

iGardening: Integrated Activities for Teaching in the Common Core Era

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At first glance, implementing the new Common Core Standards, with their dramatically higher learning expectations for early elementary students, may seem like a daunting task.¹ We think there has never been a better time for K-2 teachers to begin developing lessons that integrate all disciplines, promote higher order thinking, and make purposeful use of new technologies.²

Interdisciplinary instruction challenges students to think critically. It requires teachers and students to collaborate with peers and experts, both inside and outside of the school setting. Higher-level instruction also lends itself to the type of student inquiry inspired by project-based and place-based education. Both approaches are based on student inquiry into real-life



First graders collaborate with fourth grade to harvest carrots. A few students were acting as photojournalists to document the event.



Students harvesting worm castings using a sifter. Insert: Students measuring space between seedlings in the garden.

questions and lead to long-term, multifaceted projects.

Focusing on Problems and Places

In the early 1900s, William Heard Kilpatrick (1871–1965) reasoned that students could learn a great deal through a problem-based curriculum that mirrored their own lived experiences and proposed that the value of the well-designed classroom project was to be found in “the wholehearted purposeful act.”³ Place-based learning is built around projects that use local geographical, historical, ecological, and cultural attributes of a community as meaningful starting points for learning.⁴ Both of these ideas serve as models for innovative, hands-on, higher-level learning in K-12 classrooms, often using technology as an appropriate tool.

This article explores the ongoing work of Amanda, a first grade teacher, and her efforts to integrate these ideas into a technology-based, integrated unit of study focused on school gardening.⁵ In what began as a journey to find thoughtful applications of technology in her classroom, Amanda was able to bring social studies, language arts, mathematics, and science together in a hands-on, inquiry-based unit. In this article, we invite early elementary teachers to adapt some of these activi-

ties for their students, or to use them as inspiration for wholly new teaching activities.

An Idea for a Unit Takes Root

Amanda admits that she has never been the type of person that others would consider to have a green thumb, much less grow a garden. In fall of 2012, however, the stars were aligned too perfectly for her not to give it a try with a class of six- and seven-year-old students. Amanda had been awarded ten iPads through a small grant and had completed a Project-Based Learning (PBL) certification through the Buck Institute of Education (BIE). Other teachers had been awarded several agriculture grants to help the school become a food-growing institution. In the spirit of collaboration, Amanda teamed up with some of these grant recipients to envision a school garden.

This school garden team recognized that their first challenge was to raise enthusiasm among their colleagues more widely, to show other teachers that gardening was not a task or chore, but a pedagogical opportunity.

Amanda started by examining all of the local resources she could take advantage of, listing the skills she wanted her students to learn (and the correlating standards), and becoming familiar

with digital resources she could incorporate. She also outlined how she would manage such an involved project. She used lesson planning templates provided by the BIE to develop a driving question, to determine what skills and knowledge would need scaffolding throughout the investigation, to create formative assessment options, and to plan day-to-day activities (which were plotted on the project calendar). This planning process ensured that content areas were integrated and that the instructional time needed each day for this project could be arranged.

Fortunately, quality resources for planning a unit on sustainability are abundant. Amanda used PBL garden-related tasks as a guide for unit planning and researched local and international organizations to identify major themes centered around gardening, such as: sustainability, organic gardening, composting, healthy eating choices, and garden maintenance. She used Twitter to connect with food growing schools, organizations for sustainability, and experts in vermiculture (the cultivation of earthworms). The county's cooperative extension was a valuable source for knowledge and leads for contacting experts.

Skype Classroom also served as a valuable resource. As the weeks progressed, students often held Skype sessions with national museum staff, park rangers, students' adult family members who farm, and other students who grow food. These conversations were exciting to plan and quite informative.

Amanda made a strong effort to utilize local experts in agriculture to build relationships within the community. A county extension master gardener was delighted to show students around the community gardens, introducing them to new foods and techniques for maintaining their own garden. Later, she came to the school to show students how to test the soil and suggested ways to landscape the space available for the gardens.

