

Concrete Hardscape Decorating with Concrete

Seasons in Stone

Subject Area: Agriculture

Grade Levels: 9-12

Date: December 2, 2011

Lesson Overview

This lesson plan is intended to encourage learners to integrate the visual arts with science, mathematics and agriculture education. Students will also demonstrate an understanding of the various structural elements of a landscape and the options for their use. A specific focus will be on installation of hardscape features including the multifaceted industry of concrete aggregates. Students will be exposed to the planning, estimation, environmental consideration, art application and installation of concrete hardscape. In an effort to determine a strong match with the customer's wishes, students will be introduced to the four basics of premium concrete installation including placement, floating, coloring and stamping. With the help of air-entraining agents like water reducers, retarders, accelerators and other admixtures students will understand the value added features of concrete installation.

Materials Included in this Lesson

- Worksheets
- Supplemental Resources
- Grading Rubric
- Digital Pictures
- Videos: DIY-Yard Crashers

Other Materials for this Lesson

- 2" X 4" wood cut to length
- Finishing nails and hammer
- Seasonal theme pictures
- Colored glass pieces
- Tape measure
- pencil
- wire mesh and wire cutters
- oil
- gloves
- safety glasses
- buckets
- Concrete mix
- Sand and other aggregates
- containers
- sponge
- Concrete tools
- Brick trowel, edger, groover
- Float, Tamper
- Wheelbarrow, shovel, brooms
- Hose and water

Skills the Student will Learn

- learn how to decorate with concrete
- learn how to evaluate hardscapes
- learn how to estimate concrete jobs
- learn to identify and use concrete tools
- learn how to mix concrete
- learn how to finish concrete
- learn how to make a composition representing a seasonal theme
- learn how to utilize admixtures in concrete including colored glass pieces
- learn how to integrate CTE, art and science in appreciation of nature
- learn to utilize concrete within the environment
- learn to critique work utilizing artistry and mechanics as well as reflective journaling with self and peer reviews

Student Deliverables

Themed and Finished Concrete Stepping Stone
 Critique Sheet
 Completed Supplemental Worksheets
 Journal Entries

Length of Lesson: 10 Days

Activity Day OneDecorating with Concrete

- Students will be introduced to the concept of Decorating with Concrete in the 21st century. Utilizing concrete as a construction material and a decorator touch, students will be exposed to its current place in today's hardscape via digital photos and shows such as DIY's Yard Crashers.
- Students will experience and subsequently sketch the visual hardscape elements arising from this medium.

www.diynetwork.com/yard-crashers/rose-parade/index.html

www.diynetwork.com/diy/video/player/0,1000643,DIY_33170_4541_48803-68970,00.html

www.diynetwork.com/chessboard-patio/video/index.html

www.diynetwork.com/videos/caribbean-cabana/56321.html

- Students will compare and contrast the commercial and industrial uses of concrete with the added contemporary applications and complete accompanying sketches of each application.
- Students will experience the environmental enhancements of concrete as a contemporary building material designed to improve an exterior garden living environment.
- The student will learn about the changing environment through study and observation. They will reflect on these changes in the environment and plan their own addition to that environment through sketching and journaling.

Day 1 Supplemental Sketch and Journal Entry Prompt - Decorating with Concrete
While previewing the DIY – Yard Crasher Segments on Concrete Installation, please note two hardscape elements per episode. Complete a sketch of each and an accompanying journal entry describing their purpose within the landscape.

Activity Day Two

Hardscape Elements in the Landscape

- Using multimedia applications including websites, videos, powerpoints, online and texts students will be able to examine their surroundings in terms of hardscape features.
- Students will be able to discern between the hardscape portions of a landscape design re:
 - Cost – pavers vs. poured concrete
 - Coordination – using the elements together
 - Principles and Elements of Design coordination
 - Necessities in the landscape for safety and endurance e.g. retaining walls, drains, etc.

Students will then survey hardscape features and identify their purpose in terms of function (e.g., retaining structure, paving structure, provision for recreation, etc.); also identify the role each plays in the overall landscape design.

