

The Connected Children's Garden

A Model for Creating Unique Science Discovery Opportunities Through Children's Gardens and Technology for K-5 Children and Educators

Summary

The Connected Children's Garden project will create a model for interactive science discovery that will set a new standard for the importance of children's gardens in science education and a model that zoos, nature centers and museums will copy. The Connected Children's Garden will make a difference to children, 4-H volunteer leaders, teachers, and parents – the entire community.

The Connected Children's Garden model will effectively combine field trips to children's gardens, hands-on garden science explorations and engaging virtual extensions for 4-H programs and classrooms. Field trips to children's gardens will provide the garden science content in an interesting, engaging, fun and friendly context. Students will engage in hands-on science experiments, following the same process that scientists in the gardens follow. Experiments will be started as part of the field trip activities and data collection will occur after the field trip when classes and clubs connect back to the children's garden virtually using computer technology. Observations and measurements will be taken using live web cam images and static images captured at specific time intervals.

Children, 4-H volunteer leaders and teachers will also be able to connect with garden scientists to further explore and discover answer to their questions and discuss experiment results. As the experiments are concluded, children will be encouraged to “publish” their results on web pages. Children, 4-H leaders, teachers and parents will be encouraged to visit other Connected Children's Gardens both in person and virtually to further compare and contrast their experiments and data. Where appropriate, children, teachers and parents will be encouraged to develop gardens at their school or in their community as an “in your own backyard” source of science content.

Through the Connected Children's Garden project children, 4-H leaders, teachers and parents will experience the wonder and fun of science discovery as a scientist does. They will become linked with children's gardens in new and exciting ways both in the classroom and outside it. Their experiments and explorations will integrate technology in the same ways that a scientist does, as a tool for research, communication, data collection and to publish results. Children, 4-H leaders and teachers will experience hands-on science and technology in new ways that will excite and engage them to become eager learners. In short, the Connected Children's Garden will create a model for science exploration that interests and excites children in ways that foster lifelong learning.

Background

Children's Gardens are growing up all across the country and becoming important parts of children's outdoor learning experiences. Michigan presently has two public children's gardens – the Michigan 4-H Children's Garden in East Lansing and Dow Gardens' Children's Garden in Midland. Others are in the planning, design or construction stages. This situation is not unique to Michigan, but is happening across the country. As children's gardens are opened, they are quickly becoming popular field trip destinations for preK-5 classes and after school programs. In this role, children's gardens have the potential to significantly impact children's education, especially science education. It is, therefore, essential that children's gardens quickly develop learning experiences that effectively utilize the garden's physical sites and resources in order to enhance children's education.

As children's gardens develop effective learning experiences, two important aspects must be part of these efforts. First, existing gardens must find ways to connect, develop complimentary programs and work together to create unique garden science learning experiences. This collaboration may take many forms, and must be developed in order to offer the widest range of learning opportunities and to take advantage of the unique strengths of individual gardens. Second, any plans to address children's education must integrate computer technology. For elementary school age children, technology will be a part of everything they do, something they expect. The opportunity to create meaningful learning experiences that elegantly integrate technology is open to children's garden's educational staff. Presently there are no real examples to follow in the area of plant science education. We cannot wait for someone else to develop high quality technology integrations. We must create these, and we must create them now.

Technology applications including the 4-H Children's Garden Virtual Tour, Plant Problems, The Garden Pizza Place and Talk Back, have been prototyped and tested by the 4-H Children's Garden. These applications, tied directly to actual parts of the real garden, have been very popular with 4-H members and K-5 students and well received by 4-H leaders, teachers and parents. The Connected Children's Garden project will build on these successful prototypes.

Overall Goal:

The Connected Children's Garden project will develop a model for science learning that incorporates field trips to public children's gardens, hands-on garden science explorations and computer technology in ways that 4-H members, K-5 students, teachers and parents discover the importance, wonder and excitement of science.

Objectives:

1. Develop linkages among children's gardens, 4-H programs and schools
2. Develop coordinated K-5 learning experiences that combine garden field trips, hands-on garden activities and interactive online content
3. Effectively utilize both the common and unique aspects of individual children's gardens for garden science content and context
4. Develop a garden web cam experiment station for data collection and visits to children's gardens from 4-H clubs, classrooms and homes
5. Effectively integrate computer technology into garden science explorations

6. Promote children's gardens at schools and in communities across Michigan
7. Link garden science explorations to state and national science standards
8. Evaluate effectiveness of The Connected Children's Garden project

Develop linkages among children's gardens, schools and 4-H programs

The Michigan 4-H Children's Garden and Dow Gardens' Children's Garden will work cooperatively to develop and test meaningful linkages for The Connected Children's Garden model. One approach will be to create a Connected Children's Garden web site / network. Initially we will set up on-line linkages between the 4-H Children's Garden and Dow Gardens and plan to expand these linkages to other children's gardens as they join the Connected Children's Garden network.

To insure that all stakeholders are part of the project, an advisory panel will be assembled. This panel will include 4-H Children's Garden staff, Dow Gardens' staff, Michigan 4-H Foundation representatives, elementary school teachers, 4-H volunteer leaders, agents or staff and other stakeholders, including children, as appropriate. The advisory panel will meet quarterly.

