

# New Mexico Climate Champions

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Asombro Institute for Science Education  
Las Cruces, NM



Asombro Institute  
FOR SCIENCE EDUCATION



# New Mexico Climate Champions

- ❑ Funded by a grant to the Asombro Institute for Science Education by EPA's Environmental Education Program
- ❑ Goal: Increase 5<sup>th</sup>-12<sup>th</sup> grade students' environmental literacy and ability to **turn knowledge into action** that benefits New Mexico's environment
- ❑ Flexible program for formal and informal educators



# Asombro Mission

To increase natural science literacy  
through engaging, place-based  
education



# Asombro's K-12 Education Programs

- Field trips (Chihuahuan Desert Nature Park), classroom and schoolyard programs, Desert Data Jam, Climate Hub online activity unit, teacher workshops
- Five staff members deliver programs to more than 18,000 K-12 students annually
- Common features
  - Process: inquiry
  - Science: current science research and discoveries
  - Education: aligned with standards (CCSS, NGSS)





# New Mexico Climate Champions

- ❑ Stage 1 (Summer 2016): Develop two, 10-hour modules that include activities and student action plan development
- ❑ Stage 2 (Fall 2016 – June 2017) - Pilot test, revise and implement modules with nine classes
- ❑ Stage 3 (July 17-18, 2017): Educator workshop
- ❑ Stage 4 (Aug. 2017): \$4,500 sub-grants to eligible entities
- ❑ Stage 5 (Fall 2017): Implementation of NMCC with students throughout New Mexico
- ❑ Stage 6 (Jan. 2018): New Mexico Climate Champions Summit

# Stage 1: Module development

(Summer 2016)



- Two modules:
  - Climate change and water in New Mexico
  - Climate change and energy in New Mexico
- Educators will choose module that best fits their curriculum
- Module structure:
  - Five hours of content-rich lessons
  - Five hours (minimum) of student action project development and implementation

# Water Module



- [Insulating You, Insulating Earth \(Greenhouse Effect\)](#)
- Streams and Steam
- Ready, Set, Grow
- Climate Data Jam
- [Water Conservation](#)
- Stewardship Project Planning and Action

# Energy Module



- [Insulating You, Insulating Earth \(Greenhouse Effect\)](#)
- Energy Resources and Use
- Energy Audit
- Energy Data Jam
- [Solar Energy](#)
- Stewardship Project Planning and Action



# Stage 2: Pilot test, revise and implement modules

(Fall 2016 – June 2017)



- Implementation with 7 classes (6<sup>th</sup> – 11<sup>th</sup> graders)
- Two additional pilots in summer camp in June 2017
- Action projects ranging from 5 hours to much more extensive



# Stage 3: Educator workshop



- July 17-18, 2017 in Las Cruces
- Educators receive:
  - \$200 stipend
  - Small travel stipends for those travelling >60 miles
  - Kit of supplies worth \$500+
  - Opportunity to apply for subgrants
- Learning from experts in the field
- Practice using all activities and supplies
- Full sets of modules to use in classroom
- Application deadline: June 9 (in 8 days!)

Attention  
5th - 12th grade educators!  
Please join the Asombro Institute for Science Education at:

**New Mexico  
Climate Champions  
Educator Workshop**

July 17-18, 2017  
7/17/17: 9:00 am - 4:00 pm  
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Application deadline: June 9, 2017  
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For more information:  
575-524-3334 or [libby@asombro.org](mailto:libby@asombro.org)  
[www.asombro.org](http://www.asombro.org)

# Stage 4: Sub-grants

(July – August 2017)



- Asombro will award 5 sub-grants of \$4,500 each
- Can be used for staff time, action project costs, travel, etc.
- Must agree to implement NMCC in fall 2017 and participate in summit in January 2018
- Eligibility (EPA rules): any local education agency, college or university, state education or environmental agency, 501(c)(3) nonprofit (not individuals)
- RFP issued: July 17
- **Proposal due date: August 11**
- Award date: August 18

# Stage 5: Implementation by Asombro and sub-grantees

(Fall 2017)



- At least 12 classes / groups of students will implement NMCC water or energy module
- Stewardship plans designed and implemented



# Stage 6: NMCC Summit



- January 2018 in Las Cruces
- Presentation of action plans to each other and to the public



