SCHOOL FOOD PROJECT

Boulder Valley School District
Excellence and Equity

2014-15 GARDEN AS CLASSROOM MANUAL

FARM-TO-SCHOOL

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INTRODUCTION

RATIONALE

What is Farm-to-School?

The United States Department of Agriculture (USDA) recognizes the national Farm-to-School movement as comprising efforts to bring local or regionally produced foods into the school cafeteria while introducing students to hands-on classroom learning activities that connect them to their food. (See the USDA website at www.fns.usda.gov/farmtoschool/farm-school.) This movement encompasses a wide range of initiatives, including school gardening, farm visits, and the integration of agriculture, food production and preparation, and nutrition-related education into current standards-based curriculum.

"An investment in the health of America's students through farm-to-school activities is also an investment in the health of local economies," says Agriculture Secretary Tom Vilsack. "We know that when students have experiences such as tending a school garden or visiting a farm, they'll be more likely to make healthy choices in the cafeteria. We also know that when schools invest their food dollars in their local communities, all of agriculture benefits, including local farmers, ranchers, fishermen, food processors, and manufacturers."

In a survey conducted in the 2011–2012 academic year, the USDA found that more than 43 percent of all U.S. school districts were engaged in some sort of Farm-to-School programming. Examples of these initiatives include the following:

- Procuring local food
- Building school gardens
- Hosting culinary classes and "cook-off" events using local produce
- Visiting local farms
- Designing curriculums that tie in agriculture and nutrition
- Creating new "farmers' markets" at local schools
- Developing district-wide planting and harvesting events

What are the benefits of Farm-to-School programming?

Real-world application of content taught in the classroom is a significant driver of educational policy reform in the twenty-first century. Creating connections between concepts in science, social studies, math, language arts, and other content areas with school gardens, agriculture, and nutrition helps support educators in offering students engaging lessons that support healthy bodies and healthy minds.

While research evaluating the overall impact of Farm-to-School programming within school districts is in its preliminary stages, initial reports are finding that the implementation of Farm-to-School initiatives has had some measurable positive effects on students' dietary choices.[1] Other benefits include the community outreach and involvement that develops out of partnerships with local producers and schools, as well as parent involvement that may result from creating both formal and informal farm-to-school events and programs. Additionally, the programming gives teachers new, experience-based, inquiry-learning opportunities for delivering classroom content.[2]

How does Farm-to-School programming help support the mission of the Boulder Valley School District?

The mission of the Boulder Valley School District is to create challenging, meaningful, and engaging learning opportunities so that all children thrive and are prepared for successful, civically engaged lives. BVSD Food Services (School Food Project) believes that all children of Boulder Valley School District will have daily access to fresh, flavorful and nutritious food made with wholesome and, when possible, local ingredients, so that every child may thrive. Curriculum and educational activities that connect students with local agriculture while introducing concepts focused on nutrition and healthy eating allow students to become more active participants in both their local economy and their own food choices. These activities dynamically engage students in the process of growing, harvesting, and preparing food, while linking learning to project-based academic outcomes that can be applied to real-world situations.

[1] Morris, Jennifer, and Sheri Zidenberg-Cherr. "Garden-enhanced nutrition curriculum improves fourth-grade school children's knowledge of nutrition and preferences for some vegetables." *Journal of the American Dietetic Association* 102, no. 1 (2002): 91–93.

[2] Skelly, Sonja and Jennifer Bradley. "The Importance of School Gardens as Perceived by Florida Elementary School Teachers." *HortTechnology* 10, no. 1 (2000): 229–231.

PROGRAM IMPLEMENTATION

Boulder Valley's Farm-to-School program was introduced as part of the comprehensive reform of its school food program that began in 2009. Changes were initiated by parents in the district, who remain involved as leaders and partners. The transformation of the district's food service was also conceived as an educational initiative in which students, parents, and school personnel would all learn about food together, develop strong eating habits, and connect to resources to support lifelong good health.

Since 2009, BVSD has partnered with multiple public, private, and nonprofit organizations in the community to improve school meals, encourage Farm-to-School efforts, and support school gardens. To promote Farm-to-School procurement, Boulder Valley maintains strategic relationships with multiple farmers and other suppliers of local food.

As a 2013 USDA Farm-to-School Grant recipient, BVSD Food Services has expanded its Farm-to-School and nutrition education programs and school garden initiatives to include the following:

- Harvest-of-the-Month (HOTM) educational programming
- Increased local food procurement
- Farmer visits to schools
- Farm field trips
- Harvest festivals
- Posters for all cafeterias featuring local food and Farm-to-School concepts
- "Garden as a Classroom" professional development
- School garden installations

At BVSD, we believe experiential education opportunities, including hands-on experiences in school gardens, play a key role in student consumption of fruits and vegetables. Students who have had opportunities to get their own hands dirty through working in school gardens or taking field trips to farms or markets show much more willingness to try new foods and local products. Schools that have gardens typically show higher levels of participation in school, and lunch purchases peak after produce from school school gardens is harvested.

Prior to 2014, 27 of BVSD's 56 schools had school gardens, many of them created and supported by the local Growe Foundation, which provides assistance with design, organization, planting, maintenance, and—most importantly—lessons about biology, ecology, horticulture, and even the economics of the food business. Typically each grade in the school plants and tends a garden plot, with participation from teachers and many parents. In the spring and in the fall, a shared harvest is held, and vegetables are often taken to the school kitchen to be included on the salad bar. Students take great pride in their production, and this is a time when nearly everyone eats together!

CREATING A FARM-TO-SCHOOL COMMUNITY

CLIFF GRASSMICK • COLORADO DAILY

BVSD's Farm-to-School Grant allowed the district to expand its partnerships with local farms and school garden organizations (Garden Collaborators), resulting in the expansion of local food procurement and increased internal capacity to develop and support school gardens. This enhanced capacity, which included installation of school gardens from May 2014 to April 2015 at Monarch and Aspen Creek K–8s; Kohl, Douglass, and Eisenhower elementary schools; and Platt Middle School, inspired the Garden Collaborators group.

CONTENT COLLABORATORS

The many stakeholders involved in school gardens can be great resources for envisioning how to use the garden to deliver curriculum content. For example, after a discussion with the district-level curriculum coordinators, BVSD identified a particular standard within the Social Studies curriculum (Economics) that teachers felt could be enhanced by more experiential learning. Teachers worked together and developed a great lesson plan that uses the produce from the school gardens to create a "farmers' market," allowing students to not only practice learned concepts in this curriculum standard, but also to raise money for future garden projects!

GARDEN AS A CLASSROOM

ESTABLISHING A SCHOOL GARDEN

In this manual, we share our experiences and best practices in the hope of assisting other school districts in implementing their own Farm-to-School garden programs. While the specifics may vary depending on district circumstances, growing zones, and other factors, the basic tenets of the program should be transferable to most districts throughout the country.

In a study that compared science assessment scores for students taught content through hands-on gardening lessons versus traditional classroom instruction, the findings showed significantly higher achievement in students who were able to access a school garden.[3] Gardens not only provide an opportunity to encourage physical movement and a more active role in the food chain, but research supports their use as a tool for delivering learning outcomes.

School gardens have a variety of functions, and several unexpected benefits. Along with providing an "outdoor classroom" where student experiments and learning activities can be hosted, participation in the planting, growing, and harvesting of crops in a school garden has been shown to increase a student's willingness to try new vegetables, and generates learning about healthy diets and activities.[4] Additionally, harvested produce can be used in school cafeterias; it can also be sold—either as part of a lesson in economics within the social studies curriculum or simply to raise funds.

Parent organizations and community groups are drawn to garden projects that might utilize their expertise while also helping them form partnerships with the school for other projects. The school garden can be integrated into lesson plans in a variety of classroom subjects. Calculating the needed volume of soil, for example, achieves the same learning outcome as working with a two-dimensional rectangle on a math worksheet, but in an applicable, hands-on fashion. Developing a science curriculum around soil, water, plants, and insects can be linked quite naturally to garden activities.

In establishing a school garden, the planning process is just as important as the construction and maintenance, and it helps develop "buy-in" at the school level. The steps below outline ways of involving teachers, students, parent groups, and administrators in both the planning and subsequent processes.

[3] Klemmer, C.D., T.M. Waliczek, and J.M. Zajicek. "Growing Minds: The Effect of a School Gardening Program on the Science Achievement of Elementary Students." HortTechnology 15, no. 3 (2005): 448–52.

[4] Morris, Jennifer, Marilynn Briggs, and Sheri Zidenberg-Cherr. "School-based Gardens Can Teach Kids Healthier Eating Habits." California Agriculture 54, no. 5 (2000): 40–45

Planning

Note: Supporting documents are included in the appendices A, B, C, and D to this report.

SELECTING A SITE

The selection of an appropriate site to build a school garden has a significant impact on the overall usage and maintenance for future growing seasons. In general, the closer a garden is to the school building, the more likely it is to be used regularly. Logistically, there are several factors to consider when choosing a build site, and district policy may affect the selection process.

STEP 1: Survey Your School Community

After you have identified a school with the potential to create a school garden, an informal survey sent to the principal (see example in appendix A) can initiate the process and give the school time to consider several site options.

STEP 2: Meet with Your School or District Maintenance Department

Maintenance personnel can help you determine what regulations or infrastructure considerations need to be addressed. If you are at a BVSD school, you need to meet with the school maintenance zone supervisor. Otherwise, contact your school administration to find the most appropriate person. In any case, the person you contact should help to identify a location that has access to water and that does not conflict with other building maintenance needs (e.g., mowing, deliveries, etc.) All water supplies to gardens will need to have a back-flow component.

Step 3: Schedule a Site Visit

Once you have the survey results, schedule a site visit with the school garden team (see the following section) in order to discuss the merits of potential locations and address any possible challenges.

Step 4: Schedule the Garden Build

A school garden can be built any time of year, but spring and fall coincide best with the planting season.

General factors to consider for garden success include:

- School district policy (rules, regulations, and permits)
- Location of water source (i.e., a hose bibb with outside access)
- Light exposure (full sun with minimal shade is ideal)
- Level surface (for drainage)
- Proximity to classrooms most likely to use garden
- Ease of access (for delivering soil, tools, etc.)
- Future building plans (bond issues for new development)
- Wildlife in the area that might try to feed on crops

Other factors to consider include:

- Existing turfgrass and ease of mowing around garden beds
- Existing irrigation sprinkler heads and lines
- Traffic (how many students pass by the area)
- Visibility (how easily the garden can be seen from the road or school)
- Security and storage capability (for tools, etc.)

CREATING A GARDEN TEAM

Developing initial "buy-in" from a variety of stakeholders will help ensure that the garden remains maintained and fruitful from season to season. Parent groups are a great resource, but they're transitory, since their children grow older and move on to other schools. While parents may make up a majority of your garden team, bringing in teachers and other school employees is essential. Involving educators in the planning process as part of the garden team not only creates excitement around integrating the garden into lessons, but also helps to build a more permanent knowledge and skills bank for all Farm-to-School activities. Other stakeholders might include an administrator, a member of the custodial staff, a librarian, or a retired teacher.

Community members such as the local extension agent, a Master Gardener, the owner of a local garden and nursery center, or a small-acreage farmer make great resources. These individuals are often excited about working with schools to help educate students on the importance of agriculture. Also consider including an active youth group such as a Scouts club, YMCA group, FFA chapter, or other extracurricular club on the garden team. Such groups are often looking for projects within their community and can be great resources for garden building and summer maintenance.

THINGS TO CONSIDER

The school campus is a publicly funded part of a neighborhood. You might be surprised how many people feel they should have input into its appearance. Consider your neighboring homeowners and HOAs as potential members of your garden team. They might have rules or guidelines they'd like you to consider when locating your garden. Doing your best to comply with these and being open to their input could win you some long-term, personally invested supporters who might be willing to help care for the gardens in the summer as well!

TIPS FOR CREATING AN EFFECTIVE GARDEN TEAM

CONSIDER FORMING A "GARDEN CLUB" FOR STUDENTS WITHIN THE SCHOOL. If funds permit, allocate a teacher sponsor to help support this extracurricular group. Depending on the ages and abilities of the students in the club, they may also serve as peer leaders to help with garden projects.

CREATE A RELIABLE METHOD OF COMMUNICATION AND RECORDKEEPING. Establishing a group email list, a shared Google Drive folder, or some other method through which all members can be contacted or share out information is a good approach to maintaining communications with your Garden Team.

MEET AT LEAST TWICE PER YEAR. Meetings should ideally take place at the beginning of spring and the end of autumn. Following the initial planning and building of school gardens, members can use this time to discuss ideas and address challenges, perhaps while turning over soil or clearing out beds.

CREATE A "GARDEN SCRAPBOOK." This might include a list of crops planted and notes about what worked well and what didn't. The scrapbook could be a printed record contained in a binder or a digital document, and can include photos and videos from garden activities. This is a great tool both for planning and for future grant opportunities.

SELECTING MATERIALS

Selecting your school garden beds

There are many different materials and methods for creating new gardens, but the raised-bed method is most commonly used for school gardens. Raised beds are essentially gardens built on top of existing native soil. The frames, which may be made from wood, cinder blocks, old tires, or prefabricated plastic garden beds, can be laid directly over existing turf and filled with new soil. To control weeds and increase rooting depth, consider either a shallow tilling of the native soil or placing a highly permeable material, such as a thin layer of newspaper, on the existing turf as the first layer. You will then be able to fill the beds with a high-quality soil without having to heavily till or amend the existing soil. Ease of construction, appearance, price, longevity, and availability are all factors to consider when choosing frames for your raised beds.

Selecting soil for your garden beds

One of the most important indicators of crop health and yield is the quality of soil used in a garden. The new, high-quality soil brought in to fill the beds should contain the proper ratio of mineral and organic materials. A minimum layer of 8 inches is necessary to promote healthy root growth; ideally 12 to 14 inches of soil will initially be brought in, as some settling and compaction will occur over time.

Many soil companies deliver soil in bulk by the cubic yard, which is a much better value than bagged soil and allows you to create a good mix. Ideally, a combination of about 30 percent compost and 70 percent screened topsoil seems to work best for new gardens, though many soil companies offer a standard "gardener's mix" containing the proper ratios. Avoid "potting soil" mixes, as these are generally formulated for container growing and contain mineral materials that raise the cost.

Using a soil mixture that contains compost lessens the need for additional fertilization later in the season; furthermore, the organic matter helps retain moisture and improve soil texture. The available nutrients in

SPEAKING OF SOILS

TOPSOIL is screened, native soil that is usually scraped off the top layer of the ground. It is full of mineral material (sand, silt, and clay) that has pore spaces that provide pockets for water and air. It is beneficial for drainage and aeration. It is usually very low in organic material and not very high in nutrients.

COMPOST is broken-down organic matter that may come from a variety of sources, including animal manure and food waste. The decomposition of this material is aided by microorganisms that help cycle the nutrients and provide symbiotic relationships with plant roots. Compost helps soils retain moisture and provides a "fluffy" substrate to encourage root growth in seedlings. It is rich in essential macronutrients and can often be used as fertilizer if applied each year in a thin layer. It is important to know the source and age of compost, as newly collected manures that have not properly broken down may "burn" plants with their high ammonia content.

COMPOST TEA is watered-down strong compost. Old gardening books recommend it for certain perennial flowers such as delphiniums and clematis, but many other plants can benefit from it. Compost tea is made by putting fresh compost into water (approximately one cup of compost per gallon of water) and letting it all settle for a while before pouring it at the base of the plants.

"PLANTER'S [OR GARDENER'S] MIX" is a prepared soil usually containing about 70 percent topsoil and 30 percent compost. This blend is sold commercially in bulk; you can also mix it yourself using bags. It contains a ratio of mineral and organic material that proves to be ideal for proper water-holding capacity and good drainage. It can be used to fill garden beds. Once established, only occasional "top-dressing" (a thin layer of compost) should be necessary from harvest to harvest.

POTTING SOIL uses a variety of lighter materials such as perlite and vermiculite in place of topsoil, and has been sterilized using extreme heat. This soil mix is great for small pots and containers, but is not cost-effective for garden beds, and lacks beneficial microorganisms and nutrients.

compost can vary greatly based on the source, so it's a good idea to test the new soil for pH, nitrogen (N), phosphorus (P), and potassium (K). This can be done with a kit available for around $10 from your local hardware store, or by sending in a soil sample to your local extension agent.

The soil in a raised bed does not need to be replaced from year to year. Simply remove plant residue after each growing season, and add a thin layer (about 1 inch) of new compost each year to maintain soil health and avoid the need for fertilizers. (Our grandmothers called this "dressing the beds.") Instructions for composting on-site are found in the "School Garden Best Practices" section of this manual.

CASE STUDY

A teacher at MONARCH K–8 has created a digital storybook with "Susie the Scarecrow," a garden scarecrow, as a narrator, featuring student comments about what they most like growing in the garden. Something like this can be a great way to show the growth and development of both the garden and the students, from planting to harvest and from season to season. It's a fun way to integrate technology into garden lessons while supporting language-arts content.

