Project Name
EARTH STEWARDSHIP PROJECT

Global Project Theme	Grade/Age Level	Length of Unit
Environment	5th-12th grade	5 weeks
Unit Content	**Subject Areas**	**Sequence**
1. Unit Description 2. Final Outcome 3. Content Standards/SDGs 4. Weekly Activity Plans 5. Project Presentation & Community Engagement	Physical Science Environmental Science Chemistry	**Week 1:** Investigation on the composition of soil **Week 2:** Investigation into geology of the land and land use by society. **Week 3:** Composting of waste organic material in the community into nutrient-rich fertilizer. **Week 4:** Investigation into the availability. of waste organic matter in the community. **Week 5:** Presentation of findings

Unit Description

This unit in physical science includes the application of scientific investigations to the testing of physical properties of different soil samples and characterizing the quality of the physical composition of soil matter taken from soil samples in the local environment.

Teams of students will be involved in a process of doing science that challenges their skills and abilities to gather data, record observations and perform analysis of experimental results. Measurements of soil physical characteristics are studied to determine the effects that these characteristics have on producing quality soils.

Summary of documented physical measurements of soil samples from all participating schools will be posted and shared in a digital format on the iEARN Network within the Earth Stewardship Project. Students will be able to compare and contrast recorded physical attributes posted by other students working on the project providing opportunities to open discussion as to reasons for differences in soil texture within the local school environment and at schools from across the world.

Information gathered from these scientific investigations will develop students' ability to assess causations, analyze correlations and diagnosis the effect different variables have upon mixtures of soil and their resulting ability to support plant growth.

Essential Questions

Driving Question: What is the quality of the soil outside the school building with respect to the following four physical properties :soil supporting water flow, soil retaining adequate capacity of water, soil providing adequate density and soil providing structural composition sufficient to support plant growth?

Final Outcome/Products

Scientific investigations conducted utilizing students' skills and abilities in experimental analysis, evaluation of experimental data and assessment of recorded observations.

Data tables organizing and recording experimental outcomes, calculations of derived quantities like density, visual representations of data through graphical interpretations and the use of multiple expressions of experimental methods that help to interpret and assess experimental findings.

Experimental procedures to help obtain outcomes from hypothesis-driven scientific investigations on soil physical characteristics.

Cooperative and collaborative teams of students working effectively to prepare and implement experiments, analyzing results and create necessary artifacts that provide clear and thoughtful presentations of experimental outcomes.

Whole-class shared experiences and team presentations contributing to the determination of soil quality conditions that can contribute to plant growth.

Plot soil conditions in the surrounding environment outside the school building. Teams of students assessing specific site locations collaborate and produce a **soil quality map** of the environment outside the building.

Journal writings on scientific findings, email correspondence with peers throughout the world, blog postings, newsletter publications, YouTube productions along with website and Facebook presentations.

Content Standards and Sustainable Development Goals

Content Standards:

Developing and Using Models

Planning and Carrying Out Investigations

Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

- Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-PS1-8)
- Use a model to predict the relationships between systems or between components of a system. (HS-PS1-1)

Sustainable Development Goals:
End hunger, achieve food security and improved nutrition and promote sustainable agriculture.

Develop agricultural practices that help strengthen the resilience of the ecosystem and strengthen its capacity for adaptation to climate change, extreme weather, drought, flooding and other environmental disasters, while maintaining improved land and soil quality.

Project's Contribution to Others and the Planet

The emphasis of the project is to link understanding of physical characteristics of soil to plant growth and the production of food. Sharing scientific results about different environmental conditions will help to stimulate discussions on how we live, what we believe in and how we see ourselves as members of humanity on this planet.

The ability to share ideas about **scientifically determined effective ways to grow crops** is the essence of this project. It provides the means by which we can connect and dialog with each other on a very fundamental way. This project provides the venue for students to share a common necessity and that is producing food. This basic human endeavour ties us together and helps unite our efforts to become more informed and have greater understanding to find solutions to pressing problems of food shortages on this planet.

