NOVA SCOTIA SCHOOL GARDEN

RESOURCE GUIDE

NOVA SCOTIA

Acknowledgements

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Nova Scotia School Garden Resource Guide

School gardens have become increasingly popular in recent years as a valuable educational tool for a variety of subject areas.

Teachers tell us that lessons learned in the garden can have long-lasting effects on student well-being.

A garden can provide active engagement of students while accommodating a wide variety of learning styles in a hands-on, healthy outdoor setting.

In the garden, students can

- engage in school curriculum while having fun
- develop environmental awareness
- practise teamwork with one another, teachers, school staff, and volunteers
- be physically active in a non-traditional physical-education setting
- make the connection between food and agriculture
- develop a taste for natural and healthy foods
- foster their responsibility by caring for living things

Gardens can be as simple as one raised bed or as complex as a big garden plot to supply vegetables for the school lunch program. They can start small and stay small or increase in complexity as interest and participation grows.

There are many sources of information on the benefits of school gardens as well as the technical aspects of gardening. This resource guide is mainly focused on how to start a school garden and on curriculum links so teachers can integrate the garden into their lessons. The guide also includes information on resources available to schools in Nova Scotia and links to gardening information and contacts.

The Agricultural Education office of the Nova Scotia Department of Agriculture has many other resources on agriculture in our province.

Visit **http://novascotia.ca/agri** or contact:

Rick Hoeg, Agricultural Education Liaison
176 College Road
Harlow Building
PO Box 890, Truro, NS, B2N 5G6

Phone: 902-893-7495
Fax: 902-893-0244

So you are interested in a school garden. Congratulations!

You are not alone—there is growing recognition worldwide for the benefits of school gardens. Even the Food and Agriculture Organization (FAO) of the United Nations has prepared a school garden manual (**http://www.fao.org/docrep/009/a0218e/a0218e00.HTM**).

As well, the FAO has created a document (**http://www.fao.org/docrep/013/i1689e/i1689e00.pdf**) to provide suggestions on what governments and their development partners can do to promote school gardens.

But how should you get started? The information in this guide is organized following a suggested action plan for initiating a school garden. The recommendations will need to be adapted to suit your school.

School Garden Action Plan

Starting Out

Form a Garden Committee

It is necessary to build support within the school for the garden to be successful. To start, support for the concept from the school principal is crucial. As well, buy-in from teachers, caretakers, parents, and others is helpful. An experienced gardener is a great asset; check with the Atlantic Master Gardeners Association (see Appendix B). Call a meeting of everyone who is interested. From this group, a garden committee can be formed, with a volunteer coordinator. Remember that not everyone will be enthusiastic from the start, but as long as there is representation from each group within the school community, the committee can get to work.

Garden Committee Checklist

- ✔ principal
- ✔ teachers (at least two)
- ✔ educational assistants
- ✔ parents
- ✔ students
- ✔ community members

Decide on the Objectives

The first step of the committee is to define the objectives and scope of the garden. What do you want to accomplish and for whom? Examples of questions to consider include: Will every child in the school participate or only one class? Will vegetables be grown for the lunch program or to demonstrate the wide variety available? Do you want to attract nature and/or create craft supplies? How many volunteers will help with the labour? This will help determine the scale of the project that is desirable and feasible.

Recruit Volunteers

Once the garden committee has established the objectives and scope of the garden, you may want to invite key community members to help. Look for those with gardening skills, knowledge, and/or equipment and resources to help out. The more community support you have, the more that can be accomplished. See Appendix B for some ideas on where to look for human resources. A major consideration is who will tend to the garden's needs over the summer months. For example, one school garden coordinator, who had a garden near the soccer pitch at the school, enlisted the help of parents as volunteer weeders during practices. Be creative!

Find Funding

Gardens can cost as little or as much as you are willing to spend, depending on their size and complexity. In an Evergreen Foundation survey of Canadian schools, 65 per cent of school gardens were reported to cost less than $2,000 for start-up and 24 per cent cost less than $500. See Appendix B for potential sources of funding. You can also seek donations from your community. For example, the local building or garden supply company may provide a discount for all school garden supplies, while community members could contribute seeds and transplants. Small annual donations from a variety of sources help to ensure sustainability of the garden.

Decide on the Size and Type of Garden

Consider the objectives defined by the garden committee as well as the number of volunteers willing to provide labour. What size and type of garden could accomplish the goals with the resources available? One 1 x 3 m raised bed in a wooden frame can provide plenty of produce for tasting, is easy to tend, is not as prone to being walked on by two- and four-legged animals, and can be placed on top of any type of soil or surface. A garden plot provides more space, may be less expensive, can be cultivated with a Rototiller, and provides the full experience of being in a vegetable garden. If a garden plot is chosen, decide on the size, shape, and configuration; also, decide between rows or raised beds. Raised beds require more watering than in-ground gardens.

Choose the Garden Location

Selecting a location for the garden is an important decision. The location determines the microclimate and community environment that your vegetables will be living in.

The garden should have lots of sunshine for most of the day. A minimum of six hours of direct sunlight is needed for most vegetables. Visit the site several times from May to October and record the hours of direct sunshine. If you have fewer than six hours of sunshine, you will need to choose cool-season plants like spinach and radishes. Sun-loving tomatoes and beans will not produce well there. If the garden will be on a slope, it should be south facing to maximize exposure.

Trees compete for the sun, water, and nutrients that a garden needs. Some trees actually produce toxins to discourage the growth of other plants around them, so choose a site as far away from trees as possible. Weeds also compete for resources. In rural areas, ensure that the area around the garden can be mowed, thus decreasing the number of weed seeds that blow into the garden.

Ideally, the area should be fairly flat, to avoid erosion problems, but the site should also be well drained so that a heavy rain will not cause puddles around the peas! A slightly south-facing slope is ideal.

The location of the garden in the community can be an important consideration for reasons that include visibility and public relations, aesthetic value, and limiting the risk of vandalism. Vandals will be less likely to strike if the garden is located within sight of neighbouring houses and streets. Inviting the community to celebrate the garden may work better than building a fence to keep vandals out.

Animal vandals are another consideration. Is the proposed location visited by dogs and cats? Do raccoons and rabbits live in the area? In rural areas, deer can be a major competitor. Locating the garden in a well-lit area may help deter some animal visitors.

Wind can cause major damage to plants, both as seedlings and as tall mature plants. Buildings and hedges provide good shelter from the wind. If the preferred location is in a windy spot, it may be necessary to provide shelter from the wind by using a windbreak, such as a snow fence, or planting more robust plants on the windward side. Consider growing highbush blueberries, asparagus, zucchini, or pumpkin plants along a trellis.

The soil type is important too, but it can be improved with the addition of organic matter, such as compost. A loamy soil type is best for gardening. Loam is a mixture of approximately 40 per cent sand, 40 per cent silt, and 20 per cent clay. Two simple tests are described in the Dalhousie Garden Box Soil Science Basics fact sheet (**www.dal.ca/content/dam/dalhousie/pdf/agriculture/ExtendedLearning/gardenbox/Soil science basics.pdf**), which can help you classify your soil texture.

Rocks should be removed from the site before planting. This is especially important for carrots or other root crops.

The size of the plot should be determined by the amount of effort needed to look after the garden. It is better to start small and grow with a positive experience. A well-tended 1 x 3 m garden will provide more produce and enjoyment than an unmanageable larger one. The best size for the garden will become clear as you work through the process, but do consider whether the site has room for expansion (in case everyone wants to get involved with it next year!).

Garden Location Checklist

- ✔ six hours of full sun
- ✔ gentle south-facing slope or level
- ✔ away from trees and weeds
- ✔ visible to the community
- ✔ protected from animal pests
- ✔ near a water supply
- ✔ protected from the wind

Acquire Tools and Infrastructure

The size of the garden will determine the tools needed. If groups of children will be working at the same time, there should be enough tools to keep everyone occupied. A variety of tool sizes is needed to suit different ages.

Consider starting out with a modest collection of tools, including the following:

- A spade is a garden shovel with a square vertical blade and is used to dig up a new garden area, turn over sods, make raised beds, and dig holes for transplants or potatoes.
- A hand trowel is a small digging tool that is very helpful in cultivating soil for smaller planting jobs and weeding, especially deep-rooted weeds that might grow among plants. For young children, a hand trowel is easier to manage than a spade.
- A garden rake, also called a level head rake, is different than the rake used for raking leaves in the fall. It is used to remove rocks and help smooth the soil before planting, to make raised beds, and to tamp down the soil after planting.
- A long-handled hoe and hand cultivators are used to remove weeds from the garden or to turn over newly germinating ones.
- A garden fork, sometimes called a spading fork, is used to shake out sods and loosen the soil. It will also come in handy for digging up root vegetables in the fall.
- A watering hose from the nearest tap, or a bucket and watering can, will be needed during dry spells. Think about collecting rainwater for the garden.
- A wheelbarrow or garden cart is a good labour- and time-saving investment for the garden. Think about the size of the wheelbarrow and the physical abilities of the students who will be using it to do the work. There are many wheelbarrow / garden cart designs to choose from.

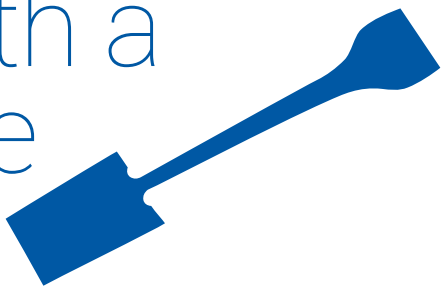
Think about where the tools and equipment will be stored. Convenience will make tending the garden quicker and easier and will allow classes to accomplish more work in a limited time frame. If the tools are kept in a locked area, decide where the key will be kept and who will have access to it.

Establish a routine with everyone who uses the tools. Since tools are expensive, they should be cared for by being cleaned and stored properly. Children should be taught how to use the tools safely; for example, one should never lay a rake or hoe down with the tines pointing upward.

Consider finding a space and building a structure to produce compost for the garden. Talk with the school custodian as they will have the best knowledge of the school property and how one may be accommodated. Indoor composting options are also possible. For example, vermiculture with red wiggler worms or European night crawlers and fermentation with Bokashi systems are two great ways for students to create a soil amendment for their garden from their own food waste. Composting provides a valuable nutrient recycling lesson. For more information on composting, check out **www.dal.ca/content/dam/dalhousie/pdf/agriculture/ExtendedLearning/gardenbox/Composting.pdf**.

Remember that it takes time to build the garden infrastructure desired. Start small, and add a shed and a composter as time and budget allow.

Gardening with a Limited Space and Budget



Gardens can cost as much or as little as you would like and can range from a simple container or pot to a traditional garden to raised beds or even include a greenhouse. Finding the space and money to create a garden in your school may be a difficult task, but the results are worth it.

The best location for the garden may not be the most appropriate location, considering schoolyard logistics. A parking lot, courtyard, rooftop, wall, or even indoors may be the only space available. The ideal garden will aid in the delivery of curriculum for all grades and suit your school's needs in terms of the variety and quantity of produce. Realistically, only a few classrooms will exploit the potential of the outdoor classroom while producing only a fraction of what will be consumed at your school.

Limited Space

Think big, but start small. Gardens come in many shapes and sizes—all are beneficial to your school. It may be that there is not an opportunity for a garden on your school grounds. If so, consider nearby space within the community, such as parks, green spaces, or vacant lots. You don't need a lot of space, but you do need good soil, light, and access to water.

If space is the limiting factor, take an inventory of all of the space in your schoolyard that is underused but receives enough light for growing. The space may only be large enough for a few containers. As you find additional space, you can expand the number or size of containers. Small containers may be moved to maintain adequate sunlight throughout the growing season or moved temporarily if they are in conflict with other schoolyard uses. Almost any container will work, from plastic bottles to large plastic tubs. There are a number of commercially available portable self-watering containers that can be used if space and/or access to sufficient water are issues. You may consider constructing your own containers. They can be made in a variety of shapes and sizes, depending on your needs or the availability of materials. Search "self-watering container" on the Internet to get some ideas.

Don't forget about vertical space. Hanging plant baskets work in a small space. You may be able to build a stand to hold containers, use a large portion of a south-facing wall, or even make use of a fence at your school. Some search terms that will locate examples of gardens for vertical space include "living walls," "water-bottle garden," and "rain-gutter garden."

Limited Budget

Recycle materials: If cost is the limiting factor, there are many items you can use to establish or expand an existing garden that are cost-effective or free. Have a brainstorming session with your students and watch the ideas they come up with. Consider materials that may be recycled, and find new practical uses for them in the garden. For example, the following suggestions may help in making a garden a reality for your school:

- chicken wire (for a trellis or compost bin)
- plastic pop bottles, plant cloche, plant pot (for a water-bottle garden)
- empty containers such as ice cream containers, milk containers, pop bottles, and buckets (for plant pots)
- eavestrough (for a rain-gutter garden)
- pallets (for a compost bin or vertical planter)
- Popsicle sticks, mini-blinds (for garden markers)
- paper towel and toilet paper tubes (for seed starter pots)
- pantyhose (for plant ties)
- lumber (for garden boxes, a trellis, or greenhouse framing)
- windows (for a cold frame)

Soil and organic matter: Topsoil can be costly, and large quantities require trucking, which adds to the financial burden. Many gardeners donate to school gardens. As well, local garden centres or retail outlets can be generous to schools or have a formal donation program. They may have damaged or faded bags of materials that they will sell at a reduced cost or donate.

