmentally conscious values and behaviours among participants. Past studies support these findings by highlighting the positive role of garden-based experiential learning in fostering environmental stewardship among children (Alexander & Grannum, 2022; Brynjegard, 2001; Kuo et al., 2019; Rios & Brewer, 2014). The affirmation that “your actions matter” and other sentiments expressed by the survey and interview participants are an example of how the workshops increased a sense of environmental responsibility among some participants.

Feedback about diverse learning needs underlined the need to balance both *choice* and *structure* in the composting workshops. The appreciation for smaller group sizes, as reflected in the feedback, emphasizes the benefits of individual attention and catering learning activities to various learning styles. Nevertheless, the challenges some learners faced underscore the importance of considering all learners' unique needs and integrating these needs into the structure of future workshops.

From these findings, we have three recommendations for future composting workshops:

1. **Continue to take a hands-on learning approach:** both children and teachers tended to favour the hands-on and experiential aspects of the workshops, including the integration of games, meaning these experiences should remain at the core of the workshops.
2. **Accommodate diverse learning needs:** While the fast-paced nature of the workshops may benefit students with high stimulation needs, others might struggle to stay engaged. We recommend providing more options for learning within the workshops. For example, by adding a “quiet learning zone” and by providing leadership roles so learners have the option of being removed from the fast-paced nature of the workshop stations. Additionally, checking in with teachers about which students might have challenges can allow workshop facilitators to proactively adapt their workshop activities and teaching strategies. Additionally, one survey respondent pointed out the necessity for “more rules around touching/damaging others' work” and for enforcing rules in activities like relay races. Considering feedback received relating to potential challenges on inclement weather days, weather protection provisions could further encourage engagement.
3. **Making connections and providing resources:** An overwhelming response from the post-workshop survey revealed that children felt a renewed commitment

towards being environmentally responsible. By making explicit connections between workshop activities and their environmental implications, The Children's Garden Project can continue to inspire children to be environmental stewards. This could include finding more opportunities to explicitly connect the workshop content to current environmental issues and by facilitating intentional conversations surrounding community (e.g., what community is, what it looks like, and how it benefits people). Providing more take-home resources could help to spark conversations about environmental stewardship, while providing opportunities for further engagement could support kids in continuing to develop a positive mindful relationship with the natural environment.

## Conclusion

Consistent with the existing literature on the benefits of gardening programming and child-led learning, The Children's Garden Project's composting workshops provide children with experiential, hands-on learning opportunities to develop mindful relationships with the environment. The survey and interview data from this research project show that the workshops had at least a short-term positive impact on the majority of participants' knowledge of composting, approach to waste, awareness of the complexity of the natural environment, and environmental stewardship. The experiential and interactive approach to learning in these workshops, including the integration of games, was an asset to supporting children's learning and engagement.

To maximize the future potential of these workshops, we recommend The Children's Garden Project continue to foster hands-on learning experiences, seek to accommodate diverse learning needs, make connections to larger environmental issues, and provide take-home resources for students to continue their learning.