Currently both Dow Gardens and the 4-H Children's Garden have strong linkages with schools and 4-H programs. The Connected Children's Garden will build on these established connections in order to deliver new learning experiences. Initial testing will be conducted with a limited number of 4-H clubs and classrooms that we are already working with. Further dissemination will be to other 4-H clubs and schools that utilize our garden resources and finally to 4-H clubs and schools throughout Michigan.

As new children's gardens are developed around the state they will be encouraged to join the Connected Children's Garden network. We have already had preliminary discussions with Applewood (C.S. Mott Estate) and Meijer Gardens who have both expressed genuine interest in becoming part of a Connected Children's Garden network.

Develop coordinated K-5 learning experiments that combine garden field trips, hands-on garden activities and interactive online content

The learning experiences will combine three key elements: 1) Garden field trips, 2) Hands-on activities (experiments) and 3) Computer and other digital technologies. 4-H clubs and classrooms will be encouraged to visit a children's garden for a themed science field trip. As part of this field trip, students will be involved in at least one garden science experiment. The Garden Science Experiments will be designed to emphasize science process as follows:

1. Ask a question
2. Research what you know about that question
3. Write a hypothesis about your question
4. Design an experiment to test your hypothesis
5. Collect data from your experiment
6. Present and explain your data (what does it mean?) and
7. Ask new questions.

To demonstrate science process we will develop two types of Garden Science Experiments that will be part of the field trip experience at both the 4-H Children's Garden and Dow Gardens and can also be done at home in a 4-H club or school. The first type is independent of location and should, if done carefully, yield similar results wherever the experiments are done. The second type will be location dependent and results will be expected to vary depending on location. Data comparisons and explanations among experiments at different gardens, schools and homes will focus on both similarities and differences in findings and probable explanations. The methods employed at different sites will be examined carefully to highlight the importance of a common set of methods when doing science.

Experiments will include seed germination, plant growth, flowering, fruiting and soils. Activities that focus on careful observation will be developed and will include observing and recording the weather, what plants are flowering, what insects or diseases you find and other observations. A model for these experiments is the One Sky, Many Voices program (<http://www.onesky.umich.edu/>) which provides exemplary inquiry-based K-12 weather curricula for the interactive study of current weather and air quality. Children, 4-H leaders, teachers, parents and scientists can participate from classrooms, homes, after-school programs or other educational settings. Their participation is coordinated with other participants throughout the world.

Web support and data reporting tools will be developed so students can input their findings onto a web interface, to view themselves, share with parents, and share with other participating 4-H clubs and schools. It will be possible for participants to explore findings from other locations, using a map interface enabling observation of geographic trends. Appropriate password protection and privacy protections will be designed into the system.

Effectively utilize both the common and unique aspects of individual children's gardens for garden science content and context

Field trips and science explorations will highlight both the common and unique aspects of each garden. Common garden science explorations (ie. Plant Parts, Living Things, Plant Growth) will be developed, but the specific content will vary somewhat from garden to garden. Therefore, further explorations that examine the similarities and differences in both experiment set up and results among children's gardens will be developed. Students will be encouraged to make a virtual visit to another Connected Children's Garden to find out what the experiment looks like there and why. In addition, children, 4-H leaders, teachers and parents will be encouraged to visit other Connected Gardens. Where possible, daylong family field trips will be developed to help make this happen.

Garden science explorations will build on activities and programs that are already offered at children's gardens. Therefore, initial garden science explorations at the Michigan 4-H Children's Garden will include: The Pizza Garden Experience, the ABC Garden and Composting. Initial garden science explorations at Dow Gardens will include Garden Weather and Butterfly Explorations. For all explorations, hands-on activities and virtual enhancements

and expansions will be created and delivered. Additional explorations will be developed in consultation with the advisory panel.

Develop a garden web cam experiment station for data collection and visits to children's gardens from 4-H clubs, classrooms and homes

While students will begin experiments as part of the field trip experience, the experiment will continue for weeks after the visit and data will need to be recorded. The garden web cam experiment station will enable children to collect data from their classroom or at home. As part of post field trip activities, children will connect to the garden web cam experiment station in order to observe their experiment and collect data. 4-H Clubs and classrooms will schedule, with the garden, dates and times that data images are to be collected. Live web cam observations of the entire garden will also be available so that students, teachers and parents can make a virtual visit any time and from any place. During winter months, web cams will be relocated inside the conservatory at Dow Gardens or in the "Greenhouse Children's Garden" at the 4-H Children's Garden.

A web page for each 4-H club and classroom will be created containing the images that they scheduled to be captured. These image grabs can be collected into a digital video movie, allowing students to view one image at a time and also to see the sequence in motion forward, reverse, and at different speeds.

