An Evaluation of a Childrens Garden in Developing a Greater Sensitivity of the Environment in Preschool Children

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SUMMARY. A childrens' garden was designed and installed in a preschool facility to determine if the garden was effective in increasing the children's respect and knowledge of a garden ecosystem. Evaluation of the children's involvement with the garden revealed it to be effectively incorporated into a multidisciplinary curriculum. The children's experience with the garden was a first step in developing environmental sensitivity while providing an opportunity for the staff to experience a garden as an educational tool.

Children typically will spend a large part of their childhood in elementary schools and daycare centers. Recreational areas generally include playground equipment, but rarely include natural areas which allow children to use their imaginations, create their own games, and

establish their own play patterns (Leccese, 1994). In addition, schools which include gardens and other natural areas are well suited for participatory teaching methods, known to be effective with young children (Matthai and Deaver, 1976). Harvey (1989) found that students who attended schools with developed landscapes demonstrated an increased knowledge of botany and more favorable attitudes toward the environment. In addition, school grounds that integrated compost bins, container plants, and bird feeders have been shown to enhance a student's learning experiences (Harvey, 1989).

Gardens are also a natural classroom to learn about soils, climates, and plant and animal ecosystems (Chawla, 1994). Children can define a task, participate in its duties, and bring it to completion when involved in all stages of gardening (Hart, 1994). Through interaction with plants and nature, children can develop a "respect for the interrelationships among all living things" and develop "knowledge about the issues that is a necessary background for environmental citizenship behavior" (Chawla, 1994; Roger Tory Peterson Institute of Natural History, 1990; Stetson, 1990).

Research objectives

This research had two main objectives. The first was to design and install a working childrens garden as

part of the educational curriculum at the Children's Development Laboratories (CDL) on the campus at Southern Illinois University Carbondale (SIUC). The second was to determine and evaluate a garden's effectiveness in increasing knowledge of a garden ecosystem and in developing a respect for different life forms.

Methods and materials

CDL is part of the Curriculum and Instruction (CI) Department in the College of Education at SIUC. The laboratories provide childcare for children age 6 weeks to 6 years, by teachers comprised of graduate students and practicum students majoring in CI. The CDL philosophy involves child-direct learning, allowing children to make choices from a variety of planned activities and learning centers throughout the day.

In this study, the design process of Booth and Hiss (1991) was used to develop the garden design. This process involves a site inventory, analysis, conceptual ideas and a refined master plan. The inventory records existing conditions and client information, the analysis utilizes the inventory to develop ideas based on opportunities and constraints. From the conceptual ideas, a master plan is generated. The CDL garden concept was to develop a childrens garden for CDL preschoolers (ages 3 to 6 years) as part of their curriculum and play.

Fig. 1. The childrens garden at the Children's Development Laboratory at Southern Illinois University, Carbondale, was comprised of small gardens with themes and spaces for various uses.

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Table 1. Subgardens and their themes.

Garden name	Feature
Dinosaur	Dinosaur sculpture Iguanodon footprint stepping stones Large, leaved plants
Brick parking lot	Space to park tricycles and wagons
Work area	Workbench
Weather station	Rain gauge Thermometer
Bird and Butterfly	Enclosed by picket fence Brick path through center Butterfly house Bird bath Variety of flowering plants and herbs
North American	Trellis house covered by vines Plants native to North America
Kitchen	Vegetables Fruit
Sensory	Plants with qualities: Touch (fuzzy leaves) Taste (edible) Hear (make sound) Smell (fragrant) Sight (bright)

Because of space limitations, half of the total garden was installed inside a fenced playground area and the other half directly adjacent and contiguous

but outside the fence.

Six smaller spaces and subgardens with themes comprised the area inside the fence (Fig. 1, Table 1): the dino-

saur garden, the parking lot, the work station, the weather station, the bird and butterfly garden, and the North American garden. The kitchen garden and the sensory garden were located outside the fence. To provide diversity and interest, elements found in the subgardens reflected each theme, subjectively selected by the researcher and CDL director.

The CDL preschoolers, staff, parents, SIUC Landscape Design class and others were instrumental in the preparation and installation of the garden as well as construction of its structures. The installation occurred in May 1997.

Four phases were employed to evaluate this research. Phase one involved written observations following interactions with the preschoolers in garden activities. Phase two of the evaluation consisted of two parts: 1) individual 10- to 15-min interviews and 2) asking each child to draw a picture of a garden. A total of 21 preschoolers chose to participate (5 boys, 16 girls), although all of them did not respond to every question. The average child age was 4 years old.

Phase three of the evaluation was a questionnaire completed by eight

Table 2. Questions and children's responses related to evaluation of schoolyard garden project at the Children's Development Laboratory at Southern Illinois University.