Check with your municipality as many municipalities make compost from organic waste. Animal manure makes great compost; check with local farms to see what is available. You may decide to build your own schoolyard composter or consider vermicomposting in the classroom to provide an ongoing source of organic matter and nutrients for your garden.

Garden tools: You can get by with a few basic tools, such as a shovel, rake, hand trowel, and hoe. Keep in mind that the more tools you have the more hands you can keep busy at any one time moving jobs forward. Tools may have to be borrowed until you can seek donations from the community or have a fundraiser to buy your own.

Seeds: Consider growing only a few types of vegetables when getting started. While this may not provide the variety you are hoping for initially, it will reduce your seed costs. Ask garden clubs, parents, the community, and other school gardens for any seeds they won't be using. Partnering with others to purchase seeds in bulk quantities can result in significant savings. If you are growing heritage plants, you can save seeds from your garden from year to year. You may be able to purchase seeds at a reduced cost at the end of the season or seek seed donations for the following year.

Choose the Water Source

All plants need a steady supply of water. Occasionally, the Nova Scotia climate provides a reasonable amount of rain throughout the summer, but more often our gardens are soaked one month and parched the next. Since planning on the weather is impossible, it is best to prepare for all scenarios. Consider the following:

- Access to an outdoor tap and hose and/or rain barrels and watering cans is required.
- Transplants and seeds need to be well watered when first planted and as they germinate.
- During summer dry spells, a weekly soaking with a sprinkler is preferable to occasional watering with a watering can.
- Raised beds dry out quickly.
- Flat garden plots may become too wet to access.
- Some of your vegetables will survive no matter what amount of water they receive!
- Mulching the garden conserves soil moisture and reduces weed growth.

Examine the Soil

"Soil," Not Just "Dirt"

Soils are more than just sand, silt, clay, and organic matter. They contain particles of rocks, minerals, air, and water, and they support a wide variety of living things, which can include bacteria, fungi, protozoa, nematodes, arthropods, and annelids.

Soils provide a habitat that supports many biological and chemical processes that break down parent materials and organic substances, making nutrients available to sustain living things. They hold the nutrients made available through these processes, along with things that may be added to the soil, such as composts, manures, fertilizers, and even unwanted contaminants. While soils can break down and use much of what is added to them, there are many pollutants that can persist for long periods of time.

Soil Contamination

It is important to know the history of the site you select. While a basic soil test will tell you what nutrient and other amendments may be required to make your garden a success, it will not identify potential contaminants. If your site has a history that may have resulted in contamination or you are unsure and would like to investigate further, you should have an analysis of soil from the proposed garden area completed. Maxxam and AGAT Laboratories will do environmental testing for soil contaminants (see Appendix B).

Soils can be at risk of contamination because of industrial practices, natural soil chemistry, and lead and zinc in old house paint and motor vehicle emissions. While it is not feasible to test for all potential contaminants, soil samples should be analysed for pH (a measure of acidity); organic matter content; and concentrations of lead, arsenic, copper, and zinc. To be sure, you can have your soil tested for heavy metals and compare the results with the Canadian Council of Ministers of the Environment (CCME) guidelines (**http://www.ccme.ca/**). Arsenic, copper, lead, and zinc are the most important metals to test for. The CCME soil quality guidelines for land used for agricultural purposes are as follows:

	ARSENIC	COPPER	LEAD	ZINC
Maximum acceptable concentration for agricultural lands (ppm)	12	63	70	200

If you're not sure or you know that your site is contaminated, there are some recommendations to consider in order to still use the site for gardening.

- You can build raised beds and bring in clean soil from elsewhere. Choose a safe material (like tiles or untreated wood) to build the beds with, and line them with a barrier that reduces the migration of heavy metals from existing soil to your garden.
- In highly contaminated environments, replace the top 3-5 cm of soil in raised beds each year. This removes dust that may have settled from surrounding areas.
- Remember that "eating or breathing dirt" is by far the most common way that heavy metals enter the human body. Clean your hands after gardening, and wash produce carefully. Avoid weeding on very dry days, or use the "chop-and-drop" method, where you cut young weeds just above the soil and let the greenery fall to the ground as mulch.
- Since heavy metals tend to accumulate in roots, peeling root vegetables and growing leafy greens or fruits is a good start.
- Last but not least, adding organic matter to your soil reduces the amount of contamination that is taken up by your plants, as does adding wood ash, lime, or eggshells to neutralize the soil's pH. These things also help your Nova Scotia garden grow!

Soil Nutrients

The soil is the essence of the garden, so consider it carefully. If you are working with the existing soil on school grounds, a soil test should be done before making a final decision on the location of the garden. This is one of the best things to do to ensure a successful garden. The soil analysis results will show what nutrients and soil amendments are needed or whether one location is more favourable than another.

How to Take a Garden Soil Sample

Step 1:

Take a garden trowel and dig down 12-15 cm in 6-10 different areas of the garden.

Step 2:

In a clean bucket, empty the contents of each area. Remove plant debris. After this is done, mix the soil together.

Step 3:

From this mixture, take a 500 mL sample. This sample will be a good representation of the garden soil.

Step 4:

Place the sample in a freezer bag that can hold the full sample.

Laboratory Services of the Nova Scotia Department of Agriculture will conduct a soil analysis (see Appendix B).

To ensure that you get the proper analysis of your soil, be sure to indicate that you are growing a vegetable garden (or another garden type, if applicable).

A fact sheet entitled “Understanding the Soil Test Report” can be found at **http://novascotia.ca/agri/programs-and-services/lab-services/analytical-lab/** or you can take the soil test results to your professional garden or farm supply centre for advice.

Prepare the Site

One way to start a garden plot in a grassy area is to remove the sod. It can be used elsewhere or be composted and added back to the soil next year. Turn the soil over (about 20 cm deep) and get rid of the big rocks and the major roots and weeds. Digging a V-shaped trench around the outside edge of the garden with a spade will help keep weeds from creeping in. Take a soil sample for nutrient testing and then cover with a thin coat of well-decomposed manure or compost.

If advanced planning is done, a lot of effort can be saved by simply covering the proposed garden area with a sheet of heavy black plastic and leaving it for an entire summer. By next spring, the sod will be gone and you can prepare the garden as above. Silage plastic is available at farm supply stores, or you may be able to get used plastic from a local farmer. Make sure the plastic is well anchored by placing rocks, logs, or tires on top of it to prevent it from blowing away in the wind.

Another method to help remove sod for a new garden is to use sheet composting, or "lasagna gardening," directly over the sod. Described in numerous online sites, this is a no-dig method using organic materials to suppress weeds and build high-quality soil.

A garden can be planted in rows or in beds. If space is not an issue and someone has the equipment and is willing to mechanically till the garden, rows may be the answer.

Beds have the advantage over rows in that a much smaller space is needed. Their slight elevation makes them easier for users who have stability problems. One important thing to remember with the size of beds is that students have to be able to reach to the middle of the bed for planting, weeding, and harvesting. Most adults can reach in about 0.5 m. If both sides of the beds are to be accessed, they should be no wider than 1 m, but you may want them smaller for children. Beds can be raised or kept level with the ground. Raised beds work best in a wetter area, they warm up earlier in the spring, and the plants are easier to reach. However, they also dry out more quickly, so they may need more watering in a dry year. To make raised beds, soil is raked into piles and then smoothed off. The beds can be edged with timbers or log sections or left unframed.

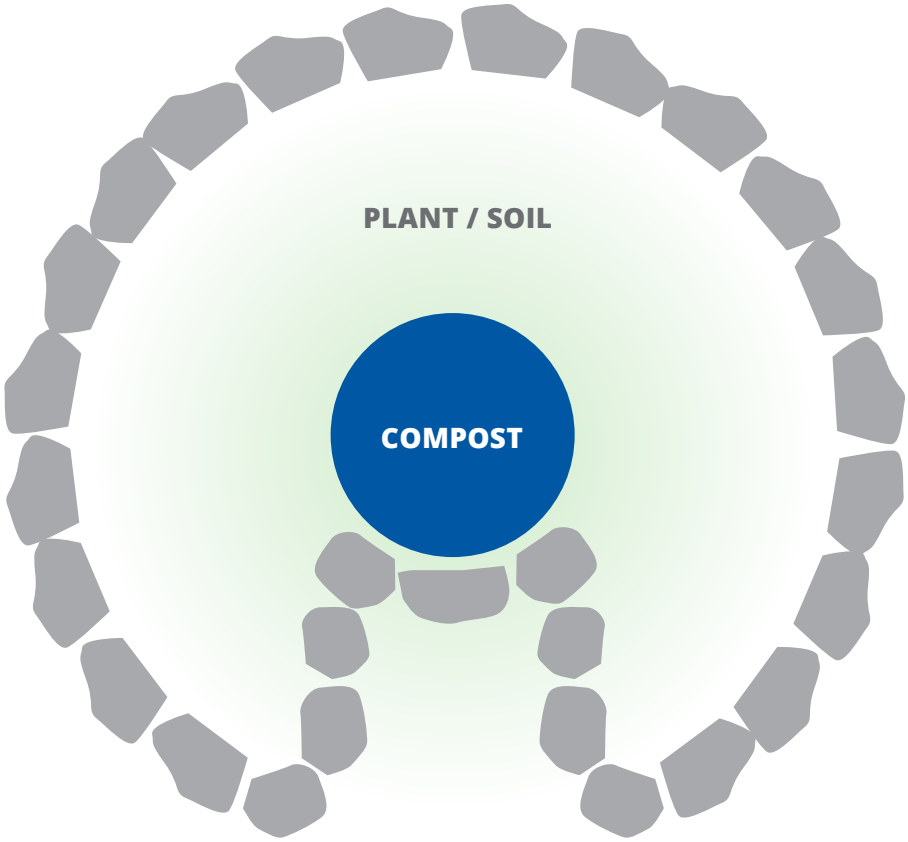
Raised beds within a garden plot can be surrounded by mulched paths. Place overlapping layers of newspaper (at least 10 layers thick) on the path and then cover with mulch such as sawdust or wood shavings. Use straw for this purpose if the entire garden area will be re-cultivated each spring. The paths can be much narrower than the raised beds.

Raised beds within a frame are a good choice if the soil is too rocky or heavy or if there is only a paved yard at school to work with and the garden needs to be elevated. In this case, make the container first and then fill it with the

growing medium. The container can be constructed of wooden beams (but not pressure-treated wood), concrete blocks, or rock about 30 cm or more in height. Raised beds provide accessible garden space for students with physical-access concerns who rely on the garden frame to help support them during gardening activities.

If you are ambitious, there are many interesting variations on the raised bed—like an African keyhole garden (see below), which combines a permanent central compost basket with a circular raised bed. Be creative! **www.sendacow.org.uk/lessonsfromafrica/resources/keyhole-gardens**

Keyhole Garden



Decide What to Grow

What is more fun than looking at garden catalogues? It's tempting to try growing a large variety of vegetables, but school gardens are faced with a simple dilemma: Students will be away for July and August. Pay attention to the "days to maturity" for the cultivars considered. Choose vegetables that take either a very short or a very long time to mature to allow them to be harvested before and after the summer break.

You may wish to choose vegetables that can be eaten raw for convenience in the classroom. Try picking a theme for the garden, like a pizza garden, a salsa garden, or a rainbow garden.

There is considerable interest in heirloom vegetables. These are traditional cultivars, which may not offer the disease resistance of newer ones, but some people prefer their flavour, appearance, and history.

Don't forget edible flowers like nasturtiums and pansies. Kids will have great fun with the idea of eating them.

Involve the students in the planning as much as possible—they will feel a true sense of ownership.

With a first garden, it is best to start simple. Schools report good success growing lettuce, tomatoes, cucumbers, pumpkins, carrots, beans (bush and pole), and radishes.

Lettuce A good choice with a short time to maturity is Mesclun Mix lettuce, which will have leaves ready for harvesting a few weeks after planting. Of course this depends on the weather, but, generally speaking, Mesclun Mix can be seeded in mid-May and should be ready for eating by the end of June. By the beginning of September, any leaf lettuce seeded in early spring will have bolted (gone to seed) and not be tasty anymore. To have lettuce ready in September, it is best to have a volunteer plant it in July.

Tomatoes are a good long-season vegetable that can be started indoors by students. Transplants can be bought at nurseries in the spring, but it is much more fun to start from seeds. If buying from a nursery, pick plants with short, thick stems and healthy green foliage with no evidence of diseases or insects. If starting seeds indoors, a brightly lit window or supplemental lighting is needed. Sweet Million is a popular tomato cultivar that does well in Nova Scotia, and there will be lots of small, tasty tomatoes for the students from just a few plants. These plants do best when staked (tied to a pole) or put in tomato cages to keep them from sagging to the ground.

