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# ENERGY WORKSHOP

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A Curriculum to Address Climate Change and  
Energy Security Issues by Enabling Individuals to  
Reduce Personal and Community-Wide  
Energy Use



design to change behavior



A Curriculum to Address Climate Change and Energy Security Issues  
by Enabling Individuals to Reduce Personal  
and Community-Wide Energy Use

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**WORKSHOP OVERVIEW**


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Below is an approximate schedule of lessons for teachers:

SUN	MON	TUES	WED	THURS	FRI	SAT
			1	2	3 Pre- surveys	4
5	6 Lesson 1	7	8 Lesson 1	9	10	11
12	13 Lesson 2	14	15 Lesson 2	16	17	18
19	20 Lesson 3	21	22 Lesson 3	23	24	25
26	27 Lesson 4	28	29 Lesson 4	30		

SUN	MON	TUES	WED	THURS	FRI	SAT
					1	2
3	4 Lesson 5	5	6 Lesson 5	7	8	9
10	11 Post- surveys	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
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# 1

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## INTRODUCTION

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The world's energy consumption is projected to double from 1990 to 2050, making the problem of stabilizing carbon emissions and fuel consumption extremely challenging (Energy Information Administration, 2008). The U.S. is one of the largest CO<sub>2</sub> emitters and energy consumers in the world. Within the U.S., over 60% of CO<sub>2</sub> emissions and energy consumption in transportation are due to cars and light trucks, which are primarily used by the residential sector (EPA, 2006; Vandenberg, Barkenbus, & Gilligan, 2008). Of non-transportation sources, such as buildings, a third of CO<sub>2</sub> is emitted and fuel is consumed by the residential sector (Energy Information Administration, 2008). Thus, actions performed by individuals in the residential sector can have a significant impact on the problems of climate change and energy insecurity.

Several highly respected organizations (e.g., Department of Energy, McKenzie and Company, and the Intergovernmental Panel on Climate Change) have recognized that addressing the energy problem through energy efficiency measures at the residential and small commercial sectors is likely to be one of our best tools in reducing energy use quickly and at very low cost; furthermore, they identify behavior-related obstacles as a major barrier so far in achieving these reductions.

The Stanford researchers that have contributed to this high school curriculum are leading the effort on applying behavioral science and design approaches to overcome these obstacles and realize large energy reductions. They work in the areas of energy (e.g., climatology, economics, policy analysis), design (e.g., product design), and behavioral sciences (e.g., psychology, marketing, behavioral epidemiology). These leaders collaborate with Pacific Gas & Electric, Google, and state agencies on cutting-edge research programs, chair an 800 person international conference on behavior and energy, give plenary talks at national energy conferences, brief national senators and heads of state agencies on the topic, and are part of the new \$100M Precourt Institute of Energy at Stanford.

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# 2

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## CURRICULUM OVERVIEW

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The high school curriculum is composed of five 1-hour classes. The curriculum demonstrates how individuals in the residential sector can change their own behavior. Students will begin to understand how to facilitate change in others by attempting to change several of their own high-impact behaviors first. They will be guided through various engaging activities that were developed based on effective behavior change techniques identified by multiple disciplines, as well as through formative work in several local high schools. The students will learn the techniques experientially and through guided instruction based on a design process developed at Stanford and at IDEO (a leading design firm) so that they can then apply these techniques to design a media message to influence the behavior of their peers. There is an option to extend the class by one period to explore ways of applying the techniques they learn to the other program levels - community-based, physical environment, and policy.

# 3

## LESSONS

### LESSON 1: INTRODUCTION TO WORKSHOP & CLIMATE CHANGE

Students learn about effects of climate change. They are introduced to the structure of the workshop.

#### LEARNING OBJECTIVES:

- Students will be able to explain the impact of climate change and be able to visualize and quantify CO<sub>2</sub> emissions.
- Students will understand the importance and urgency of these problems, and will want to learn more about these topics and change behavior.

#### THE DAY BEFORE THE LESSON: MATERIALS & CLASS PREP

- Find 4 articles, 1-2 pgs each, on the impacts of climate change and insert these into STUDENT VERSION of Design Journals. E.g.
  - Fires in California: <http://www.msnbc.msn.com/id/24776666/>,
  - Floods in Bangladesh: <http://news.bbc.co.uk/go/pr/fr/-/1/hi/sci/tech/5344002.stm>
  - Choosing between paying for heat or food: [http://www.boston.com/news/globe/editorial\\_opinion/oped/articles/2007/10/21/the\\_heat\\_or\\_eat\\_dilemma/](http://www.boston.com/news/globe/editorial_opinion/oped/articles/2007/10/21/the_heat_or_eat_dilemma/)
  - Saudi Arabian Laws: <http://www.foxnews.com/story/0,2933,312372,00.html>;
- Find videos online on credible news websites like BBC, CNN, Al Jazeera, and credible environmental websites like UCS, EPA, NAS, etc.
  - Video 1: This video should focus on positive energy-saving behavior changes such as hang drying clothes. E.g. <http://www.youtube.com/watch?v=bxpgO386JYI&feature=related>
  - Video 2: This video should focus on visualizing the amount of CO<sub>2</sub> we release in the air every year. E.g. <http://www.youtube.com/watch?v=KCYYhEiTuro&feature=PlayList&p=31725EC6BD277A2F&index=61>

### **THE DAY OF THE LESSON: MATERIALS & CLASS PREP**

- Copies of articles and Design Journals for all students.
- Print out four slips with copies of the script for each student who will help out with the science and policy briefing (“Scientist 1, Scientist 2, etc.)
- Student folders
- Markers for students
- Red balloons for students
- Science and Policy Briefings for students
- PowerPoint presentation

### **OUTLINE OF LESSON**

1. Preview of Design Project **(5 min)**
  - a. Instructor shows example of behavior change promotional video
  - b. Instructor explains purpose of design workshop
2. Introduction to Design Workshop **(5 min)**
  - a. Instructor introduces collaborators in energy efficiency related behavior change
  - b. Instructor explains differences and synergies between policy, technology and behavioral solutions.
3. Science and Policy Briefings – Local Impacts **(10 min)**
  - a. Instructor introduces structure and purpose of briefings
  - b. Students brief each other on local impacts of climate change
  - c. Students read article on California fires
4. Combustion and Carbon Dioxide Visualization **(5 min)**
  - a. Instructor presents steps of combustion
  - b. Students are given a balloon to blow up
  - c. Instructor explains balloon visualization of energy behaviors
5. Observation Worksheet **(15 min)**
  - a. Students name groups
  - b. Students fill out log and calculate group totals for baseline
6. Focus on a Behavior **(10 min)**
  - a. Instructor explains making personal changes as a way to learn about motivation and challenges associated with each behavior.
  - b. Students choose an Electricity Change

## LESSON 1, STEP 1: PREVIEW OF DESIGN PROJECT (5 MIN)



**Allow students to pick up a folder and a marker of choice as they come in the classroom.**



"Before we begin, I want to show you a short video."

[SLIDE: video]



**Show video example of behavior change promotion.**

*Note for teachers: The answers to the following questions may be different than those printed below, depending on what video you chose.*



"What do you think this video was trying to get you to do?"

*Answer: Hang dry clothes.*



"Right, this video was made to get people to hang dry clothes. Why is this important?"

*Answer: This is important because clothes dryers use ~7% of our home electricity.*



"Do you think this video will be effective in changing behavior?"



"You're right, it was an entertaining video, but it has some areas that can be improved to be more effective. We'll show you how to do this later in the workshop."

[SLIDE: ENERGY WORKSHOP]



“During this course, you will all be taking part in a workshop called “d delta b.” The overall goal of the workshop is to design a video that we will film on the last day of the class. The video will help address the problems of climate change and energy insecurity. We’ll learn about techniques from fields like design and psychology to come up with successful videos. These videos will be shown to other high school students, using either YouTube or your school’s morning announcements.”



“What do you think this video was trying to get you to do?”

*Answer: Hang dry clothes.*



“Have any of you made videos before? Was it fun?”



“In order to do this, each day we’re going to learn about the problems of climate change and energy insecurity. We’re also going to learn about how our behaviors are linked to these problems, and how we can effectively go about changing these behaviors in ourselves and others to address these problems. We’ll focus on electricity, transportation, and food behaviors because they contribute the most to these issues<sup>1</sup>.”

*Note for teachers: If students say that these climate change and energy insecurity issues aren’t motivating, explain that there are multiple benefits associated with the behaviors we’ll be working with. The best way to discover these is to try out the behaviors.*



“You’ve all received a folder. Before we start, I want you all to write your name on the sticker on your folder. We’ll be collecting these folders at the end of each day and passing them out again each class period.”

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<sup>1</sup> Allowing individuals to personalize superficial details causes them to become more motivated and personally invested (Lepper review).

## LESSON 1, STEP 2: INTRODUCTION TO DESIGN WORKSHOP (5 MIN)

[SLIDE: STANFORD UNIVERSITY]



“So, what is ‘d delta b’?”

“It stands for ‘design to change behavior’.”

“It is a movement driven by Stanford designers and behavioral scientists from the Precourt Institute for Energy Efficiency, the Program in Design, the School of Medicine, and other departments.”

“These experts have come together to apply design processes and behavioral science techniques to address climate change and energy insecurity problems. We’ll talk more in a minute about why these approaches are so important.”



“Why do you think we are learning this in high school? “

Answers:

- *The future is theirs, both in terms of the problems and the solutions.*
- *They are more innovative and flexible thinkers at their age.*
- *They are open to new technologies and products.*
- *Most of their energy behaviors are still ahead of them.*
- *It is easier for them to reach out to other people their own age.*



“Right! It is because we see tremendous potential for creative solutions and change in you.

[SLIDE: CLIMATE CHANGE AND ENERGY INSECURITY]



“Why are climate change and energy insecurity such important issues?”

Answers:

- *Climate change will result in serious problems like fires, drought, increased spread of illness, etc.*
- *Energy insecurity problems put us at risk because we depend upon unreliable sources of energy – sources that are controlled by unstable countries, abrupt price fluctuations, increasing demand, etc.*

[SLIDE: POLICY]



“Currently, various policy and technology tools are being explored for accelerating solutions to climate and energy problems. So far, discussions about policy have focused mostly on how industry – big companies and factories – should change. This is a problem because the residential sector – our houses and cars – emit 1/3 of the CO<sub>2</sub> and use 1/3 of energy.”

[SLIDE: TECHNOLOGY]



“On the technology front, most of the focus has been on energy supply, which means increasing clean energy generation, such as solar and nuclear power. However, solutions could also focus on reducing energy use in the first place.”

[ON SLIDE: WINDMILLS AND SOLAR PANELS APPEAR]



“Which do you think might be easier and cheaper: reducing our energy use by 10% or increasing the supply of wind and solar power by 25 times? “

*Answer: Reducing our energy use.*

[ON SLIDE: BEHAVIORAL SOLUTIONS]



“In order to reduce energy use, we need behavioral solutions. The U.S. Department of Energy, heads of California energy and environmental organizations, executives at California utilities, and Google are all interested in influencing behavior in the residential sector. These groups have all reached out to the group at Stanford to pursue work in this area.”



“Let’s look at how behavioral solutions play a role in these sectors.”

First, policy can help people buy energy efficient technologies by providing government subsidies for things like compact fluorescent lightbulbs and hybrid cars.

- Then we need people to use these technologies correctly. For example, a programmable thermostat is used to automatically adjust the temperature in your home, but it will only save energy if programmed

properly. Designers and scientists can design these to make them easier to program, and we can teach people how to use them

[SLIDE: BRAINSTORM]



“What are other behaviors you can think of to **DIRECTLY** reduce energy use?”

*Answers: Driving cars, using the computer, washing clothes, etc.*



“In summary, behavioral solutions in the residential sector can really make a big difference. That’s why we’ll focus on these for the next few weeks.”

## LESSON 1, STEP 3: SCIENCE & POLICY BRIEFINGS (10 MINUTES)

[SLIDE: LET'S TRY IT]



“At design workshops, designers and scientists often report to each other on their relative expertise to gain a better understanding of the problem and its cause. I have this research for you, so you’re going to pretend that you are scientists and present the findings to your peers.<sup>2</sup>”

[SLIDE: OVERVIEW (Move through animation as you say each step)]

[SLIDE: CLIMATE CHANGE]



“So, it starts with human energy behaviors. Most of these behaviors produce CO<sub>2</sub>, which leads to what?”

*Answer: Climate change.*

[SLIDE: ENERGY INSECURITY]



“They also create a demand for fuel, which causes what?”

*Answer: Energy insecurity*

[SLIDE: CIRCLE WITH “PROBLEM”]



“Today we’ll start out by looking at the problems caused by climate change.”

[SLIDE: ARROW WITH “LINK”]



“Then, we’ll link these problems back to their cause, which is human energy behaviors.”

[SLIDE: CIRCLE AROUND HUMAN ENERGY BEHAVIORS]

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<sup>2</sup> Role-playing has been proven to enhance learning. Acting out the role of scientists is a more salient way to learn and remember the impacts of climate change than just having the impacts presented by the teacher.

[SLIDE: PERSON WITH “ME”]



“Finally, we’ll talk about what we have direct control over so we can find ways to change.”



**Pass out Lesson 1 Science and Policy Briefings slips to different students.**



“Now we will move on to the scientific briefings, which I have just handed out. When it’s your turn to speak, you should stand at your seat and read your highlighted section to the class in the order indicated.”

[SLIDE: IPCC]



“Scientists today will be reporting back from the IPCC, the Intergovernmental Panel on Climate Change.”



“The IPCC is the world’s foremost authority on climate change and was established by the United Nations to put together objective scientific reports about climate change. It is made of over 2000 scientists from over 100 countries. These scientists and Al Gore won the 2008 Nobel Peace Prize for educating people about climate change so that we can begin to solve it.”