Soil is a key component in the production of food on our planet. Soil that left untended for years may require replacement of agricultural amendments. Rock phosphorus, lime, and gypsum in applied in sufficient quantities can provide phosphate, calcium, and sulfur to soil and support plant growth. Pelleted ground limestone rock adds calcium, ground rock dolomite adds lime, and ground rock gypsum all will contribute calcium and magnesium to the soil.

Bone Meal provides a slow-release source of phosphorous. Alfalfa meal from the alfalfa plant is high in trace minerals for the soil. Kelp from seaweed in both liquid and granular forms can provide a range of trace nutrients.

Adding these minerals in rock form will require years for it to fully solubilize into a soil mixture in the ground. In general if the soil has been unintended or has been utilized for a number of years, then any addition of rock amendments will be supportive to increased soil quality and plant growth.

Putting these minerals back into soil with a high percent of sand, will require organic matter mixed into this amended soil to helping to prevent water leaching minerals out of the sandy medium.

Organic composted matter added to soil has two benefits. First it will provide needed concentrations of nitrogen to the soil mixture. Secondly, it provides physical structure that will retard and retain the flow of water through this soil mixture. The best composted organic matter is manure. It not only provides a wealth of nitrogen, but it also adds to soil structure. Organic compost from green plants is another excellent amendment to soil that increases soil quality and the success soil structure.

Week 1 Activities

Scientific Investigation of Soil Composition

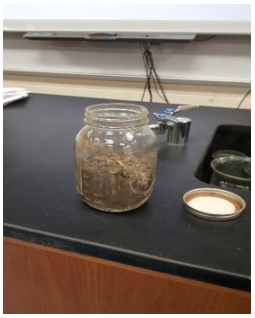
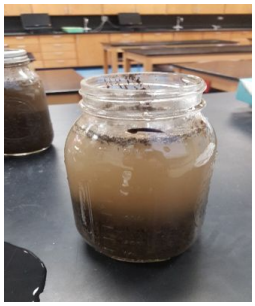
Learning Goals:

Students will be able to conduct scientific investigations utilizing their skills and abilities in experimental analysis, evaluation of experimental data and recorded observations along with presentation of findings.

Activities/Task Description

Classroom Activities

1. Teams of 2 to 3 students will be assigned specific locations outside the school building to collect and fill three one-liter bags of soil. These soil samples should be taken from three separate spots at their assigned location. Each team of students will collect three plastic bags of soil.
2. These bags of soil will be labeled by location. The bags will be sealed with tape and returned to the classroom. The preparation of these soil samples is a crucial event with respect to obtaining reliable scientific results for this project. The soil within each bag must be crushed to a consistent lite texture.
3. Take enough soil from each sample bag and add it to a quart sized glass jar (about 1 liter) until it is one-third full. Water is added to the remaining ⅔ volume in the jar. This water-soil mixture should be well mixed and left undisturbed to settle out for at least one day.
4. After a day or two take measurements in centimeters of the thickness of each layer of material. **Sand is the most dense and will be from the bottom up, silt is the next dense layer resting on top of the sand and the clay layer will rest on top of the silt.**
5. Measure the thickness of the entire sample of soil resting in the jar. Record the thickness in centimeters. Measure the thickness of each layer with a ruler in centimeters. Record the thickness of these layers in centimeters.
6. **A percent composition** of each soil type can be determined by dividing the thickness of a particular layer by the thickness of the entire soil sample. Ideal soil samples will have a percent mixture of <u>40 percent sand, 40 percent silt and 20 percent clay.</u> Students can compare their percent findings to the ideal percent composition of 40% sand, 40% silt, 20% clay.
7. Students share their results from their sample of soil with the other teams of students testing other samples of soil from the environment.

Fill glass jar ⅓ full with soil	Fill the rest of the jar with water	Soil in jar settles and the sand, silt, and clay can be measured	Measure the entire soil sample and then each of the three layers	Calculate the percent composition of each layer
				*Divide the thickness of each layer by the thickness of the entire soil sample.*

Collaboration Centre Activities

1. Students can share their lab sheets and data with the other classrooms in the project on the collaboration centre.
2. Students write their initial general conclusions on the composition of soil outside the building and share on the collaboration centre. Students should engage in discussion using the guiding questions below.
3. Student should compare and contrast the differences in local soil composition between countries.

