Horticultural Activity Program for Improving Emotional Intelligence, Prosocial Behavior, and Scientific Investigation Abilities and Attitudes in Kindergarteners

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Summary. **The objectives of this study were to examine the effects of a horticultural activity program on the emotional intelligence, prosocial behavior, and scientific investigation abilities and attitudes of kindergarteners. A total of 336 children aged 5 to 7 years in public and private kindergartens and day care centers in Incheon, South Korea, participated in a 24-session horticultural activity program. This program included indoor and outdoor activities such as planting seeds, transplanting plants, making and applying eco-friendly fertilizer, watering, harvesting, using plants to make crafts, and cooking with produce. It was designed to improve the emotional intelligence, prosocial behavior, and scientific investigation abilities and attitudes of kindergarteners. Each session lasted an average of 50 minutes and was held once per week. The results of the study showed that the 24-session horticultural activity program improved the emotional intelligence, prosocial behavior, and scientific investigation abilities and attitudes of the children ($P < 0.05$). Satisfaction with the program was very high among both the children and their teachers and parents. Future studies should consider exploring the effects of horticultural activity programs on children in different age groups.**

Early childhood is a critical time for physical, emotional, cognitive, social, and language development, and it is important to develop in harmony with each other (Oh and Choi, 2007). In particular, early childhood is a time in which children are sensitive and receptive to the benefits of nature (Kahn and Kellert, 2002; Phenice and Griffore, 2003; Zhang et al., 2014). In the 1900s, Montessori (1964) discovered that gardening for children could develop their patience, enhance moral education, increase responsibility, and improve appreciation for nature as well as develop interpersonal skills.

Interest in school gardening has increased in recent years (Desmond et al., 2004; Hoffman et al., 2004; Klemmer et al., 2005). Previous research found that educational gardening had positive effects on social skills, language abilities, ability to think, inquiry abilities, and creativity (Jeong et al., 2010, 2011, 2014; Keum et al., 2014; Lee and Kim, 2007; Miller, 2007; Zajicek, 2003). Interaction with living plants has been shown to improve the emotional functioning of children and provides them with enjoyment and self-worth (Chiang et al., 2007). Park and Huh (2010) reported that horticultural activity programs improved emotional intelligence and reduced stress among younger children. Moreover, participation in horticultural activities has been shown to reduce aggression, depression, and anxiety among children (Kang et al., 1999; Seo et al., 2013). It can, thus, be stated that gardening offers significant benefits to children at the early developmental stages of growth (Ryu et al., 2013).

However, children living in urbanized, modern societies often have insufficient opportunities to experience and interact with nature (Bailie, 2010; Hofferth, 2009). They spend most of their school time indoors, interacting with artificial teaching aids, textbooks, and toys (Bailie, 2010; Phenice and Griffore, 2003).

Therefore, the objectives of this study were to design a 24-session horticultural activity program for regular classes in day care centers and kindergartens, and to examine the effects of this program on the emotional intelligence, prosocial behavior, and scientific investigation abilities and attitudes in a large sample of children living in an urban area.

Materials and methods

Participants. To find children to participate in the current study, ≈20 public and private kindergartens and day care centers located in Incheon, South Korea, were contacted. Official letters, including the descriptions of the study's duration, contents of the horticultural activity program, and assessments were distributed. Finally, 336 Korean children aged 5 to 7 years in 12 public and private kindergartens and day care centers in the same community, the Incheon area, that is the fourth largest city in South Korea, agreed to participate in this study (Table 1). A consent form was obtained from the parents of the children before beginning the study.

Horticultural activity program. Six experts in the fields of horticulture and education, early childhood education, horticultural therapy, and horticulture science designed a 24-session horticultural activity program for this study. First, basic concepts of horticultural knowledge such as understanding soil, seeds, plant structure, propagation, and basic horticultural

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Units

To convert U.S. to SI, multiply by	U.S. unit	SI unit	To convert SI to U.S., multiply by
0.3048	ft	m	3.2808

Table 1. Characteristics of the children who participated in the study of a horticultural activity program for improving emotional intelligence, prosocial behavior, and scientific investigation abilities and attitudes in kindergarteners (N = 336).