[SLIDE: IMPACTS OF CLIMATE CHANGE]

*Note for teachers: If students debate the anthropogenic cause of climate change, explain that the scientific consensus is that human actions are a significant driver of climate change especially in the last 50 years. When data on human-induced emissions and natural climate variations are mapped together, they match the actual warming of the climate. We will not focus on the science behind climate change in this class, but will be happy to talk afterwards and refer students to articles to read.*



**Ask all students who have practiced the skit to come to the front of the room.**



“Scientists today will be reporting on local impacts of climate change.

- **SCIENTIST 1:** The IPCC has concluded that the climate is warming; there is no longer any dispute. An increase in global air and water temperatures has led to melting snow and ice, rising sea levels, stronger storms, and changes in rainfall patterns.
- **SCIENTIST 2:** Rainfall in California is generally decreasing, and serious droughts are impacting our cities, farms, environment, and economy. According to the state government, California is facing the most significant water crisis in its history. If the drought continues into next year, the results could be catastrophic to our economy.
- **SCIENTIST 3:** [ON SLIDE: FIRE PICTURE] Because of dry conditions, fires are expected to increase in frequency and intensity, and have been showing this trend in California for the last few years. This is a picture of fires in San Bernardino, California in winter of 2003/2004.
- **SCIENTIST 4:** [ON SLIDE: SKIING PICTURE] These changes can have a large impact on our economy and wellbeing. Early melting of snow in the Sierra Nevada can lead to both early closing of ski resorts and a lack of water for homes and agriculture during the summer and fall.



“Do you know anyone who has experienced any of these local impacts?”



**Allow a few students to respond and facilitate a discussion.**

[SLIDE: ARTICLE]



“Turn to the second page of your Design Journal. Now read this article silently. It covers some impacts of climate change that we just heard about. Impacts are physical, such as melting of snow; biological, such as animals and plants losing their habitats; and human, such as disease and displacement. Answer the question that follows.



**Give students a few minutes to read and write responses, & ask some of them to volunteer their answers.<sup>3</sup> Generate discussion based on the questions.**



“Do you think what happened to the people in the article is fair? Why or why not?”



“Do you think your behaviors are connected with impacts like these? What could you do in your own life to reduce the risk of such impacts on others?”



“Does hearing about these local impacts motivate you to use less energy?”

*Note for teachers: If no students are motivated by local impacts, ask them what they would find motivating.*

[SLIDE: CAUSE FOR WORLD]



“So where should we look to address the problem? The U.S., China, and India account for about 60% of the world's emissions. The black smoke plumes here represent the total amount of CO<sub>2</sub> emissions for the last 60 years.”



“Although the United States makes up only **4%** of the world's total population, we produce nearly **25%** of the world's greenhouse gases, and you can see by the red color of countries that the U.S. and Australia produce more per person than citizens in any other country.”



“Here's a video that visualizes the CO<sub>2</sub> that we emit in the U.S. each year.”



**Show video on falling elephants.**

<sup>3</sup> We have included traditional reading, answering questions, and discussion in this curriculum to maintain credibility and to let students feel a sense of familiarity with the format, since most of the curriculum is structured in an unconventional way.

## [SLIDE: BUILDING EMISSIONS]



“Not only should Americans care, but we should particularly care in the residential sector because we are having a large impact and have direct control over changes that we can make.”



“Here we see that what we do in our homes (the “residential” sector) makes up about 1/3 of energy used in buildings in the U.S. Commercial uses about another 1/3 – in other words, the restaurants and stores we visit. And a little over 1/3 is used by industry – to make the products we all use.”

## [SLIDE: CIRCLE RESIDENTIAL SECTOR]



“So, we have control over one third of emissions in the residential sector.”

## [SLIDE: TRANSPORTATION EMISSIONS]



“These three ‘sectors’ are also responsible for the energy used by transportation. Over 60% of energy is used by cars or light trucks, which are mostly driven in the residential and commercial sectors.”

## [SLIDE: CIRCLE CARS/LIGHT TRUCKS]



“So, we have control over 60% of the emissions from transportation.”



“Furthermore, individuals from wealthier communities like this one tend to emit approximately 3 times as much as those in poorer communities. Given this, and the fact that we have the education and resources to control our lives, it is our responsibility to address this.”



“Since the facts show that we are responsible, how can we reduce our impact?”

## LESSON 1, STEP 4: COMBUSTION & CO<sub>2</sub> VISUALIZATION (5 MINUTES)

[SLIDE: COMBUSTION]



"ALL these CO<sub>2</sub> impacts come from a process known as combustion."



"So what does combustion mean?"

*Answer: It means burning.*

[SLIDE: Move through animations as you say them.]



"And how does it work?"

*Answer: You take a little bit of heat, add a bunch of fuel, like gasoline, and it produces a whole lot of energy plus carbon dioxide.*



"We're going to talk in a minute about how that energy gets harnessed to do the behaviors you just named, but first let's talk a little more about CO<sub>2</sub>."



**Pass out one balloon to each student to each student.**



"I'm giving each of you a balloon. I want you to blow it up to one liter size. Make sure you don't tie the end – we'll use the balloons again later."

[SLIDE: BALLOONS]



"I'm sure you all know that one of the main gases that we exhale is CO<sub>2</sub>. The amount of CO<sub>2</sub> humans inhale and exhale balances out and does not really affect climate change. I'm going to fill this balloon with CO<sub>2</sub>. The volume of the gas in this balloon is about 1 liter."



"Now with all of the talk about climate change you might have heard things about pounds of CO<sub>2</sub> – like how many pounds are produced from people driving."



"I don't know about you, but I have no idea what a pound of CO<sub>2</sub> looks like. Why would it be difficult to imagine a pound of CO<sub>2</sub>?"

*Answer: It's a gas, so it's hard to weigh.*



"Right, it's hard to weigh and visualize a pound of gas. So we're going to convert one pound of gas to its volume in liters, or one liter balloons for our purposes. This is actually a straightforward calculation that can be done using the formula shown."



"Any guesses as to how many balloons of CO<sub>2</sub> are in 1 pound?"  
[Allow students to guess.]

[ON SLIDE: 230 BALLOONS]



"230 balloons!"



"Hold up your balloons over your head. How many balloons do we have in the class? [Have students count.] Let's round it to 30 for our next calculations."



"How many more classes this size would we need to make up one pound of carbon dioxide? [Have students calculate answer.]

*Answer: about 8 classes (or 11 classes for a class of 20 students)*

*Note for teachers: If students ask about how balloon calculations are made, say that engineers know how much energy something uses, and if we know what kind of fuel it uses, we can compute how much CO<sub>2</sub> is produced. That's how we get the pounds of CO<sub>2</sub>.<sup>4</sup>*

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<sup>4</sup> This exercise enables students to visualize and quantify carbon dioxide. One of the reasons why climate change is not considered a tangible threat is that the culprit (carbon dioxide) is difficult to visualize and quantify.



“Let's go over some common energy-consuming behaviors. Driving a car one mile produces almost 200 liters, or balloons, of CO<sub>2</sub>. How many more classes this size would we need to equal this?”

*Answer: about 7 classes (or 10 classes for a class of 20 students)*



“What about the 900 balloons produced by drying one load of laundry in the dryer?”

*Answer: about 30 classes (or 45 classes for a class of 20 students)*



“What about eating a hamburger, which produces 2000 balloons of carbon dioxide?”

*Answer: about 70 classes (or 100 classes for a class of 20 students)*



“Now let out the air from your balloons. You can make as much noise as you want. Why do you think we did this activity? Which of your behaviors relate to the behaviors we covered in this activity?”

### LESSON 1, STEP 5: OBSERVATION WORKSHEET (15 MINUTES)



**Divide the students up into groups of four or five. Students may need to move seats in order to be seated with their group**



“You have now been split up into design teams. These are the teams that you will work in for the rest of the course. Take a minute to pick a name for your design team. Pick a name that has something to do with energy, solutions, and innovation.”

[Allow students to brainstorm for 2 minutes about a name.]



“Write the name of your group on the front of your folder.”

[SLIDE: OBSERVATION WORKSHEET]



“Now turn to the Observation Worksheet in your folder, the big sheet with the number 1. Over these classes, you will be keeping a record of your behaviors.<sup>5</sup> Each week we will calculate the number of balloons saved by using low-energy behaviors instead of high-energy ones.<sup>6</sup> We will collect your group totals and track them each week in class.”

[SLIDE: DISCUSSION]



“We’ll first read the list of behaviors together. As I have you read a behavior, tell me if you already do the behavior and what you think about it.”



**Point to a student to read each behavior. Answer any specific questions about the behavior if they are raised.**

**\*\*\*Clarifying notes on behaviors:**

- Hang drying: 1 or higher refers to hang drying one load of laundry. 0 refers to drying in a dryer or not at all.
- Turning off appliances: 1 refers to appliances generally being turned off during the day. 0 refers to appliances generally being left on while not in use during the day.
- Walking, biking, carpooling or taking the bus: 1 or more refers to miles traveled without a car. 0 refers to miles driven in a car or none at all.
- Eating meals without meat: 1-3 refers to meals without meat. 0 refers to meals with meat.
- Eating whole food snacks: 1 or more refers to eating snacks made of whole foods, like fruit. 0 refers to eating packaged snacks like candy bars and chips.
- Using a reusable bottle: 1 or more refers to refilling a reusable bottle to drink from. 0 refers to drinking from a disposable bottle or can.

- [SLIDE: OBSERVATION WORKSHEET (with days of week filled out)]

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<sup>5</sup> Keeping a log has been proven to assist with behavior change, notably for weight loss behaviors. Keeping a log in this case keeps students aware of their direct carbon dioxide impact.

<sup>6</sup> We give the students the impacts of high-leverage behaviors to focus their behavior change, instead of creating general awareness. The latter has proved ineffective.



“Fill in the Class 1 chart on the worksheet. Read the behaviors and mark the corresponding number in the Monday-Sunday boxes for the past week. Then add them for the total.”  
[Show example on PowerPoint.]



“The balloons **saved** per behavior for the activities are written on your sheet. We'll calculate your appliance impact in the next class; for now you can use 300 as an estimate.

- Hang dry = 900
- Shut off appliances = ~300
- Avoid driving one mile = ~200
- Eat a veggie meal = 700
- Avoid a processed and packaged snack = 40
- Use a reusable bottle = 50

- [SLIDE: OBSERVATION WORKSHEET (with total balloons saved)]



“For the ‘Total Balloons Saved’, multiply the ‘Total’ by the ‘Balloons Saved Per Behavior’. Then add the ‘Total Balloons Saved’ column and put the sum in the box at the bottom.”



“Once you have your individual total, add up these in your group for your group total. When you have it, raise your hand and I will come around and collect them.”

[SLIDE: GROUP PROGRESS]



**Collect group names and totals<sup>7</sup> and enter into the graph on the PowerPoint. Double click the graph on the screen and enter in numbers on Sheet 2. Make sure to return to Sheet 1 with the graph picture once numbers are entered.**



**Read off the names of each group in order from highest to lowest and have them raise their hand as they are named.<sup>8</sup> High groups should try to maintain their lead and lower groups should have more motivation to set higher goals.**

<sup>7</sup> Aggregating data in this way also helps address tragedy of the commons issues, since everyone becomes invested in keeping their emissions down and no one free rides.

<sup>8</sup> Healthy competition can be a motivator in behavior change. As groups note each others' progress, they are motivated to cut their emissions even more so they can “win.”



“Next week we’ll calculate your group totals again and see which group has improved the most. That group will get first dibs on choosing their topic for their video project.”



“Each day we’ll not only record our behaviors, but have discussions about them and do activities related to them, so we better understand how we can change them. You have a Take Home Log, number 2, inside your folder. Take a moment to write your name on it. Take that with you and record your behaviors over the week in the Class 2 chart so filling in your Observation Worksheet next week will be easier. “

### *LESSON 1, STEP 6: FOCUS ON A BEHAVIOR (10 MINUTES)*



“During this course you will be working in these groups to create a group project like the video you saw at the beginning of the class. You will use your video to promote one of these behaviors to other high school students. The video will only be 30 seconds to 2 minutes long, but you should try to tell a story of a character that demonstrates how to change from a high energy to low energy behavior. We’ll show you how to do this later in the course.”



“For now, we will start with the important step of observing behaviors – our own and those of others - to understand and overcome challenges to changing behaviors.”



“Remember that in the Observation Worksheet we are going to be tracking our total energy use over the next four weeks, which includes energy in three different categories. Every week we will improve our energy savings in all the categories, but we will focus on a specific category each week.”



“Now we will start with an electricity change. Over the week, you will experiment and try to find the best way to make the change. In the second week, we’ll add a transportation change, so you will be practicing both electricity and transportation changes. In the third week, we’ll focus on food, so you will be making three types of changes by then.



“Remember that you will be making changes in all the categories every week. We will just be specializing in a different category each lesson. Once you have completed your electricity change by next week, you can set better goals for yourself and exchange ideas

with your classmates on strategies for each week's improvement. You and your classmates will be experts on how to make these changes by the end of the course, and what you learn during the process will help you design good videos."



"This week you will focus on an electricity change. Two high impact behaviors are using a dryer and leaving appliances on when you're not using them. Even though there is a wide range of behaviors involving electricity, you should choose one of these because they have a high impact in residential energy use."



"Hang drying clothes is a good way to reduce the energy used by a dryer. If you do your own laundry, you can do this very easily. If someone else does your laundry, you can offer to help them hang dry or convince them to start hang drying."



"For your appliances, you should focus on the appliances you have control over – these might be just the appliances in your room. For these, you should make a reduction in how often they are turned on or are using energy, for example, turning your computer off at night."

#### [SLIDE: EXAMPLES OF ELECTRICITY CHANGES]



"If you already do both of these behaviors, write down what motivates you to do it, how you overcame the challenges in order to do this behavior, and how you can help others change to this behavior. You can also talk to your parents about what you can do together, such as turning down the water heater, pool heater, or air conditioner."