Questions to Guide Student Feedback

What were some of the similarities or differences of composition you observed after testing the soil at different locations in the surrounding environment?

How does the soil outside the building compare to the ideal soil composition?

Why do different soil materials always stack up in the jar in the same sequence (sand, silt and clay) ?

Materials and Resources

One quart (1 liter) glass container (like mason jars) per group.
Three gallon (3.80 liter) resealable plastic bags per group to hold soil samples.
Metric ruler
Data spreadsheet to record observations at each location
Calculator
Tools and the means to dig soil samples out of ground

What is soil?
http://www.soil-net.com/legacy/advanced/what_is_soil.htm
Soil Science
https://www.soils.org/news
Soil Types
http://agverra.com/blog/soil-types/
Great website with videos and lesson resources for soil composition
https://www.natureworkseverywhere.org/resources/activity-guide-soil/

Extension Ideas

Once the composition of the soil in the surrounding environment is defined, then students can extract samples from new locations within the community and from their homes. These samples could be extracted from parks, gardens, farmers fields and from community landscapes sites.

Further investigations and analysis could be completed to explain the similarities and differences observed when testing soils from these locations.

Week 2 Activities

Investigation into geology of the land and land use by society

Learning Goals:

Students will spend the week researching information on the structure of soil mediums which include detailing soil horizons, soil formation, growth of humus material and the influence of geological location its effect upon soil development processes.

Students will research and study the formation, composition and factors that determine the soil profile in their environment. From gravel to sand to silt and organic matter, these components provide essential minerals such as phosphorous, calcium, sulfur and potassium. These minerals are key ingredients necessary for the creation of fertile soil composition.

Students will understand the many building blocks that dictate the ultimate soil formation in their local environment.

Students will discover that another very important component of soil formation is organic material that produces the humus. Humus provides essential elements such as nitrogen and it is home to microbes that support plant growth.

Students will research videos and websites from the US Geological Survey and US Forestry Service to aid their understanding of the formation and defining of the type of soil mediums produced.

Activities/Task Description

Classroom Activities

Background Information:

Having a historical perspective of the land use is an important part of this soil investigation process. Land used to grow crops or land untended for years can lose important elements necessary for plant growth. Harvesting crops from soil removes vital elements; also leaching from soil through water permeability can deplete soil nutrients.

The percent composition of the soil provided a good insight to a historical perspective of where your soil came from and the determination of needed soil amendments. Soil that has been involved with growing crops may house significantly greater quantities of nitrogen and other macronutrients like phosphorus, calcium and sulfur.

Student Research:

Students can work individually or in small groups to research the following topic areas. Each student or group can select, or be assigned, one or more of these topic areas. To conduct their research, students can use the internet resources below, additional websites, or local libraries. Students should compile their information into an presentable form - written document, powerpoint slide, poster, etc. This can be shared both with the classroom, as well as in the Collaboration Centre.

Topic #1: Formation and Origin of Soil
Student will study the formation and origin of soil in the environment. Students document the historical process of soil development on the planet earth.

Fundamentals of soil basics
https://www.youtube.com/watch?v=uP-nXy34KFA
Soil types
https://www.youtube.com/watch?v=AUhOBxVFcFk

Topic #2: Soil Horizons
Students will study soil horizons, their origins and how they are impacted by human activities. Students sketch the basic soil horizons that constitute soil structure. This can be compared to witnessed soil profiles in the local environment.

Soil environment
https://www.youtube.com/watch?v=mg7XSjcnZQM
Soil Horizons
https://www.youtube.com/watch?v=I-QTjbBTUbY

Topic #3: Soil Weathering
Students will study soil weathering and factors that influence the development of soil horizons.
Soil Weathering
https://www.youtube.com/watch?v=7iyxoclhfu0

Topic #4: Components with Soil
Students will research and study the composition of components within soil. From gravel to sand to silt and organic matter, each of these components will house within them essential minerals such as phosphorous, calcium, sulfur and potassium. Many of these elements are utilized in the plant to build amino acids, proteins and help in processing water through plant cells.

