CAMPUS AS A LIVING LAB LEARNING MODULE

MODULE TITLE: Green Building Design and Environmental Health and Justice

CAMPUS: De Anza College

MODULE BACKGROUND

The Campus as a Living Lab Project

San Jose State University, Foothill College and De Anza College have collaborated on a project to infuse sustainability throughout the curriculum at our institutions. This project, called the Campus as a Living Lab, is funded by the California State University Chancellor’s Office. The Campus as a Living Lab program is focused on using physical sustainability features on our campuses to promote sustainability through hands-on learning activities. For our collaboration, each campus developed a series of one-session teaching modules (approximately 1-3 hours each) that faculty members can use to incorporate sustainability into their courses. Each module focuses on a physical feature at SJSU, De Anza or Foothill. All modules are designed to address specific GE area student learning objectives and provide students with an active learning experience.

General sustainability definition and principles

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

- the concept of needs, in particular the essential needs of the world's poor, to which overriding priority should be given; and
- the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs."   (Bruntland 1987)

By definition, this requires citizens who wish to act sustainably to engage in actions that
are ecologically sound, economically feasible, and socially responsible.

**Key Concepts**

- Students will learn the elements of green building and how they apply to a sustainable society.
- Students will learn how green building utilizes nature to reduce energy consumption.
- Students will assess model green building policy and guidelines including LEED (Leadership in Energy and Environmental Design)
- Students will identify and understand the value of green building to society and to the individual.

**Student Learning Outcomes**

This module relates to the following Student Learning Outcome associated with ES 58 Introduction to Green Building at De Anza College:

“Investigate and communicate the relationship between the elements and principles of green building design and establishing a sustainable society.”

**Materials Needed**

- The Kirsch Center for Environmental Studies
- “KCES Green Building Exploration” handout
- De Anza Campus Map: [https://www.deanza.edu/map/pdf/campusmap_3_5_14.pdf](https://www.deanza.edu/map/pdf/campusmap_3_5_14.pdf)
- “A Few Tips on How to Live Green!” document (PDF in folder)

**How Content Will Be Delivered**

This module will be conducted at the Kirsch Center for Environmental Studies, with an indoor and outdoor component. Together, time required will be 1 ½ hours. Online access is required and available through the computers inside the Kirsch Center for Environmental Studies.

**Accessing Site**

For this module students will go to the Kirsch Center for Environmental Studies. Parking
is available at Lot C1 just south of the baseball field, or in Lot D just south of the football field. If coming from Lot D, head east and the Kirsch Center is immediately visible. If coming from Lot C1, the Kirsch Center is to the right if you face south.

Contacts

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Integral Theme - Environmental Justice

Environmental Justice “EJ”: The pursuit of equal justice and equal protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, and /or socioeconomic status. This concept applies to governmental actions at all levels -- local, state and federal -- as well as private industry activities.

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

(Signed by President Clinton on February 11, 1994)

The purpose of this order was to focus federal attention on the environmental and human health effects of federal actions on minority and low-income populations with the goal of achieving environmental protection for all communities. Federal agencies were directed to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law. Each agency was ordered to develop a strategy for implementing environmental justice as well as including environmental justice as part of its mission.

Background Study (to be conducted before the module, up to 1 hour)

Read the following article: http://www.psychologytoday.com/blog/the-athletes-way/201306/exposure-natural-light-improves-workplace-performance

- Summarize what you have learned about the benefits of natural light.
Watch this video: How Green Building Works 1 min. 33 sec.  
http://science.howstuffworks.com/482-how-green-building-works-video.htm  
● Name three ways that green buildings are sustainable.

Watch this video: More Daylight is Needed to Create Sustainable Buildings, 2 min. 15 sec.  
https://www.youtube.com/watch?v=2M1EfhIGPkI  
● Do you agree that sustainable buildings, or buildings in general, need more daylight?  
How do you feel in a building with a lot of daylight versus a building with little or no daylight?

