Gardening as a Cognitive Activity

by Deborah G. Ventis

Gardening and children are a natural combination; children love to play in the dirt, and are fascinated by growing things. The benefits of having a garden can go beyond the fresh vegetables and flowers, a lot can be learned in the process. Although skills involved in planting and caring for the garden and acquiring a rudimentary knowledge of biology are obvious benefits, many other cognitive skills can be introduced or reinforced with a garden project.

The learning can start with garden design. Designing the garden should include deciding what to plant, when to plant it, and where to plant it. Choosing what to grow can be helpful in teaching or refining the understand-

ing of food concepts like *vegetable* and *fruit*, and of the distinction between edible and poisonous plants. Knowing that we don't eat just *any* plant and that even edible plants may be only partially edible (e.g., we eat the tubers and fruits of potatoes and tomatoes but not the leaves) can be an important safety lesson. Some spectacular garden plants that should *not* be included because they could be

harmful include plants with leaves that are toxic if ingested (e.g., rhubarb) or handled (e.g., rue can cause skin irritation and hot peppers have volatile oils that will burn). Note that many ornamental plants, such as castor bean, have poisonous fruits and should be avoided.

A list of potential crops can be generated by asking about food preferences and discussing what can and

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cannot be raised in a garden (one gardening writer reports a child diligently planting pieces of bubble gum after sowing the more conventional crops!). Most experts on gardening with children recommend choosing crops that are produced from large, easily handled seeds (beans, corn, onion sets, pumpkins, radishes, squash), that produce quickly (lettuce, radishes), or that children will enjoy eating (carrots, strawberries), watching grow (sunflowers, vines), handling (scented herbs, interesting flowers and fruits), or using (loofa and other gourds).

Climate and growing season are examples of the concepts that can be introduced to use in the decision-making process. Determining when each crop will be planted and harvested can reinforce an understanding of seasonal change as well as introduce more sophisticated counting and calendar skills. Cool-season and warm-season crops can be identified and categorized as requiring short or long growing seasons. The Rockwells' *How My Garden Grew* (1982) is a simple introduction to the times for planting and harvesting some popular crops. Once children become involved in a gardening project it can become a year-round activity even where the growing season is short. The cycle of winter planning, spring planting, summer harvest, and fall cleanup can be demonstrated even with a window box or container garden if space and/or climate present problems.

Where to plant will depend on the land available. Ideally, a portion of an outdoor play area will be available so the garden is accessible throughout the

day. If space is limited, container gardening is an option. For maximum space, community garden plots may be available.

Once a site is selected, placing the plants will depend on the height and breadth of the mature crop and its need for sunlight. With the increasing popularity of "square-foot" gardening, it is easy to think of the garden as consisting of a variety of blocks of plants rather than rows. "Square" feet can easily be translated into circular or triangular patches to include a variety of shapes in the garden plan. Older children can help decide on the shapes to be used (and what is to be planted in the various sections) and can measure the actual garden plot. Younger children can identify the shapes and help draw the plots on the ground. In *The Victory Garden Kid's Book*, Waters (1988) suggests using "yardstick" garden plots, where each child is responsible for a square yard of garden space.

Depending on the age and abilities of the children involved, a variety of measurement concepts can be introduced. The height and spacing of plants can be discussed in laying out the garden. Concepts such as *tall* and *short*, *big* and *little*, *fat* and *thin*, can be used to discuss the way in which the plants will fill the garden for children who are not ready for units such as inches and feet, or millimeters and centimeters.

In addition to using garden catalogs with pictures, a field trip to a hardware store, plant nursery, or farm cooperative to purchase plants, tools, fertilizer, etc., can help children un-

derstand more about where gardening materials come from and how they are produced. For older children, comparing prices among seeds sold, or between seeds and plants of the same variety, can be a lesson in consumerism as well as a later basis for comparing the cost of "homegrown" vegetables with the cost of those purchased in the store.

Preparing the plot can be another learning experience. During the fun of digging is, perhaps, the best time to introduce biological concepts concerning soil structure and plant growth. These can be reinforced with indoor activities. For a better understanding of the world beneath the soil, Tilgner's *Let's Grow!: 72 Gardening Adventures with Children* (1988) includes instructions for creating a worm farm in a large jar.