Soil Factors affecting the formation of soil horizons.
https://www.youtube.com/watch?v=US9rSig0LHE

Soil Processes that lead to the formation of soil mediums in the Earth.
https://www.youtube.com/watch?v=3Dnf2e1i9Ag

Topic #5: Geological Processes
Students will be able to detail the geological processes that lead to the development of soil profiles and resulting structural horizon within soil mediums.

Topic #6: Humus
Students will detail the level of humus through the physical analysis in week one of the project and and present reasons for this geological outcome in their environment.

HUMUS SAVES THE DAY
https://www.youtube.com/watch?v=8Q1VnwcpW7E

US Department of Agriculture US Forestry Service
https://www.fs.fed.us/research/water-air-soil/

Topic #7: Quality Soil Mediums
Students will comment on research being completed in the field on the ability to maintain quality soil mediums that are in harmony with nature and environmental sustainability.

US Geological Survey
https://remotesensing.usgs.gov/gallery/gallery.php?cat=3#632

Collaboration Centre Activities

1. Student should compare and contrast the differences in local soil composition between countries.
2. Students should share which topic they have research along with their findings.
3. Students should engage in discussion within the **Earth Stewardship forum** on land use by using the guiding questions below.

Questions to Guide Student Feedback

What played the upon soil horizon development in their local environment?

How have the soil horizons and composition changed over the years in your local environment? What causes changes in the soil composition and the quality of the soil?

What are some of the possible changes that could be made to the use of soil in your town to help improve soil quality?

Describe how close the nearest farm or plant growing area is to you in your community? Give what you have learned about soil profiles and necessary soil quality components to support plant growth, can land areas be utilized in close proximity to urban households to produce local food crops?

Describe the daily use of the land in your community.
The use of land could include *farming, roads, parks, housing, irrigation, businesses and wildlife reservations.*

How could the use of the land be altered to provide more land mass that could be used to grow crops? Is it possible to increase the quality of soil near urban areas to turn this into a crop producing medium?

This land mass would have to be amended to improve the quality and physical structure of the soil.
Is it possible in your community to do this?

Material

Survey the land use situation in your community.

Pictures representing a selection of land use in the community.

Recordings either verbal or in writing of individuals in the community that have a long-term perspective of how land use has changed over the years.

Pictorial representation (pictures and diagrams) of land use in different sections of the country.

Extension Ideas

Students can created informative brochures that showcase their community and focusing upon the use of land in many ways to help shape their futures.

Land use in a society reflect values held by its citizens. Access to land and its utilization for people, businesses and government tells a story of how society develop and what the expectations are for the future. Provide a narrative that details your feelings about hope for the future and environmental conditions you believe can be achieved.

Week 3 Activities

Composting as a source of soil amendment and rejuvenation

Learning Goals:

Students will study the composting process and work toward creating their own composting unit to help add amendments to the soil.

Students will Investigate and learn the proper material, proper mix of ingredients, proper particle size, proper volume and air and proper moisture to create an ideal organic composting process.

Students will investigate the availability of local organic waste material ingredients to be added to the final compost bin and generate the composting process from waste material into humus.

Students will investigate the means to effectively manage this composting process.

Activities/Task Description

Classroom Activities

Background Information:

Composting is a process where most of digestible organic material is consumed and transformed into a dark brown or black humus. This is called the compost.

Videos to learn about composting:
How Compost is Made - https://www.youtube.com/watch?v=cBkBwVFFEWw
How It's Made Compost - https://www.youtube.com/watch?v=-xcgtUtqJ2o
Composting for Kids - https://www.youtube.com/watch?v=dRXNo7Ieky8
How to Make Easy Compost - https://www.youtube.com/watch?v=1wltDnYKVE4

Activities:

1. If needed, provide background information on composting. You can use the videos above or your own resources.
2. Discuss and brainstorm composting unit designs. Different composting unit designs should be discussed and examined for their viability at the school. This brainstorm session should include all ideas placed on the table for review. These ideas should be documented and utilized again when a final decision is made on a workable composting unit. Use the links below for some examples of different types of compost units.