Lesson

Lesson Introduction - PowerPoint Presentation with 2 short videos - 25 minutes  
(15 min. slides/10 min. videos)

● Green building, also known as green construction or sustainable building, refers to the application of environmental responsibility and resource-efficiency throughout a building’s life-cycle. From siting to design, construction, operation, maintenance, renovation, and demolition, green building considers the needs of humans and their environment.

● Green building is part of a larger movement in creating a sustainable society through sustainable development. As sustainable society is one in which living conditions and resource-use meet human needs without undermining natural systems and the environment. The goal is to ensure that future generations may also have their needs met and be able to enjoy a clean and healthy environment. Sustainable development considers the carrying capacity of our natural systems and applies this understanding to economic, ecological, political, and cultural decisions. If we can apply a systematic, integrated approach to planning our society, everyone can have their biological and quality of life needs met for generations to come.

● Let’s imagine how this kind of thinking can pave the way for entire sustainable cities.
  ● Watch the following video: The Venus Project, Inside the New Cities 5 min. 28 sec. -  
https://www.youtube.com/watch?v=Uou4DiutW5g
  ● If we could build cities like the ones designed by Jacques Fresco, would you be willing to participate in the construction? Why or why not?
Green Building Attributes
- Solar power
- Daylighting
- Energy efficiency and conservation
- Water efficiency and conservation
- Landscape design
- Waste handling
- Indoor air quality
- Environmentally preferable materials
  - Non toxic
  - Recycled content
- Local
- Connection to the land
  - View through the windows
- Adapted to local climate: Mediterranean
- Longevity: building will last 100’s of years
- Flexible: “moveable” walls
- Feels right and uses common sense

Green Building Design
- Green building utilizes organic design rather than arranged design. Arranged design is based on personal taste rather than utility.
- Organic design unfolds naturally as we strive toward the goal of meeting real needs.
- Green building embodies values that consider human health and the health of the environment throughout the whole life-cycle of building structures.

The Kirsch Center as a Model Green Building
- Did you know that in 2005 the Kirsch Center became the first community college Leadership in Energy & Environmental Design (LEED) platinum-rated building in the nation?
- In 2007, the Kirsch Center also won the Center for the Built Environment’s Livable Building Award.
- After 17 years of planning and teamwork, the Kirsch Center is truly "a building that teaches about energy, resources and stewardship."

Watch video:
- Kirsch Center Introduction (3 min. 30 seconds)
  - [http://www.youtube.com/results?search_query=kirsch+center](http://www.youtube.com/results?search_query=kirsch+center)
The Power of the Sun

- The KCES utilizes passive solar design to conserve energy and provide healthy and aesthetically pleasing daylighting.
- Briefly explain glass, mass, orientation, and insulation.

Watch Video:
  - How
    - https://www.youtube.com/watch?v=YylmeMilok8

Body Solar Exercise - 10 minutes

- This exercise is based on the work of Dave Deppen, designer and of the Kirsch Center.
- Lead students outside to the south entrance of the building where all the Sycamore trees are. This area is the Solar Plaza. Here, students will use their hands to follow the three paths of the sun during four different times of the year.
- The sun is at its highest point of the day during noon time. The exact sun angle height will vary depending on an area’s latitudinal position. We are situated on a circle of latitude called the 37th parallel north, because it is 37 degrees north of the equator.

Part 1: Noon Sun Angle Height on the 37th Parallel

- Instruct students to stand facing south with two arms length in between them and one arm length in front of them. Once in their positions, students will stretch their one arm out in front of them to represent the sun’s noon angle height during four different times of the year.
- Our plane of measurement will be from 0 degrees ground-level to 90 degrees straight above. We will start with December 21 and cycle through a complete one year cycle. We start with the shortest day with the lowest sun angle, December 21 and show that the days get longer until they peak on June 21, the longest day with the highest sun angle. After June 21 the sun angle and day length decrease until they reach their lowest point back at December 21.
- Instruct students to raise their hands up ⅔ of the way up from the ground:
  - December 21, Winter Solstice: On December 21, the shortest day of the year, the sun is exactly ⅔ of the way up from the ground, 30 degrees. “January, February….”
  - March 21, Spring Equinox: On March 21 the sun’s noon angle height is 59% of the way up from the ground, 53 degrees. The days have gotten longer since December 21. “April, May….”
  - June 21, Summer Solstice: On June 21 the sun’s noon angle height is
86% of the way up from the ground, 77 degrees. This is the longest day of the year, with the highest noon sun angle height. From this point the days will slowly get shorter. “July, August…”