# Bibliography

- Alexander, G. K., & Grannum, D. R. (2022). School garden benefits: Health promotion and environmental conservation. *NASN School Nurse*, 37(2), 79–82. <https://doi.org/10.1177/1942602X211058783>
- Arnott, L. (2018). Children’s negotiation tactics and socio-emotional self-regulation in child-led play experiences: The influence of the preschool pedagogic culture. *Early Child Development and Care*, 188(7), 951–965. <https://doi.org/10.1080/03004430.2018.1443919>
- Brynjegard, S. (2001). *School gardens: Raising environmental awareness in children*. <https://eric.ed.gov/?id=ED452085>
- Burt, K. G., Koch, P., & Contento, I. (2017). Implementing and sustaining school gardens by integrating the curriculum. *Health Behavior and Policy Review*, 4(5), 427–435. <https://doi.org/10.14485/HBPR.4.5.2>
- Harvey, D. J., Montgomery, L. N., Harvey, H., Hall, F., Gange, A. C., & Watling, D. (2020). Psychological benefits of a biodiversity-focused outdoor learning program for primary school children. *Journal of Environmental Psychology*, 67, 101381. <https://doi.org/10.1016/j.jenvp.2019.101381>
- Lohr, A. M., Bell, M. L., Coulter, K., Marston, S., Thompson, M., Carvajal, S. C., Wilkinson-Lee, A. M., Gerald, L. B., & Korchmaros, J. (2022). The association between duration of school garden exposure and self-reported learning and school connectedness. *Health Education & Behavior*, 109019812210842. <https://doi.org/10.1177/10901981221084266>
- MacDonald, K., & Breunig, M. (2018). Back to the Garten: Ontario kindergarteners learn and grow through schoolyard pedagogy. *Journal of Outdoor and Environmental Education*, 21(2), 133–151. <https://doi.org/10.1007/s42322-018-0011-z>
- Kuo, M., Barnes, M., & Jordan, C. (2019). Do experiences with nature promote learning? Converging evidence of a cause-and-effect relationship. *Frontiers in Psychology*, 10, 305. <https://doi.org/10.3389/fpsyg.2019.00305>
- Ohly, H., Gentry, S., Wigglesworth, R., Bethel, A., Lovell, R., & Garside, R. (2016). A systematic review of the health and well-being impacts of school gardening: Synthesis of quantitative and qualitative evidence. *BMC Public Health*, 16(1), 286. <https://doi.org/10.1186/s12889-016-2941-0>

- Passy, R. (2012). School gardens: Teaching and learning outside the front door. *Education 3-13*, 42(1), 23–38. <https://doi.org/10.1080/03004279.2011.636371>
- 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), 379-395. <https://doi.org/10.1017/S1742058X16000229>
- Rios, J. M., & Brewer, J. (2014). Outdoor education and science achievement. *Applied Environmental Education & Communication*, 13(4), 234–240. <https://doi.org/10.1080/1533015X.2015.975084>
- Savoie-Roskos, M. R., Wengreen, H., & Durward, C. (2017). Increasing fruit and vegetable intake among children and youth through gardening-based interventions: A systematic review. *Journal of the Academy of Nutrition and Dietetics*, 117(2), 240–250. <https://doi.org/10.1016/j.jand.2016.10.014>
- Skelton, K. R., Lowe, C., Zaltz, D. A., & Benjamin-Neelon, S. E. (2020). Garden-based interventions and early childhood health: An umbrella review. *International Journal of Behavioral Nutrition and Physical Activity*, 17(1), 121. <https://doi.org/10.1186/s12966-020-01023-5>
- Tillmann, S., Tobin, D., Avison, W., & Gilliland, J. (2018). Mental health benefits of interactions with nature in children and teenagers: A systematic review. *J Epidemiol Community Health*, 72(10), 958–966. <https://doi.org/10.1136/jech-2018-210436>

# Appendices

## Appendix A: Literature Review Inclusion/Exclusion Criteria and Search Terms

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> <li>• Articles published within the last 15 years.</li> <li>• Studies that involve children (ages 3-12 years) as the main participant group.</li> <li>• Studies that focus on gardening or gardening programs as the main intervention or activity.</li> <li>• Studies that measure well-being outcomes, such as emotional well-being, mental health, social development, self-esteem, resilience, and overall quality of life.</li> <li>• Studies that examine the effects of gardening on environmental attitudes, knowledge, awareness, conservation behaviors, or sustainability-related outcomes.</li> <li>• Studies involving specific populations (e.g., children with disabilities, psychiatric disorders, or specific medical conditions) if they meet the rest of the requirements.</li> <li>• Research conducted in Canada, the U.S., or other countries with similar social, political, and economic context.</li> <li>• Studies published in English.</li> </ul>	<ul style="list-style-type: none"> <li>• Articles published more than 15 years ago.</li> <li>• Articles that identify benefits of gardening/gardening programs for adolescent age groups (ages 13-19 years).</li> <li>• Studies that do not measure any well-being outcomes in relation to gardening or gardening programs OR studies that do not examine any environmental stewardship outcomes associated with gardening.</li> <li>• Studies published in languages other than English.</li> </ul>