Wooden Box Compost (the dimensions need to be approximately 1 cubic meter in size)
https://www.thisoldhouse.com/how-to/how-to-build-compost-bin

Circular wire bin compost
https://www.thespruce.com/simple-compost-bin-with-wire-fencing-2539494

Garbage Can Compost
http://pallensmith.com/2014/02/27/trash-can-compost-bin/

https://www.youtube.com/watch?v=XZyox5yLiMU

3. Investigate and learn the proper material, proper mix of ingredients, proper particle size, proper volume and air and proper moisture to create an ideal organic composting process.

The average final ratio of carbon to nitrogen is 25 to 1 for the entire composting mixture of organic matter in the composter. Here are the average C/N ratios for some compostable materials that are often used. Ash leaves 25, grass 25, plants 15, manure 15, oak leaves 50, pine needles 60, sawdust 150, straw 75,vegetables 25.

In general you should plan to add 3 pounds of nitrogen rich material for every 100 pounds of carbon rich material. Another resource states that you should mix 3 parts soft green waste to 1 part woody stuff. These portions can be measured out in buckets.

Small prototype units can be constructed and studied to help simulate the workings of the actual sized structure.

4. Investigate the availability of local organic waste material ingredients to be added to the final compost bin and generate the composting process from waste material into humus. The sources of waste material should be documented and planned for use over a 6 to 12 month time frame. The supply of readily available waste material is key to the continued success of the composting process.

5. Build a **one cubic meter container,** well aerated housing the decomposing organic matter. The ratio of raw mass of carbon organic material to nitrogen-rich organic material is 25 to 1. After the composting process has completed this ratio declines to 15 to 1. The unit should have a cover or lid and it should be kept moist to the touch, but not excessive. The composting unit should also be place in the sun to help speed up the composting process.

6. Investigate the means to effectively manage this composting process which includes occasional watering, physically turning it over and the harvesting of nutrient-rich humus from the compost container. The composting process could take months to complete. Regular maintenance including turning, watering and the regular addition of new waste organic matter will help speed the process.

What goes in can be coffee grounds, old cotton, silk or wool clothing, eggshells, floor sweepings, hair and nail clippings, paper and cardboard, rabbit or hamster bedding, tea bags, vacuum cleaning dust, vegetable waste and wood ash.

What stays out is cat litter, coal ash, dairy products, disposable diapers, fish and meat waste, oils and fat.

7. Students will write a three paragraph essay that covers the following key areas:
    1. Define the goal and reason for composting waste organic material.
    2. Describe the construction and operation of the composting housing unit.
    3. Explain the time frame for processing the material and how it will be applied to the soil when the composting is completed.

Collaboration Centre Activities

1. Post your brainstorming ideas for the design of your composting unit.
2. Share your three paragraph essay.
3. Engage in a discussion using the discussion questions below.

Questions to Guide Student Feedback

What is the most effective size of a typical composting housing unit?

How can composting be utilized to amend soil and lead to higher quality and versatility?

Why is the humus that is produced so high the essential nutrients for plant growth?

What steps can be taken to optimize the composting process and maximize production of humus?

Describe your experiences working with composting and managing the process of organic decomposition over a time period.

Materials and Resources

Composting for beginners
http://www.compost-info-guide.com/beginner_guide.htm

Composting bins
http://www.compost-info-guide.com/compost_bins.htm

Composting ingredients
http://www.compost-info-guide.com/good_ingredients.htm

Other Composting Resources:
https://ny.pbslearningmedia.org/resource/ess05.sci.ess.earthsys.compost/compost-office/

Extension Ideas

A medium of half local soil and half organic material like *grass, leaves, twigs and roots,* can be blended into a mixture for testing.

Students can test these new mixtures in similar fashion to determine it is good soil or not.

Week 4 Activities

Investigation into availability of organic waste in the community

Learning Goals:

Students will be able to investigate and research sources of organic waste in the community that can be processed into nutrient-rich humus.