# Insulating You, Insulating Earth

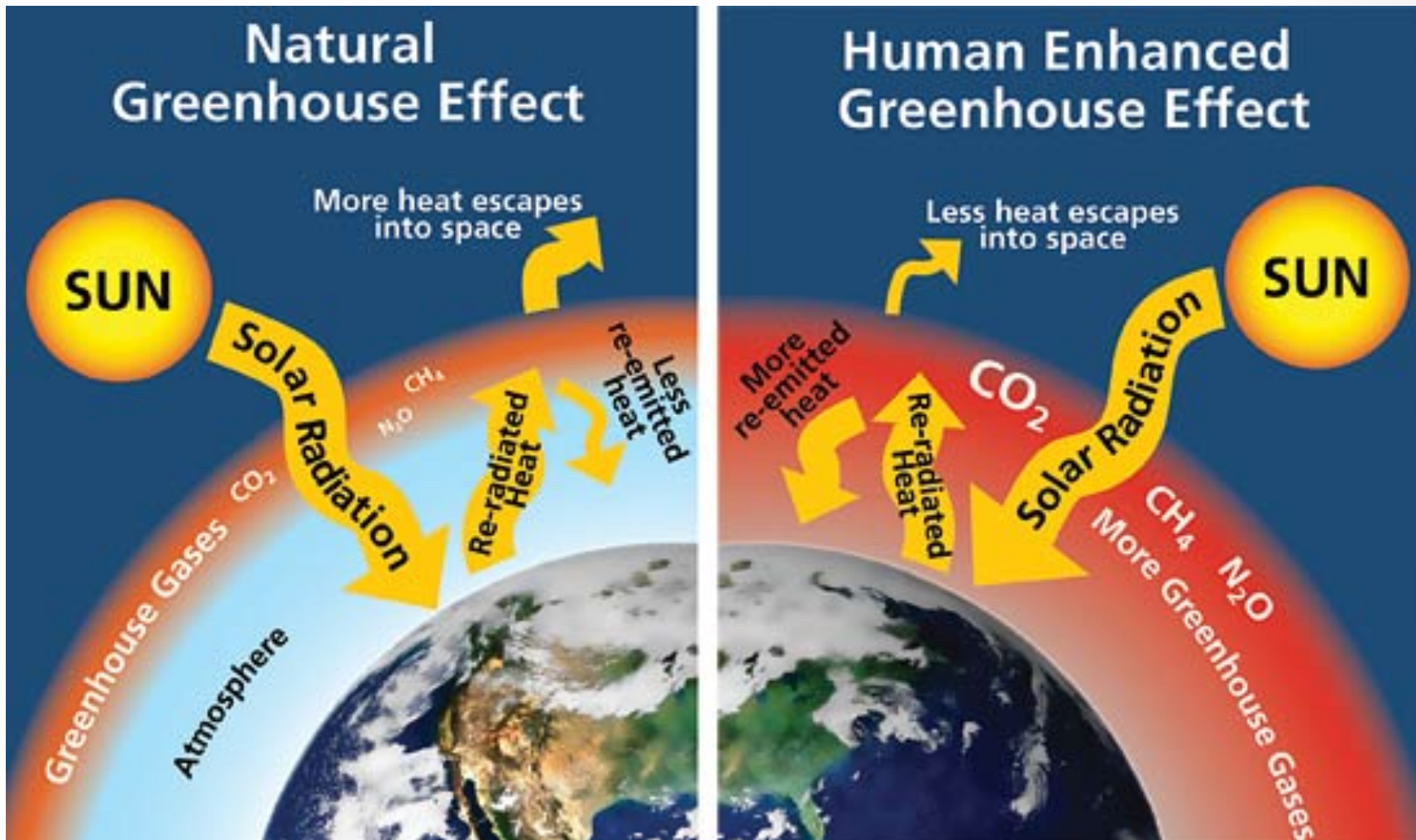
- Introductory experiment
- Time: 1 hour
- Objectives:
  - Model the greenhouse effect using towels and space blankets
  - Introduce students to climate change





# Setting Up the Experiment





Source: [www.nps.gov/goga/naturescience/images/Greenhouse-effect.jpg](http://www.nps.gov/goga/naturescience/images/Greenhouse-effect.jpg)

# Insulating You, Insulating Earth: Make prediction

Which will be warmer?

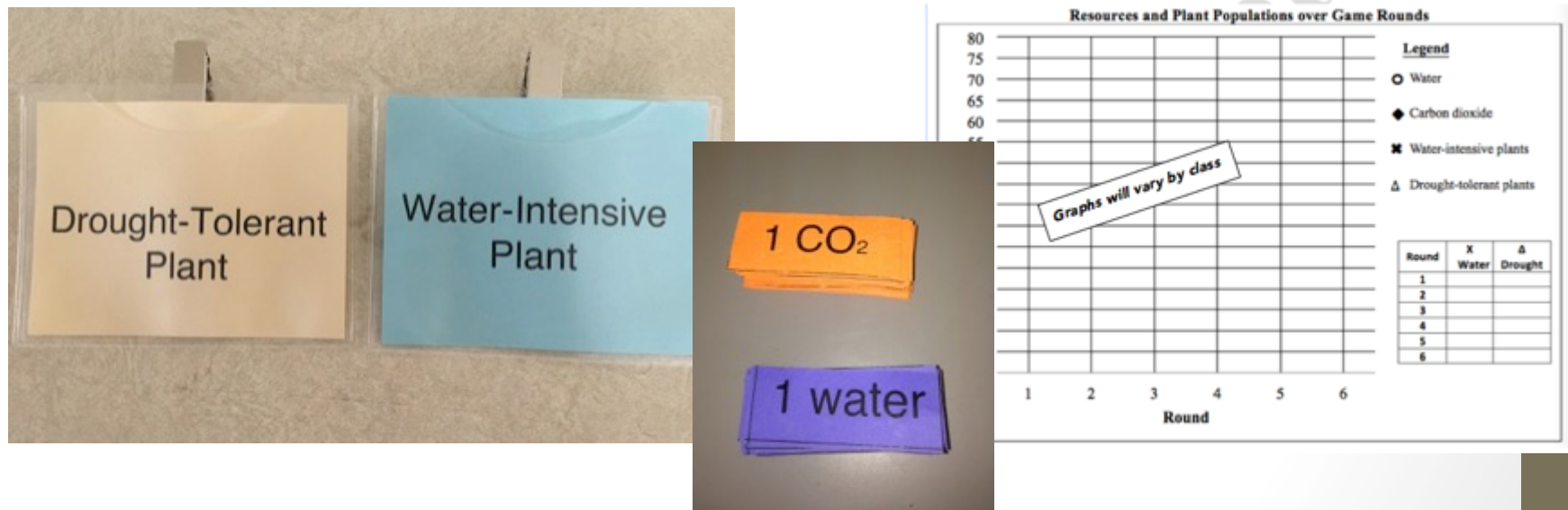
- Towel
- Towel + Space Blanket
- Neither (same)