- **Instruct students to bring their hands back down to ⅔ of the way from the ground:**
  - September 21, Fall Equinox: September 21 has the same noon angle height as March 21, 53 degrees, 59% of the way up from the ground. The days will continue to get shorter. “October, November…”

- **Instruct students to lower back down to ⅔ of the way off the ground:**
  - December 21, Winter Solstice: We are back to the shortest day of the year, December 21, with the lowest noon sun angle height, 30 degrees, exactly ⅓ off the ground.

**Part 2: The East-West Path of the Sun on the 37th Parallel:**

- Now we will use our hands to follow the east-west path of the sun as it rises and falls during the same four times of the year.

- **Instruct students to start with one hand directly to the east. Moving laterally have student bring their hand forward ⅔ of the way toward south:**
  - December 21, Winter Solstice: The “east” rising starts with our hand ⅓ of the way toward south, rises up and forward ⅓ of the way off the ground to the noon angle height of 30 degrees, and then sets on the “west” ⅓ of the way south.
  
  “January, February…”

- **Instruct students to start with their hand exactly to the east:**
  - March 21, Spring Equinox: With the hand exactly at east, bring the hand up to almost ⅔ of the way up from the ground in front of us, for the noon angle height of 59% off the ground, 53 degrees. Bring the hand down to set on exactly west.
  
  “April, May…”

- **Instruct students to start this bring their hand to east and move their hand laterally to ⅔ of the way north, slightly behind them:**
  - June 21, Summer Solstice: Starting with the hand ⅓ of the way north, the “east” rising begins. The hand moves up to almost 9/10 of the way up straight above us for the sun angle height of 86% of the way up, 77 degree. As the sun sets to the “west” our hands come down ⅓ of the way toward north.
  
  “July, August…”

- **Instruct students to bring their hand back to exactly east:**
  - September 21, Fall Equinox: Again with the hand starting in the east, we bring our hand up to almost ⅔ the way up from the ground in front of us, and then back down to set on exactly west.
“October, November…”

● Instruct student to bring their hands back to “east” and move their hands ⅓ of the way toward south:
  ○ December 21, Winter Solstice: We again raise our hands up to ⅓ of the way off the ground in front of us, and back down to our right ⅓ of the way south.

Treasure Hunt Activity - 40 minutes

● Verbally tell the students the following:
  ○ As we saw in the last exercise, the sun is never 100% of the way up above our heads.
  ○ The Spring Equinox and Fall Equinox are the only two days of the year where the sun rises exactly in the east and sets exactly in the west.
● Hand out “KCES Green Building Exploration” document. During this lecture/tour students will learn the following:
  ○ Passive solar design
  ○ Changing seasons
  ○ Glass, mass, insulation, and orientation
  ○ Heating and cooling systems
● Students will look at the windows and see how their design aligns with the sun’s four paths.
● Students will understand the use of the deciduous sycamore trees for shading in the summer and letting light in in the winter.

Closing Discussion (10 minutes)

● What effects do buildings have on society and the individual? Do we have a right to be surrounded by safe, non-toxic building structures?

Wrap up - 5 minutes

● End module and introduce post-module activity.

Post-Module Activity (up to 2 hours)

Watch the following: Sustainable Construction Achieves the Greatest Savings and Comfort for Residents, 3 min. 22 sec. https://www.youtube.com/watch?v=Cu_dmPvFxjs

● Maco Baldazo mentions applying social ethics to how he manages EXE Constructora. Given that green buildings benefit individuals and the overall environment, do you think we should apply these ethics to all future buildings? Do green building technologies belong to us all or just those who can afford it?
Now let’s consider the possibility of an entire sustainable world in which all humans live in the healthiest, highest quality buildings.