Activities/Task Description

Classroom Activities

The prefered mixture of brown and green organic waste material on a mass basis is 25 to 1.I

1. Have students find brown organic materials, like brown wood substances, dries leaves and dried grass clippings.

2. Have student find green organic materials, like leaves of vegetable, grass clippings, rotten fruit and vegetables, breads and pasta products.

3. Students will write a detailed list of waste material that can be categorized as brown or green sources (carbon rich or nitrogen rich) and quantities collected for future sources will be accounted for as resources.

4. Research and produce a schedule of when available organic waste resources, for yearly composting, could be guaranteed as a continuous supply of available compost material to be processed into humus.

5. Plan a year schedule of the production of humus through composting, based upon researched data of the availability of waste organic material in the community. Composting can takes weeks to complete the process into humus. When creating of year-long timeframes for continuous processing of organic waste matter into humus, this needed time should be taken into account when designing a schedule.

6. Create a plan for a community-wide effort to collect waste organic material in large volumes and utilized in composting on a city-wide basis. This effort would produce and make available a valuable resource for the community to help improve the environment.

Collaboration Centre Activities

Teams of students will share their investigative findings and these available resources can be pooled into one collective community compost effort.

The accumulation of data will help to formalize this effort and provide evidence to support

continuation of this effort.

This information, knowledge and understanding of soil quality along with qualitative observations on the environment outside the school building can be shared with students in other schools around the world conducting similar scientific investigations.

Questions to Guide Student Feedback

What are the possible reasons for differences in the soil quality?

How would the processing of organic waste matter be beneficial to soil if the resulting humus is mixed in with the current soil conditions?

Materials and Resources

Brainstorm, within teams of students, ideas of potential sources of organic waste matter (brown and green) that could be collected from sites throughout the community.

Collect data from original composition determined during week one of the project to determine how humus will change the composition of the soil.

Collaborative spreadsheet categorizing brown and green organic waste matter.

Detailed report on how these waste resources can be utilized for a year-long effort to process it into humus within the compost bin.

iEARN Network to post results world-wide.

Extension Ideas

A map of the school yard or ecosystem can be displayed and the locations identified and recorded on the map. At each sample location the density can be recorded and marked on the map. The quality of the soil outside the building can be expressed on a map.

Week 5 Activities

Elaboration and collaboration on the results of the scientific investigations into the quality of soils outside the school building.

Learning Goals:

Students think critically about physical characteristics that have great impact upon the viability of soil to support plant growth.

Students develop a hypothesis predicting the quality of soils produced as a result of adding half organic material, such as leaves, grass and twigs, an mixing this with soil obtained from outside the school building.

Students develop presentations (powerpoint presentations, tri-folds, newsletters, essay reports) reflecting their knowledge and understanding of soil quality. This informational presentation includes an introduction that defines the problem, a statement of hypothesis about the original expectations that students hope to accomplish and a clear explanation of experimental results achieved during the time of this research project.

Students will share these documents through the iEARN Network, online, in the Earth Stewardship Project forum.

Activities/Task Description

Students will judge and promote the quality of soil outside the school building. Presentations in multimedia forms help students solidify their understanding of doing science, while showcasing their experimental results in many digital formats.

Students will produce many multimedia opportunities to contribute to this effort to showcase experimental outcomes that have been discovered.

Classroom Activities
Teams of students will assess experimental data on soil density, water infiltration (depth), percolation rate (time) and soil composition (% sand, % silt, % clay) from results of their experimentation over the past four weeks. Students will include similar data obtained from other teams of students assigned to investigate more locations within the environment.

Presentations of outcomes will include PowerPoint Presentations, Edmodo webpage postings including graphs and pictures, newsletter publication detailing the 5 week investigative process, a final essay that summarizes details about the outcomes discovered during the 5 week project, and iEARN postings of experimental results including written correspondence with peers working on similar projects throughout the world.

Collaboration Centre Activities

During this final week of the project, students get an opportunity to fully express their accumulated knowledge and understanding as they advocate for the soil mixtures they analyzed outside the building. The determination of the soil quality depends upon the experimental findings. Students can judge soil quality by illustrating both similarities and differences between different soil samples collected from the environment.