New Mexico Climate Champions

# WATER MODULE

# Ready, Set, Grow!

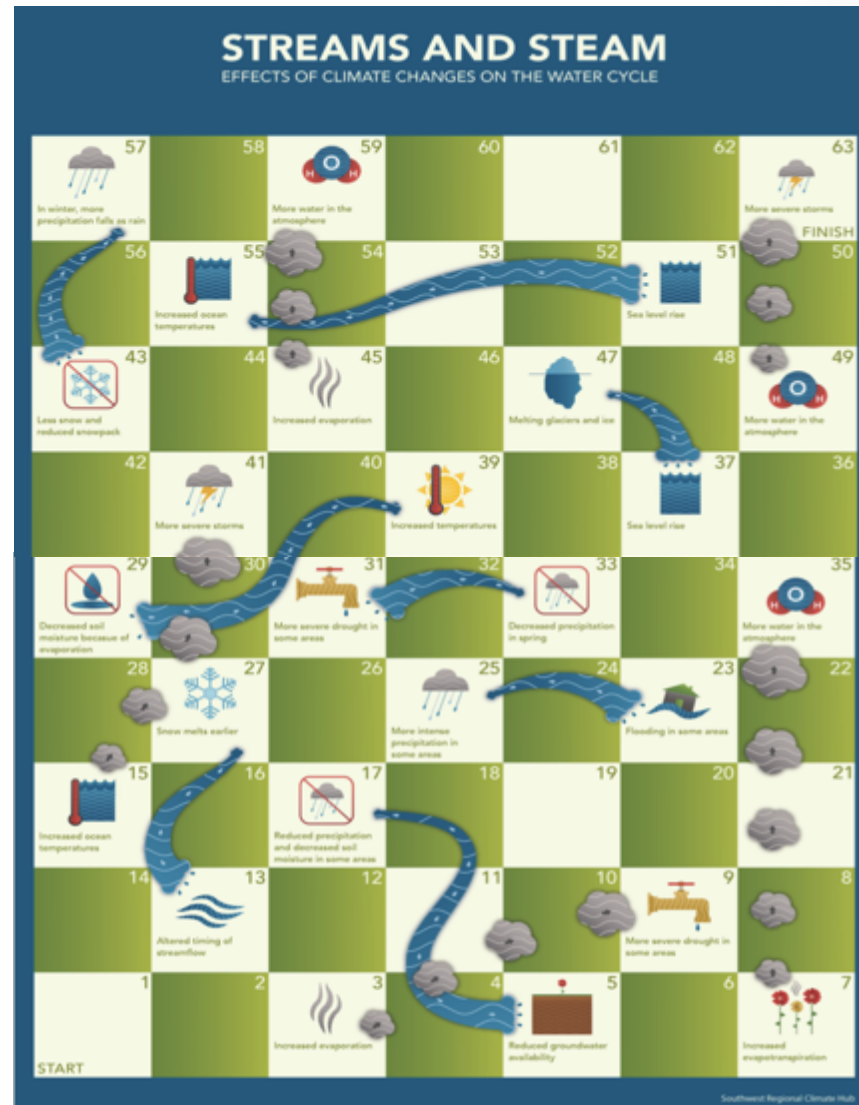
- Objectives:
  - Analyze effects of climate change on plant populations
  - Model the uptake of resources by plant structures
- Students role play as drought-tolerant and water intensive plants in a warming environment





# Streams and Steam

- Objectives:
  - Predict how increasing temperatures will affect Earth's water cycle
  - Explain how changes in the water cycle affect humans





A photograph showing two students, a girl on the left and a boy on the right, sitting at a wooden table. They are both looking down at a large sheet of paper on the table, which appears to be a project or a worksheet. The girl is wearing a dark hoodie and a colorful headband. The boy is wearing a dark jacket. There are other papers and a yellow pencil on the table. In the background, a white water dispenser is visible.

1. List all of the causes and effects that you and your group members land on when you go down a stream and/or up a column of steam while playing Streams and Steam. Only write each pair of causes and effects **once** if it is landed on multiple times.

| CAUSE | EFFECT |
|-------|--------|
|       |        |

# Climate Data Jam



- Objectives:
  - Analyze NM precipitation and temperature data
  - Develop a creative project to portray a data trend

Table 1: New Mexico Predicted Temperature Changes by County

| Temperature Category | Bernalillo County (includes Albuquerque) | Doña Ana County (includes Las Cruces) | Otero County (includes Alamogordo) | Union County (includes Clayton) |
|----------------------|------------------------------------------|---------------------------------------|------------------------------------|---------------------------------|
| Annual Total         | 3.5 °C warmer                            | 3.3 °C warmer                         | 3.3 °C warmer                      | 3.3 °C warmer                   |
| Winter Total         | 3.3 °C warmer                            | 3.1 °C warmer                         | 3.1 °C warmer                      | 2.9 °C warmer                   |
| Spring Total         | 3.6 °C warmer                            | 3.4 °C warmer                         | 3.4 °C warmer                      | 3.3 °C warmer                   |
| Summer Total         | 3.5 °C warmer                            | 3.2 °C warmer                         | 3.2 °C warmer                      | 3.5 °C warmer                   |
| Fall Total           | 3.5 °C warmer                            | 3.4 °C warmer                         | 3.4 °C warmer                      | 3.5 °C warmer                   |

# Water Conservation

- Objectives:

- Understand weekly water consumption.
- Use models to learn about 3 alternative methods of water conservation.
  - Rooftop Rainwater Harvesting
  - Greywater Recycling
  - Land Contouring

*Water Use Table*

| Activity                  | Number of Times Per Week | Water Use (Gallons) | Total Weekly Use (Gallons) |
|---------------------------|--------------------------|---------------------|----------------------------|
| Bath                      | Total                    | 35                  |                            |
| Shower (15 min)           | Total                    | 45                  |                            |
| Teeth Brushing            | Total                    | 5                   |                            |
| Hand Washing              | Total                    | 5                   |                            |
| Washing Machine (clothes) | Total                    | 35                  |                            |
| Toilet Flush              | Total                    | 3                   |                            |
| Dishwasher                | Total                    | 10                  |                            |
| Washing Dishes By Hand    | Total                    | 15                  |                            |
| Drinking a Glass of Water | Total                    | 0.06                |                            |
| Cooking a Meal            | Total                    | 3                   |                            |
| Watering Small Lawn       | Total                    | 100                 |                            |
| Total Weekly Gallons      |                          |                     |                            |

Multiply Number of Times Per Week by Water Use (in gallons).