Response	Response (%)	Children (no.)
Question: When you go outside do you like to go into the gardens?		
Yes	85.7	18
Sometimes	9.5	2
No	4.8	1
Question: What do you like to do in the gardens?		
Look at plants	33.3	10
Other (study and play)	13.3	4
Pick flowers	10.0	3
Pick vegetables	10.0	3
Maintenance of plants	10.0	3
Smell plants	6.7	2
Pull weeds	6.7	2
Play in trellis	3.3	1
Flower game	3.3	1
No response	3.3	1
Question: Which of the gardens do you like to play in the most?		
Dinosaur	37.5	9
North American	29.2	7
Bird and Butterfly	16.5	4
Sensory	4.2	1
Kitchen	4.2	1
All favorites	4.2	1
No favorites	4.2	1
Question: Which of the gardens was your favorite?		
Bird and Butterfly	42.9	9
Dinosaur	28.6	6

Table 2. Continued.

Response	Response (%)	Children (no.)
North American	14.3	3
Kitchen	4.8	1
All favorites	4.8	1
No favorites	4.8	1
Question: What do plants need to grow?		
Water	34.7	17
Sun	18.4	9
Soil	12.2	6
Seeds	8.2	4
Food	6.1	3
Roots	4.1	2
Fertilizer	4.1	2
Mulch	4.1	2
Other	4.1	2
Maintenance	2	1
Needs maintenance	2	1
Question: What is your favorite thing about plants?		
Flowers	22.7	5
Smell	13.6	3
Did not know	13.6	3
Vegetables	9.1	2
Eating plants	9.1	2
Color	9.1	2
All plants are different	4.5	1
Picking plants	4.5	1
Plants give us oxygen	4.5	1
Pulling weeds	4.5	1
Plants with berries	4.5	1
Question: What do you know about weeds?		
Pull weeds	26.9	7
Other (weeds are poisonous)	19.2	5
Did not know	15.4	4
They grow	15.4	3
Weeds are not good for plants	11.5	2
They block the sun from other plants	3.9	1
Question: What are the parts of a plant?		
Leaves	20.5	8
Stem	15.4	6
Did not know	15.4	6
Petals	10.3	4
Flowers	10.3	4
Vegetables	7.8	3
Fruit	5.1	2
Bark	2.6	1
Trunk	2.6	1
Seed	2.6	1
Root	2.6	1
Soil	2.6	1
Other (dogs smell plants?)	2.6	1
Question: In the vegetable garden, what did the flowers turn into?		
Vegetable	45.5	10
Did not know	31.8	7
Food	13.6	3
Bigger flowers	4.6	1
Color	4.6	1
Question: How do plants make you feel?		
Happy	72.2	15
So-so	16.7	4
Sad	11.1	2

Fig. 2. Paths through the bird and butterfly garden (left) and dinosaur garden (right) allow the children and their visitors to move through the gardens.

teachers. Four teachers worked at CDL in the morning, three in the afternoon and one all day. The fourth phase included a garden journal compiled by the teachers and preschoolers. The journal began with the children planting seeds of a wide variety of plants for their garden at the SIUC Horticulture Research Greenhouse in April 1997.

Results and discussion

In phase one, overall observation was that the children were very enthusiastic about gardening activities and enjoyed the garden. With adult guidance, they sowed seeds, pulled weeds, wheelbarrowed weeds to the compost bin and harvested vegetables. Typically, the children did not work in the garden without a teacher or a researcher present. However, they enjoyed playing in accessible parts of the garden and were anxious to be accompanied by an adult to the garden outside the fence.

There were many indications that the preschoolers were interested in and respected their garden. Most children were willing to give garden tours to visitors. They discovered insects, birds, and other small inhabitants [e.g., chipmunks (*Tamias striatus* L.)], and enjoyed observing and smelling the flowers. They were careful not to pick unripe vegetables or flowers as per the guidance of adults. One day, several girls picked up spent flowers from the ground for their bouquet rather than

picking fresh ones. The children quickly learned which plants were weeds and worked to keep them out of the garden. The children were very careful to stay off of the creeping pumpkin (*Curcubita pepo* L.) vines with their tricycles.

The second phase revealed that 86% of the children indicated that they liked going into the garden when they went outside (Table 2). The most popular activity in the garden was looking at flowers, yet harvesting, maintenance and smelling plants were also favorites (Table 2). The dinosaur garden was the garden the children liked to play in the most (Table 2), but their overall favorite garden was the bird and butterfly garden (Table 2). This favoritism may be due to the fact that these gardens were more accessible since they were located inside the fence. Additionally, both of these gardens had paths allowing children to play and move through the garden (Fig. 2). The least favorite gardens were located outside the fence, but the children still enjoyed the activities related to the outside gardens.

The responses to questions focusing on knowledge indicated that the children learned from their gardening experiences. Collectively, the children answered with 49 correct responses when asked to list the needs of a plant (Table 2). This may be due to the wide range of activities centered around plant needs beginning with planting seeds.

Sensory related responses made up 81% of the children's answers when asked what their favorite things about plants were (Table 2). Most of the activities in the garden involved using one of their senses.

Another frequent activity in the garden was pulling weeds. This may have influenced responses to the question asking the children what they knew about weeds. In total, 27% knew that weeds needed to be pulled from the garden, another 12% related that weeds were not good for plants (Table 2).