Cucumber plants will spread to occupy a large area, so for a smaller space, look for bush or container cultivars such as Salad Bush Hybrid. Plant all vine crops, such as cucumbers, close to one end of the garden, and then train the vines to grow outward or along a rail or trellis as they expand in length so they don't cover the rest of the garden.

Pumpkins are a member of the winter squash family. Seed companies have early and late cultivars intended for cooking or for carving. Pumpkins are heavy feeders and drinkers! This means plenty of composted manure needs to be added to the site and the plants need to be watered deeply during dry spells. Be aware that a pumpkin may draw unwanted attention in the garden in the fall and disappear before students get to enjoy it!

Carrots are a popular garden choice that is relatively pest-free. If seeded outdoors in mid-June, they should be ready for harvesting in early September. The carrot rust fly is a problem in some areas and results in carrots with small tunnels through the flesh. If this becomes a problem, choose a cultivar such as Resistafly or cover the carrot bed with a floating row cover. This is a light polyester fabric designed to form a barrier against insects while letting light and water in. The fabric is light enough to be draped over the plants without support. This is a good non-chemical protection for the plants.

Bush beans germinate quickly and are usually easy to grow. Most years, bush beans should be planted in early July for picking in September. Bush beans will be ready to harvest within a short time frame and are heavy producers, as opposed to pole beans, which produce fewer beans over a longer time. Yellow beans have the advantage of being easy for kids to find among the green foliage.

Pole beans require support and will climb up to 2 m on a trellis or teepee. Pole beans mature later than bush beans and may be a good choice for the school garden for this reason. They make good use of vertical space in a small garden. Kentucky Wonder cultivars are available in both yellow and green. Scarlet Runners attract hummingbirds to their red flowers—a bonus!

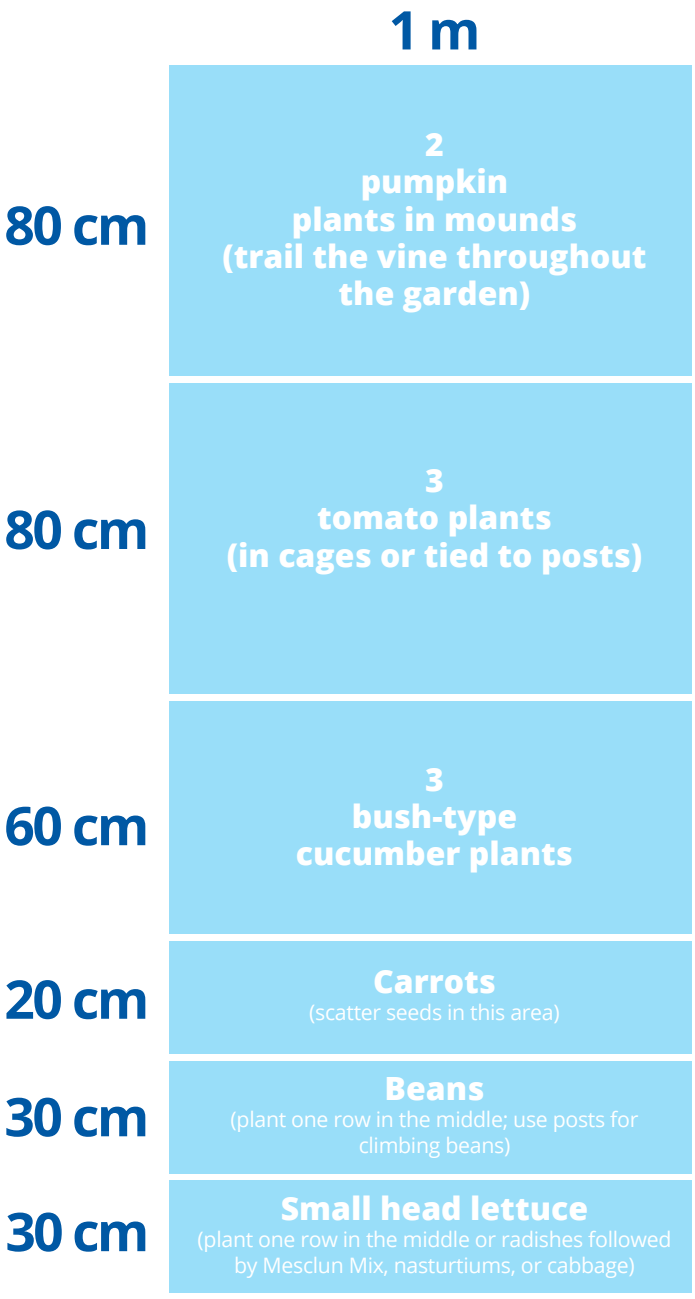
Radishes are the speediest of vegetables. They sprout quickly, grow quickly, and are finished before other vegetables are barely started. The Cherry Belle radish cultivar will grow in just 21 days! Some people like to mix carrot seeds half and half with radish seeds and plant them in a row together. This makes it easier to get the carrots spaced farther apart because the radishes will be pulled out and eaten before the carrots need room.

Potatoes may not be an easy choice for a school garden because they require considerable tending over the summer, but children generally find them of great interest both to plant and to harvest. Baked potato wedges are a favourite on the lunch menu. As the tubers grow, they need to be protected from the sun, either by hilling, mulching, or planting close together in beds. Potatoes are also often attacked by the Colorado potato beetle, which can consume the whole plant if left unattended. Control of this insect requires picking them off the plants, covering with a floating row cover, or spraying during July and August. Despite these challenges, you might want to try planting a few potatoes in a variety of colours, including red, purple, and yellow.

Some vegetables may not be the best choice for a school garden because they require considerable tending over the summer or they may be ready for harvest outside the school calendar. These include the cabbage family, green peas, and corn. Members of the cabbage family (broccoli, cabbage, Brussels sprouts, cauliflower, Chinese cabbage, bok choy, and others) are often eaten by flea beetles when they are emerging from the ground or, later, by cabbage

butterfly larvae. Green peas are best planted in May for harvesting in July and are gone by September. Corn is problematic as it takes a great deal of space and is subject to many insect pests. If you decide to grow these plants, plan to monitor them over the summer months.

Make a Garden Plan

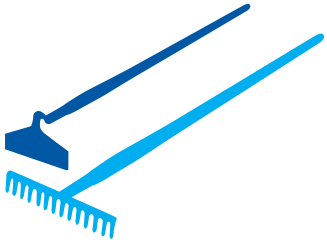


A sample garden plan for a 1 x 3 m garden growing pumpkins, tomatoes, bush-type cucumbers, carrots, beans, and lettuce is shown here. No allowance is made for pathways because it is 1 m wide, so it can be reached from both sides. The pumpkins, tomatoes, and cucumbers would be transplanted into the garden. The carrots, beans, and lettuce would be seeded directly.

Space can be maximized by seeding leaf lettuce, like Mesclun Mix, in the tomato and cucumber plots in early spring. The crop will be ready to harvest before the tomatoes and cucumbers go in. Some people like to seed radishes with the carrots, since the radishes will be harvested before the carrots need the extra space.

If the same garden area will be used every year, it is important to practise crop rotation. This technique consists of not growing the same vegetables in the same place in the garden for two consecutive years. Keep your garden plans from past years to help you remember where the vegetables were previously planted. Rotation reduces the buildup of disease and garden pests and moves the “heavy feeders” (like pumpkins) around the plot.

Find Seed and Plant Sources



Seeds are available almost everywhere. However, keep in mind that they should be from a reputable source. Some stores will put out last year's seeds for sale at a discount. Some plant seeds naturally have a shorter shelf life than others, and if the seeds were not stored properly, the results may be disappointing.

When selecting what to grow, pay close attention to the description. Some cultivars produce smaller plants that are ideal for small gardens or containers. Also look for cultivars that are described as disease-resistant, and check out the days to maturity. By growing more than one cultivar, you'll have some insurance if one doesn't perform well. Next year, grow the best performer again, and select another cultivar to try.

The Halifax Seed Company, Veseys Seeds, McKenzie Seeds, and Stokes Seeds are some options for seed sources. In addition, the Halifax Garden Network (**http://halifaxgardennetwork.com/get_growing/seeds/nova-scotia-seed-directory/**) maintains a list of heritage-seed suppliers in Nova Scotia (see Appendix B for contact information). Seeds purchased from a local business are more likely to be the seeds of cultivars that grow well in Nova Scotia. Plants that would normally grow well in different parts of the world may not do as well here.

Buying transplants is more expensive than starting plants from seed, and, in some cases, the head start they give may not be necessary since the garden won't be harvested before September. However, some vegetables are barely able to mature in our short growing season, so transplants are advised for tomatoes, peppers, and eggplants. Transplants should be purchased from a local grower whenever possible. Sometimes plants in a supermarket or chain store may not have been shipped and stored under ideal conditions. Transplants can be permanently damaged by a lack of sufficient water. Ask where the plants originated.

Transplants can be started indoors for plants requiring a longer growing season, especially if there is a bright sunny window or supplemental lighting. These could be planted around mid-May in potting medium. Cut off the top half of a 1 or 2 L milk carton and fill the bottom half with moist potting medium. Pat down gently. Plant at least two seeds per container, cover with a plastic film, and keep on a sunny windowsill. Other options include peat blocks and paper pots made from recycled newspaper. When the plants emerge, remove the plastic. When the plants are two weeks old, thin to one plant per pot and apply a water-soluble fertilizer, following the instructions on the fertilizer package. When the plants are 7-10 cm tall, or about two weeks before planting, they should be hardened off. Do this by watering sparingly, but not allowing them to wilt, and setting the plants outdoors on mild days. They may be prone to sunburn initially, so partially shade them for the first week, especially from afternoon sun.

Get Into the Garden!

In the spring, add nutrients (based on your soil test results) and mechanically till, dig, or hoe the top 3–4 cm of soil to loosen the surface layer and to blend in the nutrients and organic matter added the previous fall. Remove any weeds and their roots as well. It is recommended not to work the soil when it is wet since it could form hard clods and become compacted.

Using your garden plan, mark the areas with small pegs and some string, so you can see where each type of vegetable will be seeded or planted.

Once transplants have been hardened off, they can be planted in the outdoor garden. Choose a cloudy day (so the plants are not burned by the sun) once the risk of frost has passed. Mid-June would probably work, but in colder parts of Nova Scotia, be prepared to cover them in case of possible frost until the end of June. Using your spade or hand trowel, make a hole large enough to contain the seedling and all of its soil. Carefully remove the plant from its container and set it in the hole. Pack down the soil lightly, and water the plant with a starter fertilizer. Tie tomato plants to a stake or use a tomato cage.

Seed the Mesclun Mix lettuce directly in the garden around mid-May. Seed the carrots, cucumbers, and pumpkins outdoors in mid-June, around the same time as the tomatoes are transplanted to the outdoor garden. By then, the Mesclun Mix lettuce should be ready for harvesting. The head lettuce and beans should be planted by mid-July.

Generally speaking, the seeds should be planted to a depth of about three to four times the thickness of the seed; however, always follow the directions on the seed package. Lettuce and carrots have very small seeds, so it may be easier to scatter them in a row on the surface of the ground, sprinkle some soil overtop, and then lightly pat down the soil. Take your time with seeding, and try to space the seeds so they won't require much thinning. Seeds, especially carrots, need regular watering to germinate, so be sure to water at seeding time and then again several times a week if there is no rain.

Plants need to be thinned if they are too close together and are competing for growing space. Remove unwanted plants carefully, and try not to disturb the soil around the remaining plants. This is a good time to remove any unwanted weeds as well.

The following chart has been adapted from the Veseys Vegetable Planting Chart, which is available at **http://veseys.com/ca/en/learn/reference/plantingchart**. It indicates the planting depth, how long it takes the seeds to germinate, and the space needed between the plants.

VEGETABLE	APPROX. PLANTING DEPTH	APPROX. DAYS TO APPEAR	APPROX. SPACE BETWEEN PLANTS
Beans	3 cm	6-10	5-10 cm
Carrots	0.5 cm	14-21	2-7 cm
Cucumbers	1 cm	7-10	15-30 cm
Lettuce (leaf)	0.5 cm	7-10	2-5 cm
Lettuce (head)	0.5 cm	7-10	30-45 cm
Pumpkins	2 cm	7-12	60-120 cm
Tomatoes	0.5 cm	8-12	75-125 cm

Mulch is an organic or inorganic material applied to the soil surface to provide a protective layer. It serves to suppress weed growth and conserve soil moisture and, in some cases, helps warm the soil in the spring.

Organic mulches are made up of natural materials like straw, leaves, needles, bark, grass clippings, etc. A layer 5–10 cm thick should slow weed growth and will break down over time as it decomposes, providing organic matter to the soil. Since weeds are persistent, remove as many as possible before mulching. Do not use hay for mulch as it contains many seeds and will be a source of weed growth.