### Key Search Terms:

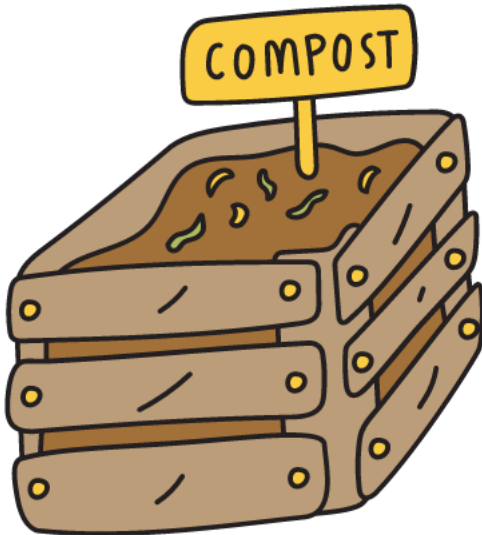
- garden\* OR gardening OR “gardening program\*” OR horticulture OR “school garden\*” OR “community garden\*” OR “nature-based interventions”
- children OR youth OR elementary school students
- well\* OR “well-being” OR “mental health” OR “emotional well-being” OR “self-esteem” OR “quality of life”
- “environmental stewardship” OR “environmental attitudes” OR “environmental knowledge” OR “sustainability”

- “child-led programming” OR “child-led” OR “child-led programming benefits” OR “child-led learning” OR “student-led” OR “inquiry-based learning”
- “sense of ownership” OR “ownership” OR “child sense of ownership”

\*\*\*use of AND if we would like to combine key terms.

## Appendix B: Pre and Post Composting Workshop Surveys for Children

### Pre Survey for The Children's Garden Compost Workshop



Please answer the following questions to help us understand your experience learning about compost! Your answers are private and will not be shared with your teacher or other students.

1. How much do you know about composting (turning food and plant scraps into soil that helps plants grow)? (Circle your answer)

Nothing                      A little bit                      A lot

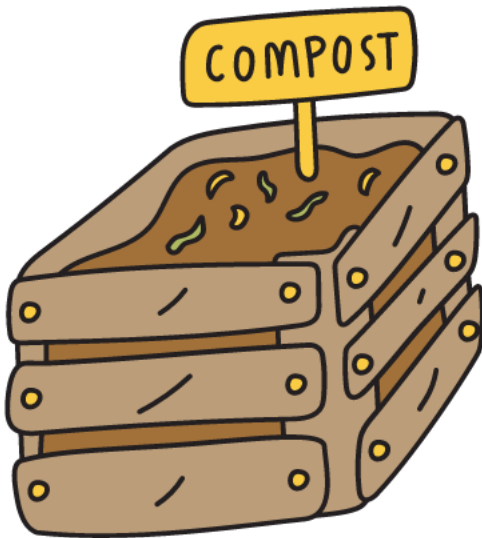
2. How interested are you, if at all, in composting (turning food and plant scraps into soil that helps plants grow)? (Circle your answer)

Not interested at all                      Neutral                      Interested

3. What do you hope to learn about composting?



## Post Survey for The Children's Garden Compost Workshop



Please answer the following questions to help us understand your experience learning about compost! Your answers are private and will not be shared with your teacher or other students.

1. Did the workshops increase your knowledge of composting? If so, by how much? (Circle your answer)

Not at all                  A little bit                  A lot

2. How, if at all, did the workshops change your interest in composting?

I'm less interested                  No change                  I'm more interested

3. How much did you enjoy the composting workshops, if at all?

Not at all                  A little bit                  A lot

4. Do you feel like you can teach your family or friends about what you learned in the workshops? If so, how much? (Circle your answer)

Not at all

A little bit

A lot

5. What were your favourite ways to learn about composting during the workshops? (Circle all that apply)

a. Hands-on learning (touching the soil, sorting waste)

b. Games (tag, relay races)

c. Listening to the teachers and compost experts

d. Other (write down what you liked best) \_\_\_\_\_

6. What was the most interesting thing(s) you learned in the workshop? (If nothing was interesting, please leave blank)

7. What's one thing you are going to do differently at home that you learned from the workshop? (If you will not do anything differently, please leave blank)

## Appendix C: Interview Recruitment Email and Interview Guide

Hello,

We are part of a Research Team with the McMaster University Research Shop – a volunteer-based program that conducts research in partnership with local organizations. We are contacting you because our team is helping The Children’s Garden Project Canada (TCGPC) collect feedback on their composting workshops.