Type		Total no. of participants	Gender		Age		
			Boy (n = 169)	Girl (n = 167)	5 years (n = 42)	6 years (n = 98)	7 years (n = 196)
Day care center	Public	A (n = 44)	20	24	—	44	—
		B (n = 36)	24	12	35	1	—
		C (n = 36)	19	17	—	17	19
	Private	D (n = 19)	7	12	—	—	19
		E (n = 38)	23	15	—	—	38
		F (n = 43)	23	20	—	24	19
Kindergarten	Public	G (n = 15)	8	7	—	—	15
	Private	H (n = 27)	9	18	—	—	27
		I (n = 25)	13	12	7	12	6
		J (n = 17)	6	11	—	—	17
		K (n = 18)	7	11	—	—	18
		L (n = 18)	10	8	—	—	18

activities such as planting, watering, fertilizing, and harvesting were selected. Next, the program was further developed with consideration given to the interests and developmental levels of the students and the Korean national curriculum. The main activities in the program included both indoor and outdoor horticultural activities such as planting seeds, transplanting, making and applying fertilizer, watering, harvesting, craft making with plants, observing plants and insects, and cooking with produce (Table 2).

Each activity targeted the previously mentioned qualities of emotional intelligence, prosocial behavior, and scientific investigation abilities and attitudes. In other words, the instructors focused on improving the factors related to the targeted objectives. For example, in each session, the instructors aimed to improve the children's expression of emotions, their recognition of their own and others' emotions, and their relationships with peers and teachers by conducting horticultural activities in class. Moreover, to improve the children's prosocial behavior, the instructors provided opportunities for helping, sharing, cooperation, and kindness during the program. With regard to scientific investigation abilities and attitudes, the instructors provided the children with opportunities for curiosity, prediction, observation, measurement, and discussion.

Seasonal plants such as corn (*Zea mays*), tomato (*Solanum lycopersicum*), lettuce (*Lactuca sativa*), kidney bean (*Phaseolus vulgaris*), carrot (*Daucus carota*), zucchini (*Cucurbita pepo*), chinese cabbage (*Brassica rapa* ssp. *pekinensis*), radish (*Raphanus sativus*), garden balsam (*Impatiens balsamina*), and insectivorous plants [venus flytrap (*Dionaea muscipula*) and cape sundew (*Drosera capensis*)] were chosen for this program. Ten raised beds (1.5 × 1 × 1.5 m each) for outdoor gardening were set up at each kindergarten and day care center. The program was conducted in both the classroom and the garden plot of each participating kindergarten and day care center once per week (averaging 50 min per session) during regular class hours from May to Oct. 2011.

Table 2. Topics of the 24-session horticultural activity program to improve emotional intelligence, prosocial behavior, and scientific investigation abilities and attitudes in children aged 5 to 7 years.

Session no.	Topic
1	Transplanting, planting seeds
2	Transplants, tying stakes
3	Planting seeds, learning about soil structure and its characteristics
4	Making eco-friendly fertilizer
5	Applying fertilizer
6	Observing vegetable plants
7	Making ecofriendly fertilizer
8	Harvesting, tasting the harvest
9	Propagation
10	Making a dish garden
11	Planting seeds, flower arrangement
12	Natural dyeing
13	Harvesting
14	Harvesting, cooking with harvested produce
15	Natural dyeing
16	Propagation
17	Transplanting, planting seeds
18	Fertilizing
19	Hydroponics
20	Observing insects in the garden
21	Harvesting, cooking with harvested produce
22	Growing sprouts
23	Making a topiary
24	Cooking with harvested produce

Before commencing the horticultural activity programs in each kindergarten or day care center, eight instructors (masters in horticultural therapy or certified Korean horticultural therapists) had teacher training meetings to understand the program objectives and activities, management methods, and matters that required attention for the children's program. Moreover, the instructors were able to practice the activities in advance and the educational materials required were previously distributed to

the instructors at the 2-d teacher training meetings.

Table 3 provides an example of the program activities. One session, called "Understanding and Growing Sprouts," aimed to provide an understanding of seed structure and observation of sprout growth. At the program introduction stage, the children were introduced to the instructor and seated in groups to encourage a sense of belonging. To capture the children's interest, the children sang a song about seeds. In the development stage, the instructor explained the seed structure and process of plant growth from seed to sprout. The children assembled a puzzle to create a sprout picture. After that, the children examined seeds in a container and made nametags for the plants with the date. In the closing stage of the lesson, the instructor explained how to care for the seeds until they sprouted. Throughout the process of the activity program, the instructors aimed to provide opportunities to implement factors related to the target outcomes, such as emotional intelligence, prosocial behavior, and scientific investigation abilities and attitudes.