Inorganic mulch, such as black plastic, works well for large spreading plants like pumpkins, tomatoes, and cucumbers. A sheet of plastic or landscape fabric can be spread over the planting area. Make sure to cover all of the edges with soil, so it won't blow away. When ready to plant, cut an X in the material that is just large enough to dig a hole and insert the plant. The black plastic warms the soil, which is especially good for heat-loving plants like tomatoes.

Weeds in pathways can be suppressed by laying landscape fabric or layers of newspaper and then covering with wood chips. Be sure to use at least 10 layers of newspaper and to overlap them well to prevent weeds from emerging. Mulched paths have the advantage of showing the children where they can walk; it is important that they not walk on the cultivated beds. The paths also allow the garden to be worked in even when the conditions are wet.

Enjoy the Harvest!

What should you do with the produce?

Use it in the cafeteria, donate it to a food bank, host a food event ... There are lots of possibilities for your harvested produce. Don't overlook having students invite their parents to sample the products of their hard work. Make it a celebration!

Even though your garden may have been organically grown, the vegetables still need to be washed before being eaten. Having a place outdoors to do the preliminary rinsing is very useful. Once indoors, wash the vegetables again and then use clean cutting boards and knives, making sure that students have tied back their hair and washed their hands well before preparing the food from the garden. For tips on safe food handling, see the fact sheet entitled "From U-Picks to Your Home" (**http://www.novascotia.ca/agri/documents/food-safety/factsheet-fruitveg.pdf**).

Nova Scotia Health Promoting Schools has a wonderful website (**http://nshps.ca/downloads/striveforfive**) with ideas on how to promote healthy food choices in schools. Garden vegetables should fit well into your school's healthy eating strategy. Check out the healthy menu items made with locally grown produce. What could be more locally grown than your school garden?

Children can learn about community support and food security by donating produce from the school garden to your local food bank. The Plant a Row Grow a Row program is a Canadian network of gardening communities working with local food banks. Their bilingual website (**http://growarow.org**) has kid-friendly gardening tips, videos, and resources. You can join the program to celebrate your part of a community success.

Select Nova Scotia has a website (**http://selectnovascotia.ca**) dedicated to connecting Nova Scotians with locally produced farm products. It has a great selection of recipes.

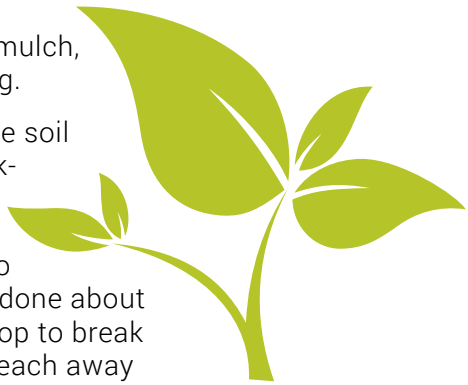
Horticulture Nova Scotia's website (**http://www.hortns.com/**) has recipes and much more. Look for information about all kinds of vegetables.

Put the Garden to Bed

At the end of the growing season, the garden should be prepared for winter.

Remove any remaining plant material to reduce potential disease and insect problems next year. An outdoor compost bin is a good way to recycle the nutrients in the garden plants and learn about nutrient cycles.

Look for ways to cover the garden soil. You can use a layer of mulch, such as straw, which can be worked into the garden next spring.



You may want to use a green cover on the garden to protect the soil and hold the nutrients over the winter. A crop of fall rye or buckwheat planted in the fall will start growing right away and continue next spring. When you are ready to plant the garden in the spring, the green cover should be mowed first, allowed to dry, and then tilled to create a "green" fertilizer. This should be done about two weeks prior to planting the garden, to allow time for the crop to break down. The green cover serves to capture nutrients that could leach away during the winter as well as to prevent wind and water erosion.

Appendix A: Curriculum Connections and School Garden Activities

This section is intended to provide teachers with an initial means of using the school garden as a teaching tool, recognizing that there are many more outcomes that can be linked to the school garden and an even greater potential for related activities to meet these outcomes. The following is a list of suggested activities, by grade and subject, to match specific outcomes taken from the Learning Outcomes Framework: Primary 6 and Grades 7 9, revised January 7, 2014, and Grades 10 12, revised September 18, 2012, unless otherwise stated. Where possible, at least one outcome has been provided for each subject area for grades P 12.

PRIMARY

SUBJECT	OUTCOMES	ACTIVITY
English Language Arts P	9. create texts collaboratively and independently, using a variety of forms for a range of audiences and purposes. • written lists	Visit the garden and identify the different vegetables. Alternatively, look at pictures in a seed catalogue. Create a large list of vegetables in alphabetical order. Take photos in the garden and create a class alphabet book using garden vocabulary (e.g., B is for beans, beets; S is for soil, seeds; W is for wheelbarrow, worms).
Health Education P	1.5 use their senses to explore a variety of healthy foods	Observe the garden plants. Examine the different shapes, colours, and feel of the various parts of the plants. Which parts do we eat? Have a taste test of the different vegetables harvested and compare • raw versus cooked • garden grown versus store-bought
Mathematics P	N05 – Students will be expected to compare quantities, 1 to 10, using one-to-one correspondence	Divide the students into small groups. Have them harvest a few different vegetables from the garden. Count how many of each vegetable they harvested. Compare the amounts of two different vegetables. Describe the results using comparison words/phrases such as more, fewer, as many as, and the same number as.
	M01 – Students will be expected to use direct comparison to compare two objects based on a single attribute, such as length, mass, volume, and capacity	Take some of the vegetables harvested from the garden and • compare the length of two different vegetables and discuss which one is shorter, longer, taller, or almost the same • compare the mass of two different vegetables and discuss which one is lighter, heavier, or almost the same
	PR01 – Students will be expected to demonstrate an understanding of repeating patterns	Visit the garden and look for repeating patterns. Take photos of the patterns or draw visual representations. Discuss the patterns found and create a class “I Spy a Pattern” book.

Physical Education P	Alternative Environments: 2.1 experience walking around the school observing landmarks and being conscious of litter and the environment	Observe the location of the garden in relation to other components of the schoolyard. Ask students to pick up as much litter as possible in a designated time and area (especially the area in and around the garden). What effect does the litter have on the garden and schoolyard?
Science P	Unit: Exploring the World with Our Senses – Sight, Hearing, Smell, Taste, Touch, Observing Using More Than One Sense	Visit the garden and ask students to describe what they see, hear, smell, taste, and touch. Create a list of their observations.
	Unit: Exploring the World of Living Things with Our Senses – Investigating Living Things Outdoors • Investigating Living Things in the Classroom	Visit the garden and ask students to point out living things. Look for insects, birds, animals, and plants. Create a list of their observations. Discuss what might live underground. Dig a shovelful of soil from the garden, take it into the classroom, and place it on a large white tarp or in plastic containers. Examine the soil, looking for living things.
Visual Arts P	6.1 explore the natural and built environment	Explore the school grounds. Ask students to find man-made and natural components. Visit the garden and discuss what parts of the garden are man-made and natural.
	2.1 work individually and with others in art making	Students can sketch what they see in the garden at different times of the year. Experiment with using different media to create garden artwork. Make a class garden mural and display it in the hallway.

GRADE 1

SUBJECT	OUTCOMES	ACTIVITY
English Language Arts 1	5. interpret, select, and combine information using a variety of strategies, resources, and technologies 5.1 engage in the research process with assistance	Using a variety of resources, including seed catalogues, engage students in research about the types of plants to be grown in the garden. Choose one vegetable type (e.g., carrot). Write what is already known about the vegetable. Identify questions to be researched. Observe and describe the characteristics of a plant growing in the garden (see the Science activities below).
	9.1 use a variety of familiar text forms and other media	Take photos or have students draw pictures of what they see in the garden. Create a garden-themed picture dictionary for students to use as a reference tool.

Health Education 1	1.5 categorize food into four food groups according to Canada's food guide, and explain how foods from these four groups can help us to grow, learn, be active, and stay healthy	Harvest vegetables such as carrots, cucumbers, and green beans from the garden. Clean and prepare the vegetables for snacking. What nutrients are in each? What other nutrients do you require? Have students consider using what they have in the garden with the other food groups to plan a well-rounded meal.
Mathematics 1	N01 – Students will be expected to say the number sequence by 1s, forward and backward between any two given numbers, 0 to 100	Visit the garden. Estimate the number of different types of plants and/or vegetables (e.g., how many zucchini, tomato, cucumber, and onion plants there are; how many zucchini, cucumbers, and tomatoes are on one plant). Weed one row. Estimate and then count the number of weeds in that row. Count and record the number of different types of plants or the number of vegetables on one plant in the garden.
	N05 – Students will be expected to compare sets containing up to 20 objects	Estimate the amount of a particular vegetable using a known quantity. For example, if plate A has five carrots on it, how many carrots do you think are on plate B?
	N06 – Students will be expected to estimate quantities to 20 by using referents	Compare the yield of two different vegetables and discuss the results using comparison words/phrases such as more, fewer, and as many as.
	PR01 – Students will be expected to demonstrate an understanding of repeating patterns (two to four elements)	Look for repeating patterns in the garden. Create a pattern book either individually or as a whole-class activity. Discuss repeating events and the different seasonal changes students observe in the garden.
	M01 – Students will be expected to demonstrate an understanding of measurement as a process of comparing by • identifying attributes that can be compared • ordering objects • making statements of comparison	Using different vegetables harvested from the garden, compare which vegetable in the set is • longest/shortest • heaviest/lightest • largest/smallest Discuss the findings with your group and explain your thinking.
Physical Education 1	Alternative Environments 2.6 experience walking as quietly as possible as a measure of sensitivity to the environment	Walk as quietly as possible around and through the garden, being careful to walk only on the pathways in order to not harm the garden plants. Listen to the sounds of the garden (e.g., rustling leaves, birds).

Science 1	Characteristics of Living Things (201-5) identify, conduct, measure, and record observations about animals and plants using appropriate terminology (201-5, 100-8, 203-2)	Observe a variety of plants in the garden. Identify and compare the stem, leaves, flowers, and roots of the different plants. Draw one or more types of plants and label the stem, leaves, roots, etc. Make a growth chart and colour in a green bar up to the height of the plant that day. Record the date beside the height.
	(203-5) listen and respond to another student's description of an animal or plant (203-4)	Observe a variety of plants in the garden. Have students describe what they see.
	(100-8) question, explore, observe, and identify the similarities and differences in how living things are able to meet their needs (200-1, 100-4, 100-5, 100-7)	Observe and compare a variety of plants in the garden. Describe the similarities and differences between the different plants and among similar plants in the garden.
Visual Arts 1	2.1 work individually and with others in the creative art-making process	Draw pictures of the garden plants (see the Science activities above). Place the plant pictures on a large map of the garden.
Social Studies 1	1.4.2 demonstrate an understanding of the factors that influence how needs and wants are met • recognize the need for people to co-operate with each other in their community to meet their various needs and wants • recognize the importance of volunteer work	Make a list of all of the activities required to have a garden. Have students identify everyone who contributes to these activities and who they are in the community.

GRADE 2

SUBJECT	OUTCOMES	ACTIVITY
English Language Arts 2	8.1 use writing and other forms of representation to • formulate questions • discover and express personal attitudes and opinions • express feelings and imaginative ideas • record experiences • record how and what they learn • generate and organize language and ideas	Create a garden journal. Visit the garden weekly; experience it early in the morning, later in the day, and on both a sunny and rainy day. Have students keep a journal of what they are doing in the garden, what they notice when they are there, what they like and don't like about being in the garden, and what vegetables they like and don't like eating from the garden. Have students use their experiences to write a book to share with their peers (e.g., If you like to eat_____, you might also like to try _____ because ...).

Health Education 2	2.5 examine Canada's food guide and demonstrate an understanding that foods within each of the four food groups provide different nutrients that help us grow, develop, learn, play, be active, and keep healthy	Make a list of the vegetables growing in the garden. What nutrients can be found in each of them? What other nutrients do you require and what foods might you eat in order to get these nutrients? Have students consider using what they have in the garden with the other food groups to plan well-rounded meals for a day.
Mathematics 2	M03 – Students will be expected to compare and order objects by length, height, distance around, and mass using non-standard units and make statements of comparison	Estimate, measure, and record the measurements of different vegetables and parts of the plants (e.g., vines, stems, leaves) using non-standard units. Compare and order the measures of two different vegetables / plant parts and explain how and why you chose to put them in that order.
	M04 – Students will be expected to measure length to the nearest non-standard unit by using multiple copies of a unit and using a single copy of a unit (iteration process)	Estimate and measure the length and width of the garden, the width of the rows and paths, and the height of the various plants using non-standard units such as a rake, a hand trowel, and the student's stride (i.e., counting their steps).
	SP01 – Students will be expected to gather and record data about self and others to answer questions SP02 – Students will be expected to construct and interpret concrete graphs and pictographs to solve problems	Conduct surveys. Record the findings using tallies, check marks, charts, or lists. • What are our favourite vegetables to eat? Students could choose to plant their top five choices. • How many tomatoes, cucumbers, and zucchini were harvested from a plant/vine? • Do the students prefer to eat raw or cooked garden vegetables? Create graphs to display data and discuss the results. Which vegetable does the class like the most/least?
Physical Education 2	Basic Movement 1.5 demonstrate an understanding of the effect of physical activity on one's heart	Participate in garden activities such as carrying water, digging, and raking. Discuss the physical effects on the body when exercising (e.g., red face, raised temperature, faster breathing). Record students' heartbeat before and after the activity.
Science 2	Forms and Changes in Moisture – identify and measure evidence of moisture in the environment, in materials, and in living things (102-9, 201-3)	Set up a simple catch device to record the amount of rainfall in the garden. Record measurements throughout May and June.
	(103-7) describe the effects of weather and ways to protect things under different weather conditions	Research when the first frost of the year is likely to occur in your area. Set up a thermometer in the garden and record the temperature first thing each morning in September and October. Gather materials such as old sheets, tarps, plastic, and a floating row cover to cover the plants when frost warnings are issued. Talk about how a greenhouse protects plants.