Add the total weekly use for each activity.

# Water Conservation

3 activity stations (Students have 7 minutes at each station)



Land Contouring



Rooftop Rainwater  
Harvesting



Greywater Recycling

# Land contouring

*Creation of basins that collect and absorb run-off; these landforms capture and “plant” rain and localized run-off*

## Globally:

- Used widely throughout wet and dry areas of Asia, North and South America, Africa and Europe for generations



## New Mexico:

- Ex. Zuni Waffle gardens
- Ex. Anasazi - Plant at the base of cliffs where water would run off and be concentrated





# Greywater recycling

*Greywater is water from bathtubs, showers, bathroom sinks, and washing machines that can be captured and saved for later use.*

- Agriculture
- Landscape
- Public parks
- Golf course irrigation
- Cooling water for power plants and oil refineries
- Toilet flushing
- Dust control
- Construction activities
- Ex. Tuscon: All new single family and duplex residential dwellings must be greywater ready

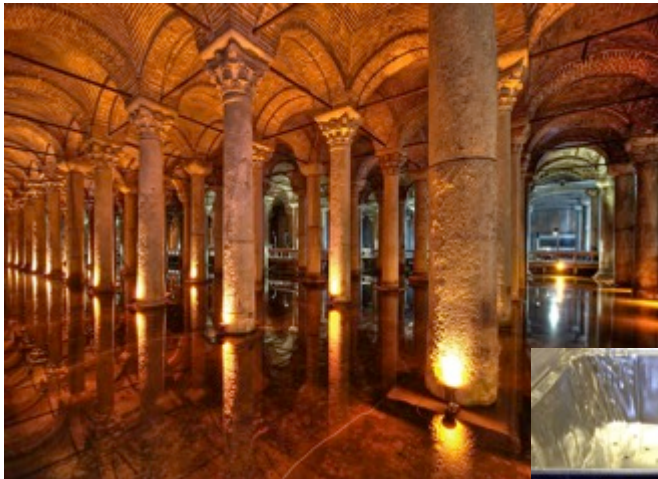




# Rooftop rainwater harvesting

*A method of collecting the rainwater that falls on a rooftop by draining it into a barrel or a cistern to store it for later use*

Ex. Basilica Cistern -  
Istanbul, Turkey - Can hold  
up to 20 million gallons of  
water