"Make sure you decide on a change that is specific.<sup>9</sup> It should be small enough that you're likely to succeed, yet large enough to be challenging. There are examples listed below each behavior option. A good rule of thumb is to look at what you usually do with regard to electricity – you just wrote this in your Observation Worksheet - and aim for an improvement that you can measure."



"Here are some examples of good electricity changes:

- Hang drying:
  - I will hang dry the next load of laundry I do.

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<sup>9</sup> Goal setting has been demonstrated to be a motivator in behavior change, and setting a goal that is challenging enough but not too difficult is crucial.

- I will hang dry one out of my next two loads of laundry.
- Shutting off appliances:
  - I will turn my computer off (or put it on sleep mode) before I get into bed every night this week.
  - I will plug my TV, DVD player, and stereo into a power strip, which I will turn off at least 5 nights this week."



"Write your change down in the box marked My Electricity Change on your Observation Worksheet (number 1). Leave some space in the box so that you can write down how you plan to improve your change next week."



"During the week, you will be responsible for making your change and coming up with either strategies to help other students overcome any challenges, or sharing the motivating things that helped you succeed. Be prepared to present your progress out loud in class next week. "



"Let's go over the things you'll be doing this week.

- First, make sure to remove your Take Home Worksheet from your folder, take it home, fill it out, and bring it back next week.
- Next, remember to work on your electricity change. Be ready to share your experience with the class next week. We'll also do some activities related to electricity, which will help you revise and improve your changes.
- Also, whichever group has improved the most next week will get to choose their topic for their group project first, so aim to beat your current score. Good luck!"



**Collect markers and folders.**

## LESSON 2: ELECTRICITY

*Students continue briefings on climate change and begin reporting about energy insecurity. Electricity lifecycle is introduced, and students participate in activities to practice and learn about low-energy electricity behaviors. Students form specific goals to reduce transportation impact during the week. For the group project, students choose a specific behavior and begin designing their storyline.*

### LEARNING OBJECTIVES

- Students will become aware of domestic challenges caused by energy insecurity.
- Students will practice low-energy transportation behaviors to overcome perceived difficulties.

#### BEFORE CLASS: MATERIALS & CLASS PREP

- Find videos online on credible news websites like BBC, CNN, Al Jazeera, and credible environmental websites like UCS, EPA, NAS, etc.
  - Video 1: This video should focus on the effects of Hurricane Katrina. E.g. <http://www.youtube.com/watch?v=s76Qn7bpCsQ&feature=related>
  - Video 2: **This video should focus on explaining the impact of Katrina on one family. Ex:**
  - Video 3: This video should focus on what happens when fuel supply is interrupted. E.g. <http://video.google.com/videosearch?q=opec+oil+crisis&hl=en&emb=0&aq=f#q=gasoline%20shortage%20news&hl=en&emb=0&start=10>

#### THE DAY OF THE LESSON: MATERIALS & CLASS PREP

- Print out four slips with the script for each student who will help out with the science and policy briefing ("Scientist 1, Scientist 2", etc.)
- Folders for students
- Science and Policy Briefings for students
- Chain game materials (one balloon, labels, and strings to hang labels around students' necks)
- Clothesline materials (clothes, clothesline, clothespins, stopwatch/timer)
- PowerPoint presentation

## OUTLINE OF LESSON

1. Results of Changes **(5 min)**
  - a. Students discuss results of Electricity Change
2. Science and Policy Briefings - Storms **(10 min)**
  - a. Students brief each other on effects of storms
  - b. Students read article on floods in Bangladesh
  - c. Students brief each other on Energy Insecurity
3. Chain Game **(5 min)**
  - a. Students act out electricity lifecycle
  - b. Students associate CO<sub>2</sub> impacts with specific behaviors and come up with alternative behaviors
4. Activities: Appliance chart and clothesline relay **(15 min)**
  - a. Students participate in clothesline relay
  - b. Students calculate unnecessary CO<sub>2</sub> emissions from their bedrooms
5. Observation Worksheet **(10 min)**
  - a. Students fill out log and calculate group total
  - b. Instructor shows results of week in front of class
6. Focus on a Behavior **(5 min)**
  - a. Students fill out "Before" steps for Electricity Change
  - b. Students choose Electricity and Transportation Changes
7. Group Project – Choose Behavior **(5 min)**
  - a. Students choose specific behavior for group project

## LESSON 2, STEP 1: RESULTS OF CHANGES (5 MINUTES)



“Let’s now talk about the electricity change that you all made last week. Raise your hand if you made the change that you wrote down.”



“If you did, that’s great. Now you can improve upon this change for next week. If you didn’t, you can either modify last week’s change or make sure you complete it this week. “



“What did you learn from your experience in trying to meet your electricity change? What will you do differently this week? For this week, what change will you make and how do you plan to accomplish it?”

*Answer: Allow other students to suggest different strategies. Use examples from 2-3 students.*

## LESSON 2, STEP 2: SCIENCE & POLICY BRIEFINGS (10 MINUTES)

[SLIDE: ENERGY WORKSHOP]



“Welcome back to the “d delta b” Energy Workshop. Last week you all made a change to one electricity behavior. This week we’ll talk about what you learned and explore some other techniques that address electricity. We’ll also get started planning your group projects.”

[SLIDE: OVERVIEW]

[SLIDE: CIRCLE WITH “PROBLEM”]



“Today we’ll start out by looking at the problems caused by climate change.”

[SLIDE: ARROW WITH “LINK”]



“Then, we’ll link these problems back to their cause, which is human energy behaviors.”

[SLIDE: CIRCLE AROUND HUMAN ENERGY BEHAVIORS]

[SLIDE: PERSON WITH "ME"]



"Finally, we'll talk about what we have direct control over so we can find ways to change."



"We will start with the Science and Policy Briefings. Again, you will present scientific briefings to your peers. When I ask you to, you should stand at your seats and read your highlighted section to the class in the order indicated."

[SLIDE: STORM IMPACTS OF CLIMATE CHANGE]



**Ask for four student volunteers to read the pre-printed specialist lines.**



"Scientists today will be reporting on storm impacts of climate change."

- **SPECIALIST 1:** Due to climate change and sea surface temperatures rising, storms are expected to increase in frequency and intensity. Danger to humans can come in the form of strong winds, powerful waves, and floods. You will likely recognize this picture of Hurricane Katrina.



"Now we will watch a video of about Katrina."



**Play first video on Katrina.**



"We'll now watch another clip about Katrina's impact on one family."



**Play second video.**



“Do you understand what happened in the video?”

*Answer: The man lost his wife in the storm and his house split in half. He feels lost and doesn't know what to do anymore. He has two children.*



“Do you know anyone who was affected by Katrina? What did you notice about the people who were most affected? Why do you think this is?”

*Answer: We see that poor people and minorities tend to live in vulnerable areas. This can be for a number of reasons, including:*

- *cultural ties to the area,*
- *availability of jobs,*
- *lack of resources to move to a new area,*
- *lack of resources to protect themselves from disasters.*

[SLIDE: ARTICLE]



“The impacts of these storms often fall more on disadvantaged populations like poor communities, minorities, and those in small island nations. These people contribute less to climate change but tend to suffer more from storm impacts, often because they live in areas subject to more disasters and don't have the resources to cope with these disasters. Now we're going to read an article about floods in Bangladesh. Turn to the third page of your Design Journal and read the article silently.”



**After students have written responses, ask some of them to volunteer their answers.**



“Do you think what happened to the people in this article is fair? Why or why not?”



“How do you think your behaviors might be connected to storms like these?”



“Do you find learning about climate change impacts on minorities and poor people like those in the video and in the article to be motivating for energy behavior change?”



“Do you think others might find it motivating? If not, what might motivate them to make changes?”

[SLIDE: ENERGY INSECURITY]



“We’re now going to talk about another impact of energy use – energy insecurity, which results from fuel demand. Just like we are having scientists report on climate change, we will have energy specialists report to us on energy insecurity.”



“These specialists have mostly put together their presentations from work done at the International Energy Agency (IEA). The IEA was established during the 1970’s oil crisis and acts as an energy policy advisor to 27 countries to improve their energy security.”

- **SPECIALIST 2:** Energy insecurity is the dependence on unreliable or a few energy sources that are subject to sudden interruptions. These interruptions can come from either natural disasters or political events, but both have an immediate impact on those reliant on the fuel. Let’s watch a video on what happened when the fuel supply was disrupted in the fall of 2008 by a storm in southeastern United States.
- [SLIDE: ENERGY IMPACTS] <watch video on fuel supply interruption>
- **SPECIALIST 3:** Another cause of energy insecurity is from world politics. These pictures on the right were taken in the 1970’s during the Oil Crisis. In October of 1973, OPEC (which is the Organization of Arab Petroleum Exporting Countries) cut oil production and put an embargo on shipping crude oil to the West. Immediately, the cost of a barrel of oil quadrupled. This led to total chaos - industries shut down to preserve oil, workers were laid off and the stock market crashed.



“What do you think we should do about our dependence on oil? How could you reduce your own fuel use to avoid worsening these problems?”



**Ask a few students to respond and facilitate a discussion.**

[SLIDE: ENERGY SOLUTIONS]

- **SPECIALIST 4:** The two solutions to energy insecurity are to (1) Diversify fuel sources with more reliable fuels (like solar), and (2) to reduce fuel use.



“This concludes today’s portion of the Science and Policy Briefings. We’re going to move on to a fun activity to really understand the link between our behavior and these larger world impacts. Today we’re going to focus on electricity-related behaviors.”

### LESSON 2, STEP 3: CHAIN GAME (5 MINUTES)

[SLIDE: ELECTRICITY LIFECYCLE]



“Look at the electricity lifecycle on page 5 of your journal. As we go over the steps, fill in the boxes in the diagram.”



“First, draw yourself in the house.”



“Now we are going to make the link between human energy behaviors such as turning on a light and the energy that it uses.”<sup>10</sup>



**Choose two students to come to the front and act as the fuel and the person performing the energy behavior. Pass out the cards to indicate their step as they come up and have them stand on either side of the front of the room. Ask questions to add each step in the process and have students come stand to fill in each link in the chain.**

<sup>10</sup> The purpose of the chain games is to connect human energy behaviors to the carbon dioxide impacts in order to make the case stronger for behavior change. The chain game also helps students visualize life cycles of electricity, transport and food and see where the carbon dioxide is emitted in the cycle. Kinesthetic activity makes the information more salient, and the game-like nature of the activity is motivating. Finally, repeating the activity for different behaviors reinforces the information.



“Since our energy behaviors are focused on electricity today, what fuel do you think he/she should represent?”

*Answer: Coal, which is used for about 50% of U.S. electricity generation.*



“Now, we can't get electricity directly from the fuel. What happens to the fuel for it to produce energy?”

*Answer: It is burned, or combusted in a furnace.*



“The fuel is burned to heat water and produce steam. What is the steam used to do?”

*Answer: It is used to turn a turbine.*



“The turbine is connected to a generator. What does a generator do?”

*Answer: It produces electricity.*



“The generator is a large magnet that spins around a wire to produce electricity. However, we still have to transport the electricity to people's homes. How do we do this?”

*Answer: Power lines.*



“We are missing one step from the process, though. What might that be?”

*Answer: Carbon dioxide emissions.*



“And where in the chain is the CO<sub>2</sub> emitted? From the person's house?”

*Answer: From combustion in the furnace.*



**Blow up a balloon and stand by the furnace.**



“Right. The fuel is burned to produce energy, and a side effect is the production of CO<sub>2</sub>.”



**When the chain is complete, have students explain each of their roles and physically act out the chain in order from fuel to energy behavior.**



“How many balloons of CO<sub>2</sub> do you think would be produced from leaving on a light for one day?”

*Answer: 700 balloons.*



“What is a way that we can reduce this impact?”

*Answer: Turn the light off; replace it with a Compact Fluorescent Lightbulb (CFL) – the swirly one.*



**Have students repeat the chain, changing the behavior to drying laundry. Then allow guesses for balloon impacts and suggestions for alternative behaviors. Repeat for the behavior of leaving a computer on.**

Behavior	Impact (# of 1L balloons CO <sub>2</sub> )	Reduce Impact By...
Incandescent bulb on 24 hours	700	CFL, turn the lights off
Drying one laundry load in a dryer	900	Hang dry
Computer on for 24 hours	500	Turn computer off

## LESSON 2, STEP 4: APPLIANCE CHART & CLOTHESLINE RELAY (15 MIN)



“Now that you understand the link between our electricity behaviors and carbon dioxide impacts, we’re going to start to observe these behaviors.”



**Divide students into two groups. One group will do each activity first. Then they will switch in the second half of the time period.**

## CLOTHESLINE RELAY<sup>11</sup>



Have students bring folders with them when going outside for the activity and answer “Before” questions on page 5 of the Design Journal.

### Directions for Clothesline Relay:

1. Divide the students into teams of about four people and see who can hang clothing the fastest, while still doing it properly. (If a team is short on team members, the first team members can also act as the last team member, etc.)
2. Each group waits in a line several feet behind the clothesline.
  - When the stopwatch is started, the first team member of each team runs up to the clothesline, put up three items of clothing, and then runs to the other side of the clothesline. They may or may not use clothespins.
  - Once they are on the other side, the next team member runs up, takes down the three items of clothing, puts them back up, and runs to the other side.
  - Continue until everyone in the group is on the other side of the clothesline. Stop the stopwatch. The first group with everyone on the other side wins.



Have students answer “After” questions in Design Journal.



“If you compare your answer on the “Before” and “After” questions, did you think the time it took to hang dry your clothes was shorter or longer after you did the relay?”



“Did you think that it was easier or harder after you did the relay?”

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<sup>11</sup> The clothesline relay is intended to overcome barriers to hang drying clothes, including the perception that hang drying is a tedious and difficult task. The activity also allows students to overcome inertia by actually practicing the task, builds mastery and associates fun with the activity.

