★ BENEFITS AND VALUES ★

Advances in the science of urban forestry allow us to assign monetary values to a wide range of benefits that trees provide. As trees grow, these values rise. This is the only part of the built environment of our cities that does so!

Goal and Objectives

Goal: Students will determine the benefits of trees and calculate their value.

Objectives: Students will

1. Use technology to calculate the value of their trail trees.
2. Analyze a wide range of benefits that trees provide.
3. Evaluate which trail tree(s) offers the most benefits and value.
4. Develop a plan to maintain and improve the value of trees on their Tree Trail.

Materials

General
- Tablet(s) or computer(s) with internet access
- Projector and screen
- White board or chart paper and markers
- Tree Trails Portfolio, Student Learning Log/Journal

Handouts
- Tree Scavenger Hunt and Answer Sheet
- Annual Benefits Breakdown
- Campus Care and Greening Plan

Time and Internet Links

Instructional Time: 3 sessions, 45 minutes each

- Arbor Day Foundation, Benefits of Trees
  https://www.arborday.org/trees/index-benefits.cfm
- Texas A&M Forest Service, Benefits of Trees
  - o Environmental, http://bit.ly/2e1LvuV
  - o Social, http://bit.ly/2dEp5iY
  - o Economic, http://bit.ly/2cT1Ux2
- i-Tree Design
  https://www.itreetools.org/design.php
- i-Tree Lessons, 7 Tree Planting Design
  http://www.itreelessons.com
- Create a WIKI page
  http://bit.ly/2dJyO3H
- Create a Class Blog
  http://wikihow.com/Start-a-Blog-on-Blogger
- Keep America Beautiful Student and Leader Learning Guides Discover What Trees Do For Your Community
  https://www.kab.org/our-programs/education/student-and-
  leader-learning-guides
- The Nature Conservancy, If Trees Could Sing
  http://www.nature.org/iftreescouldsing

Instructional Procedures

I. Engage/Excite

1. Engage students in a conversation about the benefits and values of trees and ask students what they would like to know. List their responses on a whiteboard/chart. Create a Class Blog where every student reflects on their experience.

2. To get started in learning about values and benefits of trees, students will participate in a Tree Scavenger Hunt. Divide the class into four groups and give them the Tree Scavenger Hunt Handout with a list of items in three levels of difficulty to find the item or a picture of it. Give each team approximately 10 minutes to find the items. Appoint a score keeper. Points are earned according to difficulty level.

3. Give the students the Scavenger Hunt answer sheet handout and let them total their scores. Each group should report their findings and scores. Check the items and scores and declare a winner.

4. Conclude with a discussion about the benefits and value these items mean to our community and the world. Use their responses to introduce the next activity.

II. Explore

1. On a chart/whiteboard use a graphic organizer to illustrate the relationship between three concepts of "Growth, Benefits and Value." Write the word "Growth" in the first box, next draw an arrow to a second box with the word "Benefits" in it, then draw another arrow from the "Benefits" box to the last box with the word "Value" in it.

2. Move students into small groups. Have each group brainstorm what growth means to them. Have students record their responses using their laptops/tablets or chart paper labeled "Growth." Have each group share their lists/charts with the class. If they used the laptop, have them print out the list. Place each group's list under the "Growth" box on the class chart.

   Teacher Tip: Before continuing the activity about Benefits, review the forestry definitions of Benefits and Value: benefits are a list of items and value is a dollar calculation. (Optional: Use a Compare and Contrast graphic organizer to further explain the definitions of benefits and value.)

3. Repeat the activity for the "Benefits" box to capture what benefits trees and forests provide. Remind students to use some of the items they found in the Scavenger Hunt. Remind them of other benefits such as lumber, wildlife habitat, recreation and air quality. Discuss how growth relates to benefits. Ask each group to share their lists/charts with the class. Place each groups list under the "Benefits" box.

4. Repeat the small group activity for the "Value" box. Discuss how benefits relate to value. Their list should include ways trees contribute economic dollar value.