Ex. Chihuahuan Desert Nature Park –  
Las Cruces, New Mexico



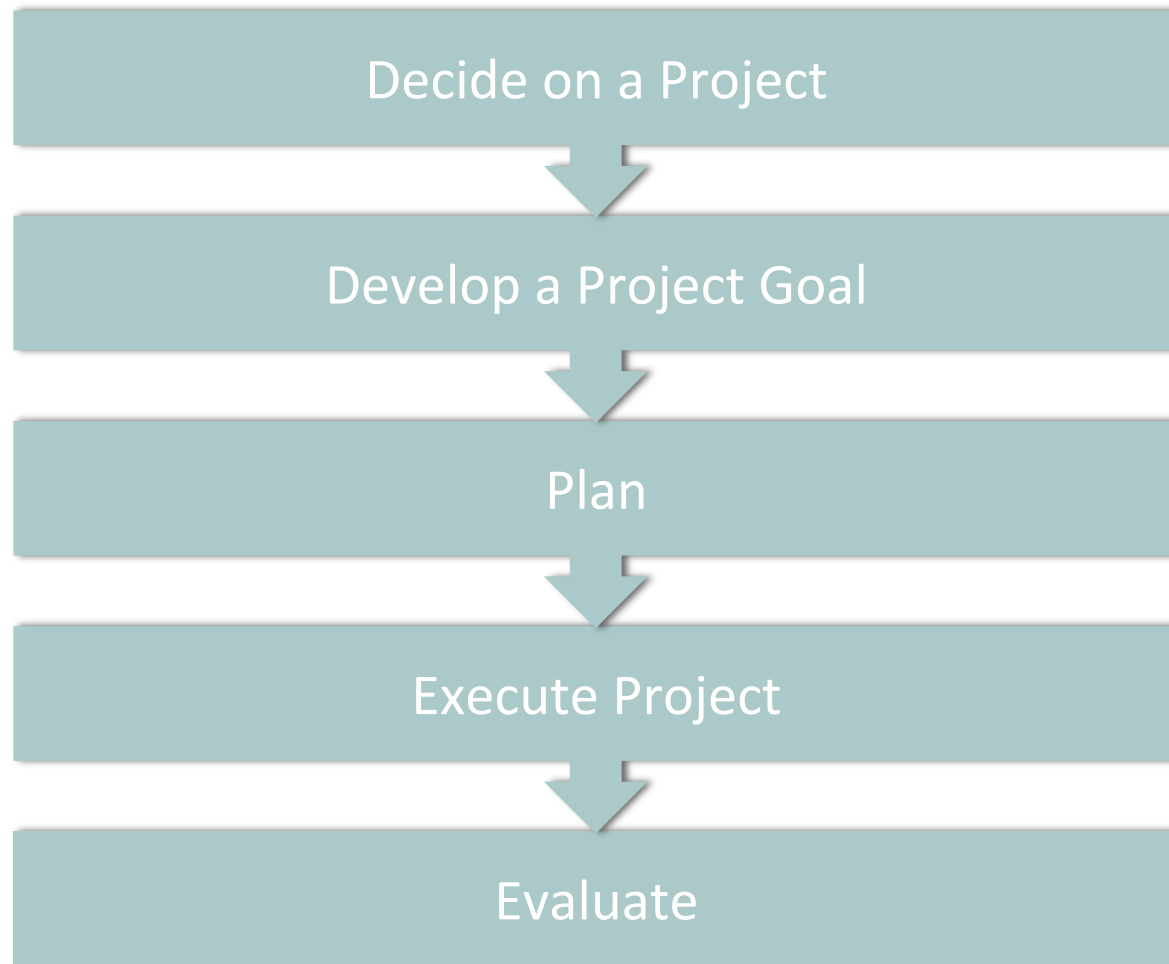
# Water Conservation

## Rooftop Rainwater Harvesting Station

Let's try it!

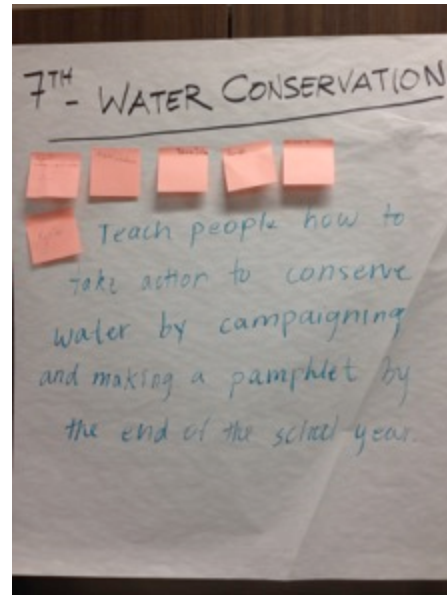
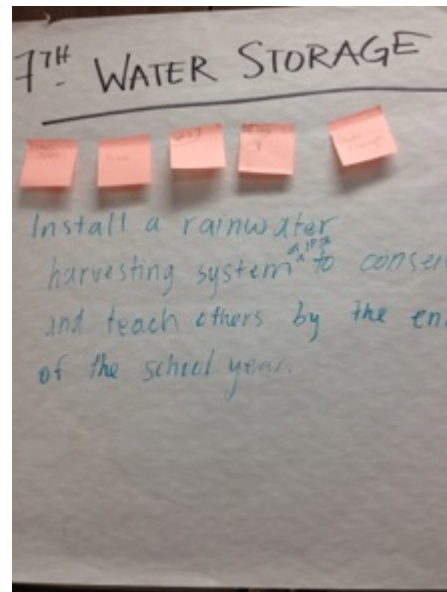
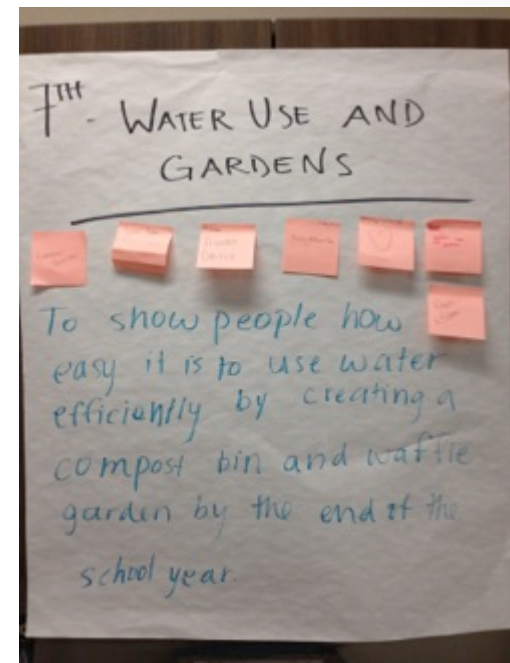


# Action Project Planning Guide



# Stage 1: Decide on a project

- Students brainstorm two project ideas at the end of each lesson.
- Once students are placed in groups, they choose their specific project idea.



# Stage 2: Develop a project goal

## Project goals should be SMART

**Specific** – Goal should be clear and explain why your project is important.

**Measurable** – You must be able to measure the progress of your project.

**Achievable** – Set a high goal, but be sure it is attainable.

**Relevant** – Be sure that your goals are relevant in taking action against climate change and educating the public about how they can too.

**Timely** – A deadline can help keep your project moving forward.

| ACTION                                                                                 | TIMEFRAME                             | OUTCOME                                                                                          |
|----------------------------------------------------------------------------------------|---------------------------------------|--------------------------------------------------------------------------------------------------|
| <u>Example</u><br>Install rainwater harvesting barrel at Chihuahuan Desert Nature Park | By the end of 2016                    | To raise public awareness of water conservation issues and to encourage conservation practices   |
| What action will your group take?                                                      | What is your deadline for completion? | What are you hoping to achieve with this action project in relation to climate change awareness? |

# Stage 3: Plan

- Students are given example project plan.
- Use blank template to create their own project plans.