Note: If students raise other barriers to hang-drying, follow up with additional questions. Examples:

- **[Challenge: clothes come out stiff or wrinkled]**
  - Ask: If you put them on when they're stiff or wrinkled, how long do they stay that way?
  - Ask: Are there ways of addressing these challenges, like throwing clothes in the dryer briefly at the end of the drying period?
  - Ask: Do you think that these wrinkles are sufficient to warrant producing 900 balloons of CO<sub>2</sub> per load as well as the resulting problems we've discussed in class?
  
- **[Challenge: it's wet and cold outside]**
  - Ask: Where else could you hang your clothes?
  - Answer: In the shower, bathroom, garage, other rooms and on other types of clothing racks, hangers or clothesline that hangs from one end of a room to the other.*
  
- **[Challenge: the time it takes for the clothes to actually dry]**
  - Ask: How long does it take for clothes to dry in a dryer?
  - Answer: ~45 minutes to an hour.*
  - Ask: How long does it take for clothes to hang dry on a sunny day?
  - Answer: ~3 hours.*
  - Ask: You occupy yourself while you are waiting for 1 hour. Can't you do the same for 3 hours?



"How many of you already hang dry?"



"Do you hang dry inside or outside?"



"How many of you do your own laundry?"

[SLIDE: APPLIANCE CHART]



“Turn to the Appliance Chart<sup>12</sup> on page 6 of your Design Journal. This chart displays the different appliances you may have and the amount of power that each appliance consumes. Beneath each appliance are two columns – the first is the balloons of carbon dioxide per hour produced while on, the second while in standby (which could be sleep for a computer, idle for a printer, or waiting for a remote signal for TVs, DVD players, stereos, etc). The rows with the different periods of the day show the number of balloons produced during that period.”



“We’re going to go through the chart and identify all the unnecessary balloons of carbon dioxide produced by appliances that you have control over. For most of you, this may just refer to appliances in your room, but if you have control over others in the house, you can use those as well. When we’re done, you will see which appliances you can focus on to make the largest electricity savings.”



**Walk the students through the Appliance Chart by reading each direction and turning to appropriate example slides. Give an example by walking through one appliance on the PowerPoint slides.**



- “Identify the times that you may be able to shut your devices off to save energy. To do this:
  - Cross off the columns of the appliances you don’t have.
  - Cross off the times that you are actively using the appliance (e.g., working on your computer).
  - Cross off the times you are not using energy, meaning you have unplugged something (TV, DVD player, stereo) **OR** turned it off and it’s not in standby mode (computer, printer). Even though an appliance is turned off, it still may be using electricity – this is what we call an Electricity Vampire. Any appliance that is plugged in uses electricity, even when it’s not

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<sup>12</sup> The appliance chart addresses information barriers by showing students how much energy they are using unnecessarily in their rooms. They are also able to think creatively about how to minimize energy wastage by using power strips to combine appliances that are used at the same times of the day, this builds self-efficacy because they are able to take action to resolve the problem once they are aware of it.

technically “on”. Some appliances (like toasters or cell phone chargers) draw very little power, so we won’t count them here, but other appliances, like TVs and desktop computers in stand-by mode, use significantly more electricity.

- Go through the remaining times and circle whether the appliance was on or in standby.
- Add up the total balloons that you’ve circled in each column. Then add the row of total balloons to find the total per day.”



“You have now identified the total number of unnecessary balloons that your appliances are responsible for each day. Now that you have an idea of which appliances use the most energy, you can target those to either shut off completely, unplug, or put onto a power strip so the power strip can be turned off.”



“Did any of you have a total of zero balloons per day?”

*Answer: If yes: [congratulate the student and tell them an electricity behavior to work on might be hang drying or teaching other members of their family how to conserve energy.]*



“If you have zero, you can use 300 (correct with accurate US average) balloons for the number of balloons saved on your Observation Worksheet.”



“For those of you who have more than zero, you should subtract your number from 300 for the number of balloons saved on your Observation Worksheet. This will be the number of balloons you can save each day by turning off these appliances.”



“So that you know more about electricity impacts, how important do you think it is to use less electricity? Which appliances will you focus on?”



**Wait for both groups to come back to the classroom.**



“So that you know more about electricity impacts, how important do you think it is to use less electricity? Which appliances will you focus on?”



“What did you learn from these activities that you can use to improve your own behavior changes? Did you find anything inspiring that you can apply to your video?”



“Next we’re going to observe our own behaviors using the Observation Worksheet you used last week.”

## LESSON 2, STEP 5: OBSERVATION WORKSHEET (10 MINUTES)

[SLIDE: OBSERVATION WORKSHEET]



“Take out your Take Home Worksheet and transfer the record of your behaviors into the Class 2 chart in the Observation Worksheet in your folders. Just like last week, we will calculate the number of balloons saved by using low-energy behaviors instead of high-energy ones. Again, you should calculate your group totals and I will come around and collect them.”

[SLIDE: GROUP PROGRESS]



“This is where your groups stand as of last class.”

Note: If students have trouble, use the following instructions and PowerPoint to guide them.

- Say: Read the behaviors and mark the corresponding number in the Monday-Sunday boxes for the past week. Then add them for the total.
- Say: The balloons saved per behavior for the activities are:
  - Hang dry = 900
  - Appliances = one day on appliance chart
  - Avoid driving one mile = 200
  - Eat a veggie meal = 700
  - Avoid a processed and packaged snack = 40
  - Use a reusable bottle = 50

- Say: For the “Total Balloons Saved”, multiply the “Total” by the “Balloons Saved Per Behavior”. Then add the “Total Balloons Saved” column and put the sum in the box at the bottom. [Show example on PowerPoint.]
- Say: Once you have your individual total, add up these in your group for your group total. When you have it, raise your hand and I will come around and collect them.



**Collect group names and totals and enter into the graph on the PowerPoint. Calculate the improvements that the groups have made. Read off the names of each group in order from highest to lowest improvements and have them raise their hand as they are named. Leading groups should try to maintain their lead and lagging groups should have more motivation to set higher goals.**

### *LESSON 2, STEP 6: FOCUS ON A BEHAVIOR (5 MINUTES)*



“Let’s now talk about the electricity change that you all made last week. Raise your hand again if you made the change that you wrote down.”



“If you did, that’s great. Now you can improve upon this change for next week. If you didn’t, you can either modify last week’s change or make sure you complete it this week. Take a minute to write down your modified change in the My Electricity Change box.”



**Give students 1 minute.**



“Having a week to practice the change should have helped you see what challenges there were and what were some strategies that worked. With these in mind, fill in the first row of boxes below the box, marked “Before”, with how you will make your electricity change during this week.”



**Give students 1 minute.**

[SLIDE: EXAMPLES OF TRANSPORTATION CHANGES]



“You will also aim to change one of your transportation behaviors to a low energy alternative behavior. There are two transportation options you can choose from this week. First, you can reduce your car trips by biking, walking, carpooling, or taking the bus. If you need to drive a car, you can drive more efficiently. There are a lot of strategies for this, so try out whatever you can think of.”



“Remember to choose a change that is specific.<sup>13</sup> It should be small enough that you’re likely to succeed, yet large enough to be challenging. Here are examples for each behavior option. You can refer to your transportation behaviors you recorded last week so you can choose a change that you can measure.”



“Here are some examples of good transportation changes:

- Reducing driving:
  - I will bike or walk to school three times this week.
  - I will take the bus to or from school four days this week.
- Driving more efficiently:
  - I will anticipate accelerating and braking by looking ahead to traffic and stoplights.
  - I will check my tire pressure and properly inflate my tires if necessary this week.”



“If you already do the behaviors listed, write down what motivates you, how you overcame the challenges in order to do this behavior, and how you can help others change to this behavior. You can also talk to your parents about what they can do, such as driving less, walking and biking more, and not idling while waiting to pick you up from school.”



“Write your change down in the box marked My Transportation Change in the Observation Worksheet.”



“During the week, you will be responsible for meeting your transportation change and coming up with either strategies to help other students overcome any challenges, or sharing the motivating things that helped you make your change. Be prepared to present your progress in class next week. It will be useful for improving your

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<sup>13</sup> Goal setting has been demonstrated to be a motivator in behavior change, and setting a goal that is challenging enough but not too difficult is crucial.

group score and for your group projects where you will be motivating others to engage in new low-energy behaviors.”

## LESSON 2, STEP 7: GROUP PROJECT – CHOOSE BEHAVIOR (5 MINUTES)

[SLIDE: PROTOTYPE WORKSHEET WITH “SELECT” CIRCLED]



“Now turn to the Prototype Worksheet, number 3 in your folder. This is where you will design your group project over the next few weeks. This project will be targeted at other high school students, encouraging them to use less energy in a short 30 second to 2 minute video that we’ll record a few weeks from now. These videos will be shown to other high school students, using either YouTube or your school’s morning announcements. Take a moment to write down your names, group name, and class period at the top of the sheet.”



“Today we will start with choosing the energy behavior for groups to focus on. We have only covered electricity-related behaviors in depth so far, but you are free to choose energy behaviors in other categories, such as transportation and food. Your group project topic may be different from the individual change you decided on earlier.”

[SLIDE: ENERGY BEHAVIORS]



**Read list of energy behaviors aloud to class.**



“To make the projects diverse within the class, every group must choose a different behavior. The group that has improved their score the most will get to choose their topic first. The second most-improved will choose second, etc...”



“Once I have collected your behavior choice, you will fill out the rest of the information in the Select section of the Prototype Worksheet. Circle the category of the behavior, then write down the high-energy behavior you want to change and the low-energy alternative behavior you want to promote. For example, in the video from last class, the high-energy behavior is using a dryer, and the low energy behavior is hang drying. The specific change should

be the take-home message for your audience, or what you want your audience to be motivated to do after watching your video. Your specific change for this behavior could be hang drying every load of laundry you do. Raise your hand if you want suggestions for changes for your behavior choice.”

Note: If students have questions about their topic, suggest appropriate goals from this list:

- **Electricity**
  - Hang drying:
    - I will hang dry the next load of laundry I do.
    - I will hang dry one out of my next two loads of laundry.
  - Shutting off appliances:
    - I will turn my computer off (or on sleep mode) before I get into bed every night this week.
    - I will plug my TV, DVD player, and stereo into a power strip, which I will turn off at least 5 nights this week.
- **Transportation:**
  - Reducing driving:
    - I will bike or walk to school three times this week.
    - I will take the bus to or from school four days this week.
  - Driving more efficiently:
    - I will anticipate accelerating and braking by looking ahead to traffic and stoplights.
    - I will check my tire pressure and properly inflate my tires if necessary this week.
- **Food:**
  - Eat less meat:
    - I will replace one meat meal with a vegetarian option.
    - I will eat meat once or fewer times per day.
  - Eat fewer processed and packaged snacks:
    - I will make my own snack out of whole foods to eat this week.
    - I will reduce the number of processed and packaged snacks by 2 this week.
  - Reduce disposable bottles
    - I will take a reusable water bottle to school 3 days this week.
    - I will reduce bottled/canned beverages by 2 this week.



**Allow one minute for groups to brainstorm preferences. In front of the class, go through each group, from most-improved to least-improved, and ask which behavior each group would like. Once the behavior is chosen, the following groups must choose from the remaining behaviors.**



“Next week you will spend more time designing your story. If you have an electricity behavior, you can use what you learned over the last week and try out new ways to change this week. If you are doing a transportation behavior, you should pay close attention this week to challenges or motivation to get ideas for a story. If you chose a food related behavior, brainstorm ideas for now. Next week we will add a food change.”



“Make sure to bring home your Take Home Worksheet, fill it out, and bring it back next week. To save time, calculate your individual totals before class. And don't forget to work on your individual changes for both electricity and transportation.”



**Collect folders.**

## LESSON 3: TRANSPORTATION

*Students continue briefings on climate change and energy insecurity. Transportation lifecycle is introduced, and students map out new routes to school with low-energy transportation. Students form specific goals to reduce meat and processed and packaged snack impact during the week. For the group project, students continue designing their storylines.*

### LEARNING OBJECTIVES

- Students will become aware of foreign impacts of climate change.
- Students plan out how to reduce transportation impact from their commutes to school.

#### THE DAY BEFORE THE LESSON: MATERIALS & BEFORE-CLASS PREP

- Choose 2 talented students, give them copies of the skit for Step 7 and have them practice for the lesson.

#### THE DAY OF THE LESSON: MATERIALS & BEFORE-CLASS PREP

- Print out slips with the script for each student who will help out with the science and policy briefing.
- Folders for students
- Find videos online on credible news websites like BBC, CNN, Al Jazeera, and credible environmental websites like UCS, EPA, NAS, etc.
- **Video 1: This video should focus on behavior change promotion.**
- Science and Policy Briefings for students
- Chain game materials (one balloon, labels and strings to hang labels around students' necks)
- PowerPoint presentation

## OUTLINE

1. Results of Changes **(5 min)**
  - a. Students discuss results of Electricity and Transportation Changes
2. Science and Policy Briefings – Human Health **(5 min)**
  - a. Student brief others on human health impacts of energy insecurity
  - b. Students read article on babies and home heating in the Northeast
  - c. Student brief others on human health impacts of climate change
3. Chain Game **(5 min)**
  - a. Students act out transportation lifecycle
  - b. Students associate CO<sub>2</sub> impacts with specific behaviors and come up with alternative behaviors
4. Activities: Map route to school **(10 min)**
  - a. Instructor uses Karen and Joe as example students
  - b. Instructor goes over map and daily schedule with students
5. Observation Worksheet **(5 min)**
  - a. Students fill out Observation Worksheet and calculate group total
  - b. Instructor shows results of week in front of class
6. Focus on a Behavior **(5 min)**
  - a. Students fill out Electricity “After” results
  - b. Students fill out Transportation “Before” steps
  - c. Students choose Electricity, Transportation and Food changes
7. Group Project – Start mapping storyline **(15 min)**
  - a. Instructor explains prototype worksheet as a map for the group project
  - b. Instructor leads students through Prototype Worksheet to choose characters, address challenges, and choose SUCCEsS strategies

### LESSON 3, STEP 1: RESULTS OF CHANGES (5 MINUTES)

[SLIDE: ENERGY WORKSHOP]



"Today we are going to continue the "d delta b" Energy Workshop. Last week you chose transportation changes to practice. We'll discuss your results today and talk about transportation-related energy more in depth. We'll also continue with your video project by developing the characters and outline for your story. We'll spend the last part of class on your videos, so it's important to work quickly so we can spend as much time as possible on planning them."