Visual Arts 2	2.1 work individually and with others in the creative art-making process	Make a scarecrow in the form of a robot, using materials from around the house.
Social Studies 2	2.4.3 demonstrate an understanding of sustainable development and its importance to our future (local, national, and global) plan, carry out, and evaluate a conservation activity	Compost plant material from the garden. Apply a layer of mulch or plant a green-cover crop in the garden.

GRADE 3

SUBJECT	OUTCOMES	ACTIVITY
English Language Arts 3	8.1 use writing and other forms of representation to • formulate questions • generate and organize language and ideas • discover and express personal attitudes and opinions • express feelings and imaginative ideas • record experiences • explore how and what they learn 8.2 explore, with assistance, ways for making their own notes 8.3 experiment with language choices in imaginative writing and other ways of representing	Start transplants indoors by planting seeds. Write procedural texts to record the steps, and create instructions on how to start transplants. Create step-by-step posters for common garden activities (e.g., how to plant a seed, how to pull out a weed, how to water the plants) and share them with younger students. Write, illustrate, and publish a variety of garden-themed poetry, pamphlets, or read-alouds to be shared with other students in the school.
Health Education 3	3.4 demonstrate an understanding that the healthiest foods come from natural sources and differentiate between whole and processed foods	Harvest vegetables such as carrots, cucumbers, and green beans from the garden. Clean and prepare the vegetables for snacking. Compare them with a processed snack food. What nutrients are in each? Discuss what natural and man-made processes go into garden snacks versus processed ones.

Mathematics 3	M04 – Students will be expected to demonstrate an understanding of measuring mass	Use a balance scale to measure and record the mass (in grams or kilograms) of different vegetables harvested from the garden. Compare two similar vegetables with different masses and explain your results.
	SP01 – Students will be expected to collect first-hand data and organize it using tally marks, line plots, charts, and lists to answer questions SP02 – Students will be expected to construct, label, and interpret bar graphs to solve problems	Record information and create graphs about the different types and quantities of vegetables harvested. Use data to determine if students should plant more, fewer, or the same amount of vegetables the next year.
Physical Education 3	Basic Movement 1.1 demonstrate an understanding of safety rules in physical education classes	Develop and discuss safety rules for use in the garden (e.g., rakes should be placed with their tines down on the ground; watch out for others when using rakes, forks, and spades; do not leave tools where others will trip over them; bend your knees to lift heavy objects; use your legs and arms to protect your back).
Science 3	Investigating Germination and Growing Conditions for Plants • place seeds in groups according to one or more attributes (202-2) • question and record relevant observations and measurements while investigating various growing conditions for plants (200-1, 201-5, 202-4)	Start transplants for the school garden. • Read the seed packets for "days to maturity" and decide which seeds should be started indoors. Using the seeds to be started, observe and compare the different kinds of seeds, noting their size, shape, colour, thickness, and appearance. Use a property chart to group them. • Plant seeds in small containers and label the containers. You will need at least 10 containers for each seed variety. Discuss the various growing conditions. Grow the seeds under a variety of conditions (e.g., on a windowsill and under a growing light; in a cool room and a warm room; with air circulating from a fan or not; two or four seeds per container; watering once a week or twice a week, using exactly the same amount of water each time). Record the date of germination. Measure the height of the plants at least twice a week.
	Water Absorption of Soils • describe, predict, and compare the absorption of water by different types of soil (100-38, 200-3) • communicate procedures and results of investigations related to water absorption of soils, using drawings, demonstrations, and/or written and oral descriptions (203-3)	In addition to the indoor activities described in the curriculum guide, students can study water absorption in the garden. When preparing the garden for planting, add organic matter to one seed bed and not to another (or use varying amounts), add sand or not, and create both raised beds and flat garden rows. Record observations of water absorption on the various seed beds. Does the water remain after a rainfall or drain away? Does the seed bed stay moist after a prolonged dry spell?
Visual Arts 3	1.2 use various materials and processes and explore their possibilities and limitations	Using seed catalogues, cut out pictures of vegetables and use them to create a collage. Draw leaf shapes.

GRADE 4

SUBJECT	OUTCOMES	ACTIVITY
English Language Arts 4	9. Students will be expected to create texts collaboratively and independently, using a wide variety of forms for a range of audiences and purposes	Create a cookbook of recipes using garden vegetables for the school lunch program. Gather recipes by choosing favourites from the Strive for 5 binder and asking grandparents for their favourite vegetable recipe.
Health Education 4	3.4 promote environmental awareness within the school community that demonstrates awareness of the connection between environment and health	Prepare posters showing how plants benefit the environment and post them around the school.
Mathematics 4	A1 identify and model fractions and mixed numbers	Plan a pizza garden. List the vegetables to be grown for a pizza (e.g., onions, tomatoes, peppers, eggplants, garlic, basil, oregano). Each student can choose the vegetables to be grown. Divide a circle into fractions, with each section representing one type of vegetable.
	D1 recognize and demonstrate that objects of various shapes can have the same area D2 recognize and demonstrate that objects of the same area can have different perimeters	Plan a pizza garden as above. Determine how much of each vegetable is needed. Use a seed catalogue to determine the area needed to grow the desired quantity. Using graph paper, plan a garden of the required area in the shape of a square, rectangle, triangle, etc. Measure the perimeter of each.
	F1 recognize and use a variety of methods for the collection and organization of data	Use the data from the Science section below to demonstrate a variety of methods for the collection and organization of data.
	F8 explore real-world issues of interest to students and for which data collection is necessary to • determine an answer	Measure the growth rates of the garden plants and graph the results. Alter the growing environment (e.g., seeds grown with fertilizer versus no fertilizer, seeds grown with purchased soil versus vermicompost-enriched soil) and compare the results on a graph.
Physical Education 4	Alternative Environments 2.4 participate in a schoolyard clean-up program	Take responsibility for keeping the school garden area clean and tidy. Visit it on a regular basis to pick up litter and keep the weeds under control.

Science 4	Life Science: Habitats • identify questions to investigate the types of plants and/or animals at a local habitat using the terms habitat, population, and community (104-6, 204-1)	Identify and describe the members of the garden habitat and the conditions under which they live. Research sunlight, temperature, spacing, and water and nutrient requirements and compare what is required by each member. Have all of the requirements been met or what has to be done to ensure that the requirements are met? What if nothing was done to the garden?
	• identify their own and their families' impact on habitats and describe how personal actions help conserve habitats (108-3, 108-6)	Discuss ways in which the students can reduce their carbon footprint and reduce the amount of waste generated in their home or school. Can they start their own vegetable garden? How can they educate others in their family/school?
Visual Arts 4	1.3 use a combination of visual elements and principles of art and design in art making	Create wooden name stakes for the garden. Use paint to decorate each stake with the name of a garden vegetable.

GRADE 5

SUBJECT	OUTCOMES	ACTIVITY
English Language Arts 5	8.1 use a range of strategies in writing and other ways of representing to • describe feelings, reactions, values, and attitudes	Visit the garden and explore it using all of the senses. Write a poem to describe the experience.
	10.3 use technology with increasing proficiency to create, revise, edit, and publish texts	Create a booklet or a PowerPoint presentation on the life cycle of a plant to share with peers and/or younger students in the school.
Health Education 5	1.5 demonstrate an understanding of the basic nutrients found in food and the function they serve within the body	Research the nutritional value of the plants grown in your garden and what is required for a healthy body. Identify other plants you could grow or other things to eat to satisfy your needs. Create a brochure, flyer, or poster to educate others on the nutritional value of the plants grown in the garden.
Mathematics 5	F4 create and interpret line graphs	Create line graphs to interpret the data collected in the garden's weather station (see the Science activity below).
Physical Education 5	Active Living 1.8 monitor nutritional intake and relate it to an active, healthy lifestyle	Analyse the healthy lunches served at school. How many servings from each food group are supplied by the different lunches? How many more servings should be consumed at home for a balanced diet, according to Canada's Food Guide? Keep a journal of physical activities for a week. How many minutes per week are students physically active, at home and at school?

Science 5	Measuring and Describing Weather – using correct names of weather instruments, construct and use instruments to record temperature, wind speed, wind direction, and precipitation (104-7, 204-8, 205-4, 205-10, 205-7, 300-13)	Build or collect a rain gauge, anemometer, barometer, and hygrometer. Set up a weather station in the garden. Record data from the instruments daily in May and June.
Visual Arts 5	1.2 develop ability and initiative in the use of techniques, technologies, materials and equipment	Explore the use of a camera. Observe the plants in the garden. Use photography to artistically record the garden plants. Use a scanner to create images of the vegetables and plants.
	4.2 identify similarities and differences in their own work and that of others	Display the photographs (from above) in an exhibit. Discuss the differences and similarities among the photographs.

GRADE 6

SUBJECT	OUTCOMES	ACTIVITY
English Language Arts 6	2. Students will be able to communicate information and ideas effectively and clearly, and to respond personally and critically	Develop a series of questions and answers about the school garden. Record the answers on index cards. Invite school visitors to tour the garden and ask questions. Respond to the questions using prepared notes to inform the visitors about the garden. Write about your garden experiences and food experiences.
Health Education 6	1.8 assess total minutes of moderate and vigorous activity during school compared to after school and weekends	Categorize the activity level of all of the jobs required in preparing, planting, harvesting, and maintaining your garden and record the length of time required for each. How does this activity compare to your regular school and home activity levels?
	1.7 describe the role of physical activity and healthy eating in maintaining healthy weight and preventing chronic disease	Plan a daily menu that includes the components of a balanced diet. Have students keep a food journal/log. Discuss whether or not they feel a difference in their energy level when they are following a balanced diet.

Mathematics 6	D6 continue to solve measurement problems involving length, capacity, area, volume, mass and time	Have students create garden plans. Using seed catalogues, determine which vegetables to plant. Decide how much of each vegetable is wanted and then the length of the row and the number of seeds required. How much space does each require? Draw several plans to accommodate the vegetables, using different shapes for the garden plot. Using the results from the soil tests, determine the amount of nutrients needed to augment the soil in gardens of different sizes.
	F9 explore relevant issues for which data collection assists in reaching conclusions	Track the amount of sunlight that different areas of the garden receive over the course of a day. Use this information to help decide where to plant different seeds.
Physical Education 6	Active Living 1.3 perform activity-specific stretching 1.5 participate in games, sports, dance and outdoor pursuits, both in and outside school, based on individual interests and capabilities 1.7 select activities designed to improve and maintain muscular strength and endurance, flexibility, and cardiorespiratory functioning	Use a variety of tools to work in the garden to dig, rake, shovel organic materials, fill and carry watering cans, and hoe weeds. Identify the muscles used with each tool. Develop a stretching program specific to garden work. Perform each garden activity using different levels of effort. Take your pulse before and after each activity, and discuss recovery rates and resting heart rates. Identify how long you can work using various levels of effort (endurance).
Science 6	Adaptations and Natural Selection • propose questions and gather information about the relationship among the structural features of plants and animals in their environments and identify the positive and negative impacts of humans on these resources (204-1, 108-8)	Visit the garden in September, assigning a group of students to each type of vegetable. Search the plants for worms and insects. Use hand-held magnifiers to observe the worm or insect and identify its structural features. Observe the host plant and describe/draw its structural features. How do the structural features of the worm or insect help it to survive on its host plant? Research the effects of the worm or insect pest on the plant and the controls humans use to manage it.
Visual Arts 6	1.1 express through art making an awareness of the complexities of the world and their role in it	Observe the plants in the garden. Use coloured clay to model a variety of the vegetables.
Social Studies 6	6.2.1 compare climate and vegetation in different types of physical regions of the world	Determine the regional origins of the plants in your garden. How is the climate in the plants' place of origin similar to or different from the climate in Nova Scotia?