| GOAL                                                                                                                                                                                                             | STEPS NEEDED TO ACHIEVE GOAL                                                   | HOW WILL YOU DO THIS? (TASKS)                                              | WHAT RESOURCES WILL I NEED TO DO THIS?                                          | WHO WILL BE RESPONSIBLE? (SPECIFIC TEAM MEMBERS) | DEADLINE        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------|--------------------------------------------------|-----------------|
| To raise public awareness of water conservation issues and to encourage water conservation practices by installing a rainwater harvesting system at the Chihuahuan Desert Nature Park by the end of summer 2016. | 1) Research the most appropriate rainwater harvesting system for CDNP          | Online and book search                                                     | Rainwater harvesting guides, people who have completed projects                 |                                                  | June 30, 2016   |
|                                                                                                                                                                                                                  | 2) Write proposal outline cost, materials, installation site                   | Determine design for system, research prices, combine for proposal         | Catalogs of materials, trip to CDNP to determine proposed site                  |                                                  | July 20, 2016   |
|                                                                                                                                                                                                                  | 3) Receive approval by the Asombro Board of Directors for installation at CDNP | Present proposal at next meeting                                           | Support from Executive Director for project presentation to Board members       |                                                  | July 20, 2016   |
|                                                                                                                                                                                                                  | 4) Purchase all materials for rainwater harvesting system                      | Trip to store, order materials online                                      | Funding for project materials, vehicle to transport materials                   |                                                  | July 31, 2016   |
|                                                                                                                                                                                                                  | 5) Install rainwater harvesting system at CDNP                                 | Go to park and set up system                                               | Help from staff & volunteers, tools for installation, money for supplies        |                                                  | August 15, 2016 |
|                                                                                                                                                                                                                  | 6) Design and display sign to explain rainwater harvesting at CDNP             | Create informational poster and have it printed on sign, installed at park | Information to be included on sign, funding for sign, supplies for installation |                                                  | August 15, 2016 |



# Stage 4: Execute project

- Carry out your project plan
- When completing your project, you will likely run into obstacles and setbacks. Be sure to return to your project plan and alter it as issues arise, including altering deadlines.
- Be sure to communicate as a team. Check-in often as a group so that team members can report on their tasks and everybody can remain on the same page.

# Stage 5: Evaluate

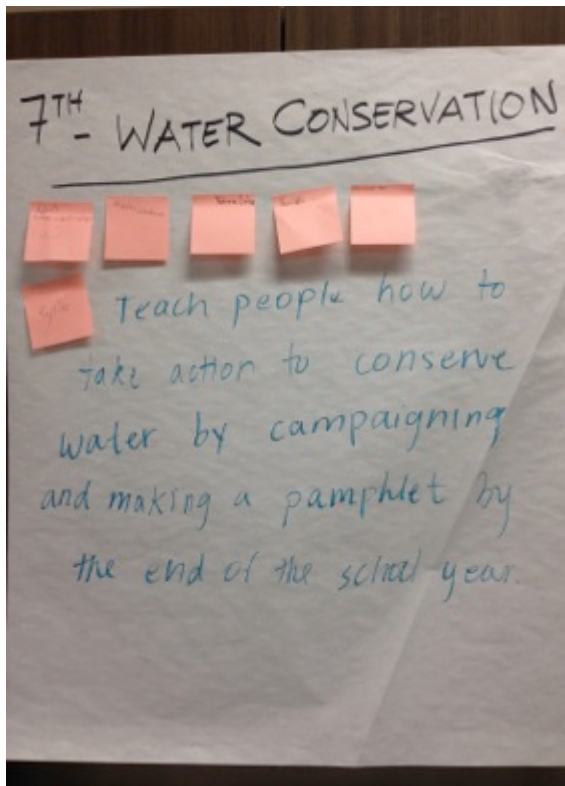
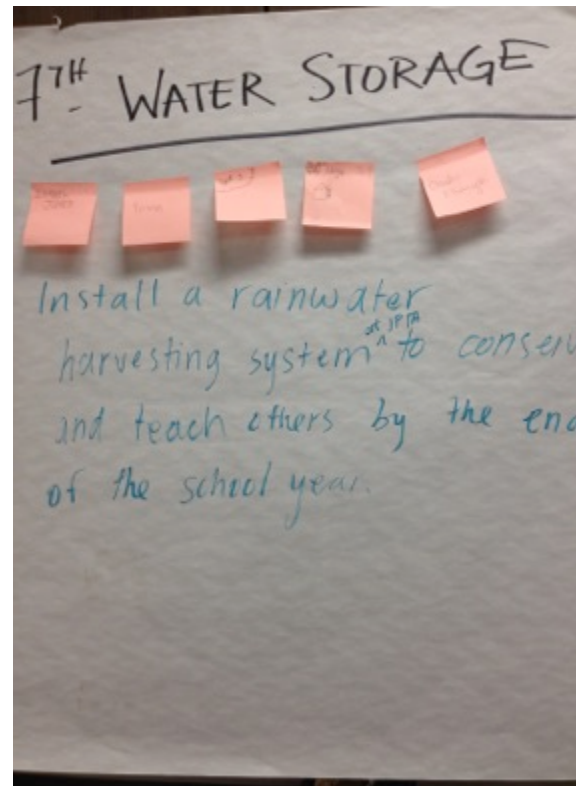
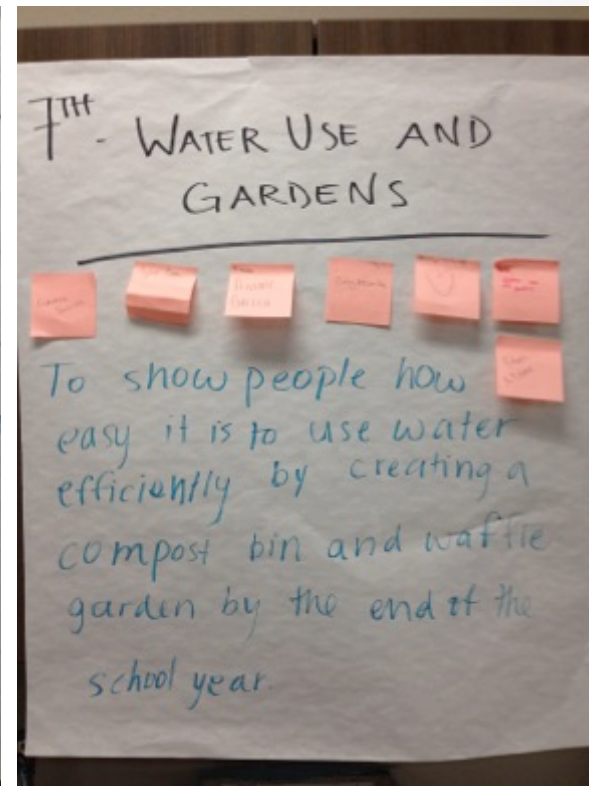
- Was this project successful?
- As a team, did we achieve our goal that we set in the beginning?