The students were especially excited to learn more about soil and organic matter from our guest expert, Dennis Holman, from Georgia Wigglers Worm Farm (who also works with Georgia's Department of Education.) He was so impressed with the students' interest in gardening and sustainability that he donated materials for building additional plots in the courtyard for vermicomposting (composting with worms). His generosity was contagious, as students' parents soon sent in seedlings, mushroom compost (see www.mushroomcompost.org), and tools. Parents also volunteered to help prepare the space. Since then, several other teachers have decided to make gardening a part of their students' learning experience, and the school has hosted several community workdays in the garden.

The Seeds of the Unit: Standards

The units Amanda designed posed key questions for investigation. The first unit, "Modern Technologies and Farming," asked, "How have new technologies in farming and weather prediction affected the way we grow food today?" The second unit, "Sustainability: Practical or Too Expensive?" required students to investigate whether growing one's own food was less or more expensive than purchasing commercially grown food. Amanda designed each unit to be implemented over

three to four weeks, but data collection and maintenance were ongoing. All content areas were integrated throughout the unit, with a heavy emphasis on the application of mathematics, ELA CCGPS (Common Core Georgia Performance Standards) as well as the Social Studies GPS.

For example, first grade students were to engage in activities that required them to apply measurement skills, to collect and analyze data, and to apply knowledge of numbers and operations in base ten (1.MD.1,2,4; 2.MD.1,3-5,9; 1.NBT.1, 4). Students engaged in all of the Standards for Mathematical Practice (SMPs) during the activities, and a heavy emphasis was placed on precision during collaboration with peers. The research necessary for this investigation exposed students to a variety of informational resources, and required them to compare content and quality of resources, and use the information they collected to make decisions and defend their findings to an audience (1.RIT.5,6,9,10; 1.W.1-8; 1.SL.1-3). To address social studies standards, the author chose to focus on two historical figures who played an important part in our understanding of agriculture, Benjamin Franklin and George Washington Carver (SS1H1a).⁶

Students were involved in data collection, measurement using nonstandard and standard units, and math operations. The lessons also suggested ways to differentiate activities to accommodate the needs of all learners. (For an outline of the two units, send an e-mail to Amanda Cavin at acavin@henry.k12.ga.us)

Playing in the Dirt: Administering the Unit

The project began with a discussion related to the two key questions. Following a short discussion, students formed a hypothesis based on their prior knowledge of plants, farming, weather, and food costs. In some settings, it is quite possible that some students may be unable to form a hypothesis at the start of the project due to a lack of prior knowledge. A reasonable alternative would be to ask students to form questions during the investigation. Peer groups were differentiated based on their hypotheses. Formative assessment tasks were also given to students to determine prior knowledge and to inform instructional planning for individual students throughout the unit. Each day, representatives from the peer groups recorded their findings and thoughts about the gardens on an Internet "back channel."⁷

The back channel served as a platform for parents and members of the school community to see what their children were learning and to pose questions related to their research. Students also blogged (once a week) about their experiences. They kept a digital journal, and entries included narratives of the investigation, descriptions of observations, and persuasive pieces about student preferences for organic or inorganic food. The investigation concluded with students creating a digital flipbook of their journal entries, which served as the final assessment activity. This task included features of a nonfiction text, which students then added to a digital portfolio.⁸ As an alternative to the flipbook, students could choose to make a documentary using iMovie

that highlighted the concepts learned and practiced during the investigation. These types of products promote creativity and give students a voice to share their learning and passion.

Students also collected and analyzed data pertaining to gardening. At the beginning of the unit, students used resources like *The Farmer's Almanac*, *George Washington Carver's Bulletins*, state park websites, and conversations with a local master gardener and park ranger to determine the types of plants that might thrive in our locale. Groups were responsible for researching plants for a specific region of our state and then presenting their findings to the class. The information was organized and QR Codes were generated to build an interactive regional map of the state (see photo) using a QR-code generating program named "i-nigma" (a play on the word "enigma," available at itunes.apple.com). Students then determined which fruits and vegetables would probably grow best in our area, and then collaborated to determine which seeds or sprouts to purchase.