II. Explore continued

5. When all groups have shared all three concepts, ask students to check to see if they would like to add other ideas they have learned about the benefits and values the ecosystem contributes.
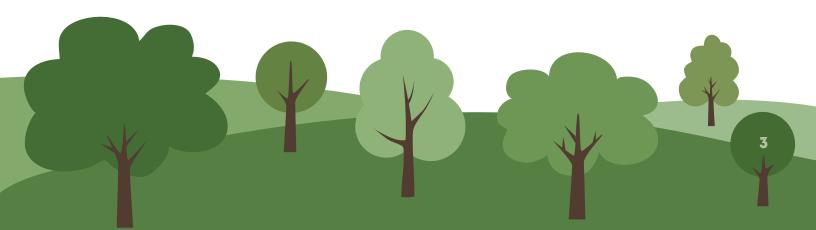
    Teacher Tip: Forests provide a wide range of ecosystem services. In addition to providing food, fuel and fiber, forests clean the air, filter water supplies, control floods and erosion, sustain biodiversity, genetic resources, and provide opportunities for recreation, education, and cultural enrichment. Many other social and economic benefits exist, find more information on the Arbor Day Foundation and Texas A&M Forest Service websites.

III. Explain

1. Provide students with the Annual Benefits Breakdown handout. Ask students to notice the types of benefits: stormwater intercepted, air quality, carbon dioxide, energy savings, and property value. Conduct a question and answer session to check on understanding of the terms.

2. Project the Tree Trails map. Ask students to follow on their tablet/laptop as projected. Open the Tree Trails application and search by the school Tree Trail name. After selecting the green trail line, they should see the name of their trail under the "Annual Benefits" column heading. The dollar values shown are for all the trees on the entire trail. Discuss the benefits and value that the entire trail provides for the school. Print the trail report to display in the class.

3. To find the benefits and dollar value of each tree, have students move into their Tree Trail groups. Using their laptop/tablet, find their trail on the map. Select their tree to view the benefits in the Annual Benefits column. They should see their tree's species listed above the pie chart. Have each group conduct a discussion about the benefits their tree provides. Ask students to determine what type of benefit has the highest percent and dollar value. Have each group record their tree's values in their Learning Logs.

IV. Extend/Elaborate

1. Have students calculate the benefits of their tree(s) for current and future years using a future/forecasting model. Have students go online to i-Tree Design. Enter the address of the school or other location. Follow the instructions and outline the building/house, then add tree data and place the trees. Choose the number of years in the estimate benefits tab to calculate benefits. Tree benefit results include estimates for the current year, the specified future year, projected totals across that future timespan, and the total benefits provided to date. Have students ask for any number of years and look at the pie and line graphs. Discuss the results. Have students print out this report.

IV. Extend/Elaborate continued

2. After the investigation(s) ask each group to discuss their reports and the overall results of their research. They should save the results to use for planning a Campus Care and Greening Plan.

3. (Optional) Inform students that resources are available to assist them with developing a Campus Care and Greening Plan. They have become the school leaders as student urban foresters on campus. They will take their leadership as a Student Tree Board to establish a Campus Care and Greening Plan to ensure their Tree Trail and other trees on campus will be maintained in the future for all to enjoy. Use the handout for further instructional procedures.

4. (Optional) Have groups create a podcast or video about their trail tree and its benefits to themselves and the community. Encourage groups to vary the roles from the Lesson 2-1 video skit. Plan, record, produce and present the video. Inspiration can be found from The Nature Conservancy's If Trees Could Sing videos.

V. Evaluate

1. Have each Tree Trail group collaborate and draw a picture of the new landscape design, including their school's Tree Trail. They may use symbols and a legend. Then indicate on the drawing the trees and other plants that will increase the benefits to the school's environment.

2. Ask students to label what types of benefits they displayed.

3. Have student groups share their drawings, ask for input and make changes accordingly.

4. (Optional) Establish benchmarks for summative and formative evaluation of the Campus Care and Greening Plan, if created, and make changes as appropriate.

VI. Extra Mileage/Attention

Extra Mileage: Have each student develop a personal home/apartment greening design based on the benefits and value it would provide.