GRADE 7

SUBJECT	OUTCOMES	ACTIVITY
English Language Arts 7	9.1 produce a range of writing forms, for example, stories, cartoons, journals, business and personal letters, speeches, reports, interviews, messages, poems, and advertisements	Write a thank-you letter to a local business to thank them for their donation toward the school garden. Create a cartoon based in the garden. Have students prepare an interview with a seed. A lesson can be found at http://www.hort.vt.edu/HORT6004/network/YouthGardener/GrowingSeedsIndoors/interviewSeed.pdf.
Healthy Living 7	7.22 recognize the characteristics of supportive environments within various community contexts for healthy eating, environmental sustainability, physical activity, and non-use of tobacco and alcohol	Participate in promoting the consumption of healthy produce from the garden by creating posters.
Information and Communication Technology Integration 7-9	PTS 9.4 (relates to 6.5, 6.6) create and manipulate sound, images and video, using digital equipment and computer-based editing, to represent their learning for particular audiences and purposes, independently	Develop a news story about the garden and track its progress throughout the season.
	RPSD 9.2 (relates to 6.1, 6.2) create and use electronic charts, maps, tables, graphs, spreadsheets, and databases to collect, analyze and display data independently	Use a spreadsheet to track plant height and create a graph of plant height versus the time since planting or germination.
Mathematics 7	B10 create and solve problems that involve the use of percent	Track the number of seeds planted and compare it to the number of plants produced in order to calculate the percentage of germination.
	D1 identify, use, and convert among the SI units to measure, estimate, and solve problems that relate to length, area, volume, mass, and capacity	Measure the perimeter of the garden, the length of a row, the height of the plants, etc. Incorporate a variety of measuring devices. Convert the measurements into other SI units. Use measurements to calculate the volume of soil required to fill the garden to a certain depth.

Science 7	Earth and Space Science- Earth's crust • investigate and discuss procedures and expenditures for enriching soils, providing science and technology examples (112-7, 113-7)	Research and apply different methods for enriching soil and see what effect this has on plant growth and yield.
	Physical Science – Heat • construct, test, and produce data using an air thermometer (208-8, 210-13, 210-2)	Build an air thermometer and use it to collect data on the air temperature and soil temperature in the garden.
	Life Science – Interactions Within Ecosystems • describe interactions between biotic and abiotic factors in an ecosystem (306-3)	Investigate the soil to identify biotic and abiotic factors. Describe which abiotic factors are necessary for plants to grow.
	Life Science – Interactions Within Ecosystems • describe how energy is supplied to, and how it flows through, the structures and interactions in a natural system, using charts, diagrams, and terminology (306-1, 111-6, 210-3)	Use an iodine test for starch to demonstrate photosynthesis. Compare a leaf from a plant kept in the dark for 24 hours to a leaf from a plant on a windowsill.
	Life Science – Interactions Within Ecosystems • describe essential conditions to the growth and reproduction of plants and microorganisms in an ecosystem, providing examples related to aspects of the human food supply (304-3, 111-1)	Magic Bean Challenge: Give each student two bean seeds and challenge them to see who can grow the largest plant (by mass) in six weeks. Students can design experiments to determine which conditions (e.g., more/less water, with/without sunlight, enriched/not enriched soil) result in optimal plant growth.
Technology Education 7	4.7 safely use basic hand tools, power tools, and equipment to create a product that solves a design problem 4.9 use fasteners to combine materials	Have students build the frame for a garden box.
Visual Arts 7	7.1.2 use a variety of art media to explore themes from experience, observation, and imagination	Use the garden as a theme for producing art. Produce signposts for the various plants in the garden.

GRADE 8

SUBJECT	OUTCOMES	ACTIVITY
English Language Arts 8	8.1 demonstrate competence in the frequent use of writing and representing strategies to extend learning; to explore their own thoughts and consider others' ideas, to reflect on their feelings, values, and attitudes; and to identify problems and describe logical solutions	Have students make and maintain a field journal where they visit the garden and have a different writing task (e.g., poetry, descriptive, imaginative, narrative) to complete in the journal each day.
Food and Nutrition 8	2.2 compare and contrast nutrient content of various foods	Rank harvested crops based on their nutrient content (found through online research).
	5.2 recognize the benefits of selecting locally grown/ produced food	Track fresh fruits and vegetables eaten daily and discuss where they came from and how they got to their plates. Follow this with a discussion with a local farmer / market worker / chef and then summarize the benefits of eating local in a format of their choice.
Mathematics 8	B5 add and subtract fractions concretely, pictorially, and symbolically B6 add and subtract fractions mentally, when appropriate B7 multiply fractions concretely, pictorially, and symbolically B8 divide fractions concretely, pictorially, and symbolically	Have students double or half a recipe they made with crops from the garden.
	D8 measure and calculate volumes and surface areas of composite 3-D shapes	Choose leaves from different plants and calculate their surface area.
Science 8	distinguish between plant and animal cells and use microscopes or microviewers to produce a clear image of cells (304-5, 209-3)	Use a vegetable from the garden (e.g., an onion) to create a wet-mount slide.

Visual Arts 8	8.5.2 use experiences from their personal, social, cultural, and physical environments as a basis for visual expression	Use the garden as a subject and create drawings or paintings of still lifes.
	8.7.3 explore the sensory qualities, their meaning and messages conveyed through the use of various media and technologies	Work outside, around the garden, to create art that invites observers to think about their senses or that conveys meaning about the importance of nature.

GRADE 9

SUBJECT	OUTCOMES	ACTIVITY
Child Studies 9	2.1 describe and model positive food experiences for children	Write a children's story about working in a garden and eating homegrown food.
English Language Arts 9	1.3 articulate, advocate, and support points of view, presenting view points in a convincing manner	Have students write an opinion essay on whether growing your own food encourages people to eat healthy.
Mathematics 9	C2 interpret graphs that represent linear and non-linear data	Have students collect and graph data on various aspects of the garden and determine if the data is linear (e.g., plant height versus day) or non-linear (e.g., the total number of plants present each day).
	F4 select, defend, and use the most appropriate methods for displaying data	Have students collect data (e.g., temperature, plant height, number of plants, yield versus day) from the garden and determine the best way to display this information.
Science 9	Reproduction • identify questions and investigate, in the laboratory, the reproduction of plants and communicate findings (208-2, 211-2)	Have students investigate various methods of plant reproduction to determine the pros and cons of each.

GRADE 10

SUBJECT	OUTCOMES	ACTIVITY
English 10 **(October 23, 2013, Draft)**	SCO 10.5 use a range of materials and ideas to clarify writing and other ways of representing for a specific audience (e.g., graphs, illustrations, tables)	Create a press release about the garden, informing the public of the purpose and benefits of the project.
Exploring Technology 10	6.4 estimate materials and labour requirements for a skilled trades-related project	Use a plan for the proposed garden to estimate the amount of materials and labour required to build the garden frame and/or other garden structures.
Family Studies—International Foods 10	4.4 initiate and carry out a personal action project for avoiding dietary excess or for feeding the hungry	Organize the donation of excess garden produce to a local food bank or soup kitchen.
Family Studies—Textile Production 10	1.4 expand their wardrobe by repairing, redesigning, and/or recycling garments	Use items harvested from the garden to create natural dyes and use these to dye fabrics.
History 10	1.4 demonstrate an understanding of the different regions of the ancient world and be able to explain their various contributions	Discuss which types of food were grown by ancient civilizations and attempt to grow some of these same foods, perhaps then using them to create a "meal" typical of one of the regions of the ancient world.

Mathematics 10 (Mathematics 10 Implementation Draft July 2013)	M01 – Students will be expected to solve problems that involve linear measurement, using SI and imperial units of measure, estimation strategies, and measurement strategies	Have students measure (in imperial and SI units) the perimeter of the garden, length of a row, height of plants, etc. Incorporate a variety of measuring devices.
	M02 – Students will be expected to apply proportional reasoning to problems that involve conversions between SI and imperial units of measure	Estimate the cost of installing fencing around the garden, given the perimeter in metres and the cost in $/foot, or complete other similar word problems. Use the measurements of different aspects of the garden to confirm that their conversions are correct. Draw a diagram of the garden to scale.
	M03 – Students will be expected to solve problems, using SI and imperial units, that involve the surface area and volume of 3-D objects, including right cones, right cylinders, right prisms, right pyramids, and spheres	Calculate (using the required measurements) the amount of soil needed for the garden. Calculate the amount of tarp required to cover the garden to protect it from frost or the amount of tarp required to cover a pile of soil delivered by a dump truck (cone shape).
	RF01 – Students will be expected to interpret and explain the relationships among data, graphs, and situations	Collect/analyse data on the garden (e.g., the plant height versus time, the number of plants versus the number of seeds planted) and graph it appropriately, identifying the domain and range.
	RF02 – Students will be expected to demonstrate an understanding of relations and functions	Collect data from the garden in tables of values and determine if the information represents the function or a relation (e.g., the plant height versus time, the number of plants versus time).
	RF03 – Students will be expected to demonstrate an understanding of slope with respect to rise and run, line segments and lines, rate of change, parallel lines, and perpendicular lines	Have students gather data from the garden (e.g., the soil temperature throughout the day, the plant height versus time) and create a graph. Then have students calculate the slope of the graph and identify the rate of change.
Mathematics Essentials 10	B4 estimate and calculate the unit prices of comparable items to determine the best buy	Investigate the cost of seeds from different companies and compare the unit price in order to determine the best buy.
	E5 analyze the geometric aspects of logos and design E6 create a personal logo, using the mathematics of symmetry, translations, reflections, rotations, or dilatations, with the aid of technology	Investigate the cost of seeds from different companies and compare the unit price in order to determine the best buy.

Mathematics at Work 10 **Implementation Draft August 2013**	G02 – Students will be expected to demonstrate an understanding of the Pythagorean theorem by identifying situations that involve right triangles, verifying the formula, applying the formula, and solving problems	Use the Pythagorean theorem and the 3:4:5 side ratio to determine if the corners of the garden box are square.
Science 10	Life Science: Sustainability of Ecosystems • distinguish between biotic and abiotic factors (318-2, 318-5)	Sift through the soil and examine the garden in order to identify the biotic and abiotic factors. Investigate the various abiotic factors of the soil (e.g., pH, moisture content).
	Earth and Space Science: Weather Dynamics • describe how the atmosphere and hydrosphere act as heat sinks in the water cycle (331-3)	Take a sample of the soil and an equal amount of water, place them in separate containers, and insert a thermometer. Shine a light source (lamp) on the two containers and measure the temperature at intervals to determine which substance heats up more quickly.
Skilled Trades 10	13. demonstrate an ability to use various measuring tools and devices	Using technology, create a logo for the school garden.

GRADE 11

SUBJECT	OUTCOMES	ACTIVITY
Agriculture/ Agrifood 11	• investigate and explain abiotic and biotic factors that influence agriculture (AG-01) • design and perform plant experiments using different variables and proper equipment (AG-02)	Have students plan a lab on plant growth to investigate variables such as soil, water, light, nutrients, pH, and pesticides.
	• examine and explain a compost heap and report on its use (AG-03)	Have students investigate, plan, and construct an effective compost to enrich the garden soil.

Biology 11 / Advanced Biology 11	Matter and Energy for Life • design, perform, and report on experiments that investigate the basic and critical processes of photosynthesis and respiration (214-11, 114-5)	Use garden plants in lab experiments to examine the use or production of CO2.
	Diversity among Living Things • describe the anatomy and physiology of a representative organism from each kingdom, including a representative virus (316-6)	Have students perform a plant or flower dissection on one of the garden plants.
	Diversity among Living Things • analyze and explain the life cycle of a representative organism from each kingdom, including a representative virus (313-1)	Have students investigate the life cycle of various garden plants. Ask students what plant parts we are eating for each garden plant and where each is in its life cycle.
	• describe and apply classification systems and nomenclatures used in the biological science (214-1)	Create/use a dichotomous key to classify garden plants. Students could develop a method for classifying plant specimens from the garden.
	Maintaining Dynamic Equilibrium I • explain, with specific examples, how behaviours such as tropisms, instinct, and learned, help to maintain homeostasis and identify multiple perspectives that influence a decision/issue (215-4, 317-8)	Have students study phototropism of seedlings in the garden, with one group of plants covered with an opening for sunlight and the other group not covered.
Visual Arts 11	UC 5.3 generate artwork that demonstrates an understanding of the elements of art and principles of design as they exist in art and in the natural and built environments	Have students examine the various garden plants for symmetry and other elements of art and create a piece based on what they observed.