Watch the following video: Ted Talks Jacques Fresco, Resource Based Economy 8 min. 10 sec. https://www.youtube.com/watch?v=fzIrIG55fkE

- If it were possible to create an entire sustainable world, would you be willing to detach from the current societal model? Why or why not?
- Do you agree with Jacques Fresco that changing the current economic structure would be necessary to create a sustainable world? Why or why not?
- Do you think that our current economic structure allows equal opportunity to access and live in sustainably designed building structures? Why or why not?
- What do you think about the concept of a resource based economy? Do you think money and resources are two different things? Do you think it’s important that society makes the distinction between money and resources?

**How to Apply This Module to Your Daily Life**

Refer to the “A Few Tips on How to Live Green!” document

**Are You Willing to Take the Pledge?**

*I pledge allegiance to the Earth, and to the flora, fauna, and human life that it supports, one planet, indivisible, with safe air, water and soil, economic justice, equal rights and peace for all.*  -Women’s Environment and Development Organization

**Online Resources**

De Anza Virtual Tour: [http://www.deanza.edu/vtour/map/](http://www.deanza.edu/vtour/map/)


The Quest for Environmental Justice - Human Rights: [https://www.youtube.com/watch?v=SYVvbs6XsNw](https://www.youtube.com/watch?v=SYVvbs6XsNw)

Malcolm Wells, Underground Architect: [www.malcolmwells.com](http://www.malcolmwells.com)

Building Science Corporation: [www.buildingscience.com](http://www.buildingscience.com)

Building Green Publishing Company: [www.buildinggreen.com](http://www.buildinggreen.com)

Healthy Building Network: [www.healthybuilding.net](http://www.healthybuilding.net)

U.S. Green Building Council: [usgbc.org](http://usgbc.org)
Welcome to the Kirsch Center for Environmental Studies!

- The Kirsch Center - A Beacon of Hope
- A Climate Responsive, Energy Efficient Building
- Designed to use the sun and seasons

The Kirsch Center uses less energy than a conventional building. The building itself is a teaching tool; the interior structure and utility systems are exposed as much as possible. The interior atmosphere is a clean, high-tech look similar to many of the most innovative Silicon Valley companies.

The primary energy design goals were to: maximize use of on-site renewable energy; minimize energy demand from the utility grid; assure thermal and visual comfort; maximize flexibility of use of building spaces; and minimize emissions from construction materials, building construction and lifetime use of the building.

You will notice the natural light reflecting off the white walls and ceilings, creating an atmosphere that is healthy, bright and comfortable.

1) Solar Plaza
The Solar Plaza showcases important features of a green building. Windows and sun shades on the south side maximize heat and light from the sun in the winter and block the sunlight in the summer. The Sycamore trees are deciduous. In the summer, the trees block the sun while in winter, the leafless branches allow the sunlight into the building. The bioswale, a type of biofilter, to the south of the walkway, captures rainwater from the slanted roof. This system stores the stormwater runoff rather than sending it into the storm drain.

2) West Wing
Notice the narrow design of this space and that there are no windows. Afternoon summer sun is very harsh and heat a building very quickly. Not having windows reduces heat transfer from the outside to the inside of the building. The west outdoor space will soon house the Stewardship Amphitheater for outdoor student and public events.

3) North Entrance
Like the south side, the north has many windows. These windows flood the classrooms with natural daylighting, providing a bright and comfortable environment for students. Students learn better in naturally daylit classrooms. Daylighting reduces the amount of electricity needed for lighting these rooms.