Extra Attention: Provide small groups with chart paper and markers. Ask them to draw a picture of a home without landscaping. Have the groups exchange drawings and ask each group to add trees to the drawing. Lead a discussion about increased value to the home and what benefits the trees provided.

TEXAS A&M FOREST SERVICE   TEXAS URBAN FORESTRY COUNCIL   KEEP AMERICA BEAUTIFUL

Tree Scavenger Hunt

Group _____

Try to find as many items on this list as you can. You may either find the item or a picture of it. You will have 10 minutes for the scavenger hunt. Items are divided into three levels of difficulty. Keep a talley because each level is worth a different amount.

If you can name what part of the tree the item comes from or what part is used in the product, you will get bonus points!

Easy Items: Find it = 1 point; What part of the tree does it come from = 2 points

☐ Chair _____
☐ Toilet tissue _____
☐ Apple _____
☐ Pecan _____
☐ Paper money _____
☐ Envelope _____
☐ Mulch _____   Easy Score _____

Difficult Items: Find it = 2 points; What part of the tree does it come from = 3 points

☐ Molasses (syrup) _____
☐ Toothbrush handle _____
☐ Cork _____
☐ Birdhouse _____
☐ Food packaging _____
☐ Chocolate _____
☐ Charcoal _____   Difficult Score _____

Expert Items: Find it = 3 points; What part of the tree does it come from = 4 points

☐ Aspirin _____
☐ Cinnamon _____
☐ Rayon cloth _____
☐ Hairspray _____
☐ Nail polish _____
☐ Ice cream _____
☐ Eyeglass frames _____   Expert Score _____

Total Score _____

TREE TRAILS

Tree Scavenger Hunt

Answer Sheet

Easy Items: Find it = 1 point; What part of the tree it comes from = 2 points

- Chair - solid wood (trunks and limbs)
- Toilet tissue - pulp
- Apple - fruit
- Pecan - nut
- Paper money - pulp
- Envelope- pulp
- Mulch - bark or the whole tree

Difficult Items: Find it = 2 points; What part of the tree it comes from = 3 points

- Molasses (syrup) - sap
- Toothbrush handle - pulp
- Cork - bark (mostly from cork oak tree)
- Birdhouse - solid wood (trunks and limbs)
- Food packaging - pulp
- Chocolate - nut (from cacao tree)
- Charcoal - wood

Expert Items: Find it = 3 points; What part of the tree it comes from = 4 points

- Aspirin - bark (of willow tree)
- Cinnamon - bark (of laurel tree)
- Rayon cloth - wood fibers
- Hairspray - contains wood resin
- Nail polish - contains chemicals leftover from making paper (makes polish glossy)
- Ice cream - contains cellulose (makes it smooth and thick)
- Eyeglass frames - Cellulose (dissolved and forms a shape)

Wood is made of tiny fibers (cellulose) and the natural glue (lignin) that holds them together. When wood is turned into pulp, heat and chemicals dissolve the lignin and release the cellulose fibers.

Sap is the watery solution that circulates through the tree.

Resin is a clear or translucent substance that oozes from trees and other plants.

Annual Benefits Breakdown

Stormwater Intercepted

Trees reduce stormwater runoff and help regulate stream flows. Water runoff from surfaces like roadways and parking lots wash chemicals like oil or gasoline into streams, wetlands, rivers and oceans. These chemicals may harm drinking water, aquatic life and the ecosystem.

Find an interactive poster at http://www.arborday.org/trees/stormwater.cfm

Air Quality

Tree improve air quality. Leaves absorb air pollution that causes asthma, coughing and other health issues. Leaves also help remove dust and other matter from the air, then rain washes it to the ground.

Carbon Dioxide

Trees help reduce atmospheric carbon. They absorb carbon dioxide during photosynthesis. Trees store carbon dioxide in their roots, trunks and leaves while they grow.

Energy Savings

Trees alter climate and conserve energy use. Trees help buildings use less energy. In summer, trees shading east and west walls keep buildings cooler. In winter, allowing the sun to shine on the southern side of a building can warm inside spaces. Trees slow down winds around buildings and help decrease heat loss.