Collecting garden tools

Local hardware companies can be a great resource for tools; parent groups can also help supply needed equipment for the gardens. The items listed below are recommended for planting and maintaining garden beds.

- Wheelbarrow
- Watering cans
- One hand trowel/shovel for each child in a classroom
- Three long-handled shovels
- Two metal rakes
- Two hoes
- Leaf rake
- Hand pruners
- Weeding tools
- Garden gloves (youth and adult sizes)
- Hose(s)
- Watering wand(s) with hand shutoff valves
- First-aid kit
- Supplies for plant signage (permanent markers, popsicle sticks)
- Supplies for classroom grow labs (paper cups, peat pots, egg cartons, soil mix)
- Supplies for repairing nicks in underground watering systems (if present)

IRRIGATION REQUIREMENTS

Work with your Zone Maintenance Supervisor to make sure any irrigation system you select follows district guidelines and protocols. Your garden irrigation should be independent of the system used to water turf at your school, as the watering requirements are different. You need to be able to easily increase or decrease the volume of water throughout the growing season. A timer attached to the hose bibb on the outside of your building will give you greater control of the irrigation; this is critical for summer, as the water can be turned on automatically for a specific time. Depending on your building, you will most likely need a "key" to turn the water on at the source. One should be available from your custodial staff.

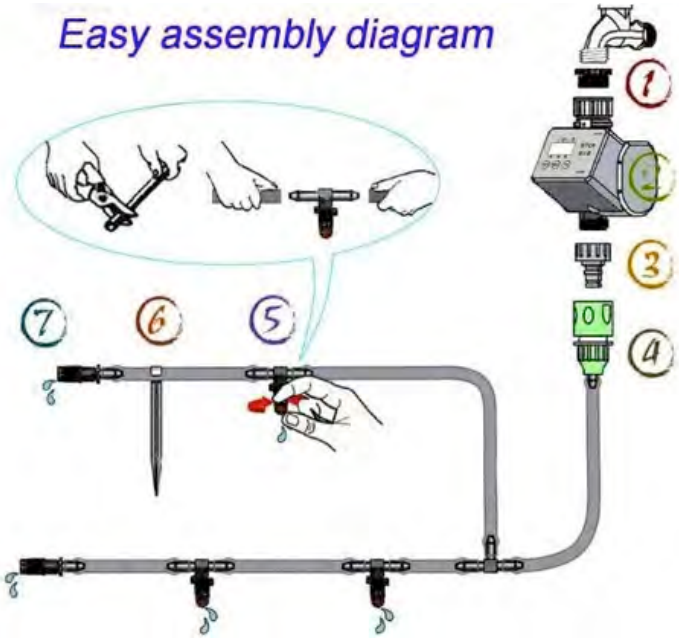
Drip system

Water is a critical element to plant growth. A reliable irrigation system with a programmable timer will help maintain soil moisture during the growing season and remove the potential for human error when it comes to watering schedules. Continue to work with your Zone Maintenance Supervisor to make sure your drip system follows district guidelines and protocols. Drip irrigation applies water more efficiently and effectively to vegetable gardens than overhead sprinklers or hand watering, and can be installed and repaired with minimal skill and cost.[5] It is also less likely to contribute to problems such as powdery mildew or leaf burn on susceptible crops. The necessary supplies for a drip system for raised garden beds can be purchased as a kit or sold separately. They should include the following:

- Programmable irrigation timer (battery-powered, with options for frequency and duration)
- Backflow preventer
- Pressure regulator (around 25 psi) with built-in filter
- Hose (length must be sufficient to reach from water source to beds)
- Main line
- Micro-tubing (either soaker-style or with prefabricated holes)
- Connectors for main line
- Barbed connectors for micro-tubing (straight, elbow and T)
- Palm hole punch
- Pruners or irrigation tool for cutting main line and tubing

Creating a drip irrigation system

There are many different manufacturers of drip irrigation systems, and your choice may be influenced by a range of factors such as price and ease of installation. Most systems sold at local hardware stores will be suitable for a school garden, so just make sure that all components are from the same manufacturer. A system that uses a ¾-inch main line with ¼-inch micro-tubing is most common, and will easily attach to a timer and hose. Systems that allow you to simply insert the line (rather than using glue or clamps) are the easiest to use and repair.



[5] Wilson, Carl, and M. Bauer. "Drip Irrigation for Home Gardens." Colorado State University Extension fact sheet no. 4.702, revised Aug. 2014. http://www.ext.colostate.edu/pubs/garden/04702.html.

YouTube features numerous videos that demonstrate the installation and repair of drip irrigation systems. Below are step-by-step instructions for the initial setup:

1. After locating the water source (#1, the hose bibb in the diagram above), attach a timer (#2) that allows you to set the time and duration for watering. Some have a manifold arrangement, allowing you to run additional hoses.

2. After the timer, connect a small back-flow preventer or anti-siphon device (#3).

3. A pressure regulator (#4) is connected to the back-flow preventer. Some have a built-in filter, or one can be added here between the pressure regulator and the hose.

4. The hose going from your timer/back-flow preventer/ pressure regulator setup runs to the main irrigation line. If the garden is located close to the water source, you may not need a hose (as in the diagram above), but hoses may be preferable as they are generally more flexible than the irrigation main line.

5. Attach the hose to the main irrigation line: secure a connector with a threaded female connection to the hose and insert the main irrigation line into the connector. Attach connectors (#5 elbow, T's, etc.) to the main line to run irrigation to each of the raised beds. The connectors can be closed at the end with a figure-8 clamp or simply folded back and held in place with zip ties.

6. You can also bring water from the main line into each of the beds using microtubing: Use a palm hole punch to make a small hole in the main line, and then push a barbed connector into the hole. An elbow connector can be used to bring the line over the edge of the raised beds. A large C or U arrangement inside the bed (pictured below) will ensure that all plants receive adequate water.

TIPS FOR PROPER WATERING USING A DRIP IRRIGATION SYSTEM

WHEN SEEDS AND SEEDLINGS ARE FIRST PLANTED, more frequent water is usually needed. It's a good idea to turn the water on daily for the first week new plants are in the ground, gradually backing off to every other day or even every two days in the spring. Here are a few tips for properly setting the timer on a drip irrigation system:

WATERING DEEPLY AND LESS OFTEN IS BETTER for root development and soil health than frequent, shallow waterings. Try watering for 30 to 45 minutes every few days during the hotter months, rather than daily for shorter amounts of time. Set the watering times for early morning or evening. In Colorado, evening watering is recommended.

POSITION SEEDLINGS AND ROWS OF PLANTS close to the irrigation lines so that water is absorbed by plant roots rather than being lost to evapotranspiration.

TO PREVENT STUDENTS FROM ACCIDENTALLY cutting irrigation lines during planting, move the lines out of the way beforehand. A line drawn in the soil is a good way to mark where plants should go without exposing micro-tubing to the danger of small children with sharp trowels.

WATER LEFT IN IRRIGATION LINES WILL EXPAND when frozen. While the lines are designed to be somewhat flexible, freezing increases the risk of cracks and leaks in the lines. Before the first hard frost of winter, detach the hose from the water source and raise one end overhead to allow gravity to drain any remaining water. Then detach the hose from the main line of the irrigation system and store it inside for the winter.

Planting information

*See supporting documents in appendices E, F, G, and H.

In most countries around the globe, the academic year has been organized around the agricultural harvest. In the early 1900s, when the standard school year was first established in the U.S., most families were involved in farming. Children were needed to work in the fields during the summer months, so the school year began in the fall once crops were harvested. In the present day, less than 2 percent of the American population is actively engaged in farming, but students are still out of school during the most productive agricultural months. This does not mean, however, that gardens cannot be utilized during the school year. With careful crop selection and planting, your gardens can be productive while school is in session. Understanding the difference between cool-season and warm-season crops is a must. Certain season-extension techniques will be discussed in the following sections as well. See appendix F for additional information.

COOL SEASON VS. WARM SEASON

In the Colorado climate, growing seasons are relatively short and are often directly opposed to the academic calendar. It is therefore important to choose crops that can be planted early in the spring or late in the fall so that students can participate as fully as possible. If the planting of your crops is timed well, you can have three different harvests—spring, summer, and fall—in the same beds. See appendix G for more information on vegetable planting in Colorado.

Cool-season crops are those that can germinate and grow in the cooler months, allowing them to be planted and harvested in both the spring and fall.[6] These can be started as seedlings in egg cartons or containers in a sunny window several weeks prior to planting for an earlier spring start. This is a great classroom activity at the end of winter.[7]

SPRING: Consider the following cool-season crops for early spring planting:

LETTUCE	BROCCOLI	POTATOES
SPINACH	RADISHES	CILANTRO
CAULIFLOWER	PEAS	CARROTS

> Start these seedlings indoors in late February and move them outside around the time of spring break. Planting sugar snap peas on St. Patrick's Day is fun, too. These crops will often be harvestable by end of May.

SUMMER: Consider the following warm-season crops for a late spring planting:

BEANS	TOMATOES	CORN
MELONS	SQUASH	BASIL
CUCUMBERS	PEPPER	PUMPKINS

> Start these seedlings indoors in late April and move them outdoors once spring crops are harvested.

FALL: Consider the following cool-season crops for an early fall planting:

ARUGULA	ONIONS	GARLIC
PARSNIPS	TURNIPS	SWISS CHARD
CABBAGE	BEETS	KALE

CASE STUDY

Teachers at ASPEN CREEK K–8 have developed a great lesson that uses data on the minimum soil temperatures seeds need for germination to guide students in scheduling garden plantings. By collecting soil temperatures and analyzing the temperature requirements for different seeds, students are able to apply what they've learned in math and science classes to a real-world situation.

[6] Applies to conditions in Colorado; other states may vary.

[7] Whiting, David, Carol O'Meara, and Carl Wilson. "Colorado State Extension Vegetable Planting Guide." Colorado State Extension's CMG GardenNotes no. 720, revised October 2014. http://www.ext.colostate.edu/mg/gardennotes/720.html.

SEED AND SEEDLING SCHEDULING FOR COLORADO'S FRONT RANGE

Typical planting and harvest period based on average frost dates and normal temperatures

Mid April	Late April	Early May **FROST**	Mid May	Late May	Early June	Mid June	Late June	Early July	Mid July	Late July	Early Aug.	Mid Aug.	Late Aug.	Early Sept.	Mid Sept.	Early Oct. **FROST**
40-45 day, cool season crops (spinach, lettuce)								75 day, cool season crops								
50-55 day, cool season crops (kohlrabi)									65-70 day, cool season crops (peas)							
60-70 day, cool season crops (beets, broccoli, cabbage, carrots, cauliflower, chard, peas)										50-60 day, cool season crops (kohlrabi, beets, broccoli, cabbage, carrots, cauliflower, chard,)						
75 day, cool season crops											40-45 day, cool season crops (spinach, lettuce)					
		50-55 day, semi-tender, warm season crops (summer squash)														
		60-65 day, semi-tender, warm season crops (cucumbers)														
		70-75 day, semi-tender, warm season crops (beans, corn)														
		80-85 day, semi-tender, warm season crops (corn)														
			70 day, tender, warm season crops (tomatoes, peppers, eggplant)													
			75-80 day, tender, warm season crops (cantaloupe, watermelon)													
			85-90 day, tender, warm season crops (cantaloupe, watermelon, winter squash)													
			95-100 day, tender, warm season crops (winter squash)													

Prepared by David Whiting, Extension Consumer Horticulture Specialist (retired), Department of Horticulture and LA, Colorado State University
Source: Colorado Climate Center at http://ccc.atmos.colostate.edu

Harvesting information

HARVEST AND POST-HARVEST HANDLING

Crops produced in the BVSD school gardens can be harvested and used either in classrooms or the school cafeteria. BVSD school garden leads must contact the Food Services District Manager (see bvsd.org/food for contact information) to coordinate delivery of the garden produce so that Food Services staff are able to properly wash and prepare the produce for safe consumption. To prevent possible illness, all school garden produce must be properly washed and handled using the guidelines below. (For more details, refer to appendix I.)

Beyond incorporating the harvest into the school food program, determining how and by whom garden produce will be utilized can be accomplished at the Garden Team meetings or through campus communication such as emails and staff meetings. These decisions do not need to be approved by anyone outside the building level. Protocols for the safe handling of produce that will be consumed by students are as follows:

How to harvest with students from a school garden

(adapted from Denver School Garden Coalition Operating Manual)

1. Teacher or volunteers working with students/class should gather containers (boxes or bowls) and garden shears/pruners that are clean and easily handled by students.
2. Have students wash hands prior to handling any of the crops. If a student is currently ill or recovering from being sick, it is best to put them in a role such as "spotting" ripe fruit or participating in another activity that does not require direct contact with food harvested.
3. Teacher or volunteers should demonstrate how to pick the fruits and vegetables that are ready to harvest.
4. Distribute containers and/or tools and assign roles to the student groups.

5. Collected fruits and vegetables should be washed under potable running water, either in a sink or with a hose, to rinse off any soil or debris.

6. Record-keeping is an excellent way to determine the actual value (in terms of amount) of a crop or school garden. Having students weigh crops and record information is an activity easily integrated into academic curriculum.

How to handle the garden vegetables in the cafeteria/classroom prior to eating

1. The teacher, volunteers, or Food Services kitchen leads should give the produce a second rinse using a colander, lettuce spinner, or other appropriate kitchen tool, ensuring that any remaining soil is removed prior to serving. Depending on school policy, produce can be served and eaten by students in the classroom.

2. If produce is not to be served immediately, fruits and vegetables should be allowed to drain and dry off. They should then be placed in a sanitized storage container labeled "School Garden Vegetables" with the date of harvest and placed under refrigeration.

3. If produce is to be served on the school cafeteria line, it should be stored in the cooler/refrigerator to reduce the temperature to below 41°F.

4. The vegetables can be used in the salad bar or at lunch service the day after the harvest if the temperature of the produce is below 41°F and if they have been rewashed and prepped by the district food manager or the kitchen lead. This temperature will be recorded on the menu production forms under the recipe the produce was used in (i.e., the salad bar recipe, Spicy Corn Salad, Veggie Patch, Garden Salad, or the Zesty Pasta Salad recipe).

How to compost the vegetable scraps from the harvest

If the school garden has a compost system, the peels, trimmings, and other scraps left over after preparing the produce can be disposed of as follows:

1. At the end of the lunch period, one or two students can retrieve the harvest tub from the kitchen lead with any vegetable scraps saved during preparation. The students will then add these scraps to the compost pile or bin and rinse out the tub. The tub will be returned to the kitchen lead.

2. The kitchen lead or food service worker will clean the harvest tub in the dishwasher or three-compartment sink and let it air dry. The kitchen staff will then fill the tub with the scale and harvest baskets and place everything in storage.

CASE STUDY

Teachers and students at EISENHOWER ELEMENTARY organized a "Rainbow Garden Market" as a way to integrate produce they've been growing in the garden into economics-focused concepts they are studying in their social studies class. Produce is harvested, washed, weighed, and sold by students, who keep track of what is grown. Parents coming to pick students up after school can purchase the produce to bring home for healthy meals. The funds generated by the sales help support projects in the garden.

IDEAS FOR ORGANIZING HARVESTS AND UTILIZING PRODUCE

- Organize garden beds by grades or subject so students harvest ripe fruits and vegetables as a class.
- Ask teachers who are part of the school's Garden Team to coordinate harvest events as crops ripen, either with their class or with the Garden Club.
- Create crop combinations based on stories that tie into curriculum content, and harvest those crops as a class. For example, discuss a story about the "Three Sisters," where students plant and harvest corn, beans, and squash at different times.
- Create crop combinations based on student interests, such as a pizza garden (tomatoes, basil, oregano, etc.) or a "fairy tale" garden with Cinderella pumpkins or "magic" beanstalks.
- Have PTO group members who are part of the Garden Team plan a "Harvest Festival" day. Students and families will be shown how to harvest the crops, which are then donated, sold, or distributed.
- Organize an after-school "farmers' market" where students can sell fruits and vegetables as a fundraiser.
- Create a program through the School Food Project so that students who receive free or reduced lunch are given bags of fresh produce to bring home.

RAINBOW DAYS WITH LETTUCE FROM THE SCHOOL GARDEN

In partnership with the Growe Foundation, BVSD works with elementary-school garden teams, School Food

Project volunteers, and Food Services staff to host "All-School Rainbow Days" featuring lettuce from school gardens. On these days, students make a "rainbow" on their lunch trays with vegetables from the salad bar, including lettuce that was planted and harvested right in the school's backyard!