"Last week you also continued with your electricity change. Turn to your Observation Worksheet and look at the latest change you wrote down for electricity and transportation."



"Who completed their electricity change? Was completing your electricity change easier after learning more about electricity and talking about strategies with your classmates ahead of time? Who found cool solutions to challenges that came up? What was fun?"



"Who completed their transportation change? Was it easy? Did you enjoy it? Did you get any good results?"



"You still have a couple weeks to try out other strategies. We'll choose these later today."

### LESSON 3, STEP 2: SCIENCE AND POLICY BRIEFINGS (10 MINUTES)



"We're going to move on now with the Science and Policy Briefings."

[SLIDE: OVERVIEW]

[SLIDE: CIRCLE WITH "PROBLEM"]



"Today we'll start out by looking at the problems caused by energy insecurity."

[SLIDE: ARROW WITH "LINK"]

[ SLIDE: CIRCLE AROUND HUMAN ENERGY BEHAVIORS]



"Then, we'll link these problems back to their cause, which is human energy behaviors."

[SLIDE: PERSON WITH "ME"]



"Finally, we'll talk about what we have direct control over so we can find ways to change."

[SLIDE: ENERGY INSECURITY IMPACTS]



**Ask for volunteers to read pre-printed skit and have them come to the front of the room.**



"At our design workshop today, oil specialists and climate scientists will be reporting on human health impacts of energy insecurity and climate change. As I ask you, you should stand at your seats and read your highlighted section to the class in the order indicated."

**SPECIALIST 1:** Over the last decade oil prices have been rising. This is shown by the red line on this graph. There are several reasons, but the largest factor is that demand has been increasing, especially in rapidly developing countries like China. If production had been increasing at the same rate, then price would remain stable. But it will take years for suppliers to significantly increase their production, especially in the regions that produce the majority of the world's oil, because the oil production facilities there are government-owned and are slow to build new infrastructure.

**SPECIALIST 2:** [ON SLIDE: WORLD ENERGY DEMAND TO 2030] Although oil prices might fluctuate a little because of the other factors that affect prices (and you can read about these in the Washington Post article that is included in your folder), this overall increasing trend is likely to continue. World energy use is on trajectory to **DOUBLE** from 1980 to 2030. We're about halfway along this curve now – you can see this on the graph with four bands of colors – the residential and commercial sectors are in yellow. This estimate is from the U.S.

Government (the Energy Information Administration), Shell, Exxon-Mobil, and others.

[SLIDE: ENERGY INSECURITY CAUSE]

**SPECIALIST 3:** Here we have a world map, but not an ordinary world map. The sizes of the countries have been modified and are proportional to the amount of fuel each country consumes. As you can see, the United States is the largest fuel consuming country in the world. Note how much fuel the U.S. consumes compared to many other nations. [ON SLIDE: FUEL EXPORTS] Now where do you think all that fuel comes from? As you can see from this second map, the Middle East is by far the largest oil-producing region in the world.

[SLIDE: OIL AND GAS RESERVES]

**SPECIALIST 4:** It may come as a surprise that U.S. owned companies – we can see them here (**point out Exxon, Shell, and Chevron**) – are very small compared to many others, mostly in the Middle East. Furthermore, the entities in green are companies, while the ones in blue are owned by governments. This means that politicians can have a significant influence and may interfere with typical supply and demand dynamics. Stanford researchers believe that because of political tensions, it is likely that there will be oil crises in the future. The complex politics of oil supply and demand can lead to situations where the poor in the U.S. and elsewhere suffer from diminished health when there are fuel shortages.



“Do any of you know anyone who has been affected by energy insecurity?”

*Answer: Do any of you drive? Then you have to deal with fluctuating gas prices.*



“Now we’re going to read an article on the local impacts of energy insecurity. This article addresses how energy shortages affect families in the U.S. For most of the U.S., electricity is generated by coal, natural gas, and nuclear power. However, some places still rely on oil for heating their homes. That means that home energy use is subject to the same price fluctuations as gasoline for our cars.”

[SLIDE: ARTICLE]



“Turn to page 7 in your Design Journal. Now read this article silently. When you finish, answer the question at the end of the article.”



**After students have written responses, ask some of them to volunteer their answers. Generate discussion.**

- Do you feel babies deserve to be affected by energy insecurity? What other groups are vulnerable but not as responsible for energy and climate impacts (think of the last two articles you read in this class)?



“How does this article relate to transportation?”

*Answer: both the families and all of us use oil-based fuel; the families need it for heating, we need it for transport, so if we use a lot of fuel, or when there's a shortage, families in the Northeast are affected.*



“What do you think we as individuals can do to make the impacts of energy insecurity less severe?”



“We're going to continue with the human health impacts of climate change.”

[SLIDE: CLIMATE CHANGE IMPACTS]

- **SCIENTIST 1:** According to scientific projections, the health of millions of people is likely to be affected by climate change. Warmer temperatures increase air and water pollution, resulting in asthma, hayfever, emphysema, and cardio-respiratory deaths.
- **SCIENTIST 2:** [ON SLIDE: PARASITE] Climate change also allows parasites to thrive in previously uninhabitable regions, which have now warmed. This can lead to the wider spread of diseases in humans, such as malaria spread by mosquitoes or Lyme disease spread by ticks, which occurs in the U.S.



“Do you know anyone who has asthma or whose asthma has become worse in the last few years? Have you ever had Lyme disease?”



“Similar to the electricity lifecycle, we’re now going to look at the link between transportation behaviors and carbon dioxide impacts.”

### LESSON 3, STEP 3: CHAIN GAME (5 MINUTES)

[SLIDE: TRANSPORTATION LIFECYCLE]



“Look at the transportation lifecycle on page 9 of your Design Journal. As we go over the steps, fill in the boxes in the diagram.”



“First, draw yourself in the car.”



“Now we are going to make the link between human energy behaviors such as driving a car and the energy that it uses.”



**Choose two students to come to the front and act as the fuel and the person performing the energy behavior. Pass out the cards to indicate their step as they come up and have them stand on either side of the front of the room. Ask questions to add each step in the process and have students come stand to fill in each link in the chain.**



“Since our energy behaviors are focused on transportation today, what fuel do you think he/she should represent?”

*Answer: Petroleum (or oil), which powers the majority of cars, trucks, airplanes and other fueled transportation in the world.*



“Once oil is pumped from the ground and processed, it still has to get to your car. What is the first step it must take from the processing factory?”

*Answer: It gets transported to a gas station.*



**Have students come up and represent both a transport vehicle and a gas station.**



“The gasoline is then put into your car. What must it do to power your car?”

*Answer: It is combusted in the engine.*



**Explain following steps in 4-stroke engine cycle and have students crouch (phase I and III) or stand tall (phase II and IV) to represent piston steps.**

- Engine phase I: **Intake stroke** – Piston withdraws and fills with fuel
- Engine phase II: **Compression stroke** – Gaseous fuel is compressed
- Engine phase III: **Power stroke** – Spark ignites fuel, which combusts, expands the piston, and produces energy to power the car.
- Engine phase IV: **Exhaust stroke** – CO<sub>2</sub> and pollution are emitted



“And where in the chain is the CO<sub>2</sub> emitted?”

*Answer: From the exhaust stroke.*



**Blow up a balloon and take place in the chain by the power stroke.**



“Right. The fuel is burned to produce energy to power the car, and a side effect is the release of CO<sub>2</sub>.”



**When the chain is complete, have students explain each of their roles and act out the chain in order from fuel to energy behavior.**



“How many balloons of CO<sub>2</sub> do you think would be produced from driving one mile in an average passenger car?”

*Answer: Almost 200 balloons.*



“How about one mile in an SUV?”

*Answer: 270 balloons.*



“What about one mile in a hybrid vehicle?”

*Answer: Under 100 balloons.*



“What is a way that we can reduce this impact and how many balloons would each produce?”

*Answer: Walking (0 balloons), carpooling (balloons/# of people), biking (0 balloons), public transit (balloons/# of people on bus)*



“How can you use what you just learned about transportation to improve your own behavior change choices or design an interesting YouTube video?”

### LESSON 3, STEP 4: ACTIVITY- MAP ROUTE TO SCHOOL (10 MINUTES)



“Now that we understand how our transportation behaviors contribute to the problem, we’ll move on to exploring alternative behavior choices.”



“Take out handout number 4 from your folder, and we’ll begin our transport activity. We have a couple of model students to illustrate alternative behaviors in this activity.”

[SLIDE: MEET KAREN]



“First, meet Karen. She is a senior at Gunn High School in Palo Alto, California, and lives a little over a mile from school.<sup>14</sup>”

[SLIDE: MAP OF AREA AROUND SCHOOL]



“Here is Gunn High School on the slide, and here is Karen’s house.”

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<sup>14</sup> This activity models the desired behavior (biking) and casts it in a “cool” way to motivate students to be more like Karen. Karen is never visualized explicitly so students may project their own identities onto her. Maps and bus routes are provided to address informational barriers. Guidelines are given for optimal goal setting.



“Now look at your own map. The zoomed in map has Gunn at the center with about a 3 mile radius. The zoomed out map also has Gunn near the center. The circle indicates the 3 mile radius. On both of the maps, the bus routes are also labeled.”



“Mark the block where your house is on the map.”

[SLIDE: KAREN'S WEEKLY SCHEDULE]



“Last year, Karen drove to school almost every day. After school she had band and tennis practice, so she needed to carry her racket and instrument to school. On Friday, she biked because she only had her backpack.”



“On your own chart on page 9 of your Design Journal, fill in your current mode of transportation to school every day. Then fill in your after school destinations and what major items you need to bring with you.”

[SLIDE: KAREN]



“Last summer, Karen went to Paris to stay with her aunt and found out how popular biking was in the cities.”

[SLIDE: BIKING IN EUROPE]



“She saw people biking everywhere and later found out that in many European countries, the proportion of trips in urban areas made by walking and biking was often around 25% compared to 7% in the U.S.”

[SLIDE: CHIC AND ROMANTIC]



“She would go shopping online and out with her friends to look at cool bikes and biking accessories. She even had a boyfriend while she was there and thought it was romantic when they would go biking together. When she got back to the U.S., she decided for all these reasons that she really wanted to bike more often.”

[SLIDE: NO CONGESTION & NO COST]



“In addition, she would avoid the congestion and costs associated with driving from when she commuted to school last year. [Read notes on slide.]”

[SLIDE: CLOTHES]



“There were a few things she needed to tackle with biking all the time. In Europe, people were very well dressed and wore everyday clothes while biking. A lot of people wore skirts and heals. She figured she could wear her everyday clothes, although some companies even make special clothes and shoes with extra flexibility or more traction.”

[SLIDE: WITH LOTS TO CARRY]



“In addition, she has a lot to carry with her books and her trumpet. In Europe, people would carry lots of things with racks, baskets or on their backs without any apparent discomfort – it was normal. So, now she's looking at different types of baskets and panniers to help carry her things.”



“What about one mile in a hybrid vehicle?”

*Answer: Under 100 balloons.*



“How do you carry your things on a bike?”

[SLIDE: IN THE RAIN]



“If it snowed around here, she might reconsider biking on those days, even though people in Europe bike in the snow! She's planning to prepare for rain with a simple rain cape and waterproof rip-off pants.”



“How do you bike in the rain?”

[SLIDE: MAP OF AREA AROUND SCHOOL]



“Karen mapped out her route from home to school and noticed there was a bus line as well. She can either bike or take the bus every day to school.”

[SLIDE: KAREN'S WEEKLY SCHEDULE]



“On your own chart, draw out a route to school.”



“Figure out which days you would be able to bike, walk or take the bus, if you don't already, and write it in the right column. If you're within the three mile radius, you should be able to bike to school. If you live near a bus line, you should try taking the bus. If you already bike, we'll talk about other changes you can make in a few minutes.”



“Who has a good reason to drive every day?”

*Answer: School is too far away. It's too dangerous to bike to school. There are no bus lines that run near my house. There are too many hills. I have too much equipment to carry. Etc.*



“So even if you have good reasons to drive to school, there are still things you can do to use less energy.”

[SLIDE: MEET JOE]



“We'll use Joe as our example.<sup>15</sup>”

[SLIDE: LARGER MAP OF AREA AROUND SCHOOL]



“Here is Gunn and this is the three mile radius around Gunn. Here is Joe's house – across the freeway and outside the 3-mile radius. This is the route Joe takes to school.”

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<sup>15</sup> Again, the desired behavior (fuel efficient driving) is modeled using a character.



“Now let’s talk a little about fuel efficient driving. There are lots of techniques drivers can use to save gas. You can also read about these on the back of your map handout.”

[SLIDE: FUEL EFFICIENT DRIVING TECHNIQUES]



**Switch to the next slide as you go through each of the six techniques. The name of the strategy should appear before you introduce it.**



“Reduce weight – Weight can use 4% of your fuel. How do you reduce weight?”

*Answer: Remove unnecessary items from your car.*



“Inflate your tires – Uses over 4% of fuel. You can reduce this by pumping the tires up and reducing the weight of your vehicle. Where do you fill up your tires?”

*Answer: At the gas station or at home.*



“Turn off your accessories like the AC, which can use over 2% of fuel. How do you avoid the AC?”

*Answer: Roll down the windows.*

*Note for teachers: Part of the reason AC is so bad is because in the car the chemicals that enable AC are very potent GHGs (much more so than CO<sub>2</sub>), and they often leak from the cars. In contrast to AC, car heating produces almost no GHGs because the heat is blown off of the engine, which is already hot. Regarding other accessories, the radio takes almost no energy. CD players etc. take a little more.]*

*Note for teachers: If students ask what to do when it is too hot to not use AC, explain that rolling down windows right away gets rid of the hot air faster by increasing circulation.*



“Pulse and glide – you can save a lot of gas with minimal acceleration and gliding to a stop. How can you do this?”