- Home
- School
- Work
- Neighborhood

Day 2 Supplemental Map of School to Complete Hardscape Survey

Activity Day Three

Estimation of Concrete Materials

- Given the following notes along with a lecture and discussion format, students will practice estimation questions and problems to gain a working knowledge of the use of concrete in many everyday home projects.
- A. Volume Estimation - The ability to estimate accurately is a very important skill
1. Area Calculation
 - a. Calculate the surface area in square feet that the structure will cover.
 - 1) To get square footage of rectangular areas:
Area = Length X Width
 - 2) To find the area of a circle:
Area = 3.1416 (pi) X R
 - 3) To find the area of a triangle:
Area = 1/2 X Base X Perpendicular Height
 2. Volume Calculation
 - a. Multiply the calculated surface area by the thickness in feet of the planned structure:
Volume = Area X Thickness (Depth)
 - b. When calculating the volume of a long, narrow structure (for example, a footing):
 - 1) First find the cross-sectional area of the structure:
Area = Width X Depth
 - 2) Then multiply the cross-sectional area by the length of the structure.
 - c. The total volume of concrete required is expressed in cubic feet.
 3. Unit Conversion
 - a. Concrete is calculated and sold by the cubic yard or the fractional quantities
 - b. To convert cubic feet to cubic yards:
Volume (cubic yards) = Volume (cubic feet) divided by 27
 - 4) Sack Mix (Sackrete)
 - a) This comes in 80-pound sacks containing the right amounts of cement, sand, gravel.
 - b) The user just adds water and mixes; one sack makes around 2/3 of a cubic foot.
 - c) This method is ideal for small jobs e.g. fence posts, a few stepping stones, etc.
 - d) Cost is generally 4 times the price of larger batches of concrete

Activity Day Four

Concrete Tools

- The purpose of this lesson is for students to be able to identify concrete tools, know what each tool is used for. They will also learn the correct steps to properly finish concrete.
- Students will utilize a handout that describes each tool and its use and includes a picture.
- Student will handle and sketch tools laid out throughout the shop that are used with concrete.
- Students will develop flash cards to assist them in labeling and describing each tool.
- Students will participate in an identification test of tools.

Activity Day Five

- Students will be introduced to the use of wood, nails, wire and other media in terms of form construction.
- Students will participate in a lecture and discussion followed by guided practice of form building

Preparation of Forms

1. A form is a metal or wooden structure that confines the concrete to the desired shape or form until it sets or hardens enough to stand by itself.
 - b. A footing is a concrete base that provides a solid, level foundation for concrete or walls.
2. Form and Footing Construction
 - a. Form boards are temporarily nailed to stakes and to each other.
 - Small pours like ours use 1" thick wood material
 - 2 X 4's are used for walks.
 - 2 X 6's are used for drives and floors
3. Concrete Reinforcement
 - Concrete which has steel rods or wire mesh embedded into it when it is poured.
 - Reinforcement increases the strength of the concrete without adding extra thickness
 - Reinforcement prevents cracking under stress of floors or driveways

Activity Day Six

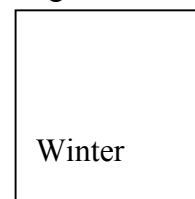
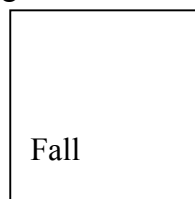
Form Building

- Students will construct a 12" x 12" square form with 2" x 4" pine material on a plywood base.
- Each student will get four 12" pieces of wood, square the boards and nail together using 3 nails on each corner. They will also place a nail half way up on the inside to hold the wire mesh that they will cut and place on the inside of the form. Students will lubricate inside with oil to allow for easy release of form from stepping stone.
- Students will cut a 12" x 12" piece of wire mesh and place on raised nails.

Activity Day Seven

Seasons in Stone

- This project consists of your group designing a garden stepping stone that has one of the four seasons as the theme: Winter, Spring, Summer or Fall.
- Your stone must have the season name and some art work to represent that season.
- Select a season and complete a sketch representing that season. Some ideas might include:



Activity Day Eight

Concrete Finishing

- Each student will pick up their form, safety equipment and finishing tools
- Students will mix cooperatively in wheelbarrows one sackrete 80# premix.
- Add water to wheelbarrow and take turns mixing with shovel.
- Mix the concrete and water together thoroughly.
- After it is thoroughly mixed together, carefully shovel the concrete into the form
- Take the trowel and smooth out the concrete or give it the desired texture.
- Design a season representation and name using the colored glass pieces and carefully place the glass pieces into the drying concrete.
- Allow drying time and hardening.

Activity Day Nine

Concrete Design Finishes

Slowly remove stepping stone from the form to avoid cracking the mortar. Use a dishwashing scrub pad to clean the dirt from the glass. Upon approval from the teacher, students will then take the forms apart after removing the stepping stone.

Place the stepping stones in the garden area in the sequence of seasons with other class members. Draw the finished product.

Activity Day Ten

Critiquing Work

Students will complete a critique of their seasons in stone project. This will be conducted in a written, oral and electronic format and will be turned in by paperless form as well as housed in the student's server space. Students will include as an attachment a scanned copy of their plan and digital representation of their finished product

Students will conduct a pair share to present their critique orally to their partner.

Enrichment Suggestions

- Go to a local builders supply and get samples of concrete materials
- Spend a day with a concrete contractor and see how concrete is placed and finished.
- Check with your grounds departments to "borrow" larger finishing tools to use as visuals.
- Use surrounding school buildings and grounds to view different types of concrete work
- Set up small concrete projects e.g. stepping stones, milk cartons
- Complete a slump test on the concrete to be poured.
- Have students survey hardscape features around the school grounds and identify their purpose in terms of function (e.g., retaining structure, paving structure, provision for recreation, etc.); also identify the role each plays in the overall landscape design (what kind of tone the elements set, how features contribute aesthetically, etc.).