4) Energy Exhibit Hall
This transitional area connects the “passive” narrow west wing and the “active” expansive east wing. The plasma screens are part of the Environmental Studies Department’s instructional program and includes nature-based films in a video-on-demand exhibit. An Energy Monitoring Display can be switched to view a graphic on the energy generated by roof-top photovoltaics (36.5 kW PV system) or the Building Monitoring System (BMS) for real-time temperature readings to allow students in the energy management program to monitor the building’s heating and cooling systems.

5) Biodiversity Lab
   (John Muir Institute of Natural Sciences)
This hands-on learning lab teaches students about California’s incredible diversity of plants, animals and ecosystems. The natural daylighting is more pleasant than fluorescent lights, and studies show that students perform better in natural daylit classrooms. The floor contains fly-ash in the concrete. Fly ash, a by-product of coal fired power plants, replaces cement in the concrete. We get a high-quality concrete and reduce the amount of waste to landfills. The radiant floor system in this room includes plastic tubes which heat or cool the concrete. The windows and fans provide additional natural ventilation. The red light/green light system tells the user to open or close the windows. This room also has a biodiversity “garage door,” which opens to our outdoor learning areas.

6) Restrooms
Waterless urinals in the men’s room save 45,000 gallons (170,000 liters) of potable water each year; floor tiles are made of old car windshields; and the toilet seat lids are made from recycled water bottles. The countertops are made from granite, which is a highly durable material and connects the building to the California landscape.

7) KC 115
This room encourages students to work in teams. Students enjoy working together on community-based projects. In this environment, teachers and student mentors are facilitators, not lecturers. How do you like to learn? This room demonstrates an efficient raised floor heating and cooling system. Air flows beneath the floor and rises through circular vents, not blown out ceiling vents. Rising air exhausts out the return ducts in the ceiling and takes dust and other contaminants with it, improving air quality. Look at the carpeting; it’s modular, made from recycled materials, the backing contains no vinyl or PVCs, and uses non-toxic adhesives. The furniture found in this building is durable, cost effective and minimizes environmental impact. For example, the tables have 80% wheat stalk as their core and the chairs are made from recycled materials and are recyclable.

Kirsch Center for Environmental Studies
“a building that teaches about energy, resources and stewardship”

8) MAX 1 (Student Learning Spaces)
Students can use the raised seating in these areas throughout the building to study, debate environmental topics, meet with others and view videos. The Monterey Bay Aquarium was an inspiration for us. Our Kirsch Center design team, including students, faculty, staff, leadership and consultants wanted to create special learning spaces.

9) KC 113
This classroom is on the south side of the building. The light shelf just under the windows bounces light into the room to maximize daylighting. See our “Mecho shades?”

10) Biodiversity Exhibit Hall (Upstairs)
This area encourages community learning with our “diner booth” and the breakout areas for study groups. One of the design criteria for the Kirsch Center was to be able to bird watch out of every window. How many birds can you count outside? Are you keeping a bird list?

The large windows to the south provide a spectacular view of the surrounding coastal ranges and connect us to the local environment. Students enjoy the comfortable and welcoming atmosphere. What do you think?

11) Statewide Energy Management Program Lab
This classroom is the headquarters for SEMP classes. Students learn about energy management systems and controls, lighting, green building design and energy policy. Look to the west to observe the “truth wall” that showcases the radiant floor system for the west wing.

12) Stewardship Circle, the Jim Anderson Memorial Library and the Student Mentor Wall of Fame
The pop-up clerestory above you floods this special gathering area with natural daylight. This notable place welcomes students, faculty and our partners to collaborate on stewardship projects along the 37th parallel.

13) Stewardship Resource Center (SRC) and MAX 2
To the east is the Cheeseman Environmental Study Area (ESA) which showcases the California Floristic Province, with over 400 native species and 12 plant communities of California. To the north is the SRC, where students can study, check out class materials, work on puzzles, or bird watch. The SRC countertop is made of pressed sunflower seed hulls; the cabinets are constructed from FSC certified lumber. The red steel beams around you are made from recycled steel. On the south wall are the 37th parallel wildlife corridors student projects.