The day prior to the Rainbow Day, second-grade students harvest lettuce from the school garden. They wash, spin, weigh, bag, and deliver the lettuce to the school kitchen. The kitchen lead or Food Services staff members wash the lettuce again and prepare it for the salad bar the following day. Then, on Rainbow Day, interns, volunteers, and parents are stationed in the lunch room. They encourage students to try a new food at the salad bar and take pictures of the great-looking salads they've made. They also hand out "I Made a Rainbow at the Salad Bar Today" stickers—but only after the students have not only put colorful foods on their tray, but have eaten them as well!

The "Make a Rainbow on your Tray" campaign encourages BVSD's elementary students to try colorful items from the salad bar and helps guide them in the creation of a healthy salad. Through this event, students become more comfortable with utilizing the salad bar and get excited about the different foods that it offers.

Check out the Rainbow Days Planning How-To Guide at thelunchbox.org/marketing/lunchroom-education/rainbow-days.

SCHOOL GARDEN BEST PRACTICES: SUSTAINABILITY

Garden maintenance

Perhaps the hardest part of managing a school garden is the routine maintenance that it involves. The excitement of planting and harvesting are easy to recruit help and assistance with, but pulling weeds and scouting for pests are less-glamorous activities that require at least a few hours each week. Below are several strategies for creating a garden maintenance plan, as well as steps for scheduling garden maintenance activities.

TIPS FOR BUILDING SUPPORT FOR GARDEN MAINTENANCE

- Coordinate with the parents and Garden Team to create a schedule for the school year and designate classes, families, or groups for certain tasks.
- Consult summer-school teachers to see if garden maintenance activities can be integrated into the summer curriculum.
- Ask building maintenance whether there are hours available for district maintenance to check on and maintain gardens.
- Speak with district principals about integrating the school gardens into restorative justice programs.
- Ask surrounding neighborhood homeowner's associations about potential partnerships that would allow them to help with the school gardens.

CASE STUDY

A local business owner with a child enrolled in PLATT MIDDLE SCHOOL has formed a group of volunteers within her company, Wholly Bites (www.whollybites.com). The employees are given a few hours off during the growing season to help with gardens each season. This is a great team-building activity for the business. It also supports of the company's corporate social responsibility objectives and covers garden maintenance in the summer while students are on break.

GARDEN MAINTENANCE CALENDAR

Note: This calendar applies to the BVSD growing zone.

JANUARY	Add compost layer (around 3 inches deep) to the tops of all beds
FEBRUARY	If desired, cover soil with a layer of black plastic to help warm soil
MARCH	• Use a pitchfork or shovel to turn and loosen soil • Sow cool-season seeds such as lettuce, kale, beets, cilantro or sugar snap peas directly in the soil • Sow warm-season seeds indoors by a sunny window
APRIL	• Check all irrigation system lines for leaks or repair needs; turn on • Pull weeds
MAY	• Move tender seedlings of warm-season crops outside for a few hours per day for a couple days in order to acclimate them before planting in the raised beds • Pull weeds • Scout for insects that might start nibbling plants; apply diatomaceous earth to the leaves and around the base of plants if insect pests or damage are spotted
JUNE	• Harvest cool-season crops and plant additional warm-season seeds in their spot in the raised beds • Spray a mixture of milk and water on leaves of all squash and melons to prevent powdery mildew • Check for pests and apply methods of pest control (see "Pest Management")
JULY	• Pull weeds and mulch the beds to hold in moisture • Check for pests and apply methods of pest control (see "Pest Management")
AUGUST	• Harvest ripe fruits and vegetables • Pull weeds • Check for pests and apply methods of pest control (see "Pest Management")
SEPTEMBER	• Pull weeds • Sow cool-season crops with short lifecycles (such as radish, lettuce, beets) directly in garden
OCTOBER	• Save seeds that have matured from the seed heads of plants like broccoli, lettuce, and radishes, as well as in the fruits of melons and tomatoes • Harvest remaining crops prior to first hard frost • Plant onion and garlic bulbs
NOVEMBER	Clear all remaining plant debris from gardens and add to compost pile
DECEMBER	Look at seeds on the Seed Bank list and dream of spring!

Pest management

INSECT PESTS

Symptoms of insect pests are usually chewed leaves or actual visible insects on leaves and stems. Most garden centers or books can help you identify whether an insect is harmful or potentially beneficial to the garden. You can also call the BVSD Agriculture Program at ext. 5094 for positive identification. Organic control methods such as diatomaceous earth, kaolin clay, spinosad, Bt, or insecticidal soaps can be effective in both controlling and helping prevent insect pest infestation. These can be applied in May and again each month during the growing season to deter insects.

If the pests are aphids (which often infest kale and broccoli plants), a child-friendly way of dealing with them is to release a bag of ladybugs at the site. Most local garden centers sell ladybugs. Water the site well first before releasing them, because the ladies will be thirsty when they come out of the bag. Just before sunset is an optimal time to release ladybugs in an aphid-infested garden. Children can watch the ladybugs taking a drink of water and feasting on aphids for dinner.

PLANT DISEASE

Disease in plants is caused by pathogens such as fungus, bacteria, or viruses. Proper management, such as removing all debris at the end of the growing season and not over-watering the garden, will go a long way toward preventing disease among plants. The most common disease a school garden is likely to experience is powdery mildew. This fungal pathogen resembles a dusting of powder on the surface of leaves and stems, sometimes starting in small circles and growing to cover large patches. Powdery mildew is difficult to treat, but a common organic solution is to dust plants with sulfur. Better still is to prevent powdery mildew from becoming a problem by minimizing water

contact with leaf surfaces (drip irrigation is helpful in this regard) and spraying leaves with a mix of equal parts milk and water. Do this with a spray bottle early on in the season and about once per month thereafter.

Successional planting, inter-cropping, and crop rotation

The most efficient use of garden space and growing season length is the practice of successional planting and inter-cropping. The idea behind successional planting is that once one crop is harvested, another crop is sown in its place. For example, a cool-season crop that is quick to mature, such as lettuce or beets, would be grown and harvested, and then warm-season seedlings like tomatoes would be planted in the same place. This not only utilizes space wisely, but is also a form of crop rotation that makes use of different nutrients in the soil and discourages pests that would prey on one crop but not the other.

Inter-cropping is a practice that was long used by indigenous peoples in the Southwest. It utilizes space efficiently while supporting the growing needs of different crops. Crops such as melons, squash or beans are planted between rows of corn or other vertical crops. This method helps shade soil while providing support for vining crops.[8]

[8] Aegerter, Steve. "Planning Your Garden." Colorado State University Extension, revised Jan. 2010. http://www.colostate.edu/Dept/CoopExt/4DMG/VegFruit/planning.htm.

Crop rotation is a great way to conserve soil nutrients while discouraging pests between years of growing seasons. With this method, rather than planting tomatoes in one bed and squash in another year after year, the annual planting of each garden bed rotates between different plant families. The table below shows common garden crops grouped by rotation.

FRUIT CROPS	Tomatoes • Peppers • Melons • Squash
ROOT CROPS	Beets • Parsnips • Radish
LEGUMES	Beans • Peas
GREENS	Lettuce • Arugula • Corn
COLE CROPS	Kale • Broccoli

Composting and soil management

Healthy soil grows healthy food, keeping plants strong and reducing the need for additional fertilizers later in the season. Newly created raised beds should contain at least 30 percent (preferably 50 percent) compost to ensure a higher content of organic material. Nutrients depleted after an active growing season can be replenished each year by top-dressing the raised beds with compost. Commercially prepared compost is sold in bags or by the cubic yard; it can also be made on-site through a compost pile.

STEPS FOR MANAGING A COMPOST PILE

Our partner, EcoCycle, has a great website that's full of composting tips (see www.ecocycle.org/recycle-compost-reuse/compost). Composting programs are also available in some municipalities within the BVSD service area. Here are the basics:

1. Set up an area between 3 and 5 cubic feet to hold your compost pile. If you're composting food scraps, it's a good idea to surround the area with fencing to keep out raccoons and other animals.

2. Combine two parts "brown" compost (high-carbon materials like dry leaves, chipped brush, or straw) to for each part "green" compost (high-nitrogen materials like grass clippings or kitchen scraps).

3. Chop large twigs or scraps into small pieces to help them break down faster.

4. Keep your compost pile moist, but not wet (you can water it with a hose) and turn it often.

5. Breakdown time will depend on weather, moisture, and oxygen content. When it's ready, your compost will look like rich soil. Then you can add it to your garden!

Seed bank

Offering access to seeds is a great way to encourage teachers to integrate garden activities into the classroom and a fun way to plan for garden success. Seeds, a low-cost method of plant propagation, can be obtained in many ways, such as through seed saving and collecting from flowers, fruits, and vegetables grown each year. Seed companies are another excellent resource for school garden seeds. Many seed companies will donate packages of seeds from the previous year, starting around late summer. Even if you must buy them, most packages of seeds only cost a dollar or two.

Lake Valley Seeds has generously donated several large boxes of seeds to the School Food Project each year. A wide variety of fruit, vegetable, herb, and flower seeds are available to BVSD teachers throughout the year at no cost. A sample list of available Lake Valley Seeds and a Seed Bank Request Form are included in appendix D of this report, and are also on the School Food Project webpage (www.bvsd.org/food).

Teachers should print out the Seed Bank Request Form and circle the seeds and quantities they would like. The completed form should be mailed to:

BVSD SEED BANK
BOULDER CTEC- AGRICULTURE PROGRAM
ARAPAHOE CAMPUS

Seeds will be sent to the teacher in campus mail. Be sure to include your name, grade, and building on the form.

Season extension

A number of techniques that provide additional warmth and protection to plants and soil can help extend the growing season at either end. This allows for increased planting opportunities during the school year. Any of the following techniques can be utilized in the BVSD gardens and initiated by classroom teachers, parent volunteers, or other extra-curricular groups or clubs to help school gardens start sooner in the spring or last longer into the fall semester.[9]

FLOATING ROW COVERS

These permeable, lightweight fabrics, available from numerous manufacturers, can be placed directly over crops. They allow light to penetrate to the plants while offering about 2° to 4°F of frost protection, shielding tender plants from wind, and screening out some insects. Row covers can provide protection from frosts over an extended period of time without being removed. On insect-pollinated crops, however, covers must be removed for pollination to occur, so they are best used as a season extension in September to add a few weeks to the harvest and in early spring as protection from the inevitable Colorado cold snap in April and May.

COLD FRAMES AND LOW TUNNELS

A cold frame is an informal structure designed to work as a sort of mini-greenhouse by sheltering plants under a material that allows light to trap heat, warming the crop and soil. The base of a cold frame is usually a boxlike structure made of wood, cinder blocks, or other material, topped with a transparent lid such as a salvaged window or skylight or polyfilm material. Glass is not recommended because it is breakable and can actually burn plants on hot, sunny days.

An easy cold-frame structure for a raised bed consists of a box or rectangle made of concrete reinforcing mesh or flexible PVC tubing, held in place with brackets attached to the sides of a raised bed, with clear plastic polyethylene film draped over the frame. This type of cold frame is essentially a low tunnel that can be rolled up during warmer weeks and closed up at the ends during cold nights for added protection.

Many gardeners have success adding additional warmth (and festivity) to low tunnels by hanging outdoor holiday lights inside them. The older twenty-five-bulb C-7 strings of lights can add from 6° to over 18°F of frost protection. Lights can be hung on the frame under the plastic and placed on a timer to turn on at dusk and off at dawn.

BLACK PLASTIC MULCH

Soil temperature is an important indicator of how soon seeds can be sown (this makes a great science lesson, by the way). Locating a garden in full sun (such as is naturally provided by southern exposure with no light obstructions from building walls) helps add a few weeks to spring plantings. Another way to raise soil temperature is to place a layer of black plastic on the soil in raised garden beds. Black plastic garbage bags, or a roll of black plastic purchased from a hardware store or lawn and garden center can be placed on beds in early March to help warm the underlying soil several weeks before planting. Heat-loving crops like peppers and tomatoes can be planted by simply punching a hole through the black plastic, which can be left on the

[9] Whiting, David., Carol O'Meara, and Carl Wilson. "Frost Protection and Extending the Growing Season." Colorado State Extension's CMG *GardenNotes* no. 722, revised October 2014. http://www.ext.colostate.edu/mg/gardennotes/722.html.

bed to warm the roots and suppress weeds throughout the summer. Other plants, however, will find the conditions too warm, so the plastic should be removed once the soil is warm enough to plant cool-season crops in late March and early April.[10]

Professional development

Note: For information on BVSD's "Garden as Classroom" teacher workshop, see appendix J.

Teachers are often faced with a seemingly insurmountable workload, and being asked to take on one more task is the last thing they need. At the same time, many teachers view the creation of a school garden as an asset, and their participation in its construction and maintenance is essential to its success. Teachers are the best resource for developing lessons that integrate core content into farm-to-school curriculum, and their enthusiasm towards this end should be encouraged and supported.

WORKSHOPS AND TEACHER TRAINING

Workshops or trainings that teach hands-on gardening skills will empower teachers to take ownership of a classroom garden and give them the tools they need to make the growing season a success. Along with information on planting schedules, pest identification, and irrigation repair, workshops and training should also include hands-on lessons and activities that teachers might use in their classrooms, and should offer a chance to practice the lesson. The sample curricula provided in this guide, as well as those listed in the Resources section, can be presented in a workshop, with teachers as the "students."

Given that they are very busy professionals, a great way to motivate teachers to attend a workshop is to link the training to a Professional Development or Continuing Education credit through a college or university. Most states require a certain number of these credits for teachers to renew licensure. Many districts also provide salary step advancement based on additional credits earned.

Workshops and teacher training may be led by a variety of professionals. The district's agriculture teacher, a member of the local extension or Natural Resources Conservation District, garden collaborator organizations, or even local gardening clubs are potential presenters at these workshops.

CURRICULUM

Any curriculum developed for the school garden or farm-to-school activities should revolve around standards established for each subject by the district, using templates that are generally recognized for lesson plan development. The curriculum developed by BVSD teachers is included in this manual (see the sample lesson plans in Appendix L), and is also posted on the BVSD School Food Project website (www.bvsd.org/food).

MOTIVATING TEACHERS

Through the support of the USDA's Farm-to-School Grant, more than thirty BVSD teachers were able to earn three college credits, at no charge, through Adams State University, for attending the "Garden as Classroom" workshops and creating authentic lesson plans that would be useful in their own classrooms. These lessons utilized school gardens and Farm-to-School initiatives to help deliver core content.

[10] Whiting, David., Carol O'Meara, and Carl Wilson. "Mulches for the Vegetable Garden." Colorado State Extension's CMG GardenNotes no. 715, revised October 2014. http://www.ext.colostate.edu/mg/gardennotes/715.html.

CURRICULUM TEMPLATE

Below is the curriculum unit template established by the Standards and Instructional Support Team of the Colorado Department of Education. This template has been used to develop lesson plans based on the Curriculum Essentials Document across different grades and subject areas for classes in the Boulder Valley School District.

The template on the following page includes descriptions for filling in the different outlined categories. A blank template can be found in appendix K.

THREE SISTERS GARDEN

In the spring of 2015, Platt Middle School Social Studies students entered a class design competition for a Three Sisters garden. The winners got to plant their section of the school garden. The students snacked on dry succotash while creating the designs. (See the Three Sisters lesson plan in appendix L.)