Student Resources

- Computer with internet access
- Decorating with Concrete – Outdoors – A Schiffer Book –Tina Skinner and the Concrete Network (2005) - concretenetwork.com

- Bob Harris' Guide to Stamped Concrete (2004)
- Bob Harris' Guide to Stained Concrete Interior Floors (2004)
- Agriculture Mechanics Fundamentals and Applications – 6th Edition, Ray Herren
- Modern Agricultural Mechanics -- Burke, Stanley R., & Wakeman, T. J. (1990). (2nd ed.). Danville, IL: Interstate Publishers
- Concrete.com
- [Portland Cement Association](http://PortlandCementAssociation.org)

Foundation Academic Standards

Foundation Standards

1.0 Academics

Students understand the academic content required for entry into postsecondary education and employment in the Agriculture and Natural Resources sector.

1.1 Mathematics

Specific applications of Algebra I standards (grades eight through twelve):

(10.0) Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques.

(12.0) Students simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms.

Specific applications of Geometry standards (grades eight through twelve):

(8.0) Students know, derive, and solve problems involving the perimeter, circumference, area, volume, lateral area, and surface area of common geometric figures.

(10.0) Students compute areas of polygons, including rectangles, scalene triangles, equilateral triangles, rhombi, parallelograms, and trapezoids.

(11.0) Students determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.

(12.0) Students find and use measures of sides and of interior and exterior angles of triangles and polygons to classify figures and solve problems

1.2 Science

Specific applications of Investigation and Experimentation standards

(1.1) Analyze situations and solve problems that require combining and applying concepts from more than one area of science.

CTE Pathway Standards

A. Agricultural Mechanics Pathway

B12.0 Students understand land measurement and construction techniques commonly used in agriculture:

B12.5 Form, place, and finish concrete or masonry (e.g., concrete block).

F. Ornamental Horticulture Pathway

F9.0 Students understand the use of containers and horticultural tools, equipment, and facilities:

F9.4 Understand how to install landscape components and electrical land and water features.

F10.0 Students understand basic landscape planning, design, construction, and maintenance:

F10.1 Know the terms associated with landscape and design and their appropriate use.

Foundation Standards

4.0 Technology

Students know how to use contemporary and emerging technological resources in diverse and changing personal, community, and workplace environments:

4.1 Understand past, present, and future technological advances as they relate to a chosen pathway.

4.6 Differentiate among, select, and apply appropriate tools and technology.

5.0 Problem Solving and Critical Thinking

Students understand how to create alternative solutions by using critical and creative thinking skills, such as logical reasoning, analytical thinking, and problem-solving techniques:

5.1 Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.

5.3 Use critical thinking skills to make informed decisions and solve problems.

Lesson Plan Relevance To Externship

Through a comprehensive experience at Rescue Concrete Company of Rancho Cordova, California, the participant teacher was well prepared to develop and deliver an integrated instructional unit on concrete. This lesson plan encompasses a multidisciplinary approach utilizing core academic and career and technical standards. These curricular areas include Agriculture, Mathematics, Science and the Visual Arts. By being exposed to a wide array of externship activities including concrete finishing, job shadowing, job estimation, hardscape and landscape planning, concrete installation, product displays, marketing, promotion, advertisement, site trouble shooting and customer satisfaction the enormity of the concrete and aggregate industry base was evident. A strong match existed between the teacher's subject matter of agriculture and the business focus of hardscape installation. This feature provided the basis for the multi day lesson plan.

Rubric for the Seasons in Stone Project

The students and teacher will view all stepping stones and critique them in written form and oral form. Students will discuss which compositions work the best, which have the best color scheme, and which ones best use space.

Student Deliverables	1 Exceeds Expectations	2 Meets Expectations	3 Approaches Expectations	4 Fails to meet Expectations
Estimated Hardscape Plan	Plan is neatly drawn to scale and bill of materials is accurately estimated.	Plan is neatly drawn and bill of materials is completed.	Plan is drawn and some materials are listed.	Plan is drawn.
Concrete Form	Form is laid out, squared, reinforced and successfully holds concrete.	Form is laid out, reinforced and holds concrete.	Form holds concrete.	Form is incomplete.
Stepping Stone	Stone is flawlessly poured, cured and finished with demonstrated theme.	Stone is poured, cured and finished with minor flaws.	Stone is poured, cured, finished with some flaws.	Stone is poured, cured, finished with major flaws.
Critique	Critique and accompanying digital picture is completed using full sentences, grammatically correct, theme clearly represented, is accurately estimated and turned in via an electronic format.	Critique is fully completed with accompanying picture and theme representation and is turned in via an electronic format.	Critique is partially completed, grammatically correct, and has an evident theme.	Critique is partially complete, contains some grammatical errors and has no evident theme.