To join us or to learn more, contact: Pat Cornely, Executive Director, Kirsch Center for Environmental Studies at cornelypat@fhda.edu or (408) 864-8628
A FEW TIPS ON
HOW TO LIVE GREEN!

<table>
<thead>
<tr>
<th>INSTITUTIONAL</th>
<th>SOCIETAL</th>
<th>INDIVIDUAL</th>
</tr>
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<tbody>
<tr>
<td>(On-Campus Efforts)</td>
<td>(Spreading Sustainability)</td>
<td>(It All Starts With YOU!)</td>
</tr>
<tr>
<td><strong>Educational</strong></td>
<td><strong>Policy &amp; Government</strong></td>
<td><strong>Energy Use</strong></td>
</tr>
<tr>
<td>• Learn about sustainability – take Environmental Studies (E.S.) classes! Many of them also fulfill GE (General Education) requirements.</td>
<td>• Get involved in political and social environmental issues. Write letters, faxes, e-mail, phone your legislators and government officials.</td>
<td>• Efficiency/Renewable – use CFL lightbulbs or go solar!</td>
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<td>• Help make sustainability/E.S. a General Education requirement for all De Anza students.</td>
<td>• Meet with representatives to discuss climate change solutions.</td>
<td>• Conservation – turn off all electronics when not in use.</td>
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<tr>
<td><strong>Get Involved</strong></td>
<td><strong>Community</strong></td>
<td><strong>Food</strong></td>
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<tr>
<td>• Participate in committees and clubs around campus.</td>
<td>• Attend city council and board meetings.</td>
<td>• Join a CSA (Community Supported Agriculture) project to support local farmers and get tasty, sustainably-grown food! <a href="http://www.localharvest.org">www.localharvest.org</a>.</td>
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<td>• Put on a lecture or movie night, or host an event on climate change.</td>
<td>• Educate friends and neighbors about environmental issues.</td>
<td>• Support REAL FOOD – purchase items that are local, seasonal, and sustainable, or grow your own food at home!</td>
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<td><strong>Living Democracy</strong></td>
<td>• Write to your newspaper in support of climate change solutions.</td>
<td>• “Eat food, not too much, mostly plants” - Michael Pollan</td>
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<td>• Problem-solving in your everyday life at school, and elsewhere. (i.e. vote with $!)</td>
<td>• Work on local climate change ordinances and resolutions.</td>
<td><strong>Transportation</strong></td>
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<tr>
<td>• Be inclusive of all peoples, and work to understand those with different backgrounds or views.</td>
<td><strong>Non-Profit</strong></td>
<td>• Get exercise while you commute - walk, bike, skateboard, and have fun!</td>
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<tr>
<td><strong>Policy &amp; Implementation</strong></td>
<td>• Give your wealth, wisdom, and work to a non-profit organization.</td>
<td>• Carpool, car share, or use the bus, train, BART, or light rail.</td>
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<td>• Work toward effectively implementing our Sustainability Management Plan (SMP) and our other sustainability efforts.</td>
<td>• Help preserve natural spaces.</td>
<td><strong>Consumption/Waste</strong></td>
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<tr>
<td>• Advocate for improved public transit access between underserved neighborhoods and the De Anza campus.</td>
<td><strong>Business</strong></td>
<td>• 4R’s - Reject, Reuse, Reduce, Recycle (and Compost, too!)</td>
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<td>• Campaign for more organic, sustainable food choices on campus.</td>
<td>• Advocate for sustainable purchasing practices, including Energy Star products.</td>
<td>• Consume less - Shop smarter, avoid extra packaging.</td>
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<tr>
<td>• Voice your support in our college’s effort toward more green buildings.</td>
<td>• Promote and implement climate change solutions in your workplace.</td>
<td>• Buy from ethical retailers – <a href="http://www.fairtradeusa.org">http://www.fairtradeusa.org</a></td>
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**Non-Profit**

**Business**

**Energy Use**

**Food**

**Transportation**

**Consumption/Waste**

**Water**

“MAKE THE WORLD A COOLER PLACE!”