Content Area		**Grade Level**	
Course Name/Course Code	**Farm-to-School Curriculum**		
Standard	**Grade Level Expectations (GLE)**		**GLE Code**
The Colorado Academic Standards relevant to this grade level and content area	**The grade level expectations addressed over the course of the year for this grade level and content area.**		**The codes for each GLE**
Colorado 21st Century Skills **C** **Self-Direction:** ***Own Your Learning*** **Invention:** ***Creating Solutions***	**Critical Thinking and Reasoning:** ***Thinking Deeply, Thinking Differently*** **Information Literacy:** ***Untangling the Web*** **Collaboration:** ***Working Together, Learning Together*** **Self-Direction:** ***Own Your Learning*** **Invention:** ***Creating Solutions***		
Unit Titles		**Unit Number / Sequence**	
Length of Time			

Focusing Lens(es)	**The frame through which students filter information. The lens brings together concepts and content for deeper thinking and meaning making; it draws instruction (and students) continually back to the significance of what they are studying (see Erickson, 2007, p. 72).**
Inquiry Questions (Engaging-Debatable):	**The engaging, debatable, and overarching questions that frame the unit. These are relevant, catch students' interest, and guide students to think more conceptually and abstractly (i.e., these questions will not have one "correct" answer).**
Unit Strands	**The large concepts (see below) that provide the unit's *breadth*—the larger standards landscape this unit covers. In the Colorado Academic Standards, these are typically the standard areas within in a discipline.**
Concepts	**The timeless and universal aspects that provide the unit's *depth*—the aspects within a standard that transcend specific places, cultures, and times.**
Materials	**The items needed for the instruction of this lesson.**
Engage	**Objects, events, or questions are used to engage students. Connections are facilitated between what students know and can do.**
Explore	**Objects and phenomena are explored. Students undertake hands-on activities, with guidance.**
Explain	**Students explain their understanding of concepts and processes. New concepts and skills are introduced as conceptual clarity and cohesion are sought.**
Elaborate	**Activities allow students to apply concepts in contexts, and build on or extend understanding and skill.**
Evaluate	**Students assess their knowledge, skills, and abilities. Activities permit evaluation of student development and lesson effectiveness.**

BVSD FARM-TO-SCHOOL

"Garden as a Classroom" Curriculum

DEVELOPED BY BVSD TEACHERS

GRADE LEVEL	SUBJECT AREA	STANDARDS GLE (Grade Level Expectation)	LESSON TITLE	SYNOPSIS
FIRST GRADE	**LIFE SCIENCE**	Life Science: Each plant or animal has different structures or behaviors that serve different functions.	*Plant Parts and Their Jobs*	Students identify structures of edible parts of plants and discuss what plants need to survive.
FIRST GRADE	**LIFE SCIENCE**	Life Science: Use direct observations and other evidence to support ideas concerning physical characteristics that help plants and animals survive.	*Garden Observations*	Students will visit the school garden to learn where food comes from and how it's harvested.
FIRST GRADE	**LIFE SCIENCE**	Life Science: An organism is a living thing that has physical characteristics to help it survive.	*Vegetable Soup*	Students will use crops from the garden to identify and explain why some foods are healthy and some foods are unhealthy.
FIRST GRADE	**HEALTH**	Health: Eating a variety of foods from the different food groups is essential for good health.	*The Rainbow Plate*	Students will learn about different vegetables from the garden and name a variety of colorful foods they need to eat in order to stay healthy.
SECOND GRADE	**LANGUAGE ARTS**	Language Arts: Use a range of strategies efficiently to construct meaning while reading literature.	*Tops and Bottoms*	Students will discuss a story about growing plants in a garden and plant seeds.
FIRST GRADE	**SCIENCE** **LANGUAGE ARTS**	Science: Analyze and interpret data about the needs of plants and animals Language Arts: Use text features to locate, interpret and use information	*Becoming Farmers*	Students will become farmers in this lesson about planting and caring for seeds and seedlings. Using science journals, they will keep track of growth, label and illustrate progress.
SECOND GRADE	**HEALTH** **EDUCATIONAL TECHNOLOGY**	Heath: Identify eating behaviors that contribute to maintaining good health Ed Tech: Illustrate and communicate original ideas using digital tools and media-rich resources	*Learning to Eat Through Literature*	Students will complete two Wixie activities that illustrate their exploration of making healthy choices for snacks and drinks.
THIRD GRADE	**LIFE SCIENCE**	Life Science: The duration and timing of life cycle events such as reproduction and longevity vary across organisms and species.	*The Circle of Life: Part 1*	Students compare the life cycle of a pea plant to that of an insect.

GRADE LEVEL	SUBJECT AREA	STANDARDS GLE (Grade Level Expectation)	LESSON TITLE	SYNOPSIS
THIRD GRADE	**LANGUAGE ARTS**	Language Arts: Introduce a topic and group related information together: include illustration when useful to aiding comprehension.	*The Circle of Life: Part 2*	Students will research the life cycle of a common garden plant or insect and present to the class.
FOURTH GRADE	**LANGUAGE ARTS**	Language Arts: Students apply research skills to locate, select, and make use of relevant information.	*Packet to Package*	Students will analyze data provided on seed packets and create a document to schedule the planting of seeds.
FOURTH GRADE	**MATH**	Math: Appropriate measurement tools, units, and systems are used to measure different attributes of objects and time	*Seasons, Soil and Seeds*	Students collect data such as temperature, height, and plant growth over time, and then create graphs to analyze their data.
FIFTH GRADE	**HEALTH**	Health: Demonstrate the ability to engage in healthy eating behaviors.	*Farm Field Trip*	Students prepare for a trip to a local farm and participate in a taste test of locally grown food.
SIXTH GRADE	**MATH**	Math: Quantities can be expressed and compared using ratios and rates.	*Salad Bar Math*	Students practice concepts around ratios by mixing different salad dressings for their garden produce.
SIXTH GRADE	**SCIENCE**	Life Science: Organisms interact with each other and their environment in various ways that create a flow of energy and cycling of matter in an ecosystem	*Classroom Compost-ing with Red Wigglers*	Students observe how nutrients are recycled by setting up and observing a composting station using red wiggler worms.
SEVENTH GRADE	**MATH**	Math: Modeling geometric figures and relationships leads to informal spatial reasoning and proof.	*Optimizing the Size and Shape of a Garden Plot*	Students apply learned concepts in geometry to help arrange plants within rectangular garden beds.
SEVENTH GRADE	**HEALTH**	Health: Physical and Personal Wellness in Health	*Benefits of Nutrients*	Students will critically evaluate portion sizes using an activity with paper plates and a My Plate presentation
EIGHTH GRADE	**SOCIAL STUDIES**	Social Studies: Geography- The relation-ship of resources and how the lead to cooperation or conflict	*Who Gives a Bean About Kernels, Seeds and Sisters*	Students are introduced to the evolution, importance and uses for corn in Colo-nial America, the trading of agricultural resources for survival and the history, concept and creation of a Three Sisters planting.

GRADE LEVEL	SUBJECT AREA	STANDARDS GLE (Grade Level Expectation)	LESSON TITLE	SYNOPSIS
EIGHTH GRADE	**SOCIAL STUDIES**	Social Studies: Geography—The relationship of resources and how the lead to cooperation or conflict.	*A Harvest to Eat and Dye For*	Students investigate primary documents that speak to the importance of early agricultural resources and their relationship to indigenous people by creating natural dyes from plant pigments to tie-dye shirts.
MIDDLE SCHOOL	**SPANISH**	World Languages: Initiate, sustain, and conclude conversations (written or oral) in a variety of situations based on familiar and unfamiliar vocabulary and learned grammatical structures (interpersonal mode).	*Como es el Jardín?*	Students learn new Spanish vocabulary about gardening and agriculture and use it to discuss the school garden.
MIDDLE SCHOOL	**SPANISH**	World Languages: Present (written or oral) in a variety of situations based on familiar and unfamiliar vocabulary and learned grammatical structures (presentational mode).	*La Mariposa Monarch*	Students learn about the cultural and environmental importance of the symbiotic relationship between plants and butterflies.
MIDDLE SCHOOL	**COUNSELING**	Counseling: Students will demonstrate the knowledge and skills necessary to make decisions, set goals and take action to achieve goals	*Goals and Gardening*	Students learn to set SMART goals and then work together building a garden project collaboratively.
HIGH SCHOOL	**LIFE SCIENCE**	Life Science: Physical and behavioral characteristics of an organism are influenced to varying degrees by heritable genes, many of which encode instructions for the production of proteins.	*The Great GMO Debate: GMOs in Our Food System*	Students gather and analyze information from several different sources about genetically modified organisms in our food system and identify pros and cons of potential impacts.
HIGH SCHOOL	**LANGUAGE ARTS**	Language Arts: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.	*The Great GMO Debate: Accessing Credible Information*	Students discuss the concept of credible sources and learn to use a library database to find factual, peer-reviewed information about GMO technology.
HIGH SCHOOL	**LANGUAGE ARTS**	Language Arts: Deliver organized and effective oral presentations for diverse audiences and varied purposes.	*The Great GMO Debate: Considering All Sides*	Students participate in a debate about the topic of GMOs, taking either an affirmative or negative stance and using evidence to support their claims.

NOTE: Anyone may access lesson plans that have been developed based on district standards—or add their own plans—by going to Schoology (www.schoology.com). Lesson plans may be accessed by joining the Garden as a Classroom class with the access code 7243M-Q8GCS. All lessons will be posted on the School Food Project website (www.bvsd.org/food) beginning in August of 2015.

ORGANIZATIONS

Growing Gardens

www.growinggardens.org

Growing Gardens is a Boulder-based nonprofit organization established in 1998. The group's mission is to enrich the lives of the local community through sustainable urban agriculture. Growing Gardens envisions people experiencing a direct and deep connection with plants, the land and each other. Through its many gardening-based programs, Growing Gardens strives to reach gardeners and would-be gardeners of all ages to work alongside the organization and build community through urban agriculture.

Growing Gardens unites the Boulder County community through urban agricultural projects such as the Cultiva Youth Project (ages 12–19), the Children's Peace Garden (ages 4–11), Horticultural Therapy (for seniors and people with disabilities), Fresh Food Families & Fitness, and the Community Gardens (for the general public).

CONTACT INFORMATION:
Annie Sweeney, Program Director
annie@growinggardens.org | 303-443-9952 ext. 2

BVSD PARTNER SCHOOLS:
Community Montessori, Horizons K–8, Eldorado K–8, Columbine Elementary, Heatherwood Elementary, BCSIS, Eisenhower Elementary, Crest View Elementary, Foothill Elementary, and Douglass Elementary

Cultiva Youth Project: Casey Middle School, Summit Charter Middle School, New Vista High School, and Centaurus High School

RESOURCES FOR BVSD SCHOOLS:
The Children's Peace Garden serves children ages 3 to 11 through field trips and classroom visits for pre-K and elementary-aged groups. These programs are led by trained Environmental Educators either at the urban agricultural site or in the classroom. Their objective is to support teachers' efforts to enhance elementary science curriculum through urban agricultural experiences. In addition, the Cultivata Youth Project employs BVSD students during the summer months by offering work on an urban farm.

Growe Foundation

www.growefoundation.org

The Garden-to-Table program is a comprehensive elementary school program that transforms school gardens into outdoor classrooms to enrich academic learning. Standards-based lessons for Pre-K to fifth-grade classes provide students with opportunities for using science, math, and social studies in a garden setting and learning firsthand about ecology, economics, nutrition, and meteorology.

The Growe Foundation program model engages principals, teachers, parents, and community supporters and provides the necessary structure for school-wide participation. Through partnering with school communities, the foundation strives to achieve its goals of enriching student education, addressing health and environmental issues, and building community.

CONTACTS:
Bryce Brown, Executive Director
bryce@growefoundation.org | (303) 564-0133

Deborah Foy, Program Manager
deborah@growefoundation.org | (303) 898-9991

BVSD PARTNER SCHOOLS:
BCSIS, Coal Creek, Columbine, Community Montessori, Creekside, Crest View, Emerald, Fireside, Flatirons, Foothill, High Peaks, Lafayette, Louisville, Pioneer, Ryan, Superior, University Hill, and Whittier International Elementary

RESOURCES FOR BVSD SCHOOLS:
The comprehensive Garden-to-Table program includes installation of an on-site vegetable garden, Pre-K to fifth-grade spring/fall lessons, program training for teachers and parents, lesson videos, lesson materials, and garden maintenance support.

Eco-Cycle

www.ecocycle.org/schools/overview

The Boulder/Broomfield County School Recycling and Environmental Education Program is coordinated by Eco-Cycle and funded by Boulder County, BVSD, SVVSD, Eco-Cycle, and the cities of Boulder, Broomfield, and Superior. The free offerings of this program include Nature's Recycling and Composting classroom presentations for all grade levels; Growing Green tours, which include visits to the Agricultural Heritage Center, a large-scale compost facility, and an organic farm; worm-bin workshops and presentations for classrooms; on-site composting assistance in the schoolyard; and the Green Star Schools program, which offers large-scale collection of school-produced organic materials such as food waste and non-recyclable paper.

CONTACT INFORMATION:
Cyndra Dietz, Program Director
cyndra@ecocycle.org | 303-444-6634 x122

BVSD PARTNER SCHOOLS:
All public schools in Boulder and Broomfield counties

RESOURCES FOR BVSD SCHOOLS:
Classroom presentations, field trips (buses are funded), and the Green Star Schools (Zero Waste) Program

The Kitchen Community

www.thekitchencommunity.org

The Kitchen Community, a 501(c)3 nonprofit organization founded in 2011, reaches more than 100,000 children a day with nearly 200 Learning Gardens in schools and community organizations across the country. These Learning Gardens function as outdoor classrooms and experiential play-spaces that connect kids to real food and empower them to make healthier food choices. They are designed to be a place where students want to learn and teachers want to teach. Garden Educators at the Kitchen Community support teachers and schools on a regional basis so that they can succeed in growing food and teaching through their Learning Gardens.

CONTACTS:
Timothy Villard
timothy@thekitchencommunity.org | 720.445.5949

Josh McGuire
josh@thekitchencommunity.org | 716.983.3286

BVSD PARTNER SCHOOLS:
Alicia Sanchez Elementary, Ryan Elementary; Pioneer Bilingual Elementary; Casey Middle School, New Vista High School; Whittier International Elementary

RESOURCES FOR BVSD SCHOOLS:
The educational resources that the Kitchen Community shares with schools can be found on their website: https://thekitchencommunity.org/recommended-curriculum/. They have also created a packet of ten lessons that are all STEM-focused (https://thekitchen-community.org/lesson-plans/stem-in-your-own-learning-garden/). The "Welcoming Packet" for schools with new gardens includes a blank garden map and a specific garden plan for the year outlining how the Kitchen Community will be supporting them with seeds, seedlings, and planting day help.

For a list of other organizations that may serve as potential partners for BVSD schools, please see our website: bvsd.org/food.

BVSD "Garden as a Classroom" Schools, spring 2015

SCHOOL NAME	GARDEN
K-8 Schools	
ASPEN CREEK K-8 ELEMENTARY SCHOOL	USDA Garden
MONARCH K-8 SCHOOL	USDA Garden
Elementary Schools	
BCSIS	Growe Garden
BEAR CREEK ELEMENTARY SCHOOL	Garden (Additional support from USDA Farm to School Grant)
COAL CREEK ELEMENTARY SCHOOL	Growe Garden
COLUMBINE ELEMENTARY SCHOOL	Growe Garden/Greenhouse in partnership with Growing Gardens
COMMUNITY MONTESSORI SCHOOL	Growe Garden
CREEKSIDE ELEMENTARY	Growe Garden
CREST VIEW ELEMENTARY SCHOOL	Growe Garden
DOUGLASS ELEMENTARY SCHOOL	USDA Garden
EISENHOWER ELEMENTARY SCHOOL	USDA Garden
EMERALD ELEMENTARY SCHOOL	Growe Garden
FIRESIDE ELEMENTARY SCHOOL	Growe Garden
FLATIRONS ELEMENTARY SCHOOL	Growe Garden
FOOTHILL ELEMENTARY SCHOOL	Growe Garden
HEATHERWOOD ELEMENTARY SCHOOL	Garden
HIGH PEAKS	Growe Garden
KOHL ELEMENTARY SCHOOL	USDA Garden
LAFAYETTE ELEMENTARY SCHOOL	Growe Garden
LOUISVILLE ELEMENTARY SCHOOL	Growe Garden
MESA ELEMENTARY SCHOOL	Garden
PIONEER BILINGUAL ELEMENTARY SCHOOL	Growe Garden
RYAN ELEMENTARY SCHOOL	The Kitchen Community/Growe Garden
SANCHEZ ELEMENTARY SCHOOL	The Kitchen Community and Community Garden
SUPERIOR ELEMENTARY SCHOOL	Growe Garden
UNIVERSITY HILL ELEMENTARY SCHOOL	Growe Garden
WHITTIER ELEMENTARY SCHOOL	Growe and The Kitchen Community Gardens
High Schools	
ARAPAHOE RIDGE HIGH SCHOOL	Garden and Greenhouse
FAIRVIEW HIGH SCHOOL	Garden
NEW VISTA HIGH	The Kitchen Community Garden
Middle Schools	
CASEY MIDDLE SCHOOL	The Kitchen Community Garden
NEVIN PLATT MIDDLE SCHOOL	USDA Garden Install planned for 5/14/15

RESOURCES

Lesson plans

National Agriculture in the Classroom: http://www.agclassroom.org

Growing Minds: http://growing-minds.org

Nutrients for Life: https://www.nutrientsforlife.org/for-teachers

Edible Schoolyard: http://edibleschoolyard.org/resources-tools

Lifelab: http://www.lifelab.org/for-educators/schoolgardens/#lessons

Jones Valley Teaching Farm: http://jonesvalleyteachingfarm.org/educators/curriculums/

USDA's Dig In: http://www.fns.usda.gov/tn/dig-standards-based-nutrition-education-ground

USDA's Great Garden Detective Adventure: http://www.fns.usda.gov/tn/great-garden-detective-adventure-standards-based-gardening-nutrition-curriculum-grades-3-and-4-1

Denver Public Schools Garden-to-Cafeteria: http://dug.org/garden-to-cafeteria/

School garden/gardening information

Western Growers' Foundation: http://csgn.org/

Colorado State Extension: http://www.ext.colostate.edu/pubs/pubs.html

Colorado Farm-to-School Gardens: http://coloradofarmtoschool.org/schools/school-gardens

Funding opportunities

Impact on Education: http://impactoneducation.org/get-involved/volunteer/classroom-mini-grant-reader-information-scoring-guide/#

National Farm-to-School Program: http://www.farmtoschool.org/fundingopps.php

Whole Kids Foundation School Garden Grant program: https://www.wholekidsfoundation.org/schools/programs/school-garden-grant-program

Let's Move Salad Bars to Schools: http://www.saladbars2schools.org

Tools for school food change

The Lunch Box: thelunchbox.org.