Effectively integrate computer technology into science explorations

Computer technology is an important tool in science experiments and science process. Computer technology is a part of everything that children do and teachers are under great pressure to effectively use computer technology in their teaching. Therefore, we must provide opportunities for students to use technology as a scientist uses it, for research, communication, data collection, data analysis and to 'publish' results. Through close working relationships with the award-winning design teams at the Communication Technology Laboratory at Michigan State University, we have the expertise necessary to develop computer applications that specifically meet garden science needs. The Comm Tech Lab will work with Dow Gardens and the 4-H Children's Garden to create the webcam experiment station and data collection strategies. We will also together continually explore existing and newly emerging technologies for adaptation to science learning experiences. Technology will be used to expand and enhance the hands-on explorations that are done in the garden, classroom or club.

Technology applications will include: web pages, Quick Time Video, web cams, email and interactive chat. Interactive technology linkages will be made to other parts of a Botanic garden, other children's gardens, schools, 4-H Clubs, Michigan 4-H Foundation's Kettunen Center, other resources (Museums, zoos, nature centers), state science standards, scientists and other experts.

Promote children's gardens at schools and in communities across Michigan

In order to bring hands-on garden science learning to all children, the 4-H Children's Garden and Dow Gardens' Children's Garden will promote the development of gardens at schools and in

communities across Michigan. Initial efforts will focus on offering “Growing Gardens” workshops at both children’s garden sites. Other activities will involve serving as resources for information about starting children’s gardens, how to integrate them into the curricula and how to link with 4-H programs. Additional ways to effectively promote children’s gardens at schools and in communities will be explored continually with the project advisory panel.

Link garden science explorations to state and national science standards

Connected Children’s Garden science learning experiences will be designed to address a wide range of Science Education Content Standards including Science as Inquiry, Physical Science, Life Sciences, Earth and Space Science, Science in Personal and Social Perspectives and the History and Nature of Science Standards. To empower 4-H leaders, teachers and parents to best use the Garden Science Learning Experiences, we will create a Teacher Edition Site in addition to the student site to provide teacher overviews and lesson plans and to show how each Garden Science Learning Experience relates to science education standards.

Evaluate effectiveness of the Connected Children’s Garden project

We will be user-experience testing the Connected Children’s Garden software throughout the creation process. Impacts on learning will be carried out on individual technology applications, and on the overall Connected Children’s Garden project. Research will examine the learning and motivational impact of participating in science projects that are directly linked to a children’s garden and the perceived effectiveness of virtual data collection, virtual learning and virtual garden visits according to 4-H leaders, teachers and children.

4-H leader and teacher feedback as well as children’s journals will be key tools used for assessment. In order to participate in the coordinated learning experiments and to schedule experiment image captures 4-H leaders and teachers will need to register their club or class to receive password access. Thus, we will be able to keep a database of city, state, and ages of participants. We will also be able to log web usage data to track overall use of the non-password protected question of the week and live webcams.

Sustainability:

The Connected Children’s Garden project will become an integral part of the education outreach of the Michigan 4-H Children’s Garden and Dow Gardens’ Children’s Garden and will, therefore, become part of each gardens’ budget. Fees will be charged for each garden field trip. The feasibility of an annual fee for schools or clubs to be part of the Connected Children’s garden project will be studied and initiated if appropriate. In addition, as new children’s gardens are developed and join the Connected Children’s Garden project, it will become part of their ongoing outreach programs. We are confident that the program will interest and engage students and will be in demand throughout Michigan.

Project timeline:

Objective	Activities	Year		
		1	2	3
Develop linkages among children's gardens, schools and 4-H programs	<ol style="list-style-type: none"> 1. Form advisory panel 2. Advisory panel meetings 3. Identify 4-H clubs and classes for initial testing 4. Expand to 4-H clubs and schools 	X X X	X	X X
Develop coordinated K-5 learning experiences that combine garden field trips, hands-on garden activities and interactive online content	<ol style="list-style-type: none"> 1. Develop prototypes 2. Test prototypes 3. Revise and retest 4. Deliver to schools and 4-H clubs 	X X	X X X	X X X
Effectively utilize both the common and unique aspects of individual children's gardens for garden science content and context	<ol style="list-style-type: none"> 1. Develop prototypes 2. Test prototypes 3. Revise and retest 4. Expand to 4-H clubs and schools 	X X	X X X	X X X
Develop a garden web cam experiment station to enable data collection and visits to children's gardens from classrooms and homes everywhere	<ol style="list-style-type: none"> 1. Develop experiments and data collection prototypes 2. Test prototypes 3. Revise and retest 4. Expand to a 4-H clubs and schools 	X X	X X X	X X X
Effectively integrate computer technology into garden science explorations	<ol style="list-style-type: none"> 1. Develop prototypes 2. Test prototypes 3. Revise and retest 4. Expand to 4-H clubs and schools 	X X	X X X	X X X
Promote children's gardens at schools and in communities across Michigan	<ol style="list-style-type: none"> 1. Growing Gardens workshops 2. Serve as resource 	X	X X	X X
Link garden science explorations to state and national science standards	<ol style="list-style-type: none"> 1. Garden experiments 2. Teacher Edition site 	X	X X	X X
Evaluate effectiveness of The Connected Children's Garden project	<ol style="list-style-type: none"> 1. Develop protocols 2. Collect data 3. Evaluate data 4. Reports to Dow Foundation 	X X X X	X X X X	X X X X