Instruments. To examine the effects of the horticultural activity program on the emotional intelligence, prosocial behavior, and scientific investigation abilities and attitudes of the children, the children who participated in this study were randomly assigned to be measured through the use of one or two surveys. The surveys were developed to be answered by the teacher instructing the children. Class teachers answered the questionnaires based on daily classroom observations. Accordingly, 135 children in four kindergartens (A, B, C, D) were measured regarding emotional intelligence, 133 children in four kindergartens (E, F, H, I) were measured for prosocial behavior, and 68 children in four kindergartens (G, J, K, L) were measured for scientific investigation abilities and attitudes. A pretest was conducted 1 week before the commencement of the horticultural activity program and a posttest was conducted 1 week after the program's completion. The teachers completed their responses to the questionnaire for the students they had been allocated, within 1 week of observations.

To understand the effects of the 24-session horticultural activity program on emotional intelligence, the modified emotional intelligence scale (Kim, 1998) for children developed by Mayer and Salovey (1997) was used. Emotional intelligence is the ability to recognize, express, and control emotions, to recognize and understand the emotions of others, and to use emotions for success and achievement in life (Mayer and Salovey, 1997). Moreover, Kim (1998) identified that emotional intelligence is made up of the six subitems of utilization of emotion, recognition and consideration of others' emotions, recognition and expression of one's own emotions, emotional regulation and impulse control, relationships with teachers, and relationships with peers, based on the emotional intelligence theories of Mayer and Salovey (1997) and Goleman (1995).

A five-point Likert scale was used in the emotional intelligence questionnaire, which consisted of 50 questions with the six subscales identified by Kim (1998). The children's teachers answered the questions based on their daily classroom observations. For example, for each student, the teachers rated the question "helps friends who need help" as "strongly agree," "agree," "moderately agree," "disagree," or "strongly disagree." Higher scores are equivalent to more positive behavior. The Cronbach's alpha was 0.90 in this study, whereas Kwon (2012a) reported a Cronbach's alpha of 0.97.

To understand the effects of the program on prosocial behavior, the revised, prosocial behavior questionnaire by Lee (1996) was used. This questionnaire is based on the prosocial behavior questionnaire developed by Weir and Duveen (1981) and the modified prosocial behavior questionnaire by Doescher (1985). This questionnaire used a three-point Likert scale and consisted of a total of 20 questions with four subscales such as helping, sharing, cooperation, and kindness. For example, for each student, the teachers rated the item "apologizes for mistakes he/she has made" by responding "agree," "neutral," or "disagree." Higher scores are equivalent to more positive behavior. As in the previous questionnaire, the teachers answered the questions based on their daily classroom observations. The Cronbach's alpha was 0.89 in this study, whereas a previous study reported a Cronbach's alpha of 0.87 (Lee, 1996).

To assess the scientific attitudes of the children, a scientific attitude survey revised by Lee (2000) and based on the survey developed by Yoo (2000) was used. A five-point Likert scale was used in the survey, which consisted of 27 questions with the nine subcategories of curiosity, volunteerism and activeness, forthrightness, objectivity, openness, criticism, objectivity, cooperation, and patience. For example, for each student, the teachers rated the item

Table 3. Example of a horticultural activity session to improve emotional intelligence, prosocial behavior, and scientific investigation abilities and attitudes in children aged 5 to 7 years.

Title	Understanding and growing sprouts	
Objectives	To learn about seed structure and observe sprout growth	
Materials used	Seeds (radish), a transparent plastic container, cotton, spray, name pen	
Procedures	Contents	Target factors
Introduction	1. Greeting. 2. Sit with groups. 3. Sing a Korean children's song about seeds.	Emotional intelligence, eco-friendly attitudes, prosocial behavior, scientific investigation abilities, scientific attitudes
Development	1. Lesson on seed structure and the process of growth from seed to sprout. 2. Assemble a sprout puzzle. 3. Plant seeds in a container and make a nametag with the date.	
Closing	1. Explain how to care for the seed container.	

"describes the characteristic exactly" as "strongly disagree," "disagree," "neutral," "agree," or "strongly agree." The teachers answered the questions based on their daily classroom observations. A higher score indicates a better scientific attitude. The Cronbach's alpha was 0.92 in this study, whereas a previous study reported a Cronbach's alpha of 0.87 (Lee, 2000) and internal consistency of 0.94 (Kwag, 2009).