GRADE 12

SUBJECT	OUTCOMES	ACTIVITY
Biology 12	Reproduction and Development • design, perform, compile data, and evaluate experiments on plant materials, using instruments effectively, controlling major variables, and selecting appropriate processes (212-3, 213-3, 212-8, 213-5)	Use the garden plants as subjects for student-designed experiments.
	Reproduction and Development • select and integrate information from various sources and explain current reproductive technologies for plants and animals (231-7, 313-5)	Research the current reproductive technologies for plants (e.g., asexual reproduction from cuttings, hand pollination) and apply some of these in the garden.
	Genetic Continuity • investigate, perform, and defend a position or course of action on genetic modification, integrating various sources and science- and technology-based careers (215-5, 117-7, 213-7)	Have students investigate whether any of the seeds planted in the garden were genetically modified and debate the benefits of such seeds or create an advertisement to outline their advantages and disadvantages.
	Genetic Continuity • explain how the current model of DNA replication, the structure of DNA and RNA, and protein synthesis revolutionized thinking in scientific communities (315-4, 315-5, 115-3)	Use some of the produce from the garden for a DNA-extraction lab.
	Evolution, Change, and Diversity • identify questions to investigate, collect information, and construct arguments to support the development and diversity of living organisms, using examples and evidence (212-1, 213-6, 118-6)	Have students choose a garden plant and investigate one of its adaptations and its usefulness for survival.

Business Technology 12	1.1 create professional looking documents using basic and advanced software features	Have students create posters advertising the availability of crops grown from the school garden in cafeteria meals.
Chemistry 12 / Advanced Chemistry 12	• determine the concentration of an acid or base solution using stoichiometry (320-6) • use instruments effectively and accurately for collecting titration data (213-3)	Juice various garden produce known to contain vitamin C. Have students investigate the concentration of vitamin C with a titration lab.
Communi-cations Technology 12	2.5 control light using advanced manual settings of a camera and existing light photography methods	Take pictures of the garden and its contents under various natural lighting conditions.
	6.5 create, edit, and distribute web appropriate video	Create a video about the garden and its uses by students.
Food Science 12	2.6 explain practical methods of food preservation	Have students preserve garden produce using appropriate methods.
	2.9 describe the fermentation process and make a fermented product	Have students make lacto-fermented vegetables from their choice of harvested vegetables.
Geomatics 12	3.2 actively engage in collecting, geocoding, and mapping the community features	Collect, geocode, and map the features of the school, including the garden.
	4.4 manipulate data to produce thematic representations or maps	Create a map of an existing garden or propose the location and size/layout of a new garden.
Global Geography 12 / Advanced Global Geography 12	4.1 analyze factors that affect the global production and distribution of food	Have students use their knowledge of the school garden and the factors required for successful food production as stepping stones for examining factors that affect global food production.

Math for the Workplace 12	1.2 use a measuring tape to measure tactile items in both imperial and SI units	Measure the different aspects (e.g., width, height, plant height, plant spacing, row height) of the garden.
	1.3 identify the difference between length, area, and volume	Determine the amount of fencing required to enclose the garden, the amount of tarp needed to cover the garden, and the amount of soil needed to fill the garden.
	1.4 demonstrate an understanding of the meaning and uses of significant figures	Have students use a variety of measuring tools, each with its own level of precision, to measure the different aspects of the garden. Discuss how many significant figures there can be with each measuring tool.
	1.6 identify, use, and convert among and between SI units and imperial units to measure and solve measurement problems	Determine how much wood is required to frame the perimeter of the garden. Students can measure the perimeter in SI units and be provided with the cost of the wood in imperial lengths.
	3.6 sketch enlargements and reductions of objects using various scales	Have students draw a leaf or flower (enlarged) and/or the garden (reduced).

Appendix B
School Garden Resources

Contents

Resource Contacts

Nova Scotia Department of Agriculture
Judy Grant, Agricultural Awareness Coordinator – Phone: 902-893-6598
Rick Hoeg, Agricultural Education Liaison – Phone: 902-893-7495
Fax: 902-893-0244
Civic: 176 College Road, Harlow Building, Truro, NS, B2N 2P3
Mail: PO Box 890, Truro, NS, B2N 5G6
http://novascotia.ca/agri/programs-and-services/educational-resources/

Nova Scotia Department of Agriculture Regional Offices
http://novascotia.ca/agri/programs-and-services/regional-services/

Cape Breton phone: 902-563-2000
Eastern phone: 902-863-7180
Central phone: 902-893-6575
Valley phone: 902-679-6021
Western phone: 902-638-2395

Nova Scotia Department of Agriculture Food Protection Section
Food-handling education and training, information, and inspections.
http://novascotia.ca/agri/programs-and-services/food-protection/factsheets-publications/

Dalhousie University Faculty of Agriculture
Dr. Norman Goodyear, Associate Professor, teaching courses in plant science, organic horticulture, and horticultural therapy.
Dalhousie University Faculty of Agriculture, Truro, NS
Phone: 902-893-6366
E-mail: norman.goodyear@dal.ca

Carol Goodwin, Associate Professor, Department of Environmental Sciences, teaching courses in arboriculture, landscape management, garden history and design, and plant identification. Dalhousie University Faculty of Agriculture, Truro, NS
Phone: 902-893-6673
E-mail: carol.goodwin@dal.ca
http://www.dal.ca/faculty/agriculture.html

Perennia
Agricultural specialists, publications, guides, newsletters, events, and links.
Phone: 902-896-0277 (Truro); 902-678-7722 (Kentville)
http://www.perennia.ca/

Atlantic Master Gardeners Association
Brings keen gardeners together with a mission to serve in an educational role to help others learn to enjoy horticulture.
E-mail: carol.goodwin@dal.ca
http://atlanticmastergardeners.ca/

Organic Agriculture Centre of Canada
Phone: 902-893-7256
Fax: 902-896-7095
E-mail: oacc@dal.ca
http://www.organicagcentre.ca/

Nova Scotia Association of Garden Clubs
The coordinating body for organized gardening groups in the province.
http://nsagc.com/

Atlantic Canadian Organic Regional Network (ACORN)
Information on organic agriculture, eating organics, and connecting all of the parts together.
Phone: 506-536-2867
Toll-free: 1-866-32 ACORN (22676)
Fax: 506-536-0221
E-mail: admin@acornorganic.org
http://www.acornorganic.org/

Nova Scotia Health Promoting Schools
Encouraging youth to eat well and to exercise while promoting the physical, social, spiritual, mental, and emotional well-being of all students and staff.
https://nshps.ca/

Nourish Nova Scotia
A province-wide non-profit organization that supports nourishment and food-literacy programs in school communities.
https://nourishns.ca/

Feed Nova Scotia
A charitable organization that helps feed hungry people by collecting and distributing food to more than 150 member agency food banks and meal programs.
Phone: 902-457-1900
E-mail: communications@feednovascotia.ca
http://www.feednovascotia.ca/

Green Schools Nova Scotia
Fostering a culture of environmental sustainability, Green Schools works to strengthen positive efforts already under way and helps establish new leadership in schools that are ready to go green.
http://greenschoolsns.ca/

Clean Nova Scotia Foundation
Clear the Air and Farm to Schools program supports educational events that promote local foods and healthy eating.
E-mail: info@clean.ns.ca
http://clean.ns.ca/programs/youth-engagement/clear-the-air/

School Garden Information Websites

Setting Up and Running a School Garden
A manual for teachers, parents, and communities from the Food and Agriculture Organization of the United Nations.
http://www.fao.org/docrep/009/a0218e/a0218e00.htm

Little Green Thumbs
An indoor-gardening program that gives elementary and high school students the opportunity to become food producers right in their own classroom.
http://www.littlegreenthumbs.org/

Alberta Agriculture and Rural Development
A Guide to Growing School Gardens in Alberta
Provides information for starting and maintaining a school garden, including the involvement of students and community members.
http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/agic7623/$FILE/Get_Growing_Manual_Interactive.pdf

Plant a Row Grow a Row
Gardening advice and encouragement to plant, grow, and harvest an extra row of specific vegetables for local food banks and soup kitchens.
http://www.growarow.org/

BC Agriculture in the Classroom Foundation
Spuds in Tubs Program
http://aitc.ca/bc/programs/spuds-in-tubs-2/

School Garden Wizard
A guide created for the U.S. K 12 school community through a partnership between the United States Botanic Garden and the Chicago Botanic Garden.
http://www.schoolgardenwizard.org/

The Edible Schoolyard Project
Connects educators around the world to build and share a K 12 edible-education curriculum.
http://www.edibleschoolyard.org/

National Gardening Association (U.S.)
How-to guides, lessons, activities, and project ideas.
http://www.kidsgardening.org

Urban Agriculture Notes (City Farmer)
Books, websites, and other resources for school gardens.
http://www.cityfarmer.org/schgard15.html

Aggie Horticulture Just for Kids (Texas A&M University Horticulture Program)
Tips on nutrition, composting, and starting school and community gardens.
http://aggie-horticulture.tamu.edu/kindergarden/

GreenHeart Education
The value of school gardens, their history, their benefits, and how-to information.
http://www.greenhearted.org/school-gardens.html

FoodShare Toronto
A non-profit organization that works with communities and schools to deliver healthy food and food education.
http://www.foodshare.net/

General Gardening Information Websites

Dalhousie University Faculty of Agriculture, Extended Learning
The Garden Box is a web page with downloadable fact sheets with information and recommendations on specific gardening topics, along with activities to help you have fun as you learn about gardening.
http://www.dal.ca/about-dal/agricultural-campus/about/gardens/garden-box.html

Organic Agriculture Centre of Canada
Practical and scientific resources for organic production.
http://www.organicagcentre.ca/

Frost Chart for Canada
Determine the time available for growing your garden from The Old Farmer's Almanac Frost Chart for Canada, produced from Environment Canada weather data.
http://www.almanac.com/content/frost-chart-canada

Plant Hardiness Zones in Canada, AAFC
http://sis.agr.gc.ca/cansis/nsdb/climate/hardiness/index.html

Canadian Soil Information Service, AAFC
http://sis.agr.gc.ca/cansis/

Halifax Garden Network
An online urban garden network for gardeners and citizens of the HRM. Guides on various garden topics, including trellising, raised beds, season extension, etc.
E-mail: info@halifaxgardennetwork.com
http://www.halifaxgardennetwork.com/

Ontario Ministry of Agriculture, Food and Rural Affairs
Urban Agriculture Business Information Bundle, Producing Food in Cities
Provides information about urban agriculture.
http://www.omafra.gov.on.ca/english/livestock/urbanagbib/welcome.htm

Arizona Master Gardener Manual
Tips for an intensively grown garden with the intent to harvest the most produce possible from a limited space.
http://ag.arizona.edu/pubs/garden/mg/vegetable/intensive.html

Perennia
Production guides for some fruit and vegetable crops.
http://www.perennia.ca/fruit.php
http://www.perennia.ca/vegetables.php

Weed Guides / Information
http://novascotia.ca/agri/documents/weed-identification-guide.pdf
http://www.weedinfo.ca/
http://www.omafra.gov.on.ca/english/crops/facts/ontweeds/weedgal.htm

Canadian Organic Growers, The Organic Backyard
http://www.cog.ca/uploads/OrganicBackyard2ndEd.pdf

Canadian Gardening, How to — Organic Gardening
http://www.canadiangardening.com/how-to/organic-gardening

Seed Suppliers and Other Garden Supplies

The Halifax Seed Company
5860 Kane Street, PO Box 8026, Stn. A, Halifax, NS, B3K 5L8
E-mail: info@halifaxseed.ca
Phone: 902-454-7456
Fax: 902-455-5271
https://www.halifaxseed.ca/

Hope Seeds
324 St. George Street, PO Box 460, Annapolis Royal, NS, B0S 1A0
Phone: 902-286-4673
http://www.hopeseed.com

Annapolis Seeds
8528 Hwy. 201, RR#3, Middleton, NS, B0S 1P0
E-mail: owen@annapolisseeds.com
http://www.annapolisseeds.com/

Veseys Seeds
PO Box 9000, Charlottetown, PEI, C1A 8K6
Toll-free: 1-800-363-7333
http://www.veseys.com/

McKenzie Seeds
http://www.mckenzieseeds.com/

Stokes Seeds
PO Box 10, Thorold, ON, L2V 5E9
Phone: 1-905-688-4300
http://www.stokeseeds.com/

Ontario Seed Company (OSC)
PO Box 7, Waterloo ON, N2J 3Z6
Phone: 519-886-0557
Fax: 519-886-0605
http://www.oscseeds.com/

Lee Valley
100 Susie Lake Crescent, Bayers Lake Business Park, Halifax, NS, B3S 1C7
Phone: 902-450-1221
Fax: 902-450-1331
Toll-free customer service: 1-800-267-8761
E-mail: customerservice@leevalley.com
http://www.leevalley.com

Soil Testing

SOIL CONTAMINANT TESTING

AGAT Laboratories
11 Morris Drive, Unit 122, Dartmouth, NS, B3B 1M2
Phone: 902-468-8718
Toll-free: 1-888-468-8718
http://www.agatlabs.com

Maxxam, Environmental Services
Three locations:
Burnside Industrial Park, 900 Windmill Road, Unit 110, Dartmouth, NS, B3B 1P7
Phone: 902-444-3315
200 Bluewater Road, Suite 105, Bedford, NS, B4B 1G9
Phone: 902-832-4852
465 George Street, Unit G, Sydney, NS, B1P 1K5
Phone: 902-567-1255
Toll-free: 1-888-535-7770
http://maxxam.ca/services/environmental-testing-services