We would love to chat with you about your experience with the TCGPC Series on “Protecting the Environment: How Composting Benefits Plants, Soil and Community”.

If interested, we’d like to organize a time within the next couple of weeks that works for you for a phone or Zoom interview. The interview will take approximately 20-30 minutes to complete. Participation is completely voluntary.

If you are interested in an interview, please select a timeslot at the following link:

<https://calendly.com/bossea1/30min>

We will follow up with you once we receive your selected time. If none of the times listed work for you, please let us know and we can figure out an alternate time.

Please let us know if you have any questions or concerns.

Thank you for your time and consideration.

Best,

Anneka, Emily, and Runisan  
Children’s Garden Project Research Team  
[McMaster Research Shop](#)

## The Children's Garden Project Interview Guide

### Greetings

Hello, our names are [names], and we're volunteers from the McMaster Research Shop helping The Children's Garden Project collect feedback on their composting workshops. We're interviewing teachers to get their perspective on the value of the workshop, what students learned (if anything), and how things can be improved. This conversation shouldn't take longer than 20-30 minutes. With that basic information, do you have any questions about what we're doing?

### Confidentiality

Before we start our conversation, I'd like to outline a few basic rules for our discussion today:

- Your participation is entirely voluntary. You can opt to leave or stop participating in this interview at any moment, without any repercussions.
- There is no obligation to answer any questions.
- The information we collect from this interview is intended to be confidential, and any quotes we use will be anonymous. However, please be aware that since we're only interviewing a few teachers, anything you share could be recognized by readers.

With your consent, we would like to record this interview. This will help us improve the accuracy of the information and minimize the possibility of misinterpreting what you say.

- All audio files and transcripts will be stored securely in a cloud-based folder that is only accessible to our research team.
- We will also be taking notes during our discussion for reference purposes.
- Only our research team will have access to the transcripts from this discussion.
- These recordings and transcripts will only be used for the purposes of this project and will be destroyed once the report is finalized.

### Introduction

Let's get started. If at any time you need to take a break, let me know.

### Interview Questions

#### *Part 1: Background*

1. Can you tell us your name and what grade you teach?
2. How many composting workshops did your class participate in?

- a. Was there a particular workshop that stood out to you or your students, and why?
3. What was your role in the composting workshop(s)?
  - a. Would you prefer a different role in the future, or did you feel this was suitable?

*Part 2: Gaining knowledge of composting*

1. How much, if anything, do you feel most of your students learned about composting?
  - a. Can you provide some specific examples of what you think they learned?
  - b. Do you feel like certain students learned more than others? If so, why?
2. Did you notice any changes in the students' confidence or skills in composting as the workshops progressed?

*Part 2: Development of Environmental Stewardship*

1. What role do you see these workshops playing in fostering environmental stewardship in students?
  - a. Can you provide an example of how this was shown in a student or a group of students?
  - b. Can you share any notable shifts in student behaviour or attitudes towards composting and environmental issues since participating in the workshops?
2. What specific behaviours or attitudes have you noticed?
  - a. Can you share any examples of how the workshops have encouraged students to practice environmentalism outside of the workshops?

*Part 3: Workshop Structure (Child-Led Model)*

1. From your perspective, what were the most engaging parts of the workshop(s), if any?
  - a. Can you elaborate on why you found these parts most engaging?
2. Which elements of the workshop do you believe had the most significant impact on student ownership of learning, if any? [Student ownership of learning: when students take an active role in the learning process.]
  - a. Can you share an example or story that demonstrates this impact?
3. How do you feel about the workshop content? For instance, do you feel like it covered the most relevant topics, or do you feel like certain content was missing?
4. Are there any instances where students took initiative or demonstrated leadership during the workshop(s)?
  - a. Can you share a particular moment or experience of this?
5. Do you have any recommendations for future workshops (with regards to the structure, content, or instruction)?