Students will be able to share with other students plans to further their research and investigation into developing of new soil growing mediums. Students can share ideas they have on how they can improve soil mixtures outside the building. These new ideas can be written as a conclusion to a final essay and it can be part of a PowerPoint Presentation laying out plans for further investigations.

Working together as a collaborative community of learners on the iEARN Network, with shared experiences, students will forge bonds of friendship and interest in the lives of people from many countries that were once foreign, but now can be considered as colleagues , allies and friends in the pursuit of knowledge and understanding of the world we live in.

Questions to Guide Student Feedback

What are some of the most important personal qualities you need to possess to do well when conducting scientific inquiry and investigations?

What were some of the most important physical characteristics of good soil?

Could the soil, at different locations on the school property, be improved?

What methods could be used to begin this improve soil?

Materials and Resources

Spreadsheets of experimental results for percolation, density, infiltration and composition will be accessed from online postings of many schools involved in the Earth Stewardship Project.

Computer access of online resources and postings in the Earth Stewardship Project in the iEARN Network.

Access to a number of presentation formats including powerpoint, digital images, web page presentations, YouTube video presentations and digital documents of essays, lab reports and blogs that detail experimental achievements.

Soil composition
http://www.ctahr.hawaii.edu/mauisoil/a_comp.aspx

Soil Powerpoint
https://www.google.com/#q=composition+of+soil+ppt

Soil and Forests
http://www.fs.fed.us/research/water-air-soil/

Extension Ideas

Students worldwide can begin to brainstorm ideas on the utilization of soil mediums to grow plants. Students can share a wealth of creative ideas on different types of plants that can be tested using a variety of housing units within organic farms indoors and outside.

Experimental models designed to test for the growth rate of plants in new soil mediums compared to soil mediums such as potting soil or soil from test sites.

Testing new mixtures of **50 percent outside soil and 50 organic materia**l, like grass and leaves, can be a scientific investigation where students begin to employ, utilizing their greater understanding and appreciation for soil quality, and grow their own plants from seeds. Herbs and vegetables plant seeds can be a great resources to use in this process.

Project Presentation & Community Engagement

EARTH STEWARDSHIP PROJECT PRESENTATION

Project Description(s)

The performance outcomes achieved from the scientific investigation, on the development of soil mixtures, will be presented in the same format as a science fair presentation.

Each group is responsible to showcase results of their testing of soil mixtures with respect to density, water percolation, water infiltration, and soil composition.

This scientific evidence will be featured on a tri-fold poster along with data tables including experimental findings, graphical analysis of data, stated problem that guides the investigation, hypothesis that predicts possible outcomes and a conclusion that explains what was achieved in the project.

Published newsletters and online webpage will be part of the featured presentations.

City park administrator, school physical plant operations personnel, city council members and local garden club advocates will be invited to attend a viewing of student presentations and solicit their feedback on the results achieved by students working on the project.

Students will be able to engage in discussion with these officials discussing possible means through which specific methods of soil management and physical enhancement of soil can be employed on school grounds, in home gardens and in city parks.

Overview/Plan

The Earth Stewardship Project provides the means by which students can develop their cognitive abilities to organize investigations, gather data, analyze results and communicate their findings to a receptive audience including their peers and with other members of the community.

The goal is to provide an outcome that has real meaning for improving their community. Students engaged in the project work to contribute to both their understanding of the physical aspects of soil and to educate others about the need for quality soil in our environment.

Presenting Final Products

Final Product	Teams of students will produce evidence-based arguments that support their assessment of the quality of soil in their environment. Scientific analysis of experimental data will support the claim of quality and give rise to measures that can be taken to help improve soil quality.
Presentation	Tri-Fold presentations similar to science fair formats will be designed to help communicate discoveries, insights and understanding of factors that contribute to soil quality.
Audience (local/global)	Teams of students will showcase soil samples taken outside the school and analyzed with supporting scientific evidence. Through the iEARN Network students will have the means to collaborate with teams of students in classrooms throughout the world. City park officials, city council members, school officials and local gardening advocates will witness student artifacts and supporting scientific analysis of soil quality. Students will engage in discussion of experimental discoveries and resulting conclusions.