Books

Big Ideas: Linking Food, Culture, Health and the Environment. Center for Ecoliteracy.

Resources in Spanish

Lifelab: http://www.lifelab.org/2011/07/spanish/

Further reading

Draper, Carrie, and Darcy Freedman. "Review and Analysis of the Benefits, Purposes, and Motivations Associated with Community Gardening in the United States."Journal of Community Practice 18, no. 4 (2010): 458–492.

Ratcliffe, Michelle, Katherine Merrigan, Beatrice Rogers, and Jean Goldberg. 2011. "The Effects of School Garden Experiences on Middle School-aged Students' Knowledge, Attitudes, and Behaviors Associated with Vegetable Consumption." *Health Promotion Practice* 12 (1): 36-43.

Miller, Dana L. "The Seeds of Learning: Young Children Develop Important Skills Through Their Gardening Activities at a Midwestern Early Education Program." *Applied Environmental Education and Communication* 6, no. 1 (2007): 49–66.

Bowker, Rob, and Penni Tearle. "Gardening as a Learning Environment: A Study of Children's Perceptions and Understanding of School Gardens as Part of an International Project." *Learning Environments Research* 10, no. 2 (2007): 83–100.

Klemmer, C. D., T. M. Waliczek, and J. M. Zajicek. "Development of a Science Achievement Evaluation Instrument for a School Garden Program." *Hort Technology* 15, no. 3 (2005): 433–438.

Lekies, Kristie S., and Marcia Eames Sheavly. "Fostering Children's Interests in Gardening." *Applied Environmental Education & Communication* 6, no. 1 (2007): 67–75.

Pigg, A. E., T. M. Waliczek, and J. M. Zajicek. "Effects of a Gardening Program on the Academic Progress of Third, Fourth, and Fifth Grade Math and Science Students" *HortTechnology* 16, no. 2 (2006): 262–264.

APPENDICES

PLANNING INFORMATION

A. School Garden Project—Sample Letter of Introduction to Schools

B. School Garden Project—Sample Letter of Interest and Contract

C. Sample Donation Solicitation

D. BVSD Seed Bank List and Request Form

PLANTING INFORMATION

E. Academic Year Planting Schedule

F. Climate Guide for Colorado

G. Colorado State University Vegetable Planting Guide

H. Garden Planting Chart

I. Garden Harvest Safety Checklist

CURRICULUM INFORMATION

J. "Garden as a Classroom" Workshop Description

K. Farm-to-School Lesson Plan Template and Explanation

L. "Garden as a Classroom" Lesson Plans

M. Columbine Elementary Greenhouse Project Description

APPENDIX A: School Garden Project
Sample Letter of Introduction to Schools

Dear BVSD Principal:

We are excited your school has chosen to participate in the implementation of our district's USDA Farm to School Grant. The information below outlines the general information and next steps in this process. You will be send a Google Form

Teacher Workshop:
This will be offered on **May 3rd from 8am-5pm** at the Boulder Career and Technical Education Center (Arapahoe Campus next to Ed Center). Teachers will learn hands-on gardening skills, develop lesson plans and receive ongoing contact and support for implementing school garden curriculum. A minimum of 2 and a maximum of 5 teachers from your school may register. The Farm to School grant will support 3 credits through Adams State University for their participation. Teachers sign up through **Avatar** and may anticipate a total of 75 hours of coursework- the bulk of this time will be spent in building, maintaining and developing lessons around the school garden for use in their classes.

School Garden Plan:
If your school is receiving a garden, you and the teachers participating in the workshop will need to meet in early April to complete the School Garden Plan form that will be send to you as a Google Form. This asks for you to attach the School Garden Plan form. This helpful planning tool should be filled out online and submitted by April 15th.
We look forward to working with you on this exciting project and hope you will contact us with any questions you may have.

APPENDIX B: School Garden Project
Sample Letter of Interest and Contract

Dear BVSD Principal:

The Boulder Valley School District has recently been awarded a USDA Farm to School Grant, which has the purpose of helping to improve access to local foods in eligible schools. You school has been chosen to participate in this grant and will be eligible to receive the following:

The Farm to School Grant will provide:

- Six new raised beds with soil and spring seedlings, to be installed between May-September
- Training for at least three teachers from your school in how to care for the garden and incorporate it into lessons that support core content and learning objectives across the curriculum posted to BVSD's IMS system, while gaining 3 college credits
- A BVSD maintenance person for 4 hours weekly from during the growing season to perform general maintenance/troubleshooting of the garden

In order for this innovative grant to have a lasting impact, we ask that **the School Principal will provide:**

- Sunny ground space of about 200square feet close to a water source (such as hose bib) nearby to school building
- Three teachers interested in earning 3-credits (tuition covered) by attending a one-day workshop, creating a garden-themed lesson plan and helping with the construction and maintenance of the new gardens, who will be committed to maintaining the garden
- A committee of teachers or parents interested in being "garden stewards" who will decide how the garden produce is utilized and who will help to maintain the garden use in curriculum and projects for at least 3 years

Due to the timely nature and accountability of grants, we ask that you meet with Ann Cooper, head of the School Food Program, prior to March 21st, 2014 if you are interested in participating in this grant.

Congratulations!

Farm to School Program Grant Contract: _____
BVSD School

The Farm to School Grant will provide:

- Six new raised beds with soil and spring seedlings, to be installed between May-September
- Training for at least three teachers from your school in how to care for the garden and incorporate it into lessons that support core content and learning objectives across the curriculum posted to BVSD's IMS system, while gaining 3 college credits
- A BVSD maintenance person for 4 hours weekly from during the growing season to perform general maintenance/troubleshooting of the garden

_____ _____
School Food Program Director Date

In order for this innovative grant to have a lasting impact, we ask that **the School Principal will provide:**

- Sunny ground space of about 200square feet close to a water source (such as hose bib) nearby to school building
- Three teachers interested in earning 3-credits (tuition covered) by attending a one-day workshop, creating a garden-themed lesson plan and helping with the construction and maintenance of the new gardens, who will be committed to maintaining the garden
- A committee of teachers or parents interested in being "garden stewards" who will decide how the garden produce is utilized and who will help to maintain the garden use in curriculum and projects for at least 3 years

_____ _____
School Principal Date

APPENDIX C:
Sample Donation Solicitation

McGuckin Hardware
2525 Arapahoe Ave Unit D1
Boulder, CO 80302-6795

March 25th, 2014

Dear Ms. Garrels,

As a teacher for Boulder Valley School District, I am aware of the many occasions where McGuckin's has supported student success and learning on a variety of different projects throughout the years. In my first year of teaching, I myself was given a gift card to help contribute towards the purchase of supplies at your store to start our school greenhouse. Over the past decade, as a high school teacher that runs a vocational program in agriculture, I've made thousands of dollars of purchases at your store using our school card, on which you have generously given our district a slight discount.

Recently, the Boulder Valley School District has been awarded a USDA Farm to School Grant, which has the purpose of helping to improve access to local foods in eligible schools. One use of the grant will be the building of 5 new school gardens at local schools that have less access to fresh, locally-grown produce. We will be building these gardens with students, teachers, parents and volunteers this coming spring.

As part of our grant proposal, we included the following materials:

Topsoil	**120 bags**
Peat	**45 3.8 cubic feet bales**
Compost (aged)	**90 bags**
Soaker hose	**30 of at least 10 feet**
Hose or irrigation line	**At lest 200 feet**
Irrigation connectors	**60**
Irrigation timers	**5**
Hose manifold	**5**
Trowels/spade	**50**
Watering cans	**10**

Originally, we had budgeted using a national chain store for our supplies, but would much prefer to use our local hardware store for a variety of reasons. One of the main goals of this federal grant is to help develop partnerships between school districts and local agricultural businesses and we feel that McGuckin's has such a presence in our community. One concern is that retail costs of these supplies at your store are higher.

We would like to ask if it might be possible to give us a further discount on these materials, potentially at cost, or even through a donation. In exchange, we would visually acknowledge McGuckin's support in a variety of ways, including all printed materials, newsletters, media releases, and signage at the school gardens themselves. We are open to any creative ideas in which we could make the support of these gardens through a donation of some materials worthwhile to your business.

I am happy to meet with anyone to answer questions or discuss ideas around this request or project. Again, we appreciate your continued support of our schools and students, who will grow up with fond memories of green vests and weekend shopping trips to your store.

Kindest regards,

Heather Riffel
Educator
Boulder Valley School District
(720) 561-5094 heather.riffel@bvsd.org

APPENDIX D:
BVSD Seed Bank List and Seed Bank Request Form

BVSD SEED BANK	...made possible through a generous donation by our local Lake Valley Seed company
SEED	**VARIETY**
ARUGULA	Rocket
BROCCOLI	Spring
BEET	Chioggia
BEET	Ruby Queen
BRUSSEL SPROUTS	Long Island +
CABBAGE	Copenhagen mrkt
CABBAGE	Red Acre
CUCUMBER	Armeniean
CUCUMBER	Pickling
CANTALOUPE	Hearts of gold
CANTALOUPE	Minnesota midget
CANTALOUPE	Hales best jumbo
CANTALOUPE	Imperial 45
CORN	Silver queen
CORN	Precious gem
CORN	Sugar pearl
CORN	Kandy korn
CORN	Peaches n cream
CELERY	Utah
EGGPLANT	Long purple
EGGPLANT	Black beauty
ENDIVE	Batavian full heart
GOURDS	Small fancy mix
LEEK	American flag
LEEK	Kohlrabi
LETTUCE	Salad bowl green

LETTUCE	Black seeded Simpson
LETTUCE	Salad mix
LETTUCE	Red oak leaf
LETTUCE	Spicy Salad Mix
MELON	Honeydew
MELON	Charentais
OKRA	Emerald
ONION	White Lisbon
PEA	Sugar snap
PARSNIP	Hollow crown
PAK CHOI	Toy choy
PUMPKIN	Big max
PUMPKIN	Cinderella
PUMPKIN	Connecticut field
PUMPKIN	Lumina
PUMPKIN	New england suggar pie
PUMPKIN	Jack-be-little
PUMPKIN	Jack-o-lantern
RADISH	Easter egg mix
RADISH	White icicle
RADISH	Sparkler
RADISH	Watermelon
SQUASH	Early Yellow Crookneck
SQUASH	Jumbo Pink Banana
SQUASH	Spaghetti
SQUASH	Cocozelle
SQUASH	Early Straightneck
SQUASH	Cucuzzi
TOMATO	Beefsteak
TOMATO	Big Boy
TOMATO	Celebrity hybrid
TOMATO	Brandywine
WATERMELON	Sugar baby

BVSD School Gardens Seed Bank Request Form

Name of School:_____

Name of Teacher:_____

Seed	Quantity	Date Needed:

Please fill out and send via campus mail to:

BVSD SEED BANK
BOULDER CTEC- AGRICULTURE PROGRAM
ARAPAHOE CAMPUS

Seeds will be sent within 1-2 weeks to your school via campus mail.

APPENDIX E:
Academic Year Planting Schedule

Academic Year Planting Guide

August	September	October	Nov	Dec	Jan	February	March	April	May
Sow Directly: Beet Carrot Chard Radish	Lettuce Radish Spinach	Garlic (clove)					Lettuce Beet Cilantro Kale	Peas Spinach	Beans Corn Lettuce Spinach Potato Sweet Potato
Start Indoors *Transplant (after 3-4 weeks):* Cabbage Broccoli	Onion (seed)					Broccoli Cauliflower	Leeks Onion	Melon Tomato Eggplant Squash Basil	Cucumber Pepper

APPENDIX F:
Climate Guide for Colorado

Colorado State University Extension
Colorado Master Gardener℠ Program

CMG GardenNotes #741

Climate Summary: Boulder and Longmont, Colorado

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Monthly Temperatures														
Boulder	average extreme high	64	67	72	80	86	94	97	94	90	81	71	67	
	normal high	45	48	55	62	71	82	87	85	77	66	52	46	65
	normal low	**19**	**23**	**28**	**35**	**43**	**52**	**57**	**56**	**48**	**38**	**28**	**22**	**38**
	average extreme low	-4	0	9	18	31	41	49	48	32	21	6	0	
Longmont	average extreme high	63	67	75	82	89	97	100	98	94	84	73	64	
	normal daily high	**42**	**47**	**54**	**62**	**72**	**83**	**89**	**87**	**78**	**66**	**52**	**44**	**65**
	normal daily low	**12**	**17**	**24**	**32**	**42**	**51**	**55**	**53**	**44**	**33**	**22**	**14**	**33**
	average extreme low	-9	-5	6	17	30	40	48	46	31	19	4	-8	

Note: Climate averages/norms are based on a 30 year period.

Site Information	Station	Number	Elevation	Latitude	Longitude
	Boulder	50848	5400	40° 01’	105° 16’
	Longmont	55116	4950	40° 10’	105° 04’

741-1

		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Total Monthly Precipitation (inches)														
Boulder	normal	0.7	0.7	1.8	2.7	2.9	2.0	1.9	1.7	1.9	1.3	1.5	0.8	19.71
	maximum*	2.2	2.4	5.2	6.0	9.6	6.0	4.8	5.5	4.3	4.3	3.5	2.2	29.4
Longmont	normal	0.4	0.4	1.2	2.0	2.4	1.7	1.1	1.4	1.5	0.8	0.8	0.6	14.4
	maximum*	1.4	1.5	4.7	4.8	7.0	5.1	3.5	4.8	3.8	4.8	2.5	1.7	20.9
Total Monthly Snowfall (inches)														
Boulder	normal	10.9	9.9	16.9	12.0	1.1	0	0	0	2.1	4.7	16.0	11.8	83.6
	maximum*	29.1	28.8	56.7	38.6	23.0	0	0	0	21.0	30.1	44.6	31.5	125.3
Longmont	normal	5.2	3.4	5.5	4.7	0.5	0	0	0	0.5	1.2	5.5	7.1	32.3
	maximum*	13.8	13.8	26.0	19.0	8.0	0	0	0	10.0	12.0	22.0	32.0	72.0

Frost Probability and Growing Season Length Summary

		Spring Frost Probability			Fall Frost Probability			Length of Growing Season (days)		
		90%	50%	10%	10%	50%	90%	10%	50%	90%
Boulder	32° threshold	Apr 22	May 3	May 13	Sept 18	Oct 1	Oct 15	133	152	171
	28° threshold	Apr 8	Apr 21	May 5	Sept 23	Oct 11	Oct 28	154	172	191
	24° threshold	Mar 31	Apr 11	Apr 22	Sept 27	Oct 19	Nov 11	169	191	213
Longmont	32° threshold	Apr 22	May 05	May 17	Sept 15	Sept 27	Oct 9	127	145	163
	28° threshold	Apr 10	Apr 24	May 8	Sept 22	Oct 9	Oct 25	146	168	190
	24° threshold	Mar 31	Apr 15	Apr 29	Sept 29	Oct 17	Nov 4	165	185	206

741-2

Typical planting and harvest period based on average frost dates and normal temperatures

Mid April	Late April	Early May **FROST**	Mid May	Late May	Early June	Mid June	Late June	Early July	Mid July	Late July	Early Aug.	Mid Aug.	Late Aug.	Early Sept.	Mid Sept.	Early Oct. **FROST**
40-45 day, cool season crops (spinach, lettuce)								75 day, cool season crops								
50-55 day, cool season crops (kohlrabi)									65-70 day, cool season crops (peas)							
60-70 day, cool season crops (beets, broccoli, cabbage, carrots, cauliflower, chard, peas)										50-60 day, cool season crops (kohlrabi, beets, broccoli, cabbage, carrots, cauliflower, chard,)						
75 day, cool season crops											40-45 day, cool season crops (spinach, lettuce)					
		50-55 day, semi-tender, warm season crops (summer squash)														
		60-65 day, semi-tender, warm season crops (cucumbers)														
		70-75 day, semi-tender, warm season crops (beans, corn)														
		80-85 day, semi-tender, warm season crops (corn)														
			70 day, tender, warm season crops (tomatoes, peppers, eggplant)													
			75-80 day, tender, warm season crops (cantaloupe, watermelon)													
			85-90 day, tender, warm season crops (cantaloupe, watermelon, winter squash)													
			95-100 day, tender, warm season crops (winter squash)													

Prepared by David Whiting, Extension Consumer Horticulture Specialist (retired), Department of Horticulture and LA, Colorado State University
Source: Colorado Climate Center at http://ccc.atmos.colostate.edu

- CMG GardenNotes are available online at www.cmg.colostate.edu.
- Colorado Master Gardener training is made possible, in part, by a grant from the Colorado Garden Show, Inc.
- Colorado State University, U.S. Department of Agriculture and Colorado counties cooperating.
- CSU Extension programs are available to all without discrimination.
- Copyright 2002. Colorado State University Extension. CMG GardenNotes may be reproduced, without changes or additions, for nonprofit educational use.