To assess the scientific investigation ability of the younger children, a questionnaire revised by Lee (2000) and developed by Martin (1997) was used. This questionnaire was comprised of 21 questions with the five subcategories of prediction, observation, classification, measurement, and discussion, which were scored on a five-point Likert scale. For example, for each student, the teachers rated the item "pays attention to the new targets" on the scale of "strongly disagree," "disagree," "neutral," "agree," or "strongly agree." The teachers answered the questions based on their daily classroom observations. A higher score indicates better investigation ability. The Cronbach's alpha was 0.95 in this study, whereas a previous study reported a Cronbach's alpha of 0.89 (Lee, 2012).

Finally, a satisfaction survey was developed by the researchers for this study to investigate the levels of satisfaction with the 24-session horticultural activity program. Most of the children who participated in the horticultural activity program, their parents, and the teachers completed satisfaction surveys at the end of the program. In the satisfaction survey for the children, four questions asked about overall satisfaction (e.g., the question "were you satisfied with the program?" was answered using a three-point Likert scale: satisfied, neutral, not satisfied); interest (e.g., the question "were you interested in the program?" was answered using a three-point Likert scale: not interested, neutral, interested); degree of difficulty (e.g., the question "were the activities difficult?" was answered using a three-point Likert scale: easy, moderate, hard); and preference of activities in the horticultural activity program (e.g., "what was your favorite activity? Choose three activities among the horticultural activity pictures that were conducted"). Because most of the children were too young to read Korean independently, the program instructors and classroom teachers helped them to read the questions and record answers if needed. In both the satisfaction surveys for the parents and teachers, two questions asking about their overall satisfaction with the program and their desire for its continuation were included.

Data analysis. To analyze the differences before and after the horticultural activity program, a paired *t* test was conducted using SPSS (version 19.0; IBM Corp., Armonk, NY) at $P < 0.05$. The mean, SD, and percentage of the responses to the satisfaction surveys were analyzed using Excel (MS Office 2007; Microsoft Corp., Redmond, WA).

Results and discussion

Emotional intelligence. To investigate the effects of the 24-session horticultural activity program on emotional intelligence, 135 children in four public and private day care centers (A, B, C, D) were evaluated. The results showed that the emotional intelligence of the children was significantly improved after the 24-session horticultural activity program [$P < 0.001$ (Table 4)]. The children showed significant improvement in the six subscales of the emotional intelligence scale, including the utilization of emotions, recognition and consideration of others' emotions, recognition and expression of their own emotions, emotional regulation and impulse control, and relationships with teachers and peers after the 24-session horticultural activity program.

Previous studies have also reported the positive effects of horticultural activities on emotional intelligence (Jeong et al., 2009; Park and Huh, 2010; Ryu et al., 2013). Children aged 4 to 5 years significantly improved their emotional intelligence in the subitem of utilization of emotions, recognition and consideration of others' emotions, emotional regulation and impulse control, and relationships with peers after completing a 12-session horticultural activity program (Kwon, 2012b). Ryu et al. (2013) reported that a 16-session horticultural activity program significantly improved emotional intelligence in the subitems of self-awareness, recognizing emotions in others, self-regulation, and emotional regulation of others in 15, 6-year-old children at day care centers. Additionally, a study conducted by Jeong et al. (2009) found that 6-year-old children showed significant improvements in their emotional intelligence in terms of self-awareness, recognizing emotions in others, self-regulation, and emotional regulation of others after a 14-session horticultural activity program. Finally, in a study by Park and Huh (2010), 5- to 7-year-old kindergarteners significantly improved in self-awareness and emotional regulation of others in emotional intelligence through a 32-session horticultural activity program.

Table 4. A paired *t* test for the results regarding emotional intelligence before and after the 24-session horticultural activity program for children aged 5 to 7 years (N = 135).

Items[z]	Pretest [Mean ±SD (1–5 scale)]	Posttest [Mean ±SD (1–5 scale)]	*P* value
Utilization of emotions	3.35 ± 0.83	4.01 ± 0.88	0.000
Recognition and consideration of others' emotions	3.36 ± 0.59	3.79 ± 0.68	0.000
Recognition and expression of own emotions	3.86 ± 0.73	4.30 ± 0.63	0.000
Emotional regulation and impulse control	3.62 ± 0.65	4.11 ± 0.81	0.000
Relationships with teachers	3.77 ± 0.90	4.19 ± 0.71	0.000
Relationships with peers	3.73 ± 0.92	4.09 ± 0.84	0.000

[z]The emotional intelligence scale for children developed by Kim (1998) was used. It consists of 50 questions with six subscales, including "utilization of emotions, recognition and consideration of others' emotions, recognition and expression of own emotions, emotional regulation and impulse control, relationships with teachers, and relationships with peers." Teachers answered the questions based on the daily classroom observation. Higher scores were equivalent to more positive behavior.