## POSSIBLE INDICATORS OF SUCCESS EXAMPLE

- *The amount of rainwater harvested using the rain barrel at CDPN*
- *The number of people who left positive feedback in visitor register*
- *The number of rainwater harvesting systems inspired by ours*
- *The number of people that were involved in the project from beginning to end*

## POSSIBLE INDICATORS OF SUCCESS FOR YOUR ACTION PROJECT

# Possible Water Action Plans?



New Mexico Climate Champions

# ENERGY MODULE

# Energy Resources and Use

- Time: 60 minutes
- Objectives:
  - Identify the need for increased dependence on renewable energy sources.
  - Explain relationships between energy consumption, human population, methods of energy production and climate change.



# Part 1: Constant energy consumption

Renewable = green beads



- Remove 10 beads each round (year).
- Renewables can go back into bag, non-renewables cannot.
- Stop after 5 rounds (years).

Non-renewable = black beads





# Part 2: Increasing energy consumption

- Remove an increasing amount of beads each round (year).
- Renewables can go back into bag, non-renewables cannot.
- Stop after 5 rounds (years).

Renewable = green beads



Non-renewable = black beads



<http://www.census.gov/popclock/>

# Energy Data Jam

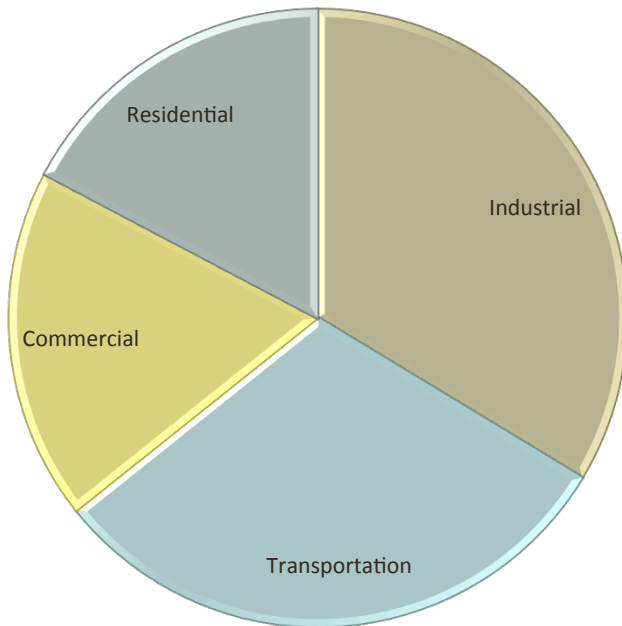
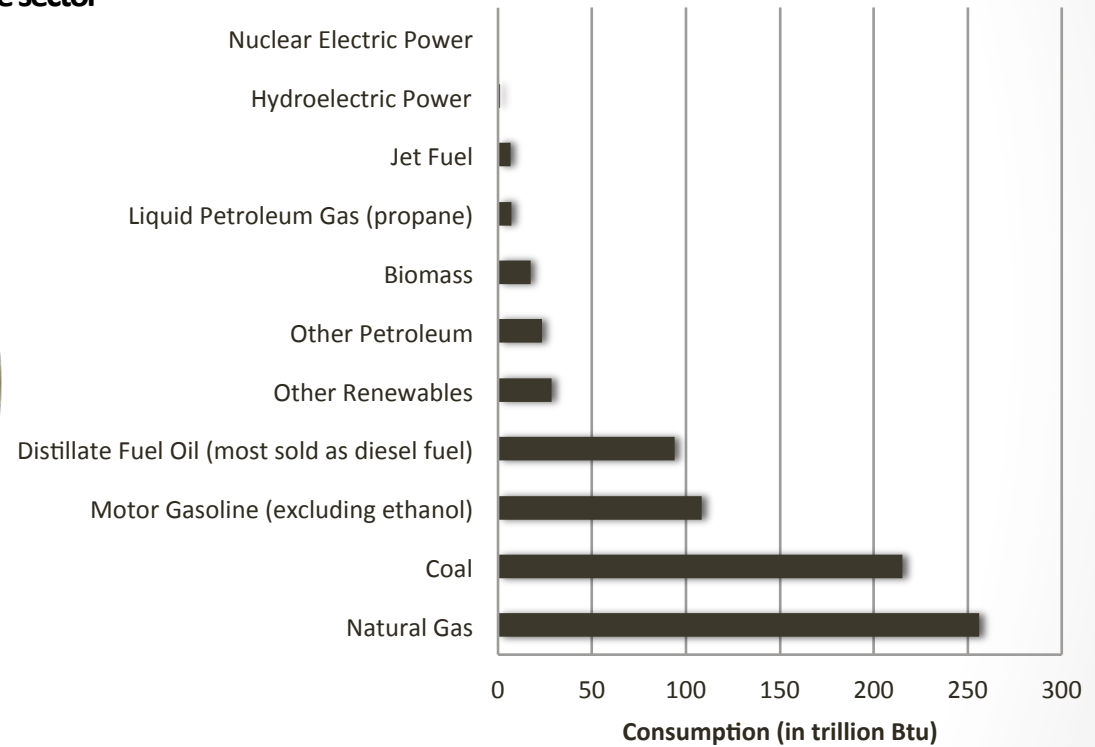
- Time: 60 + minutes
- Same concept as Climate Data Jam except with New Mexico energy consumption source and sector data