Find an animated model showing trees around a house at
1. http://texastreeplanting.tamu.edu/energy_efficiency.html
2. http://www.arborday.org/globalwarming/summerShade.cfm

Property Value

Trees in front of homes increase property value. Research has verified this by showing that homebuyers are willing to pay more for properties with more trees.

Resources:

National Tree Benefit Calculator
http://treebenefits.com/calculator/
USDA Forest Service Center for Urban Forest Research
http://www.fs.fed.us/psw/programs/uesd/uep/
Arbor Day Foundation
http://arborday.org/trees/index-benefits.cfm
International Society of Arboriculture Consumer Information Program
http://treesaregood.org/

**Every year,
1 large tree**

Retains
1000 gallons
of rainwater

Absorbs the carbon dioxide of a car driven
500 miles

Generates
260 pounds
of oxygen

Saves $32 in summertime air conditioning

Provides a home for
1-3 species of wildlife

★ TREE TRAILS ★

Campus Care and Greening Plan

Instructional Procedures

1. Inform students that resources are available to assist them with developing a Campus Care and Greening Plan. They have become the school leaders as student urban foresters on campus. They will take their leadership as a Student Tree Board to establish a Campus Care and Greening Plan to ensure their Tree Trail and other trees on campus will be maintained in the future for all to enjoy.

2. Move students into small groups and have students follow on their laptops/tables and project the Community Forestry Resources website to review some of the resources they may use. Other resources are: Arbor Day Foundation, Tree City USA, Tree Campus USA, Keep America Beautiful, U. S. Forest Service, Forestry Associations, Garden Clubs, or Nursery & Landscape Associations.

3. Discuss ways they can use these resources to create their Campus Care and Greening Plan. These resources would be easier to use if these were compiled in one list: a Tree Trail Resource List.

4. Have each group research and develop a list of resources on their laptops/tablets. Have the groups share and consolidate the list. As feasible, find a volunteer to assemble the Tree Trail Resource List. Post it on the school website, WIKI page and/or print it as a booklet. Acknowledge the list as valuable contribution to their school, class and community.

5. Take the class outside to revisit their Tree Trail. Ask how the Tree Trail benefits the school and community. Ask what they can do to maintain the benefits their Tree Trail provides. Ask how they can expand these types of benefits and values to the campus landscape. Ask them to think how a Campus Care and Greening Plan could not only maintain their Tree Trail but improve benefits to the total school landscape. Brainstorm ideas for the plan.

6. Form five student committees to develop and carry out the plan. Refer to the Keep America Beautiful Leader Guide's Community Greening section for more planning tools.

   Groups

   a. **WHY**: Information Taskforce to inform classmates and the community the benefits and values trees, native and indigenous plants provide and why they need care and maintenance to thrive.

   b. **WHAT**: Action Taskforce to define and sequence what actions are needed to develop and maintain improvements to the school landscape.

   c. **HOW**: Design Taskforce to design the plan that includes at least five different tree species based on their investigation which concludes which trees provide the most benefits and represent the ability to adapt to the climate of the local area.

   d. **WHO**: Resource Taskforce to identify resources to help with steps in the plan.

   e. **WHEN**: Ways and Means Taskforce to create a how-to plan to carry out, develop checkpoints and evaluate the implementation of the Campus Care and Greening Plan overall plan.

Instructional Procedures continued

7. Ask each committee to incorporate resources they found to assist with their part of the plan.

8. Present the Campus Care and Greening Plan to other classes, parents, school administrators, community leaders. Recognize all who assisted with the project.

9. Post the Plan on a school WIKI page as well as in the school and create a Class Blog where every student reflects on their learning experience and what they have Learned.

Resources

U.S. Forest Service Urban and Community Forestry Program
http://www.fs.fed.us/managing-land/urban-forests/ucf

Texas A&M Forest Service, Urban and Community Forestry
http://txforestservice.tamu.edu/abouturbanandcommunityforestry

National Arbor Day Foundation
https://www.arborday.org/programs/

Keep America Beautiful Student and Leader Learning Guides, Community Service Learning
https://www.kab.org/our-programs/education/student-and- leader-learning-guides