Many activities involving seeds and tubers can help children see the processes involved in plant growth. Having children glue seeds to outlines, drawings, or pictures of the fruits or vegetables they produce is one way of emphasizing the connection between seed and plant. Sprouting bean seeds in moist paper towels and examining them at different points in the growth process demonstrates the transformation of seed to plant. Avocado pits (balance each in a glass of water with toothpicks inserted in the sides of the seed), carrot tops, and sweet potatoes are popular indoor choices for illustrating sprouting and root growth. Planting easy-to-germinate seeds in soil-filled cutoff milk cartons with one side replaced with a plastic wrap "window" shows more

realistically what is taking place in the outdoor garden.

Once the plot is prepared, seed packets or labels on seedlings can be identified by the children, and number concepts can be reinforced in counting out large seeds or transplants. Depth can be discussed as the seeds and plants are planted. Reading concepts are fostered by making labels for the plot. Plant names in large print accompanied by small drawings of the plants or photographs from packages or seed catalogs can be laminated for protection against the weather and added to the plot as a way of reinforcing picture-word associations.

Reading and writing skills are also strengthened by writing to request garden catalogs, reading about gardening, and keeping a simple garden journal. Garden books introduced through book corners or story times can help sustain interest in the gardening project as well as provide additional motivation for reading activities. A number of picture books about gardening present garden advice as well as interesting stories; even the youngest children can be introduced to garden activities such as starting a compost heap (Rockwell's *The Compost Heap*, 1974). Gardening is made familiar by linking it to well-known storybook characters as Garland does in *Peter Rabbit's Gardening Book* (1983) Bryan's *A Garden for Children* (1986) includes descriptions of a nursery rhyme garden and gardens based on other themes from children's literature. Reading about famous figures like Johnny Appleseed (Steven Kellogg has a 1988 version of his exploits) can also bring a sense of adventure to gardening.

A garden journal can include planting, germination, and harvest dates as well as the amount produced (or crop failures). Garden pests, the weather, or fertilizing and watering schedules may also be included. The journal itself can take the form of a calendar with large blocks for recording information in pictures as well as words. In this way, information about the garden can be included in daily calendar time.

A journal might also be used to record the results of "experiments" conducted in the garden itself or in

doors during the winter. For the youngest children, sprouting seeds and observing capillary action by placing a celery stalk in food-coloring water are good ways to start. For older children, projects such as subjecting seedlings to different circumstances (varying light levels and frequency of watering and fertilizing) illustrate the importance of growing conditions.

Harvesting the crops and helping prepare the produce for meals provide further opportunities for introducing measurement concepts. Counting, measuring, and weighing the produce are all fun activities. Following the directions for simple recipes using the harvest demonstrates the importance of attending to sequence.

The transformations foods go through from harvest to plate prove instructive as well. In many cases the edible parts of plants are readily identifiable; what we pick from the plant looks pretty much like what appears on the plate (e.g., green beans, strawberries, cherry tomatoes). Sometimes, however, we eat only the seeds (peas) or only the flesh (watermelons), and other times the prepared product may bear little resemblance to what can be seen in the garden (mashed potatoes)! Corn and peanuts are crops that illustrate the kinds of changes involved in producing many food products. Corn on the cob or peanuts in the shell are clearly identifiable parts of the growing plant, but cutting the corn off the cob, using dry corn for popcorn, and grinding corn into cornmeal for muffins, or peanuts into peanut butter, show how these original products become other familiar foods.

Harvest time can also provide reinforcement of color concepts. Flowers provide a profusion of bright shades to identify, and the color changes of ripening crops (e.g., tomatoes from green to red, pumpkins from yellow to orange, peppers from green to a variety of colors) give students a comparison to make between fruits on the same plant at the same time or of a single item at two points in time.

Other sensory qualities can also be explored in the garden. In discussing the sense of smell, show children that some plants have flowers or leaves that smell wonderful (mints, scented

geraniums), many have no particular smell, and others are rather unpleasant (marigolds). Smell may also be an important factor in judging ripeness of fruits (cantaloupes, for example). Touch is another interesting aspect of gardening. Foliage can be smooth or hairy (lamb's ears, or stachys, a perennial used as an edging plant in flower borders, is a favorite for "petting"); one can distinguish leaf shapes by tracing their outlines with a finger. A simple introduction to identifying plants by their leaves is Beame's *Leaf and Tree Guide* (1989) with its accompanying *Leaf Collecting Album*.

Gardening activities obviously enhance all facets of the cognitive curriculum: mathematical concepts, prewriting, writing, and reading, as well as science. Along with these cognitive benefits, gardens provide sustenance of the best type: for both body and spirit. Digging a small plot in an outdoor play area, participating in a community garden project, or purchasing a few planting containers can provide a growing source of challenges and excitement.

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