*Answer: Control the speed of the car with the gas pedal, not the brake. Drive slower. Follow the speed limit. Look ahead to brake lights and traffic lights. Etc.*



“Shift – Energy is lost with inefficient transmission. You can control this yourself if you drive a manual car.”



“Don’t idle – you can save over 17% of fuel by turning off your car while you wait. When should you turn off your car? “

*Answer: While you wait to pick up or drop off people. (Not usually when you are waiting at a short light or stop sign – that can be dangerous.)*



“You also lose a lot of energy just turning on a car. Internal combustion engines are not that efficient, and you lose almost 2/3 of the fuel just in the combustion process.”



“Now let’s see if we were able to reduce our energy impact with the behaviors we practiced last week.”

### LESSON 3, STEP 5: OBSERVATION WORKSHEET (10 MINUTES)

[SLIDE: OBSERVATION WORKSHEET]



“Take out your Take Home Observation Worksheet and transfer the record of your behaviors into the Class 3 section of the Observation Worksheet in your folders. Once you’ve calculated your group total, I’ll come around and collect them.”

[SLIDE: GROUP PROGRESS]



“Here are the results of your group’s changes as of last week.”



**Collect group names and totals and enter into the graph on the PowerPoint. Read off the names of each group in order from highest to lowest improvements and have them raise their hand as they are named. Most improved groups should try to maintain their lead and less improved groups should have more motivation to set higher goals.”**



“For the groups that improved, do you want to share your strategies or insights with the class?”

[SLIDE: CLASS TOTALS]



"This is where your class stands compared to the other classes. Look at how much the balloon savings add up when this many students contribute."



"You will have more opportunities to improve your group score this week."

### LESSON 3, STEP 6: FOCUS ON A BEHAVIOR (5 MINUTES)

[SLIDE: ELECTRICITY "AFTER" CIRCLED ON OBSERVATION WORKSHEET]



"Let's return to your electricity change. Fill out the "After" steps, the second row of boxes, on your Observation Worksheet."



**Give students a minute to fill out the boxes.**



"Now write down your improved changes for next week in the My Electricity Change and My Transportation Change boxes. We want you to make these changes at the same time so you can prioritize where you can make the biggest balloon savings."



**Give students a minute to fill out the boxes.**

[SLIDE: TRANSPORTATION "BEFORE" CIRCLED ON OBSERVATION WORKSHEET]



"Having a week to practice the changes should have helped you see what challenges there were and what strategies worked. Keep these in mind and refer back to what you learned from your electricity changes, then fill in the first row of boxes below the box for your transportation change, marked "Before," with how you will make your change during this week."



**Give students a minute to fill out the boxes.**

## [SLIDE: EXAMPLES OF FOOD GOALS]



“This week we are also adding a food change. Just like with electricity and transportation, you will experiment with making the change this week and observing any challenges or motivating things that come up. Then we’ll discuss those in class next week and modify our changes.”



“There are three food options you can choose from this week. The first is to eat less meat. Next, you can eat fewer processed and packaged snacks. Lastly, you can reduce the number of disposable bottles and cans that you use by bringing a reusable bottle with you.”



“Remember to choose a change that is specific. It should be small enough that you’re likely to succeed, yet large enough to be challenging. There are examples listed below each behavior option. You can refer to your food behaviors from last week so you can choose an appropriate change that you can measure.”



“Here are some examples of good food related changes:

- Eat less meat:
  - I will replace one meat meal with a vegetarian option.
  - I will eat meat once or fewer times per day.
- Eat fewer processed and packaged snacks:
  - I will make my own snack out of whole foods to eat this week.
  - I will reduce the amount of processed snacks by 2 this week.
- Reduce disposable bottles
  - I will take a reusable water bottle to school 3 days this week.
  - I will reduce bottled/canned beverages by 2 this week.



“If you already do all of these behaviors, write down what motivates you, how you overcame the challenges in order to do these behaviors, and how you can help others change to these behaviors. You can also talk to your parents about what you can do together, such as planning family meals that don’t include meat, reducing the number of packaged and processed snacks you consume, and eliminating the use of disposable beverage

containers.”



“Write your change down in the box marked My Food Change.”



**Give students a minute to fill out the box.**



“During the week, you will be responsible for completing your change and coming up with either strategies to help people overcome any challenges or sharing the motivating things that helped you make your change. Be prepared to present your progress in class to your group next week. It will be useful for your group projects when you have to motivate others to engage in new low-energy behaviors.”

### *LESSON 3, STEP 7: GROUP PROJECT – START MAPPING STORYLINE (15 MINUTES)*

[SLIDE: PROTOTYPE WORKSHEET WITH “STEP 2” CIRCLED]



“Now we are going to walk through a guided brainstorm for your group project and by the end of it you will have a detailed outline of your project. Take out your Prototype Worksheet (number 3) and follow along. As part of the design process, each step will be timed and you will need to do things quickly. This sparks your creativity and helps you focus your thoughts. Remember that your peers will watch your movie, so aim to design a story that you think they would find fun and motivating.”



“Step 1 is to select the behavior. Last week all of you chose your behavior and wrote in the low energy alternative and a specific change. “



“To illustrate how you will do Step 2, let’s watch the video we watched in our first session and see how we can improve it. “



**Show video example of behavior change promotion.**



“What is this video missing?”

*Answer: This video could be made much better if it actually showed why the negative character, Brad, is unwilling to hang dry his clothes, and then addressed these challenges for Brad so that he could change his behavior, exactly as you have all been practicing. We are going to act out a skit for you that makes some improvements on the video – watch and listen carefully to pick out what we did differently. This will be directly useful to your project.*



**Call the two students previously picked to the front of the class to act out skit for students (Brad, Earth):**

(Setting: Brad's laundry room)

(Situation: Brad is using a dryer)

Earth: Ah, it's so satisfying to hang dry clothes! Why don't you hang dry Brad?

Brad: It just seems like it's so slow and a lot of work. I always use a dryer – it's a habit.

Earth (sadly): Don't you know a single load of laundry dried in a dryer releases 900 balloons of carbon dioxide? This contributes to overheating me and makes me very upset.

Brad: Why should I care? I want my clothes to be smooth so I don't need to iron them. If I hang dry they get wrinkly right? Then it's more work to iron them.

Earth: You know, hang drying is so relaxing and it takes me only minutes – you should try it! After hang drying, if you leave your clothes in the bathroom while you're showering the steam gets rid of wrinkles and helps smooth out your clothes.

Brad: Hey, I never thought of that shower idea! That sounds interesting – I will try it!

Earth: And, you will contribute less to the extreme heat waves in the summer by putting less carbon dioxide in the atmosphere.

Brad: Ohhh...my Grandma suffered a lot in the heat waves last year...I don't want to be a part of her suffering... Thanks Earth! You've shown me a better way to do laundry, so I can keep my Grandma healthier AND I will save money AND help keep you cooler! Wow! Everybody wins!

(Brad switches off dryer)



What was different about the skit compared to the video?

*Answers: The skit is engaging and emotional. Earth is a positive character that models the desired low energy behavior; Brad is a transitional character who becomes motivated and changes his behavior; there is a surprising insight; there is emotion; informational and perceptive challenges are overcome. The skit also links dryer use to the problem of climate change. The video was engaging and emotional but Brad did not change his behavior.*



“Right, Earth, a positive character, actually showed how to overcome challenges so that Brad, a transitional character, could change his behavior. Note that Earth was able to inform Brad about strategies to change his behavior in a way that motivated Brad. This is exactly your task with your video. “

*Note for teachers: If students say that the skit is too cheesy and won't motivate high school students, tell them that their job is to make their own skit more motivating. That is precisely why we are working with high school students.*



“Now I'm going to walk you through the steps you will take to design your own project. This can be a skit, a song, a rap, a poem, or other type of medium listed. In step 2 in your Prototype Worksheet you will fill out the characters you will use. Think of a positive character (like Earth), a transitional character (like Brad), and other characters and name them. Write down your setting and situation. In the skit Earth and Brad were in Brad's laundry room and the situation was Brad using his dryer.”



“Now look at step 3 on your worksheet. This is where your own individual experiences will play a large role in addressing challenges to behaviors and providing motivation to your audience. Try to think of the creative ways that you went about making your change and use them to tell a meaningful and engaging story. We'll go over the questions using the skit as an example.”



**Ask the following questions and allow students to brainstorm how the video addressed these questions:**

- How does the low-energy behavior link to bigger issues (like climate change, energy insecurity)? *(Answers: Earth mentions the balloons of carbon dioxide released from using a dryer, links carbon dioxide to heat waves)*
- How did the skit encourage the audience to remember to do this behavior? *(Answers: By connecting impacts to Brad's grandma, providing a surprising insight about steam in the shower, and by using balloons to visualize and quantify carbon dioxide emissions)*
- What is challenging about the behavior? *(Answers: Brad already has a "dryer habit," he is averse to wrinkles in his clothes, he thinks hang drying takes too long, and he doesn't care about impacts to Earth)*
- How did the character overcome the challenge? *(Answers: Brad was motivated by emotion, and the new strategy of smoothing out wrinkles in the shower)*
- What are some good things about the low-energy behavior? *(Answers: reduces carbon dioxide emissions; saves energy; contributes less to heat waves thereby improving grandma's health; saves money)*

[SLIDE: STICKY IDEAS]



"Now look at the SUCCEs<sup>16</sup> tools."



**Once you introduce the feature (e.g. Simple), ask students to give a definition.**

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<sup>16</sup> The SUCCEs model shows how to make ideas "stick". It was developed by Chip Heath, a Stanford professor, and Dan Heath, an educator. They performed an extensive analysis of urban legends, wartime rumors, proverbs, conspiracy theories, jokes, class lectures, and psychology experiments to find that messages "stick" when they are Simple, Unexpected, Concrete, Credible, and Emotional Stories.



“What does simple mean?”

Answer: **Simple** – Use one core idea; don't cram in too many ideas.



“What does unexpected mean? “

Answer: **Unexpected** – Use surprise, and then curiosity to maintain interest; don't make it too boring or predictable



“What does concrete mean?”

Answer: **Concrete** – Use a clear example; don't leave it abstract



“What does credible mean?”

Answer: **Credible** – Use a good spokesperson or make it consistent with experience; don't make it too farfetched



“What does emotional mean?”

Answer: **Emotional** – Tap into an emotion; instead of using lots of facts



“What makes a good story?”

Answer: **Stories** – make it meaningful and memorable, give it a flow; don't have scattered events



“You will circle the SUCCEsS tools you want to use to make your video “sticky” or memorable and write down how you want to apply them. In the skit there was a surprising insight about steaming clothes in the shower, and emotional moments where Brad felt sad about the impact of his actions on his grandmother's health.”



“Next week you will finish planning your group projects and should be rehearsing by the end of class. Keep thinking about insights from your experience so far that you can add to the storyline by continuing to observe yourself and complete your individual changes. This will be helpful for both the electricity and transportation groups, but especially for the food groups.”



**Allow students to work in groups for the remainder of the class.**



“Make sure to bring home your Take Home Observation Worksheet, fill it out, and bring it back next week. Calculate your individual totals to save time.”



**Collect folders.**

## LESSON 4: FOOD

*Students continue briefings on climate change and energy insecurity. Food lifecycle is introduced, and students create recipes from low-impact food options. For the group project, students finish storyline and start rehearsing.*

### **CLASS OBJECTIVES:**

- Students will become aware of foreign impacts of energy insecurity.
- Students will be able to make low-impact food choices.

### MATERIALS & BEFORE CLASS PREP

#### **THE DAY BEFORE THE LESSON: MATERIALS & BEFORE CLASS PREP**

- Choose six talented students and have them practice the skit in Step 2 of the lesson ("Specialist 1, Scientist 1" etc.) They will perform in front of the class for the actual lesson.
- Find videos online on credible news websites like BBC, CNN, Al Jazeera, and credible environmental websites like UCS, EPA, NAS, etc.
  - Video 1: This video should focus on the effect of climate change on the arctic sea melt Ex: <http://www.youtube.com/watch?v=neXB1XzMu7Y&feature=related>
  - Video 2: This video should focus on the effects of climate change on the habitats of polar bears. Ex: <http://www.youtube.com/watch?v=nKPD108iygc&feature=related>
  - Video 3: This video should be about thermohaline circulation. Ex: [http://www.youtube.com/watch?v=lazg1F9hE\\_c&feature=related](http://www.youtube.com/watch?v=lazg1F9hE_c&feature=related)

#### **THE DAY OF THE LESSON: MATERIALS & BEFORE CLASS PREP**

- Print out slips with the script for each student who will help out with the skit.
- Folders for students
- PowerPoint presentation

**OUTLINE:**

1. Results of Changes **(5 min)**
  - a. Students discuss results of Electricity, Transportation, and Food Changes
2. Science and Policy Briefings – International **(10 min)**
  - a. Students brief others on international effects of energy insecurity
  - b. Students read article on Saudi Arabia
  - c. Students brief others on international effects of climate change
3. Chain Game **(5 min)**
  - a. Instructor explains different types of food impacts
  - b. Students associate CO<sub>2</sub> impacts with specific behaviors and come up with alternative behaviors
  - c. Instructor explains Pocket Food Guide
4. Activities: Recipe creation **(10 min)**
  - a. Students create three recipes
  - b. Students choose one recipe to make during the week
5. Observation Worksheet **(5 min)**
  - a. Students fill out Observation Worksheet and calculate group total
  - b. Instructor shows results of week in front of class
6. Focus on a Behavior **(5 min)**
  - a. Students fill out Transportation “After” results
  - b. Students choose Electricity, Transportation, and Food Changes
  - c. Students fill out Food “Before” steps
7. Group Project – Finish storyline **(15 min)**
  - a. Students finish planning storyline
  - b. Students start rehearsing group projects

## LESSON 4, STEP 1: RESULTS OF CHANGES (5 MINUTES)

[SLIDE: ENERGY WORKSHOP]



“Welcome back to the “d delta b” Energy Workshop. Last week you made changes to reduce food-related energy use. We’ll go over those today and learn more about food in depth. We’ll also finish planning the group project so you should be able to rehearse at the end of class. These videos will either be put up on YouTube or shown to your peers in the morning announcements, so try to produce something that they’ll find motivating and appealing.”