Revised December 2006

APPENDIX G:
Colorado State University Vegetable Planting Guide

Colorado Master Gardener[sm] Program
Colorado Gardener Certificate Training
Colorado State University Extension

CMG GardenNotes #720

Vegetable Planting Guide

Outline:

Cool season vegetables, page 1
- Hardy vegetables – Broccoli, cabbage, kohlrabi, onions, lettuce, peas, radish, spinach, turnips, page 1
- Semi-hardy vegetables – Beets, carrots, cauliflower, parsley, parsnips, potatoes, and Swiss chard, page 1

Warm season vegetables, page 2
- Tender vegetables – Beans, celery, corn, cucumbers, New Zealand spinach, and summer squash, page 2
- Very tender vegetables – Lima beans, cantaloupe, eggplant, pepper, pumpkin, winter squash and pumpkin, tomato, and watermelon, page 2

Planting Guide Table – Vegetable planting guide, page 3
Average Frost Dates, page 4

Cool Season Vegetables

These vegetables prefer cool growing temperatures (60°F to 80°F) and lose quality in hot weather. They are often replanted mid-summer for fall harvest.

Hardy Vegetable

Crops: broccoli, cabbage, kohlrabi, onions, lettuce, peas, radish, spinach, turnips

Temperatures: Hardy vegetables grow with daytime temperatures as low as 40°F and may survive a frosty nip.

When to plant:

- Based on soil temperatures, refer to Table 1.
- Plant as soon as soil adequately dries in the spring.
- These crops may be planted as early as 2-4 weeks before the date of the average last spring frost.

Semi-Hardy Vegetables

Crops: beets, carrots, cauliflower, parsley, parsnips, potatoes, and Swiss chard

Temperatures: Semi-hardy vegetables grow with minimum daytime temperatures of 40°F to 50°F, but are less tolerant of a frosty night.

When to plant:

- Based on soil temperature, refer to Table 1.
- Plant as soon as soil adequately dries in the spring.
- These crops may be planted as early as 0-2 weeks before the date of the average last spring frost.

Warm Season Vegetables

Warm season vegetables prefer summer-like weather with temperatures between 70°F and 95°F. They are intolerant of frost and may be sensitive to cool spring winds.

Tender Vegetables

Crops: beans, celery, corn, cucumbers, New Zealand spinach, summer squash

Temperatures: Tender vegetables grow with a daytime temperature above 55°F, and are intolerant of frost.

When to plant:

- Based on soil temperature, refer to Table 1.
- Soil is adequately dry to work.
- These crops may be planted (from seed) around the date of the average last spring frost. Transplants of cucumbers and summer squash without frost protection should be delayed until frost potential is over.

Very Tender Vegetables

Crop: lima beans, cantaloupe, eggplant, pepper, pumpkin, winter squash and pumpkins, tomato, and watermelon

Temperatures: Very tender vegetables are not only intolerant of frost, but also cool spring winds. They need daytime temperatures above 60°F, and prefer temperatures of 70°F to 95°F. A week of daytime temperatures below 55°F, may stunt the crop.

When to plant:

- Based on soil temperature.
- Soil is adequately dry to work.
- These crops are typically planted two plus weeks after the average last spring frost date.
- Weather is becoming summer-like, (i.e., consistently above 55°F (daytime) and breezes should have lost any cool nip).

Table 1 – Vegetable Planting Guide

Vegetable	Germination Temperature[1] Min.	Optimum	Max.	Plant Spacing[2]	Planting Depth	Days to Germination	Typical Days to Harvest	Age of Transplant (weeks)
Cool Season Crops[3]								
Beets	40°	80°	90°	4-6”	¾-1”	7-10	60	
Broccoli[4]	40°	80°	90°	18”	½”	3-10	65T[4]	5-7
Cabbage[4]	40°	80°	90°	18”	½”	3-10	85T[4]	5-7
Carrots	40°	80°	90°	2-3”	¼”	10-17	70	
Cauliflower[4]	40°	80°	90°	18”	½”	3-10	65T[4]	5-7
Kohlrabi	40°	80°	90°	7-9”	½”	3-10	50	
Leeks	40°	80°	90°	4-6”	¼”	7-12	120	
Lettuce (leaf types)	35°	70°	70°	7-9”	¼”	4-10	60	
Onion, green	35°	80°	90°	2-3”	¼”	7-12	60	
Onions, dry (seed)	35°	80°	90°	4-6”	¼”	7-12	110	
(sets)				4-6”	1-2”			
Parsnips	35°	70°	90°	5-6”	½”	15-25	70	
Peas	40°	70°	80°	4-6” or 3”×8”	1”	6-15	65	
Potatoes	45°			12-15”	4-6”		125	
Radish	40°	80°	90°	2-3”	½”	3-10	30	
Spinach	40°	70°	70°	4-6”	½”	6-14	40	
Swiss Chard	40°	85°	95°	7-9”	1”	7-10	60	
Turnips	40°	80°	100°	4-6”	½”	3-10	50	
Warm Season Crops								
Beans, snap	55°	80°	90°	6” or 4” x 12”	1-1½”	6-14	60	
Cantaloupe[5]	60°	90°	100°	36-48”	1-1½”	3-12	85	2-3[5]
Corn	50°	80°	100°	12” x 30”	1-1½”	5-10	60-90	
				9” x 36”				
Cucumbers	60°	90°	100°	6” trellised	1”	6-10	55	2-3[5]
				24-36” untrellised				
Eggplant	60°	80°	90°	18-24”	¼”	7-14	60T[6]	6-9
Pepper	60°	80°	90°	15-18”	¼”	10-20	70T[6]	6-8
Tomato	50°	80°	100°	trellised: 24”	¼”	6-14	65T[6]	5-7
				between plants				
Squash, Summer	60°	90°	100°	36-48”	1-1½”	3-12	50	2-3[5]
Squash, Winter	60°	90°	100°	36-48”	1-1½”	6-10	100	2-3[5]
Watermelons	60°	90°	110°	36-48”	1-1½”	3-12	85	2-3[5]

720-3

1 **Germination temperature –** Soil temperature is one of the best methods to determine spring planting time. Plant when soils reach minimum temperature measured at 8 a.m., 4 inches deep. Beans are an exception, being measured at 6 inches deep. Optimum temperatures listed in the table are useful for starting seeds indoors. Maximum temperatures are listed in regards to high soil temperatures that may interfere with seed germination in the summer.

2 **Plant Spacing –** Spacings given are equal-distance spacing for crops grown in block or close-row style beds. For example, beets, with a spacing of six inches are thinned to six inches between plants in all directions. In other words, beets are thinned to six inches between beets in the row and six inches between rows. The closer spacing listed should be used only on improved soils with 4-5% organic matter.

Close-row or block style planting works well for raised bed gardening, with blocks/beds 4 feet wide (any length desired) and 2-foot wide walkways between blocks/beds.

3. **Cool Season Crops** – Cool season crops prefer a cool soil. Lawn clipping and newspapers make an excellent mulch for these crops by cooling the soil, preventing weed germination, and conserving water. Apply fresh grass clippings only in thin layers (less than ½ inch) and allow it to dry between applications. Thick layers will mat and smell. Do not use clipping from lawns treated with weed killers or other pesticides. Several layers of newspapers covered with grass clippings also work well between rows. Do not use glossy print materials.

4 **Transplanted Cole Crops –** Since cole crops (cabbage, cauliflower, broccoli, and Brussels sprouts) germinate better in warmer soil, they are typically started from transplants in the spring. Days to harvest are from transplants. In the warmer areas of Colorado, these crops produce the best quality when direct seeded mid-summer (early July for the Front Range area) for harvest during cooler fall weather. Before planting out, harden off seedlings.

5 **Transplanting Vine Crops –** Vine crop (cucumbers, squash, melons) roots are extremely intolerant of being disturbed, and perform best when grown by direct seeding rather than by transplants. With the use of black plastic to warm the soil, direct seeded crops germinate rapidly. If using transplants, select small, young plants, not more than 2-3 weeks from seeding.

6 **Tomato family transplants** – The tomato family is traditionally planted from transplants. In warmer areas of Colorado, they can also be direct seeded with minimal delay. Days to harvest are from transplants.

Average Frost Dates

The following *CMG GardenNotes* (available online at www.cgm.colostate.edu) give average frost dates and growing season information.

- Climate Summary: Boulder and Longmont, #741
- Climate Summary: Canon City, #755
- Climate Summary: Castle Rock, Littleton and Parker, #742
- Climate Summary: Colorado Springs, # 743
- Climate Summary: Dillon, #744
- Climate Summary: Eagle and Glenwood Springs Area, #745
- Climate Summary: Fort Collins, Greeley and Estes Park, #746
- Climate Summary: Gunnison and Crested Butte, #747
- Climate Summary: Northeast Colorado, #748
- Climate Summary: Northwest Colorado, #749
- Climate Summary: Norwood and Telluride, #753
- Climate Summary: Pueblo, #751
- Climate Summary: San Luis Valley, #754
- Climate Summary: Southwest Colorado, #750

Authors: **David Whiting** with Carol O'Meara and Carl Wilson; Colorado State University Extension.

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Revised January 2012

Colorado Master Gardener℠

APPENDIX H:
Garden Planting Chart

A Garden Planting Chart							
Crop	**Days to Maturity**	**Spring Planting Dates**	**Fall Planting Dates**	**Seed/Plants 100 ft.**	**Distance Between Rows**	**Distance Between Plants**	**Depth to Plant**
Asparagus	2nd season	Apr 5 - 25		50 roots	3 to 5 ft.	1½ to 2 ft.	6 in.
Bean, bush	50-60	Apr 25 - May 30	July 25- Aug 5	½ lb.	3 ft.	2 to 4 in.	1-1½ in.
Bean, pole	65-75	May 10 - 20		½ lb.	3 ft.	6 to 12 in.	1-1½ in.
Bean, lima	65-75	May 10 -25		1 lb.	2 to 2½ ft.	3 to 4 in.	1-1½ in.
Beet	55-65	Apr 1 - 15	Aug 1 - Sept 25	1 oz.	2 to 2½ ft.	2 in.	1 in.
Broccoli	60-80	Mar 25 - Apr 5	Sept. 25 - 30	100 plants	2½ ft.	14 to 18 in.	
Cabbage	65-80	Apr 1 - 20	Sept 20 - 30	100 plants	2½ ft.	12 in.	
Cantaloupe	80-90	May 10 - 20		1 oz.	4 to 6 ft.	3½ to 4 ft.	1½ in
Carrot	70-80	Mar 25 - Apr 10	Sept 20 - 30	½ oz.	2 ft.	2 to 3 in.	½ in.
Cauliflower	55-60	Apr 1 - 20	Sept 20 - 30	100 plants	3 ft.	12 to 18 in.	
Collard	55-70	Mar 20 - Apr 10		½ oz.	2½ ft.	8 to 16 in.	½ in.
Corn	80-100	May 1 - July 20		¼ lb.	3 to 3½ ft.	12 to 18 in.	2 in.
Cucumber	60-65	May 10 - 30		1 oz.	3½ to 5 ft.	3 to 4 ft.	1½ in.
Eggplant	75-90	May 15 - 25		50 plants	3 ft.	2½ to 3 ft.	
Kale	50-70	Mar 25 - Apr 5		½ oz.	3 ft.	10 in.	½ in.
Kohlrabi	50-70	Apr 1 - 15	Sept 20 - 25	½ oz.	3 ft.	10 in.	½ in.

Lettuce	60-85	Apr 1 - May 15	Sept 1 - 15	½ oz.	2 to 2½ ft.	10 to 12 in.	½ in.
Mustard	40-50	Mar 25 - May 1	Aug 1 - 30	½ oz.	2 ft.	1 in.	½ in.
Okra	55-60	May 10 - 25		1 oz.	3 to 3½ ft.	6 in.	1 in.
Onion (mature)	100-120	Mar 25 - Apr 15	Sept. 1- Dec. 31	300 plants or ½ gal. sets	1 to 2 ft.	3 to 4 in.	¾ in.
Peas, garden	60-80	Mar 25 - Apr 10		1 lb.	2½ ft.	1 in.	1½-2 in.
Peas, southern	60-70	May 1 - 15		½ lb.	3 ft.	4 to 6 in.	1½-2 in.
Pepper	65-80	May 15 - 30		50 plants	2½ ft.	1½ to 2 ft.	
Potato, Irish	70-90	Apr 1 - 15		1 peck	2½ to 3 ft.	10 to 14 in.	5 in.
Potato, sweet	90-150	May 15- June 5		100 plants	3½ ft.	12 in.	-
Radish	25-30	Mar 25 - May 1	Aug 1- 20	1 oz.	1½ ft.	1 in.	½ in.
Spinach	40-45	Apr 1 - 20	Aug 10 - Sept 20	1 oz.	1½ to 2 ft.	1 to 2 in.	¾ in.
Squash, bush	50-55	May 15 - 30		1 oz.	3 to 4 ft.	2 ft.	1½-2 in.
squash, winter	85-90	May 15 - 30		½ oz.	5 ft.	3 ft.	1½-2 in.
Tomato	70-85	May 15 - 30		50 plants	3 to 4 ft.	2½ to 3 ft.	
Turnip	45-65	Mar 25 - May 1	Aug 5 - Sept 20	½ oz.	1 to 2 ft.	1 to 2 in.	½ in.
Watermelon	80-90	May 10 - 20		1 oz.	10 ft.	8 to 10 ft.	1½ in.

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APPENDIX I:
Garden Harvest Safety Checklist

Requirement	Yes	No	N/A
Food Safety Program			
1. Employees are trained in and required to follow proper sanitation and GAPS practices.			
2. A documented food safety program has been implemented.			
3. A system for tracing products sold is in place and documentation can be provided to customers upon request.			
Personal Hygiene			
4. All guests and employees are required to follow proper hand hygiene.			
5. Hand soap and potable water are available for hand washing.			
6. Eating, drinking, chewing gum and tobacco use are confined to designated separate from where food product is handled. Water is allowed in closed containers.			
7. Workers with flu-like symptoms, infectious conditions, or open wounds are restricted from handling crops. Any crops that have come in contact with bodily fluids will be disposed of and any equipment surfaces that come in contact any body fluids will be disinfected.			
Water and Sewage			
8. The source(s) of water used to wash produce is tested annually to determine E. coli level.			
9. The farm sewage treatment/septic system functions properly, and there is no evidence of leakage or runoff.			
10. No sewage or sewage byproducts are used on the farm.			
Manure			
11. Manure lagoons located near crop production areas are maintained to prevent leaking or overflowing and measures have been taken to stop runoff into crop production areas.			
12. If raw manure or a combination of raw and composted manure is used as a soil amendment it is incorporated at least 2 weeks prior to planting and a minimum of 120 days prior to harvest. Or, if manure is composted and applied less than two weeks before planting or less than 120 days before harvest, there is documentation that it has been thoroughly heated.			
13. Composted manure and/or biosolids are properly treated, composed, or exposed to environmental conditions that would lower the expected level of pathogens.			
14. Manure is properly stored prior to use.			
Animal Access & Pest Control			
15. Reasonable efforts are made to restrict irrigation water sources from excessive exposure to livestock, wildlife, and other potential pollution sources			
16. Measures have been taken to minimize opportunity for wildlife to access crop production areas.			
17. Measures are taken to exclude animals from storage facilities.			

18. There is a written pest control program for the washing/storage facility that includes measures to exclude animals or pests from storage facilities.			
19. Pesticide, fertilizer, or other crop and soil applications on the farm are documented and on file, including name of person applying materials, date, field/crop location and amount applied.			
Equipment, Facility, & Storage			
20. Prior to loading/unloading crops, all containers and handling equipment are inspected to make sure they are clean and free from disagreeable odors and obvious dirt and/or debris; they are cleaned if necessary.			
21. All employees are instructed to inspect and remove foreign objects such as glass, metal, rocks, unidentified objects or other dangerous/toxic items from harvest containers or equipment.			
22. Harvest containers and other equipment are kept in good repair or are replaced if damaged.			
23. Harvest containers will be used solely for the carrying or storage of the intended crop and non-produce items are not be allowed in these containers during the harvest season.			
24. Non-food grade substances such as paints, lubricants, fertilizers, pesticides, etc., will not be stored near harvested crops or in crop washing/storage areas.			
25. The washing/storage facility is cleaned and maintained in an orderly manner.			
Ice & Refrigeration			
26. Climate controlled rooms are monitored and temperature logs maintained.			
27. Refrigeration equipment is cleaned on a regular basis.			
28. Refrigeration systems work properly and appropriate storage temperatures are maintained.			
29. Refrigeration system condensation does not come in contact with produce.			
30. The water used for ice/cooling is potable.			
Transportation			
31. Produce items are not loaded with potentially contaminating products.			
32. Efforts are made to ensure minimal damage to crops during harvest, handling and transportation. Crops are not handled or transported with potentially contaminating products.			