Children's experiences in gardens or in observing the plant growth process in cooperation with their peers provide opportunities for emotional development (Kim et al., 2014). Working cooperatively with plants in gardens provides children with various emotional experiences and opportunities to understand others' feelings. In this study, horticultural activities with peers provided children with opportunities to use their emotions, recognize and be considerate of others' emotions, recognize and express their own emotions, develop emotional regulation and impulse control, and foster relationships with teachers and peers (Table 4).

Emotional intelligence develops in the early stages of childhood (Goleman, 1995). Young children with a low level of emotional intelligence are more likely to experience poor interpersonal relationships, lower academic achievement, and inferior psychological adaptation, which put them at risk for juvenile delinquency (Grolnick et al., 1996; Rubin et al., 1995). On the other hand, younger children with high levels of emotional intelligence demonstrate a tendency for better peer relationships and higher levels of life satisfaction (Denham et al., 1990; Petrides et al., 2006). Thus, children who can understand and express their emotions or understand the causes and effects of emotional situations experience better relationships with others (Denham, 1993). Moreover, children with stable emotional intelligence perform better academically (Casey and Schlosser, 1994) and demonstrate higher levels problem-solving skills and creative abilities (Jeong et al., 2009).

Prosocial behavior. To investigate the effects of the horticultural activity program on children's prosocial behavior, 133 children in four public and private day care centers and kindergartens (E, F, H, I) were evaluated. After completion of the horticultural activity program, the children demonstrated significant improvements in the prosocial behaviors of helping, sharing, cooperation, and kindness [$P < 0.001$ (Table 5)].

Prosocial behavior can be defined as actions undertaken for other people's interests, without the expectation of receiving anything in return (Bar-Tal, 1976). Kim (2003b) classified prosocial behavior as helping, sharing, cooperation, and consolation. Prosocial behavior is necessary for the functioning of communities and societies (Ministry of Education, 1998).

The results of this study are consistent with previous studies. A study by Hwang (2004) of a 10-week gardening program showed significant improvements in helping, sharing, and cooperation skills among children aged 4 to 5 years. Kim et al. (2014) reported that elementary school children improved in the areas of persistence and adaptability within peer relationships, as well as compliance with classroom rules and collaboration with classmates by participating in a school gardening program. Waliczek et al. (2001) reported that school gardens had positive effects on

Table 5. A paired *t* test for the results regarding prosocial behavior before and after the 24-session horticultural activity program for children aged 5 to 7 years (N = 133).

Items[z]	Pretest [Mean ±SD (1–3 scale)]	Posttest [Mean ±SD (1–3 scale)]	*P* value
Helping	2.37 ± 0.46	2.57 ± 0.43	0.000
Sharing	2.53 ± 0.41	2.66 ± 0.36	0.001
Cooperation	2.42 ± 0.43	2.66 ± 0.38	0.000
Kindness	2.30 ± 0.38	2.55 ± 0.40	0.000

[z]The revised prosocial behavior questionnaire by Lee (1996) was used. The questionnaire consisted of a total of 20 questions with the four subscales, including "helping, sharing, cooperation, and kindness." Teachers answered the questions based on daily classroom observations of children. Higher scores were equivalent to more positive behavior.

Table 6. A paired *t* test for the results regarding scientific investigation ability and scientific attitude before and after the 24-session horticultural activity program for children aged 5 to 7 years (N = 68).

Survey	Items	Pretest [Mean ±SD (1–5 scale)]	Posttest [Mean ±SD (1–5 scale)]	*P* value
Scientific investigation abilities[z]	Prediction	3.11 ± 0.83	3.54 ± 0.63	0.002
	Observation	3.34 ± 0.92	3.99 ± 0.67	0.000
	Classification	3.25 ± 0.93	3.93 ± 0.66	0.000
	Measurement	2.88 ± 0.97	3.70 ± 0.68	0.000
	Discussion	3.04 ± 0.85	3.55 ± 0.81	0.001
Scientific attitudes[y]	Curiosity	3.17 ± 0.98	4.11 ± 0.67	0.000
	Activeness	3.13 ± 0.95	4.10 ± 0.65	0.000
	Forthrightness	3.31 ± 0.77	4.07 ± 0.54	0.000
	Objectivity	3.07 ± 0.72	3.88 ± 0.69	0.000
	Openness	2.98 ± 0.64	3.55 ± 0.58	0.000
	Criticism	2.79 ± 0.69	3.46 ± 0.59	0.000
	Judgment reservation	2.72 ± 0.74	3.42 ± 0.70	0.000
	Cooperation	3.13 ± 0.67	3.94 ± 0.65	0.000
	Patience	2.57 ± 0.77	3.77 ± 0.89	0.000

[z]A questionnaire revised by Lee (2000) was used. The questionnaire included a total of 21 questions with the five subcategories, including "prediction, observation, classification, measurement, and discussion." Teachers answered the questions based on daily classroom observations of children. Higher scores indicated better investigation abilities.