“You also continued with your electricity and transportation changes, which I’d like to discuss right now. Raise your hand if you completed your electricity change.”



“What new strategies did you use to complete your electricity change? What worked? Do any of you have interesting stories that you can use for your group project?”



“Who completed their transportation change? Was completing it easier after learning more about transportation and talking about strategies with your classmates ahead of time? Who found cool solutions to challenges that came up? What was fun? Can you use anything you learned to improve your story for your video?”



“Who completed their food change? Was it easy? Did you try out any new foods?”



“You still have another week to try out other strategies and share them with the class next week. We’ll choose these later today.”

## LESSON 4, STEP 2: SCIENCE AND POLICY BRIEFINGS (10 MINUTES)



“We will now move on to the Science and Policy Briefings. As I ask you to, you should stand at your seats and read your highlighted section to the class in the order indicated.”

[SLIDE: ENERGY INSECURITY IMPACTS]



**Ask for two students to come to the front of the room to read the pre-made slips and perform the skit.**



“Oil specialists and climate scientists today will be reporting on international impacts of energy insecurity and climate change.”

- **SPECIALIST 1:** Our oil dependence has far reaching effects. The more a country is dependent upon another for oil, the more they have to tolerate their policies, give them power & money, and compromise their stance on human rights and other ethical issues. One example is Saudi Arabia. There it is illegal for females to drive and women receive severe lashings or prison time if they are found with an unrelated male, or if they aren't completely covered with cloth in public. The government is not a democracy – it is ruled by a small number of the royal family. Yet, the U.S. treats Saudi Arabia as an ally, and we have military bases there and protect them.
- **SPECIALIST 2:** Another example is China, which gets much of its oil from Sudan. In recent years, civil war and genocide have led to the deaths of many people, especially in the Darfur region. Yet, whenever the U.N. Security Council votes to put pressure on Darfur, a region of Sudan, China votes against it, preventing any action from being taken.

[SLIDE: ARTICLE]



“Now turn to page 10 of your Design Journal. Read this article silently. When you finish, answer the question that follows.”



**After students have written responses, ask some of them to volunteer their answers. Generate discussion.**

- What do you think of the Saudi Arabian laws described in the article?

*Note for teacher: If students bring up that people in other countries should follow the rules set by their governments, explain that the U.S. has a history of acting as a global enforcer of human rights. If we didn't depend on Saudi Arabian oil, wouldn't we oppose their policies outright? Our dependence makes our actions inconsistent with our values.*



“How do you feel about the impact of large sums of American money flowing from our gas pumps to the government of Saudi Arabia, which has policies like the ones you just read?”

*Note for teacher: If students say that our gasoline purchases should not support Saudi Arabia, ask where else the money could be spent. One method of opposition is to stop trade with offending countries. Investing in alternative domestic energy sources is another way to avoid supporting unjust foreign policies. One example is how countries refused to trade with South Africa until they ended apartheid.*



“How do you feel about these impacts?”



“Do you feel motivated to use less energy to avoid supporting Saudi policies like the one you just read about?”



“Think back to the local impacts (fires in CA, babies in the U.S.) versus the international impacts (floods in Bangladesh, oppression of women in Saudi Arabia). Do you feel more connected to people around the world or people in the U.S.? Why? Who do you feel most connected to?”



“We'll now turn to some international impacts of climate change.”

[SLIDE: ENDANGERED SPECIES]



**Ask four students to come to the front of the room to read the pre-made slips and perform the skit.**

- **SCIENTIST 1:** Climate change is also having an impact all over the world. The IPCC projects that globally about 20% to 30% of all known species alive today will go extinct due to human-generated greenhouse gases. Since most plant and animal species can only survive successfully within specific ranges of conditions, they die if they cannot adapt fast enough. Some species that are endangered due to climate change are depicted on this slide.

[SLIDE: ARCTIC ICE]

- **SCIENTIST 2:** The poles are warming faster than many regions in the world. We're going to show you a projection of the melting of Arctic sea ice from 1990 to 2049. <View video> Scientists have found that the Greenland Ice Cap is melting much faster than predicted. This is because once melting started, the newly created water was darker than ice, causing it to absorb more light and melt the surrounding ice faster.

[SLIDE: POLAR BEARS]

- **SCIENTIST 2:** This puts species such as the polar bear at a higher risk than other organisms. Here's a short video on one possible fate of the polar bear. <watch video on polar bears>

[SLIDE: CORAL]

- **SCIENTIST 3:** Tropical areas are also vulnerable. Coral and their symbiotic algae are both sensitive to temperature, so when sea temperatures rise, they lose their color, as you can see on the slide. This process is called bleaching. If warming trends continue, these coral and algae could die, and this could cause the collapse of reef ecosystems.

[SLIDE: THERMOHALINE CIRCULATION]

- **SCIENTIST 4:** Although we think that climate change will happen gradually, many things in nature don't work that way. Sometimes there are thresholds in nature, so that things change gradually but then, when they've reached a critical point, they crash abruptly. In this next video, you'll see a simulation of the ocean's thermohaline circulation, or the conveyor belt of warm and cool ocean currents that moves water around the globe and controls the world's climate. <watch video on thermohaline circulation> The Gulf Stream is a current that runs north through the Atlantic Ocean and keeps the Northeastern U.S. and Europe warm. There is evidence that this current has stopped functioning abruptly in the past due to excessive warming. If warming of the oceans continues, scientists are concerned that this collapse could happen again.



“What do you think about these large-scale problems and uncertainties? Do you think we can reduce the risk of these events by motivating ourselves and others to reduce our own impacts? How?”

*Note for teachers: If students do not think these large-scale events are likely, use fire insurance as an example of risk assessment and disaster preparedness. The chance of your home burning down is about 1%, yet almost everyone has fire insurance.*



"We've covered the major aspects of the climate and energy problem. Let's review how this workshop addresses these problems."

### LESSON 4, STEP 3: CHAIN GAME (5 MINUTES)

[SLIDE: FOOD LIFECYCLE]



"This week we're going to understand the connection between the food we eat and the energy used to produce these foods. Turn to the Food Lifecycle on page 11 of your Design Journal."



"Let's start with eating a hamburger as our energy behavior. Where does a hamburger come from?"

*Answer: A cow.*



"How do we feed cows?"

*Answer: Farmers produce grain.*



"Right, farmers use fertilizers, plowing, harvesting and transporting grain to cows to feed them."



"Now, How do we process cows?"

*Answer: At a cow-processing plant.*



"And once we process the cows, how do we get meat to restaurants/stores?"

*Answer: In refrigerated trucks.*



"And what's the final piece of this chain that we are missing?"

*Answer: CO<sub>2</sub>.*



“And where is the CO<sub>2</sub> emitted from?”

*Answer: From the farming (fertilizers, plowing, harvesting and transporting), cow-processing factory, meat refrigeration and transportation, and cooking the meat for the hamburger.*



“How many balloons do you think come from one hamburger?”

*Answer: 2000.*



“How can we reduce the CO<sub>2</sub> impact from hamburgers?”

*Answer: By eating less beef or switching to lower impact meats such as pork and poultry.*



“Other types of foods also have a high impact, like processed and packaged snacks such as snack bars, chips, candy bars, frozen meals and other things that have been sliced, diced, chopped, ground and wrapped in plastic.”



“How many balloons are in average processed and packaged snacks?”

*Answer: The average small bag of chips has 38 balloons, which we will round to 40 balloons and you can use this as a proxy for other processed and packaged snacks until all the figures are available. You can convert other processed and packaged snacks' balloon impacts by comparing the snacks' weight to the weight of the bag of chips (35g) and converting to balloons using the ratio 35g: 40 balloons.*

*Note for teachers: If students ask questions about other foods, explain that every food takes energy to produce and there are many degrees of processing. Things like milk and eggs go through factories for minimal processing, even though they come out in a recognizable form. Produce that is shipped across the world is a whole food, but requires a lot of transportation energy compared to local foods. Foods like bread and processed bulk foods save energy by reducing individual packaging, but still require more energy than whole foods. All of these use less energy than meat. Students should use their judgment when buying foods and try to put these different factors in perspective to make the least energy-intensive food choices possible.*



“How can we reduce the impact from processed and packaged snacks?”

*Answer: Eat more whole foods – ones that haven't been processed and packaged in a factory, or have been minimally processed and are still in their original form or close to it. These include fruits and vegetables as well as whole grains like brown rice.*



“Another energy behavior that starts to add up is bottled beverages. Both water and soda tend to have similar impacts based on the amount of packaging required.”



“How many balloons do you think are in one bottle of soda or water?”

*Answer: 50.*



“And how can we reduce the impact from bottles?”

*Answer: Use reusable containers like steel water bottles.*



“Now turn to the Pocket Food Guide<sup>17</sup> we have made for you. It is filled with useful information about how to eat healthy, make it fun and reduce the number of balloons of carbon dioxide and methane associated with our food choices.”



“First on one side we have a list of seasonal foods in the bay area so you can use it to purchase fresh seasonal foods when you go shopping. You'll also probably save money when you buy foods that are in season. Foods with high nutrient content have symbols next to them.”



“On the back, there are also some eating tips on various greenhouse gas savings you can make with your food choices and the health benefits of reducing meat, such as avoiding heart, kidney, weight, and other health issues.”



“On the bottom there is a list of foods that are available year-round.”

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<sup>17</sup> The Pocket Food Guide gives instructions on how to eat local and healthy, and makes this information readily available to students and potentially their parents.



“Now that you know more about low-energy food choices, you can design creative recipes! Also, keep in mind that these activities can be used as inspiration for your YouTube videos and revision of your food changes.”

#### LESSON 4, STEP 4: ACTIVITIES – RECIPE CREATION (10 MINUTES)



“We learned from the food lifecycle and the Pocket Food Guide that we can eat less meat, fewer processed and packaged snacks, and use fewer disposable containers.”



“First, remember the definitions of processed and packaged snacks and whole foods and write in the definition and examples for both types on page 11 of your Design Journal.”



Will someone volunteer what they wrote?

*Answer: Processed and packaged snacks are changed from their original form e.g. dried and/or fried and/or combined with preservatives and other chemicals, and packaged, while whole foods are usually raw or otherwise in their natural form.*



“Now, I'd like you to answer the pre-activity questions in your design journal.<sup>18</sup>”



“Imagine you are a chef in a restaurant and you need to create three new meals.”



“We want to you try at least ONE of these meals to cook at home over the week. We'd also like you to bring results in, if possible, to next week's class. During class you can try out each other's recipes while we film your group projects.”

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<sup>18</sup> These questions, similar to the “before” questions in the clothesline relay activity, are designed to show students that their perceptions about eating healthy being difficult are inaccurate, and overcome those barriers of perception.



“Turn to your recipe handouts, number 5 in the back pocket of your folder. First we’ll be creating a DELICIOUS meal. “

- Choose breakfast or dinner.
- Choose favorite dish, favorite ingredients, favorite toppings and circle.
- Name your dish.
- Ingredient tips are below, so use whatever tips you need to cook your meal.



“Turn to your snack/lunch page. This will be your UNEXPECTED meal.”

- Close your eyes and randomly move your finger on the page.
- Then circle the recipe you have chosen.
- Now choose the ingredients and toppings for the snack and circle.



“Turn to the last recipe, breakfast or dinner. This will be your THEME meal.”

- Choose dish, ingredients, toppings based on common theme such as color, shape, texture, sound, or starting letter.
- Name your dish.
- Ingredient tips are below, so use whatever tips you need to cook your meal.



“Once you choose one of these meals and try it out, you will fill out the following parts of the recipe at home.”

- Any cooking tips for yourself.
- Comments.
- The time to cook.
- The star rating of the meal based on taste.



“Choose at least ONE of these meals to try out at home and bring in to class if you can next week.<sup>19</sup> Try to choose something that you can bring easily to school in a container. If you do, there will be lots of different and interesting foods for you to try out.”



“Now let’s see if we were able to reduce our energy impact with the behaviors we practiced last week.”

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<sup>19</sup> This activity allows students to feel challenged (Lepper), and to build efficacy and creativity, and to feel some peer pressure to cook something tasty to share with their group. Students also practice mastery as they cook their chosen dish.

## LESSON 4, STEP 5: OBSERVATION WORKSHEET (10 MINUTES)

[SLIDE: OBSERVATION WORKSHEET]



"Take out your Take Home Observation Worksheet and transfer the record of your behaviors into Class 4 of the Observation Worksheet in your folders. Once you've calculated your group total, I'll come around and collect them."

[SLIDE: GROUP PROGRESS]



"Here's how your group is doing as of last week."



**Collect group names and totals and enter into the graph on the PowerPoint. Read off the names of each group in order from highest to lowest improvements and have them raise their hand as they are named. Most improved groups should try to maintain their lead and less improved groups should have more motivation to set higher goals.**



"For the groups that improved, do you want to share your strategies or insights with the class?"

[SLIDE: CLASS TOTALS]



"This is where your class stands compared to the other classes. Look at how much the balloon savings add up when this many students contribute."



"You will have one more opportunity to improve your group score this week."

## LESSON 4, STEP 6: FOCUS ON A BEHAVIOR (5 MINUTES)



"Let's return to your transportation change. Fill out the "After" results, the second row of boxes, on your Observation Worksheet."



**Give students a minute to fill out the boxes.**



“Now write down your improved changes for next week in the Electricity, Transportation, and Food Change boxes. This is a good chance to try out something new, like hang drying or checking out a new bus route. Now that you are choosing changes for all three categories, you can really strategize and focus on where you can make the largest balloon savings.”