APPENDIX J:
"Garden as a Classroom" Workshop Description

ED 589: Garden as Classroom

INSTRUCTOR:	Heather (Riffel) Ridge
ADDRESS:	805 34th St Boulder, CO 80303
EMAIL:	heather.riffel@bvsd.org
PHONE:	303-912-0220 fax: 720-561-5258
WEBSITE:	**Schoology code: 7243M-Q8GCS**
COURSE CREDIT:	3 graduate credits through Adams State University or BVSD
DATES & TIMES:	Workshop: May 3rd 8am-5pm Material completed by December 31st, 2014
LOCATION:	Boulder Career and Technical Education Center 6600 Arapahoe Rd., Boulder CO 80303

Course Description:

This course is designed for elementary and secondary teachers who are interested in utilizing, creating and/or maintaining their school garden for the year and wish to integrate concepts and learning into their academic curriculum. This course explores relevant environmental and botanical sciences in the design, establishment and maintenance of a garden, including practical tips for building and maintaining a school garden through an onsite workshop that will cover topics such as soil science, plant propagation, pest management and plant processes. Participants will create lesson plans that utilize the garden in core content areas using ideas and skills obtained through the workshop. Additionally, they will maintain an ongoing blog throughout the year to demonstrate their use of the garden in their instruction. Ongoing guidance and support with be offered through their participation in discussions and readings from the class website, interactions with the instructor through their blog posts and feedback on their established goals and objectives.

Expectations

- Attend workshop- *May*
- Create SMART Goals for School Garden Project - *September*
- Submit at least one lesson plan involving school garden- *December*
- Maintain a garden blog/journal for your school garden project- *December*
- Be an advocate/ liaison for your campus's school garden- *Always :)*

STUDENT LEARNING OUTCOMES:

Upon completion of the course, the student will be able to:

1. Create, develop and/or maintain a garden-based project within their district that will be utilized as an instructional resource.
2. Utilize skills developed in workshop around soil testing, amending, irrigation, plant propagation, crop production and pest management to effectively manage their garden-based project.
3. Identify areas within current curricula where inquiry-based science lessons can be developed using the school garden.
4. Develop lesson plans that utilize activities within the garden to facilitate student writing, math, science or art instruction.
5. Integrate environmental principles into age and grade-level appropriate projects.
6. Maintain records and develop a management plan for the school garden that includes; planting, irrigation, harvest and post-harvest techniques.
7. Identify resources within the community and external grant opportunities to continue to sustain, grow and develop their designed garden-based project.
8. Connect with resources provided through the classroom website and discussions, as well as access existing resources through the extension service, to effectively maintain a school garden and troubleshoot challenges that may arise throughout the growing season.

TEXTS, READINGS, INSTRUCTIONAL RESOURCES:

Resource Guide: provided at workshop

Online resources will be available on the classroom website:

These include:

Colorado State Extension Fact Sheets: http://www.ext.colostate.edu/pubs/pubs.html

COURSE REQUIREMENTS:

1. **Workshop activities:**

   Each student will complete the following on the day of the workshop

   a. Interactive Science Notebook
   b. Soil testing lab
   c. Garden bed construction
   d. Irrigation activity
   e. Plant processes experimental design
   f. Crop scheduling activity and calendar
   g. Seed germination experiment and graph
   h. Plant propagation activity
   i. Integrated pest management plan (collaborative)

2. **Project-Based Learning Requirement**:
Each student is required to spend a minimum of 75 hours working on their project

a. Garden-Based Learning Project-
SMART GOALS- Each student must submit project objectives, strategies and timeline (using the SMART GOALS template provided) to the instructor for feedback and approval prior to implementation, within two weeks of attending the initial workshop. The completed SMART goals, including final reflection, will be submitted at the end of the semester.
Course participants must schedule a mid-project review with the instructor; please contact the instructor no later than one month after implementation of the project to schedule this review.
In addition to the mid project review, course participants must check in with the instructor a minimum of three times during the course of the project – more often, if questions come up.
HOUR LOG- Students must track hours (outside of normal school day) spent designing, building, maintaining or otherwise developing school garden using the template provided.
GARDEN BLOG/JOURNAL- Each student must post a minimum of three times during the course of the project to receive feedback, discuss challenges and refine learning outcomes with the instructor. This will be established by the student to record information regarding crop plantings and integrated pest management from year to year and can be used by the school as assignments change or new teachers/parent groups wish to take on the responsibilities of the school garden.

b. Integrated Lesson Plan – Each student must create a lesson plan to be taught wthin existing curriculum that utilizes the school garden while addressing learning outcomes from current standards. This will be submitted by the end of December, as well as posted online to the school district's lesson library.

GRADE DISTRIBUTION AND SCALE:
Grade Distribution:

Workshop Activities	30%
SMART Goals	10%
Lesson Plan	50%
Garden Blog/Journal	10%
Total	100%

Grade Scale:

90-100%	A
80-89%	B
70-79%	C
60-69%	D
59 and below	F

CLASS SCHEDULE:

WORKSHOP:

8:00am-8:45am: **Welcome and introductory activity**
-Complete an interest inventory and introduce students to interactive science journal

8:45am-9:15am: **School garden tour (on-site)**
-Visit gardens at school to see different types of season extension techniques. Students will create a math-based activity using garden structures and spaces

9:15-10:00am: **Soil Nutrients/ soil testing lab**
-Students will test soils they have brought from their school (or home) for essential nutrients and select from a grade-level appropriate lab that they can use in their classrooms to demonstrate the role of soil in plant nutrient uptake

10:00am-10:45am: **Vermiculture/ worm bin building activity**
-Students will explore the role of decomposition in soil development and fertility and create a simple vermiculture bin to use as a source of fertilizer as well as a demonstration for a variety of lessons for the classroom

10:45am-12:00am**: Plant Processes and environmental cycles activity and lab-building**
-Students will participate in a hands-on activity that demonstration the relationship with photosynthesis, respiration and transpiration and then work collaboratively in small groups to design a lesson that is grade-level appropriate for their classrooms

12:00am-12:30pm: **Working lunch (writing activity)**
-Students will create their online blog to be linked to the class website and used to keep logs of garden activity and projects throughout the year

12:30pm- 1:30pm: **Crop scheduling activity**
-Students will develop a timeline using cold/warm season crops and climate data from their county to create a schedule for starting seeds, transplanting and harvesting

1:30pm- 2:00pm: **Seed germination experiment**
-Students will design and conduct an experiment to determine factors affecting seed viability and germination rates. Using their interactive science notebook, students will explore new ways of giving instructions and procedures in a science experiment and also produce a variety of tables and chart formats for recording data that is grade-level appropriate

2:00pm- 2:30pm: **Plant propagation activity**
-Students will use a variety of asexual plant propagation techniques such as cuttings, division, layering and grafting to create new specimen that may be transplanted into their school garden

2:30pm-3:30pm: **Pest Identification and IPM strategies**
-Students will participate in an activity that identifies typical garden pests and illustrates the concepts of integrated pest management

3:30pm- 5:00pm: **School garden tour (off-site) and review/evaluation**
-Students will visit three different school gardens (one elementary, one middle and one high school) to view the various styles, layout, irrigation systems and season extension techniques and reflect on learned concepts and ways to integrate new knowledge into existing lessons and units.

APPENDIX K:
Farm-to-School Lesson Plan Template and Explanation

Farm to School Curriculum:
Lesson Plan Template

Desired Results	
Students will learn about basic concepts in agriculture and food production, while developing skills and competencies in the core content areas.	
Unit Title: **Topic(s):** **Key Concepts:**	**Course:**
Students will know:	**Students will be able to:**
Assessment Evidence	
Performance/Transfer Tasks	**Diagnostic:** **Formative:** **Summative:** **Other Evidence:**
Rubrics: (Listening, Speaking, Reading, Writing, and/or Culture)	**Student Self-Assessment and Reflection:**

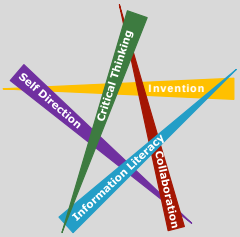
Learning Plans	
Learning Activities	
Materials	**Accommodations**
Technology Integration	

Curriculum Development Course at a Glance
Planning for Farm to School Curriculum

Content Area	Farm to School	**Grade Level**	
Course Name/Course Code			

Standard	**Grade Level Expectations (GLE)**	**GLE Code**
The Colorado Academic Standards relevant to this grade level and content area	The grade level expectations addressed over the course of the year for this grade level and content area	The codes for each GLE

Colorado 21st Century Skills



Critical Thinking and Reasoning: *Thinking Deeply, Thinking Differently*

Information Literacy: *Untangling the Web*

Collaboration: *Working Together, Learning Together*

Self-Direction: *Own Your Learning*

Invention: *Creating Solutions*

Unit Titles	**Length of Unit/Contact Hours**	**Unit Number/Sequence**
The engaging titles of each unit to be taught over the course of the year (or class)	The approximate/suggested teaching time required for each unit	The order/sequence in which each unit could be taught
		.

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Curriculum Development Overview
Unit Planning for Kindergarten Visual Arts

Unit Title	The engaging title of this unit		**Length of Unit**	The approximate/suggested amount of teaching time this unit will require
Focusing Lens(es)	The frame through which students filter information. The lens brings together concepts and content for deeper thinking and meaning making; it draws instruction (and students) continually back to the significance of what they are studying (see Erickson, 2007, p. 72)	**Standards and Grade Level Expectations Addressed in this Unit**	The codes for the Colorado Academic Standards and Grade Level Expectations met in this unit	
Inquiry Questions (Engaging-Debatable):	The engaging, debatable, and over-arching questions that frame the unit. These are relevant, catch students' interest, and guide students to think more conceptually and abstractly (i.e., these questions will not have one "correct" answer)			
Unit Strands	The large concepts (see below) that provide the unit's *breadth*-the larger standards landscape this unit covers. In the Colorado Academic Standards, these are typically the standard areas within in a discipline			
Concepts	The timeless and universal aspects that provide the unit's *depth*- the aspects within a standard that transcend specific places, cultures, and times			

Generalizations **My students will Understand that…**	**Guiding Questions** **Factual**	**Conceptual**
The essential and conceptual understandings in which two or more concepts are stated in a relationship and are supported by the critical content. Generalizations represent the big/deep student understandings that build as result from the teaching of a unit; they transfer/apply across learning experiences (see Erickson, 2007, p. 31, 71)	These (convergent) questions link directly to building the generalizations and are tied to specific topics/content and typically have objective, definitive and/or right/wrong answers	These (divergent) questions link directly to building the generalizations and are designed to provoke thoughtful, multiple, and/or subjective answers that ask for deeper levels of thinking

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Curriculum Development Overview
Unit Planning for Kindergarten Visual Arts

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
• The "locked in time and place" topics and factual information that students must know in order to successful master the unit's larger understandings (generalizations)	• The transferable skills (i.e., skills that are applicable across content areas) that will be introduced and/or refined in order for students to successful master the unit's larger understandings (generalizations)

Critical Language…	
EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend the critical language in the following statement: *"Mark Twain exposes the hypocrisy of slavery through the use of satire."*	The Academic and Technical (Tier 2 and Tier 3) ***vocabulary, semantics, and discourse*** which are particular to and necessary for accessing a given discipline. ▪ Cross discipline *and* discipline specific language and discourse patterns (language of academic success) ▪ Extended, reasoned, logical, precise, connected discourse ▪ Language of instruction ▪ Language of academic texts (receptive & productive) ▪ Language of assessment
Academic Vocabulary:	Cross discipline language and discourse patterns
Technical Vocabulary:	Discipline-specific language and discourse patterns

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APPENDIX L:
"Garden as a Classroom" Lesson Plans

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **Plant Parts and Their Jobs**

Grade Level: First Grade

Subject: Science

Standards:

Life Science: Each plant or animal has different structures or behaviors that serve different functions
Life Science: An organism is a living thing that has physical characteristics to help it survive
Health: Eating a variety of foods from the different food groups is vital to promote good health

Materials:

- Books about plant parts such as the "Pebble Plus" series by Vijaya Khisty Bodach (*Flowers, Leaves, Roots, Seeds*)
- FOSS Unit: New Plants plant diagram
- Markers/colored pencils

Lesson Time: 45 minutes

Overview:

Students identify structures of edible parts of plants and discuss the things that plants need in order to survive.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **Garden Observations**

Grade Level: First Grade

Subject: Science and Health

Standards:

Life Science: An organism is a living thing that has physical characteristics to help it survive
Life Science: Use direct observations and other evidence to support ideas concerning physical characteristics that help plants and animals survive
Health: Eating a variety of foods from the different food groups is vital to promote good health

Materials:

- The book *How Groundhog's Garden Grew* by Lynn Cherry
- Harvested garden plants
- Baskets labeled with plant parts
- Shovels, garden gloves
- Scissors, glue
- Sorting chart

Lesson Time: 60 minutes

Overview:

Students will visit the school garden to learn where food comes from and how it's harvested.

Boulder Valley School District
Farm-to-School Curriculum

Lesson: **Vegetable Soup**

Grade Level: First Grade

Subject: Science and Health

Standards:

Life Science: An organism is a living thing that has physical characteristics to help it survive
Life Science: Use direct observations and other evidence to support ideas concerning physical characteristics that help plants and animals survive
Health: Eating a variety of foods from the different food groups is vital to promote good health

Materials:

- Crock pot, bowls, spoons, salt, pepper for taste
- Variety of vegetables
- Variety of unhealthy snacks
- The book *Vegetable Soup* by Lois Elheart

Lesson Time: Two 30-minute sessions

Overview:

Students will identify and explain why some foods are healthy and some foods are unhealthy using crops from the garden.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **The Rainbow Plate**

Grade Level: First Grade

Subject: Science and Health

Standards:

Life Science: An organism is a living thing that has physical characteristics to help it survive
Life Science: Use direct observations and other evidence to support ideas concerning physical characteristics that help plants and animals survive
Health: Eating a variety of foods from the different food groups is vital to promote good health

Materials:

- The book *Mossy* by Jan Brett
- Tag board paper (cut in the size of a placemat)
- Glue
- Various colorful pictures of food

Lesson Time: Two 30-minute sessions

Overview:

Students will learn about different vegetables from the garden and name a variety of colorful foods they need to eat in order to stay healthy.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **Tops and Bottoms**

Grade Level: Second Grade

Subject: Language Arts

Standards:

Language Arts: Use a range of strategies efficiently to construct meaning from literature

Materials:

- The book *Tops and Bottoms* by Janet Stevens
- Computer and digital projector
- Trowel
- Ruler
- Seeds for tomatoes, beans, onions, cauliflower, lettuce, squash

Lesson Time: 2 to 3 days

Overview:

Students will discuss a story about growing plants in a garden, act it out in small groups, and plant seeds.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **Become Farmers**

Grade Level: First Grade
Subject: Science, Reading, Writing
Standards:

Writing:
Presentation of Knowledge and Ideas
With guidance and support from adults, recall information from experiences, or gather information from provided sources, to answer a question.
Reading:
Use text features (titles, illustrations, headings, bold type) to locate, interpret, and use information.
Science:
Offspring (new plants) have characteristics that are similar to but not exactly like their parents' characteristics
Analyze and interpret data about the needs of plants and animals

Materials:

- Various gardening books for children (ask your librarian to show you and your students the section in the library so you will know what is available in your school)
- YouTube videos on gardening
- Dead plant and a thriving plant
- Various vegetable seeds, label for each student's plant, Small paper cups
- Soil (70% top soil, 30% compost) – or a "Planter's Mix"
- Plot for garden
- Small digging tools
- Notebook for each child to record his/her observations of growth.

Lesson Time:
Will span several months as the seeds are planted and then begin to grow. Each day will need 5-15 minutes for observations and short discussions.

Overview:
First grade students will become farmers in this lesson about planting and caring for seeds and seedlings over time. They will not only take care of the plants, they will also keep track of growth, label illustrations and monitor progress using science journals.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: Learning to Eat Through Literature

Grade Level: Second Grade

Subject: Health

Standards:

Health
Physical and Personal Wellness
-Identify eating behaviors that contribute to maintaining good health

Language Arts
Speaking and Listening
-Engage effectively in collaborative discussions

Ed Tech
Illustrate and communicate original ideas and stories using digital tools and media-rich resources.