## **Conclusion and Follow-Up**

Thank you so much for your time and thoughtful responses. Your insights are invaluable to us and will contribute to our understanding of the impact and effectiveness of The Children's Garden Project's composting workshops.

We'd love to share our report with you when it's available. If you're interested in receiving a copy of our report, could you please provide us with the best method of contact for you? We will ensure that all information shared is kept confidential and is used solely for sharing this research.

If you have any additional thoughts, feedback, or questions following this interview, please feel free to contact us at [bossea1@mcmaster.ca](mailto:bossea1@mcmaster.ca).

We appreciate your participation and your commitment to fostering environmental stewardship in your students. Thank you once again for your time, and we hope you have a wonderful day.

## Appendix D: Stages of Interview Analysis

The analysis proceeded in four stages:

### 1. Data Preparation

The first stage of the analysis was data preparation. After recording each interview through an audio file, a speech to text plugin via Microsoft Word was used to create a transcript for each respective interview.

Data cleaning was an essential part of this stage. It involved checking the data for errors or inconsistencies and addressing any issues that could potentially impact the analysis. This included ensuring that the data were complete and correctly transcribed, and that any identifying information was removed to maintain the confidentiality of the participants.

Once the data was cleaned and prepared, the interview transcripts were read multiple times to familiarize ourselves with the content. This immersion in the data allowed us to gain a sense of the overall depth and breadth of the content, understand the context of the participants' responses, and start identifying preliminary patterns and themes.

### 2. Initial Coding

The second stage of the analysis was initial coding. This involved a detailed and systematic examination of the interview transcripts to identify and highlight significant phrases or sentences that captured key thoughts or concepts.

The coding process was both inductive and deductive. Inductive codes emerged organically from the data, reflecting the unique responses and language of the participants. Deductive codes, on the other hand, were pre-determined based on the research question and the specific areas of interest it outlined.

During this stage, we also started to note initial relationships between codes and began grouping related codes together. This iterative process allowed us to refine our codes as we progressed through the data and gained a deeper understanding of the emerging themes.

The initial coding process was critical for breaking down the data into manageable segments and starting to reveal the underlying patterns and themes.

### 3. Identifying Themes

The third stage of the analysis involved identifying themes. This was a crucial step in moving beyond the detailed coding of the data and starting to interpret the broader meanings and implications of the findings.

During this stage, we grouped the initial codes into potential themes. This involved examining the codes and considering how they may combine to form overarching themes that capture the key aspects of the data. We gathered all data relevant to each potential theme, ensuring that each theme was supported by sufficient data and that all data could be accommodated within the identified themes.

We then reviewed and refined the themes, considering whether they accurately represented the coded data and the overall data set. This involved a constant back-and-forth process between the coded data and the identified themes, ensuring that the themes were grounded in the data and accurately reflected the participants' experiences and perspectives.

This stage of the analysis was critical for starting to make sense of the data and identifying the key themes that would form the basis of our findings.

#### 4. Reviewing and Defining Themes

The final stage of the analysis was reviewing and defining the themes. This involved refining the themes and sub-themes to ensure that they were distinct, coherent, and meaningful. We considered the scope and focus of each theme, ensuring that it had a clear and identifiable core concept.

We then defined and named the themes. This involved developing a clear definition of what each theme was about and what aspect of the data it captured. We also considered how each theme fit into the overall story that the data were telling, and how the themes related to each other.

During this stage, we also selected compelling quote extracts that captured the essence of each theme. These quotes were chosen for their ability to convey the key aspects of each theme succinctly and powerfully, and they provide a direct link between the themes and the raw data.

Finally, a codebook was created to document the final themes and sub-themes, their definitions, and example quotes. The codebook serves as a record of the analytical decisions made during the analysis and provides a guide for interpreting the findings.



This final stage of the analysis was critical for ensuring that the themes accurately and meaningfully represented the data, and for preparing the findings for presentation and interpretation.