SOIL NUTRIENT TESTING

Nova Scotia Department of Agriculture, Laboratory Services
Civic: 176 College Road, Harlow Building, Truro, NS, B2N 2P3
Mail: PO Box 890, Truro, NS, B2N 5G6
Phone: 902-893-7444
http://novascotia.ca/agri/programs-and-services/lab-services/

Funding for School and Community Gardens

Clean Foundation
Nova Scotia Youth Conservation Corps cost shares wages to provide youth in their area with valuable work experience while completing a project that benefits the entire community and environment.
http://clean.ns.ca/programs/community-engagement/nova-scotia-youth-conservation-corps-2/

Nova Scotia Community Health Board grants
The Nova Scotia Department of Health and Wellness provides grant funding to Community Health Boards through District Health Authorities and Community Health Boards. Check with the health board in your community for more details.
http://www.communityhealthboards.ns.ca/

EcoAction Community Funding Program
Environment Canada's EcoAction Community Funding Program provides financial support to community-based non-profit organizations for projects that have measurable positive impacts on the environment.
http://www.ec.gc.ca/ecoaction/

Farm Credit Canada AgriSpirit Fund
The fund is about making life better for people in rural communities. Donations from $5,000 $25,000. View this site for past projects that have received funding.
http://www.fcc-fac.ca/en/AboutUs/Responsibility/agrispiritfund_e.asp

Halifax Foundation
An independent non-profit organization with a mandate to support existing and new endeavours in arts and culture, education, environment, health, heritage, recreation, and social response that enhance public places, facilities, and public services in the HRM.
http://www.halifaxfoundation.ca/ (Look under Grants)

Irving Oil Foundation
Irving Oil has been actively supporting communities through programs and partnerships focusing specifically on the areas of environment, education, and community need.
www.irvingoil.com/in_the_community/sponsorships_and_donations/

Monsanto Fund
The Monsanto Fund accepts grant proposals for programs providing basic education support and meeting critical needs in communities by supporting non-profit organizations that help with things such as food security, sanitation, access to clean water, public safety, and various other local needs.
www.monsantofund.org

Coastal Communities Network
Provides fiscal support to provincial, municipal, and community initiatives that support and encourage Nova Scotians to engage in responsible, active, and healthy outdoor physical activities that foster environmental stewardship and/or directly enhance the environment.
http://www.coastalcommunities.ns.ca/

Royal Bank of Canada Community Donations
In 2014, RBC committed more than $104 million in donations and sponsorships worldwide to support community activities and organizations.
www.rbc.com/community-sustainability/community/index.html

Shell Fuelling Change Fund
Fuelling Change is Shell's exciting new social investment program that grants $2 million each year to environmental projects that improve the state of Canada's land, air, and water.
www.shell.ca/en/environment-society/environment-tpkg/fuellingchange.html

TD Friends of the Environment Foundation
TD Friends of the Environment Foundation provides environment funding for not-for-profit organizations across Canada.
https://fef.td.com/funding/

Evergreen
The Greening School Grounds grants provide up to $3,500 to schools.
http://www.evergreen.ca/

Tree Canada
Tree Canada is a charitable organization that partners with local volunteers to improve our quality of life by planting and caring for trees. In your neighbourhoods, schoolyards, parks, and in the countryside, Tree Canada leaves a living, breathing legacy for generations to come.
www.treecanada.ca

Training Opportunities

Dalhousie University Faculty of Agriculture, Extended Learning
Provides a series of practical workshops on gardening techniques and Master Gardeners Training.
PO Box 550, Truro, NS, B2N 5E3
Phone: 902-893-6600
E-mail: extended.learning@dal.ca
http://www.dal.ca/faculty/agriculture/extended-learning.html

Ecology Action Centre, The Our Food Project
2705 Fern Lane, Halifax, NS, B3K 4L3
Phone: 902-429-2202
Fax: 902-405-3716
E-mail: info@ecologyaction.ca
https://www.ecologyaction.ca/issue-area/food-action

Watershed Farm
Workshops and seminars explore connections between healthy food, artistic expression, mindful practices, and just society.
768 Allen Frauzel Road, Baker Settlement, NS, B4V 7H8
Phone: 902-685-3901
E-mail: info@watershedfarm.org
http://watershedfarm.org/index.html

Cole Harbour Heritage Farm Museum
This agricultural museum is open throughout the year for group visits. Presentations are available year-round for groups of all ages upon advance request, and teachers may arrange class visits, borrow material, or have museum staff come to their school.
http://coleharbourfarmmuseum.ca/

Eating Local and Healthy

Select Nova Scotia
http://www.selectnovascotia.ca/

Nova Scotia Federation of Agriculture Food Miles Project
http://www.nsfa-fane.ca/food-miles-project

Meet Your Farmer
http://meetyourfarmer.ca/

Slow Food Nova Scotia
Slow Food Nova Scotia exists to honour the tradition of experiencing the taste of local food in a social and convivial atmosphere through excursions to farms, special dinners, tastings, and public projects.
http://slowfoodns.com/

Slow Food in Canada
http://www.slowfood.ca

Falls Brook Centre, Food Miles: Growing Local Food Connections
New Brunswick teachers resource kit (K-8).
http://www.fallsbrookcentre.ca/fbc/wp-content/uploads/2010/09/Food-Miles-Module.pdf

Nova Scotia Health Promoting Schools
Nova Scotia Health Promoting Schools encourages children and young people to eat well and to exercise and promotes the physical, social, spiritual, mental, and emotional well-being of all students and staff.
http://nshps.ca/

Nova Scotia Department of Health and Wellness
http://novascotia.ca/dhw/

The Stop Community Food Centre (Toronto)
Strives to increase access to healthy food in a manner that maintains dignity, builds community, and challenges inequality. This website has comprehensive information about food security, the organization itself, events, etc.
http://www.thestop.org/mission

Ecology Action Centre
The goal of the Our Food: Reconnecting Food and Community Project is to strengthen communities' relationship to food by helping to build what we call "positive food environments."
https://www.ecologyaction.ca/ourfood

LifeCycles
This Victoria organization is predominantly youth driven and is geared toward education and building community connections through hands-on projects that work toward creating better local and global food security.
http://lifecyclesproject.ca/initiatives

Appendix C
Horticultural Therapy and School Gardens

Dr. Norman Goodyear
Dalhousie University Faculty of Agriculture

The Role of Horticultural Therapy as an Adjunctive for both Normative and Non-normative Development with Youth

"There seems to be something magical about bringing together children, soil, and plants and offering the children a time when they can get 'down and dirty,' explore the world, and feel good about their accomplishments." (Simpson & Straus, 1998:215)

The use of examples from the natural world has always been a part of education, and its application has included teaching numeracy, science, and literacy skills. Agriculture in general is an important part of curriculum as in the past century we have seen a drop (from about 90 per cent of the population to less than 20 per cent) in the number of people involved in the food industry in some form. This has meant that as a population we are disconnected from primary food production and a basic knowledge of where food comes from. Society has become increasingly separated from nature, with today's youth being more disconnected than any previous generation. Humans have an innate tendency to focus on life and lifelike process-a love of living things. Wilson (1984) posited the theoretical basics of this as "biophilia." Because this connection is so innate to our being, a disconnect can have damaging emotional consequences. Louv (2005) reflects on this loss for children and writes extensively on nature-deficit disorder, or, rather, on saving children from this disorder.

A new vision of horticulture emerged in the last half of the 20th century-one of understanding horticulture from a psychosocial and social perspective. From its roots in psychiatry and occupational therapy, horticultural therapy has emerged as its own profession. Horticultural therapy (HT) uses plants and the natural world to improve the social, spiritual, physical, and emotional well-being of individuals who participate in it (CHTA, nd). The therapeutic benefits of plants are based on three factors: reaction (the intrinsic benefits of being around plants), interaction (the opportunity that plants offer for non-threatening interaction with others), and action (the benefits of growing and nurturing plants). Therapeutic horticulture (TH) is that innate benefit that we all receive from connecting or reconnecting with the natural world.

The course of childhood is characterized by persistent and progressive change as the child traverses a path leading from a relatively helpless and dependent infant to a competent and independent adult. Indeed youth is the only group in which we can have an effective horticultural therapy program without an identified problem. Therapy with children can be undertaken to facilitate and reinforce the normal development (normative) or to re-mediate misdirection and blockages (non-normative).

In the normative development HT is a viable and effective means for enhancing healthy development through engagement in plant focussed activities. It offers an opportunity to work co-operatively with other children, to learn new skills and information, and to participate and grow plants equal to adults, and it promotes healthy interaction and developmental growth of the child. Skills developed are transferable to other areas; for example, there can be a reinforced sense of mastery and heightened self-esteem. HT techniques can be applied to healthy management of behaviours, feelings, and relationships. Children learn about their environment, the cycle of development, and themselves and develop a greater appreciation for the environment. As part of the program, children can develop a greater appreciation for improved nutrition (e.g., learning about and growing vegetables).

Childhood is not a carefree and wondrous experience for all; approximately 15 per cent of children in North America suffer from emotional and behavioural problems of sufficient significance to warrant mental health services. Within that group, 3 to 8 per cent are seriously emotionally disturbed. A recent news article out of the United Kingdom reported that more than 850,000 British youth suffer from mental health issues and 75 per cent of those are not receiving adequate help (BBC News). Children can and do suffer many of the same mental disorders that are found in the adult population. The Diagnostic and Statistical Manual of Mental Disorders has divided childhood problems into five general categories: intellectual, developmental, behavioural, emotional, and physical. Many more children are psychologically at risk and could benefit from preventative services. Some environmental risks include poverty, parental psychopathology, physical and sexual abuse, parental divorce, and serious childhood illness.

HT can offer an effective intervention for the majority of those cases. HT for children provides a challenging and rewarding opportunity because a wide range of physical and cognitive functioning can be found within the same age group. The benefits of HT for children are seen in four areas: cognitive development, psychological growth, social skill learning, and pre-vocational work skills development.

COGNITIVE DEVELOPMENT

Horticulture is a fun science where new skills and ideas are explored. Those who like what they are doing exhibit improved concentration and an increased attention span and learn new information.

PSYCHOLOGICAL GROWTH

By working with plants, children learn the responsibility of taking care of something that is dependent on them. They learn that even if living organisms are sick, they can get better and thrive if they are cared for. And they also learn to deal with loss, as part of natural life cycles or other causes. There

are emotional benefits accrued to children when working with plants. There is improved self-esteem and self-confidence, enhanced affects-management skills, and excess energy channelled into constructive activities.

SOCIAL SKILL LEARNING

As modelled by the therapist/teacher, children are always expected to exhibit respect and politeness in interactions, and they learn to participate in co-operative tasks. The evidence suggests that a child's active participation in gardening has a calming and relaxing effect.

PRE-VOCATIONAL WORK SKILLS DEVELOPMENT

Children learn that they need to work to the best of their abilities, which allows them to feel good about what they have accomplished. They experience the importance of following directions, staying on task, and accepting support. They learn how to appropriately process feedback and the value of feedback.

The goals of the HT program will depend on the type of facility and the needs of the children. For example, an after-school program for normative development can have a social or educational focus and may include the teacher, horticulturists, and families. A program designed as an intervention for non-normative development may take place at an institution such as a hospital and would include social workers, therapists, an occupational therapist, and/or a special-education teacher. Such a program would have clearly articulated goals and a clear implementation plan. The areas targeted are directly related to the child's diagnosis, past history, educational goals, family needs, and future goals. The program goals focus on broad areas of development with specific desired outcomes. Program goals must be behavioural and measurable. Objectives are the steps taken to achieve the identified goals and must be child (client)-specific and include time frames and clear methods of assessment and measurement. Objectives should start small and then increase as they are met. The child should be aware of and understand their goals and hopefully be in agreement.

A treatment focus on the development of social skills and interpersonal relationships, for example, could have as its goal to reduce demanding behaviour. An objective could be that the child will ask for supplies politely one time per group for one week. In a program there would be multiple objectives associated with several activities that would ultimately lead to reaching the broader goal. Another example is increasing self-esteem and self-confidence. The goal can simply be to increase self-esteem. One objective could be that the child will successfully complete one task daily for one week. Mastery of some aspect of the environment to enhance a sense of control could have as its goal that the child will accept responsibility for a plant. An objective would be for the child to pick a plant and care for it daily for one month.

"Training teachers to perform lessons outside of the classroom can help young people reconnect with their environment." (The Guardian) Children represent society's most valuable resource. The mental and emotional health of children, as a resource, needs to be carefully fostered and nurtured. HT benefits both the normative and non-normative development of children.

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Places of Practice

The Julien Project **http://thejulienproject.com/**

Homewood Health Centre **http://homewood.org/**

Guelph Enabling Garden (GEG) **http://www.enablinggarden.org/**

Providence Farm **http://providence.bc.ca/**

Dandelion Project, Denver, CO **http://rockymountainchildrenslawcenter.org/program**

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