Materials:

- Set of Chromebooks or 1 class period in the Computer Lab;
- Books: *The Berenstein Bears Grow-It! Mother Nature Has Such a Green Thumb* by Stan & Jan Berenstein; *From Seed to Plant* by Gail Gibbons; *Good Enough to Eat: A Kid's Guide to Food and Nutrition* by Lizzy Rockwell

Lesson Time: One class period

Overview:

A second- grade class will begin their unit on Health/Gardening by first learning about choosing healthy foods, snacks, and drinks every single day. They will read three books and complete two Wixie activities. This lesson will be a springboard into further lessons about seeds, plants, gardening, soil, and planting. It will also set the stage for having the class decide on two vegetables to plant in the garden.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **The Circle of Life: Part 1**

Grade Level: Third Grade

Subject: Science

Standards:

Life Science: The duration and timing of life-cycle events such as reproduction and longevity vary across organisms and species

Materials:

- Books about the life cycle of plants and insects
- Poster paper
- Markers

Lesson Time: Two 60-minute sessions

Overview:

Students compare the life cycle of plants to that of insects. They create posters, write a reflection in their notebooks, and use a Venn diagram to compare and contrast.

Boulder Valley School District

Farm to School Curriculum

Lesson**:** **The Circle of Life: Part 2**

Grade Level: Third Grade

Subject: Science

Standards:

Life Science:
The duration and timing of life cycle events such as reproduction and longevity vary across organisms and species

Lanuage Arts:
Introduce a topic and group related information together: include illustration when useful to aiding comprehension

Materials:

- Document camera
- Science notebook
- Markers

Lesson Time: One 30 minute sessions

Overview:

Students will use information generated from Part One of this lesson to work in groups comparing the different stages of lifecycles and generate a discussion around their findings.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **Packet to Package**

Grade Level: Fourth Grade

Subject: Language Arts

Standards:

Language Arts: Students apply research skills to locate, select, and make use of relevant information
Skimming to find information related to a topic by identifying key terms
Formulating research questions

Materials:

- Poster paper
- Markers

Lesson Time: 60 minutes

Overview:

Students will analyze data provided on seed packets and create a document to schedule the planting of seeds.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **Seasons, Soil, and Seeds**

Grade Level: Fourth Grade

Subject: Math

Standards:

Math: Appropriate measurement tools, units, and systems are used to measure different attributes of objects and time
Represent measurement quantities
There is an interaction and interdependence between and among living and non-living components of ecosystems

Materials:

- 6 – Meat thermometers – with a minimum six inch probe
- Ruler, clipboards, pencils and science notebooks
- Worksheet with data table (attached)
- Books such as *If You Hold a Seed* by Elly McKay, *From Seed to Plant* by Allan Fowler, *The Vegetables We Eat* by Gail Gibbons, *Roots, Shoots, Buckets, and Boots: Gardening Together with Children* by Sharon Lovejoy, *Time for Kids: Plants!* by Brenda Iasevol, and *Roots* by Vijaya Khisty Bodach
- Variety of seed packets (ideally several from different growing seasons; at least one per student)

Lesson Time: One class session each month over the course of a year

Overview:

Students collect data such as temperature, height, and plant growth over time and create graphs to analyze data.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **Farm Field Trip**

Grade Level: Fifth Grade

Subject: Health

Standards:

Health:

a. Identify eating behaviors that contribute to maintaining good health
b. Make a personal commitment to improve food choices
c. Choose healthy foods and beverages instead of less healthy ones
d. Use current federal nutrition standards and guidelines to plan healthy meals and snacks (MyPlate)
e. Demonstrate the ability to identify and select healthy from unhealthy foods
f. Summarize how to request politely foods that are more nutritious
g. Analyze the difference between disordered eating and eating disorders
h. Investigate potential health effects of dyes, preservatives, and other additives in our food

Materials:

- Carrots or other locally grown vegetables
- Student notebooks/pencils

Lesson Time: Three 45-minute sessions, plus a field trip to a farm

Overview:

Students prepare for a trip to a local farm and participate in a taste test of locally grown food.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **Salad Bar Math**

Grade Level: Sixth Grade

Subject: Math and Health

Standards:

Math: Quantities can be expressed and compared using ratios and rates
Health: Analyze how positive health behaviors can benefit people throughout their life span

Materials:

- Jars or containers with lids
- Oil (different types)
- Vinegars (different types)
- Herbs from the school garden
- Salt/sugar

Lesson Time: 60 minutes

Overview:

Students practice concepts around ratios by mixing different salad dressings for their garden produce.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **Classroom Composting with Red Wigglers**

Grade Level: Sixth Grade

Subject: Science

Standards:

Life Science	Organisms interact with each other and their environment in various ways that create a flow of energy and cycling of matter in an ecosystem. SC09-GR.6-S.2-GLE.2
	Connections with other disciplines and information acquisition

Materials:

- Red wiggler worms
- Worm bin filler: shredded newspaper, dry crushed leaves, chopped vegetable waste
- Worm bin with air holes
- Shallow bin for observations
- Magnifying glasses
- Observation graphic organizers
- Copies of the book *Worms Eat My Garbage* by Mary Appelhof

Lesson Time: Two 40-minute sessions

Overview:

Lesson 1- Introduce composting and the use of red wiggler worms to compost. Give students the opportunity to observe/explore the worms and ask questions/make predictions about the worms' behavior
Lesson 2- Set up the vermicompost bin, read sections from "Worms Eat Our Food", and make a poster to be hung in the class about what can be composted.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **Optimizing the Size and Space of a Garden Plot**

Grade Level: Seventh Grade

Subject: Math

Standards:

Math: Quantities can be expressed and compared using ratios and rates
Health: Analyze how positive health behaviors can benefit people throughout their life span

Materials:

- Tape measures
- Worksheet printout
- Whiteboard or paper for making chart of measurements

Lesson Time: 40 minutes

Overview:

Students apply concepts learned in geometry to help arrange plants within rectangular garden beds.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **Benefits of Nutrients**

Grade Level: Seventh Grade

Subject: Health

Standards:

Standard: 2. Physical and Personal Wellness in Health

Materials:

- Computer and projector
- MyPlate power point
- Paper plates
- Markers of different colors

Lesson Time: 2 days

Overview:

Students will be taught about nutrients (vitamins and minerals) and the importance they have on our bodies. In this lesson, they will study which fruits and vegetables carry certain vitamins and minerals, the affect such nutrients have on our bodies, and why they are an important part of everyone's daily diet.
Students will also be introduced to portion sizes from the MyPlate presentation. They will discuss what portion sizes look like in their own opinion of their plate. Students will then draw portion sizes that they feel are appropriate on individual paper plates.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **Who Gives a Bean about Kernels, Seeds, and Sister? (Spring/May lesson)**

Grade Level: Eighth Grade

Subject: Social Studies: U.S. Society

Standards:

Social Studies	Explores the relationship of resources and how they lead to cooperation or conflict
	Demonstrates how collaboration leads to improved crops, which leads to more viable agricultural sources
Geography	Examines places, regions, and connections

Materials:

- Corn, bean, and squash seeds
- Gardening tools
- Graph paper
- Tape measure

Lesson Time: One 90-minute lesson

Overview:

In this lesson, students are introduced to the evolution, importance, and uses of corn in colonial America. They will learn about the trading of agricultural resources for survival, as well as the history, concept, and creation of a Three Sisters Planting Plan.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **A Harvest to Eat and Dye For (Fall/September lesson)**

Grade Level: Eighth Grade

Subject: U.S. Society

Standards:

Social Studies	Explores the relationship of resources and how they lead to cooperation or conflict
	Demonstrates how collaboration leads to improved crops, which leads to more viable agricultural sources
Geography	Examines places, regions, and connections

Materials:

- Containers/bags for harvesting vegetables
- Large Crock-pot, old white t-shirts or cloth, and indigo dye ($14, must be ordered in advance from http://www.knitpicks.com/cfAccessories/Accessory_Display.cfm?ID=80641&media=PPCgpGen&gclid=CNun06fslMUCFZeDaQodg0oAQA&utm_source=media&utm_medium=marketing&utm_campaign=PPCgpGen
- Two large plastic tubs and water for dyeing
- Set of Classroom Chromebooks

Lesson Time: One 90-minute class period

Overview:

Students investigate primary documents that speak to the importance of early agricultural resources in colonial America and their relationship to geography and indigenous people, trade and survival, while using natural dyes made from plant pigments to tie-dye shirts.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **Como es el Jardín?**

Grade Level: Middle or High School

Subject: **Spanish**

Standards: World Languages

Standard 1: Communication in a language other than English
Standard 3: Connections with other disciplines and information acquisition

Materials:

- To review comparisons, you may want to use this video:
  https://www.youtube.com/watch?v=gHYUjQZhtSk
  or this one with more/less commands
  https://www.youtube.com/watch?v=uWecVfkkMds
- Access to school garden
- Notebooks, writing materials

Lesson Time: 90 minutes

Overview:

Students review comparison vocabulary and learn names of different fruits and vegetables. Using items from the school garden, students will make comparisons and answer questions in Spanish.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **La Mariposa Monarch**

Grade Level: Middle School

Subject: Spanish

Standards: World Language

Communication in a language other than English
Knowledge and understanding of other cultures
Connections with other disciplines and information acquisition

Materials:

- Template for monarch butterfly design
- Postage and envelope to send monarchs made by the classroom to Journey North by the necessary deadline (see Journey North website at http://www.learner.org/jnorth/tm/symbolic/About.html). Also include return postage in order to receive monarchs back from students in Mexico in the spring
- Milkweed seeds or seedlings to be planted in the school garden
- Containers and soil for seeds or seedlings

Lesson Time: 3 to 5 class periods

Overview:

Students learn about the cultural and environmental importance of the symbiotic relationship between plants and butterflies.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **Goals and Gardening**

Grade Level: Middle School

Subject: Counseling lesson for all students: goal setting

Standard:

> Standard 6: Students will demonstrate the knowledge and skills necessary to make decisions, set goals, and take action to achieve their proposed goals

Materials:

- PowerPoint for goal setting

Lesson Time: Four class periods, with follow-up time to work in the garden

Overview:

Students learn how to set SMART goals and then work together on building a garden project collaboratively.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **The Great GMO Debate: GMOs in Our Food System**

Grade Level: High School

Subject: Science and Language Arts

Standards:

Life Science	Physical and behavioral characteristics of an organism are influenced to varying degrees by heritable genes, many of which encode instructions for the production of proteins
	Evolution occurs as the heritable characteristics of populations change across generations and can lead populations to become better adapted to their environment
Language Arts	Deliver organized and effective oral presentations for diverse audiences and varied purposes

Materials:

- Computers with access to databases
- Debate timesheets and roles

Lesson Time: 3 to 5 class periods

Overview:

Students gather and analyze information from several different sources about genetically modified organisms in our food system and identify pros and cons of potential impacts. Students discuss the concept of credible sources and learn to use a library database to find factual, peer-reviewed information about GMO technology. Students participate in a debate about the topic of GMOs, taking either an affirmative or negative stance and using evidence to support their claims.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **The Great GMO Debate: Accessing Credible Information**

Grade Level: High School

Subject: Language Arts

Standards:

Language Arts	Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

Materials:

- Presentation on analyzing sources for credibility
- Computers with access to databases

Lesson Time: 1 class period

Overview:
Students learn how to analyze a variety of print and online sources for credibility and use databases to access information available in peer-reviewed journals.

Boulder Valley School District

Farm-to-School Curriculum

Lesson: **The Great GMO Debate: Considering All Sides**

Grade Level: High School

Subject: Science and Language Arts

Standards:

Life Science	Physical and behavioral characteristics of an organism are influenced to varying degrees by heritable genes, many of which encode instructions for the production of proteins
	Evolution occurs as the heritable characteristics of populations change across generations and can lead populations to become better adapted to their environment
Language Arts	Deliver organized and effective oral presentations for diverse audiences and varied purposes

Materials:

- Debate roles and schedule of speaking times
- Notecards, pens, etc.
- Debate scoring rubric

Lesson Time: 1 class period

Overview:
Students work in teams to support or negate a side in a debate around a local issue involving genetically modified organisms.

APPENDIX M:
Columbine Elementary Greenhouse Project

Columbine Elementary's "Growing Dome" Greenhouse - a 21st Century Learning Center

Boulder community unites for hands-on, year-round garden education

On March 10, 2014, students, parents and staff at Columbine Elementary in Boulder, Colorado, held an "Open Greenhouse" event - the first chance for the community to check out their newly constructed 33 foot-diameter geodesic Growing Dome Greenhouse. The greenhouse is a pilot project for BVSD schools, expanding their current Garden to Table program for year-round gardening and a hands-on learning center for students.

"The classroom of the future looks different - it's a place where students learn about math, science, sustainability, conservation, working in groups, and it's done in a relevant way that fosters them becoming 21st century learners," says Columbine Elementary Principal Guillermo Medina. "Our teaching staff sees the validity of how the Growing Dome provides a learning opportunity that contextualizes standards and makes them relevant to students in ways that make sense."

Columbine Elementary is proud to offer this model Greenhouse & Garden to Table Program for students. The goals are to encourage children to seek, grow, prepare and eat nourishing, delicious and sustainably grown food, empower them to make choices that have a positive influence on their personal health, family, community and surrounding environment, and create a more vibrant learning environment.

The Greenhouse is a compliment to the already successful Garden to Table Program offered at the school in partnership with the Growe Foundation. This program includes in-ground garden preparation, spring planting, spring and fall harvesting, healthy lifestyle lessons, and curriculum guides for teachers. The Growe Foundation has created these successful programs

at many schools in Boulder Valley School District and provides the materials, guidance and support for the gardening program.

In March of 2014, after five years of PTA fundraising and planning, Columbine built a 33' geodesic "Growing Dome" greenhouse to compliment the in-ground garden program and serve as a year-round growing and learning center for students. The greenhouse is a great addition to the traditional Garden to Table Program since the primary growing season in the region is largely outside of the regular school year. The greenhouse enables students to partake in growing their own food throughout the school year and provides an excellent hands-on learning center for science, math, and language arts.

Growing Gardens, a nonprofit offering gardening education at a nearby community garden, is teaching free benchmark-specific lessons in the greenhouse in both Spring and Fall to all of Columbine's classes. Growing Gardens has worked with the Growe Foundation to develop complementary programming for each grade level.

Programs in the Greenhouse are free to students and taught by Growing Gardens educators. Teachers are invited to sign up for classes which are aligned with grade level academic standards and complement lessons taught through the Growe Foundations' Garden to Table Program. From learning about seeds, edible parts of plants to life cycles, aquaponics and gardening for health to greenhouse growing design and planting, the comprehensive Greenhouse education program is truly a 21st Century learning lab experience reaching approximately 500 students per year through school and after school programs.

Columbine Elementary's Greenhouse Program Coordinator also offers after-school Greenhouse and Garden Club classes weekly for Columbine students as part of the Family Resource Schools programs. Activities include planting, watering, weeding, vegetable tasting, learning about foods from around the world, medicinal plants, urban and sustainable agriculture, aquaponics, composting and more. Seedlings are grown for a Spring Garden Plant Sale to raise money for materials and maintenance.

Teachers and students participate regularly in the maintenance and care of the greenhouse by spending at least one day per month watering plants, feeding fish, hand-pollinating, and harvesting vegetables for delivery to the cafeteria. These veggies are used in the school salad bar or are used by teachers to make a classroom treat.

The Boulder Valley School District supports this pilot project as a replicable model for other schools. In May of 2014 the BVSD Superintendent awarded Columbine's Principle and two Parent Coordinators onto the "Superintenden'ts Honor Roll" in recognition of outstanding commitment and leadership for the support of BVSD students.

Installation and construction of the Growing Dome Greenhouse was made possible thanks to generous donations from Columbine Elementary families, staff and community members, as well as community partners. What started as a design idea as part of Columbine's remodel in 2012 become a reality.

The Growing Dome was constructed the first four days of March by approximately 30 volunteers - parents, teachers, neighbors and community members, with two supervisors from the company that makes the geodesic domes, Growing Spaces. The greenhouse is designed to be off-grid - requiring no supplemental heating. It features a water tub that acts as a heat battery, with solar powered fans, waterfall, and also LED motion-sensor lighting thanks to Citizens for Clean Energy.

"We are excited to offer year-round, hands-on gardening education and an outdoor learning center to our students," says Micah Parkin, PTA board member and Greenhouse Program Coordinator. "The greenhouse is an excellent way for students to see their academic learning from the classroom extended in the real word, connecting what they have learned in math, science and social students as they engage in greenhouse activities - and, they will have fun while doing it!"

To learn more about the Columbine Elementary Greenhouse & Garden to Table Program:

- *Check out this PowerPoint presentation.*
- *Check out our Greenhouse and Garden to Table Brochure to learn more about the lessons in our school garden and growing dome. Link to Spanish Brochure.*
- *Read more about the positive impact this program will have on the Columbine Community!*

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CREDITS

Boulder Valley School District Food Services Staff

This manual was written by Boulder Valley School District Food Services staff as well as other members of the community. It is intended for use by school and community partners and school districts in support of school gardens, Farm-to-School programs and related programming.

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