There were 39 different responses when asked to name parts of a plant. Leaves (20.5%) was the most frequent response (Table 2). Additionally, 45% responded correctly that flowers on plants in the vegetable garden turn into vegetables and 13.6% responded that the flowers turn into food (Table 2).

To understand how the children felt when they were in the subgardens, they were asked to rate each garden by selecting a happy, neutral (so-so), or sad face (Fig. 3). Most (average 65%) of all the subgardens received a happy face rating. Explanations of the sad faces (average 9%) included a fear of bees and a fear of stepping on pumpkin vines. The high positive response indi-

Fig. 3. Children were asked to rate several questions by selecting a face expression best reflecting their opinion. These images were scanned from the original yellow construction paper cut outs. Each face was laminated and measured about 6 inches (15 cm) in diameter.

Fig. 4. This garden plan drawn by a 4-year-old female preschooler illustrates several details. The garden area is defined, there are numerous types of flowers, and a weed with roots!

cated that children enjoyed activities in every subgarden, not just their favorites (data not shown). In total, 72% of the children felt that plants make them happy (Table 2).

The last part of the interview asked children to draw a picture of a garden

he/she would create. The overall content of the drawings consisted of a wide range of items. There were more flowers drawn than vegetables, yet a greater variety of vegetables were drawn. Other items such as bird baths, insects and people were included in

some drawings. One child drew a scene of flowers and weeds. The roots were drawn on the weed, but not on the flowers (Fig. 4).

Phase three provided contrasting results. Contrary to the opinions of the children, 50% of the staff felt that the children's favorite garden was the kitchen garden. The teachers felt that the activities associated with the kitchen garden gave the children a complete experience, making it their favorite. The bird and butterfly garden was thought to be the children's second favorite by the staff because it generated discussions of such topics as flower color and insects (Table 3).

Again, contradictory, the dinosaur garden was thought to be the least favorite (50%) of the children (Table 3). The teachers felt that there weren't many activities the children could do in that garden. However, the teachers commented that the children weren't visible as they followed the path behind the shed. Therefore, the teachers weren't able to watch the children and sometimes restricted play in that garden.

All eight of the teachers had participated in an activity with the children in the garden. Activities ranged from weeding to measuring plants (Table 3). All eight teachers felt that

Table 3. Questions and teacher's responses related to evaluation of schoolyard garden project at the Children's Development Laboratory at Southern Illinois University.

Response	Response (%)	Teachers (no.) ²
Question: Which garden do you feel was the children's favorite garden?		
Kitchen	50	5
Bird and Butterfly	30	3
North American	20	2
Question: Which garden do you feel the children liked the least?		
Dinosaur	50	4
Sensory	12.5	1
Did not have least favorite	37.5	3
Question: What type of garden activities did you include in your curriculum?		
Picking vegetables	75	6
Cutting flowers	50	4
Planting	50	4
Weeding	37.5	3
Watering	37.5	3
Preparing and eating food	37.5	3
Looking for insects	25	2
Journal writing	25	2
Measuring plants	12.5	1
Looking for colors	12.5	1
Reading rain gauge	12.5	1
Bird watching	12.5	1
Matching game	12.5	1

²Two teachers gave two responses.

the garden was a successful tool for CDL and that the children benefitted in numerous ways from the garden experiences. However, the teachers felt they needed more information on gardening to feel more comfortable teaching it to the children.

Phase four, the garden journal entries, revealed that the teachers were very active in using the garden in daily activities and that the children spent free time involved in garden related activities. For example, harvesting and preparing vegetables became a counting game. The children would count green beans (*Phaseolus vulgaris* L.) after picking, then again after washing and snapping (before eating). They gathered flowers to dry, learning the common flower names as they worked. The teachers remarked frequently that the children learned the names faster than they did. The journal also noted that the children quickly learned to care for the garden; recognizing and pulling a weed and helping to water and mulch. Other recorded activities included daily temperature, rain fall, scavenger hunts for specific plants, measuring and observing plants, learning "good" and "bad" insects, creating a bird bath and garden related projects inside. The journal contained photographs, comments, stories and drawing, and revealed that teachers incorporated garden activities into their curriculum and numerous spontaneous activities occurred throughout the summer.

Conclusion

The children's garden was an effective educational tool. The garden provided plant growth and maintenance opportunities for the children

and the staff at CDL. Children gained knowledge of a garden ecosystem and exhibited some forms of respect for the garden and its inhabitants. Teachers were able to create and incorporate garden experiences as part of their curriculum. Some teachers were apprehensive about working in the garden with children for fear they could not answer technical questions. Yet most questions did not require an in depth knowledge about horticulture or plant biology. In cases where a teacher did not know the answer, researching the topic with the child became a shared activity.

The presence of the garden in conjunction with the garden activities may be the first step in developing environmental sensitivity in the preschoolers and encouraging teachers at CDL to incorporate gardens into their curriculum.

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