**Give students a minute to fill out the boxes.**



“You’ve had a week to practice your food change now and have an idea of what strategies to use to complete it. With these in mind, fill in the first row of boxes below the Food Change box, marked “Before,” with how you will make your food change during this week. You can refer back to the electricity and transportation changes for ideas.”



**Give students a minute to fill out the boxes.**

#### *LESSON 4, STEP 7: GROUP PROJECT – FINISH STORYLINE (15 MINUTES)*



“Last week we chose the characters, setting, and tools you wanted to apply to your group project. Now you will put these together to prototype your story and be ready to rehearse by the end of class.”



“Look at the final story outline on the bottom left of your sheet. Here you want to write your story, song, or poem step by step. For your skit or soap opera, each number would correspond to a scene. For your song or poem, each line would be a line in the song or a verse of the poem.”



“Now for those of you doing a skit or soap opera style activity, draw each scene frame by frame in the storyboard section of the activity sheet. Each box should show where the characters are and have a note about what is happening in that scene. For those of you who are working on a song or poem, write it out in its final form and practice reciting or singing it. Take the rest of class time to rehearse your activity and edit it. Think about props you might want to bring and appropriate clothing you may want to wear to portray your

character for filming. Remember that your activity should be between 30 seconds and 2 minutes long. Also remember to use your own stories for your videos.”



“Next week we will be filming your group projects in front of the class. You will have a chance to rehearse once before you go onstage, but if you need extra time, work with your groups during the week.

Also remember to bring the dish you prepare next week to share with your group. Bring enough plates or bowls and utensils for your group to use. Try to avoid disposables.

This is also your last chance to improve your group scores and we will declare the winner at the beginning of class. So, be sure to work on your electricity, transportation, and food changes this week and calculate your individual totals before you come to the next class.



**Collect folders.**

## LESSON 5: GROUP PROJECT DAY

*Students try and rank food from other students in their group. Student projects are filmed.*

### LESSON OBJECTIVES:

- Students reinforce the viability of low-impact food options with new foods presented in their groups.
- Students become advocates for specific behavior by acting in and filming their group projects.

### THE DAY OF THE LESSON: MATERIALS & BEFORE-CLASS PREP

- Folders for students
- Food and project rating sheets for students
- Spare utensils, plates and napkins for food
- Video camera
- PowerPoint presentation
- A plan for a spare room or place outside for groups to practice their presentations

### OUTLINE

1. Food Presentation **(5 min)**
  - a. Students share food with group members
  - b. Students start to rate food
2. Observation Worksheet **(10 min)**
  - a. Students discuss results of Food, Electricity and Transportation Changes
  - b. Students calculate group total and show in class
3. Filming **(30 min)**
  - a. Students alternate rehearsing and filming projects in front of class
  - b. Students rate projects as they are presented
4. Closing discussion **(10 min)**
  - a. Students discuss sources of motivation for low-energy behaviors
  - b. Students provide feedback on the structure and purpose of the workshop
  - c. Students discuss their collective impact in reducing carbon dioxide emissions

### LESSON 5, STEP 1: FOOD PRESENTATION (5 MINUTES)



"Welcome to the final day of the "d delta b" Energy Workshop. As you come in, take out the food you brought to share with your groups. Then start filling out your food rating sheet – first for your own food, then for the favorite food you tasted in your group."



"Turn back to page 11 of your Design Journal in your folder and look at the responses you wrote to the questions about whole foods. What do you notice about your responses now? Have your feelings changed about the number of whole food options and their appeal?"

### LESSON 5, STEP 2: OBSERVATION WORKSHEET (10 MINUTES)



"Let's discuss the progress you made on your Food Change. Turn to your Observation Worksheet and look at the latest change you wrote down for food. Raise your hand if you completed your change."



"Was completing your food change easier after learning more about food and talking about strategies with your classmates ahead of time? Who found cool solutions to challenges that came up? What was fun?"



"Now fill out the boxes marked "After" for your food change."



**Give students a minute to fill out the boxes.**



"Who completed their latest transportation change? Electricity change? What new things did you come up with for those?"

[SLIDE: OBSERVATION WORKSHEET]



"Take out your Take Home Log and transfer the record of your behaviors into the Class 5 section of the Observation Worksheet. Once you've calculated your group total, I'll come around and collect them."

[SLIDE: GROUP PROGRESS]



**Collect group names and totals and enter into the graph on the PowerPoint. Read off the names of each group in order from most improved to least improved and have them raise their hand as they are named. Announce the winning group (the one that has the largest overall improvement) and have the class applaud.**

[SLIDE: CLASS TOTALS]



“This is where your class stands compared to the other classes.”

### *LESSON 5, STEP 3: FILMING (30 MINUTES)*



“Now we’ll choose the order for the filming. The winning group will get their choice of when they’d like to go – first, last, or in the middle. The second best group will then choose their order, and so on.”



“As each group performs, you should write down comments about each group that you watch. At the end, you should write down which video is your favorite and we’ll use your choices to decide which videos will be shown to other high school students. For those not filming first, use these 10 minutes to work on your planning for your video.”



**Let groups practice outside (or to a different room) for 10 minutes, staggered with a group going outside every 5 minutes. There will be a maximum of two groups outside at once.**

**Groups will then have 5 minutes to film in front of class, with 1 re-take.<sup>20</sup>**

**Groups will announce names of students and title of project before take.**

**Groups will spend 1 minute explaining how they applied what they**

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<sup>20</sup> The process of designing and acting in a skit or video and presenting a motivating message to their peers allows students to become more invested with the behaviors than if they were only practicing on their own. This activity is designed to make students advocates of the low-energy behaviors, and to focus on their peers, not on themselves only, which is more motivating.

**learned in the class to their project.**

**Students in audience should fill out rating sheet for each project**

At: 15 min –	1 <sup>st</sup> group outside to practice for 10 minutes
20 min –	2 <sup>nd</sup> group outside to practice
25 min –	1 <sup>st</sup> group starts FILMING 3 <sup>rd</sup> group outside to practice
30 min –	2 <sup>nd</sup> group FILMING 4 <sup>th</sup> group outside to practice
35 min –	3 <sup>rd</sup> group FILMING 5 <sup>th</sup> group outside to practice
40 min –	4 <sup>th</sup> group FILMING 6 <sup>th</sup> group outside to practice
45 min –	5 <sup>th</sup> group FILMING
50 min –	6 <sup>th</sup> group FILMING



“Now take a moment to write down which video was your favorite and why.”

#### *LESSON 5, STEP 4: CLOSING DISCUSSION (15 MINUTES)*

*Note for teachers: If short on time, you should make sure to highlight a few key points. These should include:*

- *The rationale for making the videos – to reach out to their school community*
- *The importance that we scale up individual changes to larger levels – so that students can make a bigger impact and help address the significant impact of the residential sector (30% of energy use in the U.S.)*
- *The levels at which to address world issues: government, technology and residential.*
- *Why we have focused on residential energy use – see 2<sup>nd</sup> bullet point*

- Why we have chosen these specific behaviors to focus on – they are easy to change and high-impact
- How students made changes at a larger level – using their videos
- Overview of structure of workshop – understanding the issues, linking them to behaviors, and making changes individually and through the videos
- Total improvements and balloons saved over workshop



“Why do think we made these videos?”

*Answer: To tell others about the problems, what they can do to help solve them, and how to make changes to their energy behaviors to reduce their carbon footprint.*



“Why is it important that others change their behavior too?”

*Answer: So the burden is not just on us to change.*



“Can one person make a difference?”

*Note for teachers: If students don't think they can make a difference, ask if they made a difference in their group. If everyone contributed to their group, their improvements really start to add up.*



“What about on a larger scale, like everyone in the class?”



“What about the entire town?”



“What about all of California?”



“Why do we need such large solutions?”

*Answer: We are dealing with large and significant problems, like climate change and energy insecurity.*



“In order to deal with significant problems, we have to use multiple levels of solutions. Let’s go over a of couple levels at which changes can be made:

- The government: They mainly focus on industry regulations, not residential.
- Technology: There is a lot of focus on energy production, not reducing energy use. And even for products using efficient technology, we still need people to buy it and use it. Also, remember back to what I asked on the first day. What is easier and cheaper, reducing energy use by 10% or multiplying our wind and solar by 25 times? (*Reducing energy use*)”



“Why have we focused on residential energy use?”

*Answer: Residential energy use makes up a very significant portion – 30%- of U.S. energy demand.*



“Why did we focus on these behaviors specifically?”

*Answer: These behaviors are high-impact and we can make the changes easily and immediately.*

*Note for teachers: If students ask why small balloon behaviors (snacks, bottles, appliances) are significant, explain that they are very frequent and add up to the large impact behaviors (drying, hamburgers, etc).*



“By learning about these changes at the individual level, we can also make changes at a larger level. How did **YOU** do this during the workshop?”

*Answer: Students created media messages to promote behaviors at larger levels, like in your school and town. Students also talked to their families about making changes.*



“We can also combine these efforts with those at the levels of technology and policy. You helped us to tackle the residential sector by making your videos and promoting changes to the school and local community.”



“We are also running this workshop to understand and address major world issues, like climate change and energy insecurity. Who mostly suffers from climate change?”

*Answer: Poor people in the 3<sup>rd</sup> world and future generations like babies, young people and those who haven't even been born yet. Local impacts also effect us in California and the U.S.*



“Who suffers from energy insecurity?”

*Answer: In the U.S., people who can't afford high gas prices to drive their cars or heat their houses. In Saudi Arabia, women continue to be oppressed while the U.S. continues to buy Saudi oil. In Darfur, the U.N. will not intervene because China depends on Sudan for oil.*



“Who is responsible for these major issues?”

*Answer: U.S. We have the highest per capita energy use.*



“So we are responsible, but are we accountable? What does accountable mean?”

*Answer: Accountable means that we should be held responsible and made to fix the problems we've caused.*



“So if we should be accountable, can we be forced to do things? Who is going to initiate these changes?”

*Answer: We can't really be forced because we are such a powerful country. That's why we need to take the initiative to make these changes on our own. We're already a world leader – we need to take initiative in leading these changes as well.*



“So why do we need to make these changes and not the people who are suffering?”

*Answer: First of all, we are the ones who use more energy per person than other countries – this means we can reduce our energy use the most. The people who suffer the most impacts do not use as much energy in the first place. Secondly, we have the resources to make these changes*

*Note for teachers: Explain that if people in rich countries are using 100 units of energy, they can reduce by 10% (10 units) much more easily than people in poor countries using only 10 units of energy for their basic necessities. Because*

*our emissions are for luxury purposes, it is a much easier for us to make small reductions.*



“We don’t need just one person to give up and sacrifice everything. We just need everyone to contribute with a few high-impact behavior changes.”



“And that leads us back to the structure of this workshop.”

[SLIDE: OVERVIEW]

[ON SLIDE: CIRCLE AROUND CLIMATE CHANGE AND ENERGY INSECURITY]



“We started with explaining the issues of climate change and energy insecurity locally and around the world. We did this by reading articles and listening to scientific briefings.”

[ON SLIDE: ARROW]



“Then we linked these issues back to their cause. We did this with the energy lifecycles, when you came up to the front of the room to link behaviors to energy sources, like we did for electricity and transportation.”

[ON SLIDE: CIRCLE AROUND HUMAN ENERGY BEHAVIORS]



“Then we focused on specific behaviors.”

[ON SLIDE: SINGLE PERSON]



“We did this by trying out the behaviors ourselves, then using activities like the clothesline relay to learn strategies, and then sharing our experiences with each other to find the best way to make the change.”

[ON SLIDE: GROUP OF PEOPLE]



“Then we explored how to make these changes on a larger scale, by influencing other people and helping them to make the same

changes. This is why we made the videos - to motivate other high school students. If everyone makes these high-impact changes, the burden isn't on just a few of us."



"What do you think of this structure? We're trying to find the most effective way to motivate students. What do you think is the most motivating for other students – what was most motivating for you? What would you like to see more of?"

[SLIDE: CLASS CUMULATIVE BALLOON SAVINGS]



"Then we explored how to make these changes on a larger scale, by influencing other people and helping them to make the same changes. This is why we made the videos - to motivate other high school students. If everyone makes these high-impact changes, the burden isn't on just a few of us."



"This is the sum of the CO<sub>2</sub> balloons that all your classes have saved from being released into the atmosphere. Look at what a difference you made in just four weeks! Imagine how much more your school, city and state can do."



"Thank you all for participating in this workshop. We appreciate all the contributions you have made to motivating behavior change among your peers. As you have shown through your changes, individuals can make a significant difference by using less energy themselves, and using their own experiences to design solutions to complex problems like energy insecurity and climate change. We hope you will take all you have learned and continue to apply it to whatever challenges you may encounter."

### General Notes for Teachers:

If students make a negative comment about a topic, make sure to turn the question around and end on a positive note before moving on.

If students become too engaged in one topic and slow down the class, explain that while you appreciate all of their input, they will lose valuable time unless they stay on track. Extra discussion should happen after class or when the topic comes up again.

If students question scientific assumptions, refer them to references and supplement sheets and ask them to come back with what they've learned next week to share with you.

If students have questions you cannot answer, DON'T GUESS. Ask the rest of the class, ask the student to research it over the week, or write it down to look up the answer over the week and share it in the next class. Students will appreciate the honesty and willingness to seriously consider all of their questions.

If students bring up perceived barriers to behaviors before trying out the behaviors, tell them their assignment is to try out the behavior first. Then, they can talk about how difficult the barriers really were. Strongly emphasize that making their change requires them to try out each behavior they choose for the week.

Use your own examples of changes, challenges, and motivation throughout the course. By participating in making changes and acknowledging the actual challenges, you may be seen as more credible. It also helps build trust when you share your own experiences.

Use local news stories and current events as well as your personal experiences in discussions about climate change and energy insecurity.

## APPENDIX

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