Students discussed the meaning of a sustainable, organic garden. Free iPad apps such as "Veggie Calculator" and "Veggie Calendar" helped students calculate how much food would have to be grown to sustain the class for one year. Students worked in pairs to determine how many plants were needed and prepared to present their findings—noticing, in the process, that repeated addition is akin to multiplication (a third grade math standard in the state). Similarly, students determined the total cost of the garden materials (e.g., mushroom compost, soil, plants and seeds, lumber for garden boxes or barrels, etc.) and compared that total to the cost of buying an equivalent amount of food at the grocery store. Students accomplished the task by "shopping" online sites such as Wal-Mart, U.S. Grocer, and Net Grocer. Students also explored gardening alternatives such as vermiculture by inviting a local expert to address the class. Students began to seek out other creative alternatives as a solution to the problems they encountered during the investigation.

Planting the Seeds

In addition to grant money, there were donations and some fundraisers organized by students. It was spring, and time to begin planting. Amanda gave each group or pair of students a large piece of craft paper (paper that is used for bulletin boards) to map out the garden plots, using symbols to represent plants, with proper spacing between neighboring plants. This work involved the careful measurement of the garden plots and the use of a map scale (e.g., 1 inch on the map = 1 foot on the ground).

Students selected a nonstandard or standard measuring tool of their choice (first grade Common Core standards teach nonstandard units of measure; second graders learn about standard units. We offer both forms based on the readiness of the students). Students had the choice between Unifix cubes or a standard ruler. They had to justify their selection of the tool and explain how it's used. Groups recorded their work in their math journals or used one of the digital options mentioned previously.

After planting the seeds or seedlings, students began to take daily measurements of temperature and rainfall. Students mea-

sured the height of the plants each week. Students also discussed which factors might contribute to changes in the health and growth of the plants. This activity provided a valuable opportunity for students to engage in mathematical discussions by explaining their math thinking, justifying their reasoning, making connections, and thoughtfully critiquing the reasoning of others.

Many other activities were included within the unit to promote collaboration, creativity, communication, and critical thinking. We visited local community gardens, invited parents and community members to volunteer in the garden, and compared costs of organic and inorganic foods by visiting a local grocery store.

We reached out to other food growing schools via Twitter, which led to opportunities for my students to interview other students about their gardens. We connected with a fifth grade class in Richmond, California, and learned about the gardens they grow in repurposed wine barrels. My students developed questions centered on organic methods of gardening.

We also connected with classes around the world through Skype Classroom. We joined the Global Weather Project, which connected us with classes as far away as Thailand and Sydney, Australia. We recorded the weather daily (during a six-week period) on a Google spreadsheet and commented on a chat room on the Schoolology website. The online discussions centered around weather observations. Teachers would post pictures of weather in their area and talk about how the weather affects their day and methods of gardening. Students who did not have a garden were very curious about the foods we were growing and often asked about how we started growing food at Unity Grove.

Harvesting: What We Learned

Amanda's students began creating their own homework: surveying members of their household to determine their favorite fruits and vegetables, creating a salt dough map of the physiographic regions of our state, "publishing" a nonfiction book about plants, catching ladybugs to rid green bean plants of aphids, discovering cinnamon as an organic way to rid a garden of ants, and researching ways to deter animals from the gardens when they noticed deer tracks nearby.

During most days in the garden, Amanda would often see students plucking weeds from the spaces, nibbling on lettuce, and snacking on basil. Students were so eager to share their findings with other students and adults that they organized a demonstration for PTO Math and Science night in the spring. They set up stations that included a garden tour, an iPad gardening application demonstration, and an organic versus inorganic taste test.