[y]A scientific attitude survey revised by Lee (2000) was used. The survey was comprised of the nine subcategories, including "curiosity, volunteerism and activeness, forthrightness, objectivity, openness, criticism, judgment reservation, cooperation, and patience" and a total of 27 questions. Teachers answered the questions based on daily classroom observations of children. Higher scores indicated better scientific attitudes.

the interpersonal relationships of elementary school students. Finally, Keum et al. (2014) reported that a horticultural activity program improved the social skills of maladjusted children in particular.

Most horticultural activity programs include activities that require cooperation with others. By participating in collaborative horticultural activities, children can learn role allocation, as well as develop a sense of responsibility and a cooperative attitude (Zajicek, 2003). In particular, group horticultural activities provide opportunities for interaction with others. Children can experience support, encouragement, and achievement (Zajicek, 2003). The horticultural activity program in this study also included group activities, which provided opportunities for cooperation with peers, role allocation, and the development of a sense of responsibility and a cooperative attitude.

Scientific investigation abilities and attitudes. A total of 68 children in four public and private kindergartens (G, J, K, L) demonstrated significant improvements in their scientific investigation abilities, including curiosity, volunteerism and activeness, forthrightness, objectivity, openness, criticism, judgment reservation, cooperation, and patience (Table 6). Moreover, their scientific attitudes in terms of prediction, observation, classification, measurement, and discussion were significantly improved (Table 6).

Scientific investigation consists of cognitive skills for obtaining new information through specific experiences (Cho and Kim, 2015; Renner and Marek, 1990), and can be classified into observation, classification, prediction, and discussion (Seo, 2003). A scientific attitude is a respect for evidence, honesty, creativity, flexibility, curiosity, objectivity, and skepticism (Yoo, 2000). It includes cognition, response, and an interest in science.

Lee (2008) reported that 4-year-old children improved their scientific investigation abilities, such as observation, classification, measurement, and discussion through experiences with nature. Previous studies reported that children improved their scientific abilities through investigation and observation of nature (Bae et al., 2005; Jeong et al., 2011; Kim, 2003a; Lee and Kim, 2009). Children can develop scientific abilities and attitudes by working with plants and maintaining gardens. Moreover, children can interact with others by sharing and discussing their experiences with gardening.

Satisfaction with the horticultural activity program. After completing the 24-session horticultural activity program, the 326 children answered a satisfaction survey. The percentage of children who reported that, overall, they were very satisfied with the program was 87.5% (n = 286), whereas 7.0% (n = 23) responded that they were satisfied. Moreover, 92.4% (n = 302) of the children reported that they were interested in the program, whereas 87.8% (n = 287) responded that the degree of difficulty of the activities was appropriate. With regard to activity preference, 61.2% (n = 200) of the children reported that they liked making crafts with living plants, such as dish gardens and topiary, as well as harvesting and eating the plants. Making eco-friendly fertilizer was the next most popular activity, at 48% (n = 157).

Moreover, a total of 56 parents participated in the satisfaction survey, with 50.0% (n = 28) responding that, overall, they were very satisfied with the program, and 48.2% (n = 27) responding that they were satisfied. Additionally, 96.4% (n = 54) of the parents responded that they hoped for a continuation of the program for their children. Nineteen teachers participated in the satisfaction survey, with 100% (n = 19) responding that they were satisfied with the program, and 100% (n = 19) answering that they hoped for a continuation of the program for their students.

In conclusion, the 24-session horticultural activity program improved the emotional intelligence, prosocial behavior, and scientific investigation abilities and attitudes of the children, 5 to 7 years of age, who participated in this study. Moreover, satisfaction with the horticultural activity program was very high among the children who participated, as well as among their teachers and parents. Future studies should consider exploring the application of horticultural activity programs with different age groups of children with a randomized controlled trial study to further investigate the benefits of horticultural activity programs on children.

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