When students are not limited to the standards designed for only their grade level and they have the flexibility to inquire and to make discoveries of their own, learning new information becomes meaningful and students are constantly engaged and motivated. Amanda's young students demonstrated that they could go beyond nonstandard units to master standard units, go beyond writing in isolation to create a chapter book that included all genres of writing, go beyond analyzing data to use

data to make informed decisions about real world problems, and make connections between repeated addition as multiplication. Better still, students seemed to love every minute of the unit activities. Some students would rush through breakfast so they could spend time in the computer lab blogging or writing in journals before the morning announcements. Others would complete content area menu items before deadline so that they could help maintain the garden for that day. A majority of students became comfortable communicating their experiences and ideas to adults who frequently visited to learn more about interactive learning in a classroom community.

At first, this unit may seem overwhelming or unrealistic for first grade students, but that proved not to be the case. While there are risks involved, Amanda knows first-hand that her students are capable of work at this level. This project-based approach to creating lessons requires intensive planning and scheduling of resources, but the level of engagement and collaboration Amanda observed among her students inspires her to continue to change the traditional structures of the classroom to meet the needs of today's learners in both the use of technology and thinking creatively about their world. 🌍

Notes

1. For example, the Common Core Standards say that first grade students are required to “Describe the connection between two individuals, events, ideas, or pieces of information in a text” (CCSS.ELA-Literacy.RI.1.3); “Identify the reasons an author gives to support points in a text” (RI.1.8); and “With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers” (W.1.6). For more information see “Common Core State Standards Initiative English Language Arts Standards” (National Governors Association of Best Practices, Council of Chief State School Officers), www.corestandards.org/ELA-Literacy and Lucy Calkins, Mary Eherenworth and Christopher Lehman, *Pathways to the Common Core: Accelerating Achievement* (Portsmouth, NH: Heinemann, 2012).
2. There have been several articles published in *Social Studies and the Young Learner* (SSYL) concerning interdisciplinary instruction as well as incorporating technology at the elementary level. Regarding the former, see Elizabeth O. Crawford and Thea Monsion, “Drop by Drop: First Graders Learn about Water, Sanitation,

and Conservation,” *SSYL* 24, no. 2 (November/December 2011) 9-13; Eric Groce, Rachel Wilson, and Lisa Poling, “Tomb It May Concern: Visit your Local Cemetery for a Multidisciplinary (and Economical) Field Trip,” *SSYL* 25, no. 3 (January/February 2013):13–17. Regarding technology, see Bruce Feh and Kimberly Heckart, “Producing a Documentary in the Third Grade: Reaching all Students through Movie Making,” *SSYL* 25, no. 3 (January/February 2013): 18–22; Mary Beth Henning and Danielle Bell, “Second Graders Connect to their Community with a WebQuest,” *SSYL* 24, no. 1 (September/October 2011):10–13.

3. W. H. Kilpatrick. “The Project Method.” *Teachers College Record* 19 (1918): 319–335.
4. See David Sobel, *Place-Based Education: Connecting Classrooms and Communities* (Great Barrington, MA: The Orion Society, 2004); Gregory Smith and David Sobel, *Place- and Community-Based Education in Schools* (New York: Routledge, 2010); Gregory Smith and David Gruenewald, *Place-Based Education in the Global Age: Local Diversity* (New York: Routledge, 2007).
5. School gardening has been around for more than a century in public schools in the United States and grew quite popular in the early 20th century during the Country Life Movement. Our article has a deeper emphasis on technology, interdisciplinary unit planning, and younger-aged students. See Kevin C. Armitage, *Nature Study: The Forgotten Popularizer of America's Conservation Ethic* (Lawrence, KS: University Press of Kansas, 2009); Nancy P. Gallavan and Freddie A. Bowles, “School-Community Gardening: Learning, Living, Earning, and Giving,” *SSYL* 24, no. 3 (January/February 2012): 13-16.
6. “Georgia Performance Standards: GPS by Grade Level:K-8” (Georgia Department of Education) www.georgiastandards.org/standards.
7. Back Channel is a discussion-based website created to help teachers have secure discussions “chats” with their students. Amanda used the website Todays Meet (www.todaysmeet.com) with her students.
8. Amanda's students used the website Flip Snack (www.flipsnack.com) to create these portfolios.

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