# Energy Data Jam: Data

New Mexico Energy Consumption by source

New Mexico Energy Consumption by end-use sector



# Energy Audit

- Time: 60 minutes
- Objectives:
  - Measure the energy use of several household appliances.
  - Analyze the potential reduction of energy use by conscientious use of appliances.
  - Summarize how energy production has contributed to climate change.



# Energy Audit: Calculate CO<sub>2</sub> Saved

$$\frac{\text{_____}}{\text{watts}} \times \frac{\text{_____}}{\text{hours/day}} \times \frac{\text{_____}}{\text{days/week}} \times 52 \frac{\text{weeks}}{\text{year}} = \frac{\text{_____}}{\text{watt hours/year}}$$

Convert watt hours/year to kilowatt hours (kWh)/year.

$$\frac{\text{_____}}{\text{watt hours/year}} \div \frac{1000 \text{ watts}}{\text{kilowatt}} = \frac{\text{_____}}{\text{kWh/year}}$$

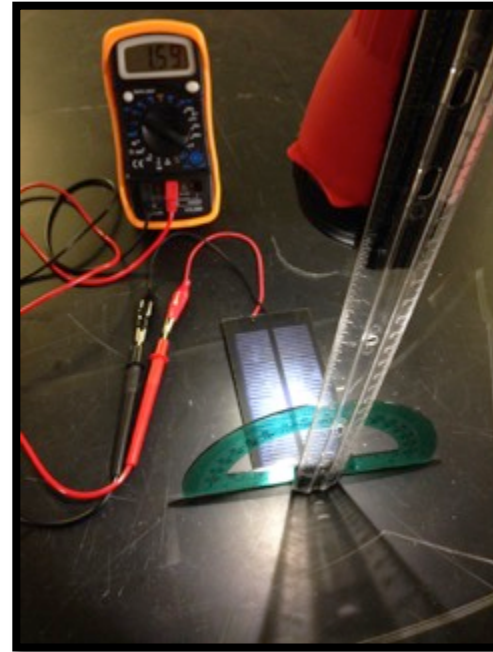
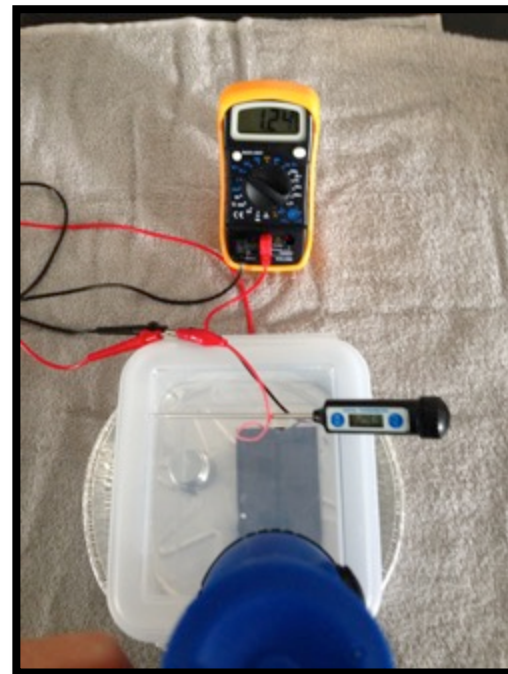
Calculate the mass (lb) of carbon dioxide that you would keep out of the atmosphere every year.

$$\frac{\text{_____}}{\text{kWh/year}} \times 0.14 \frac{\text{lb of CO}_2}{\text{kWh}} = \frac{\text{_____}}{\text{lb of CO}_2/\text{year}}$$

Raise your hand when you have this number so that it can be added to the class data table on the board.

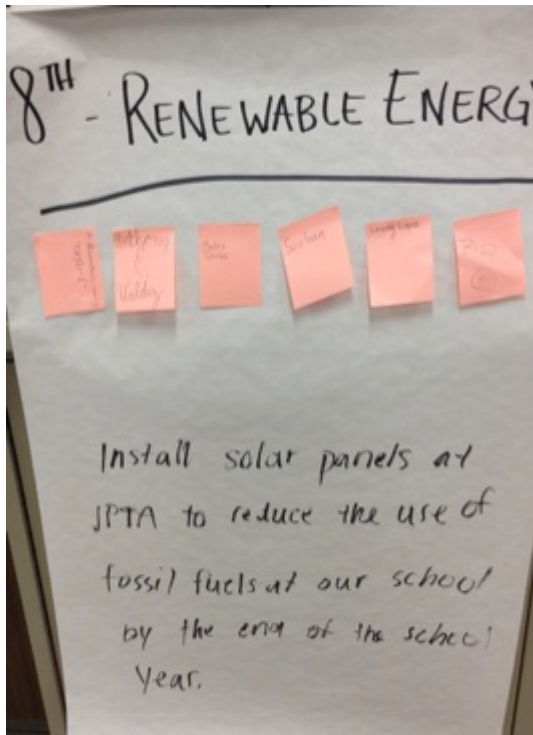
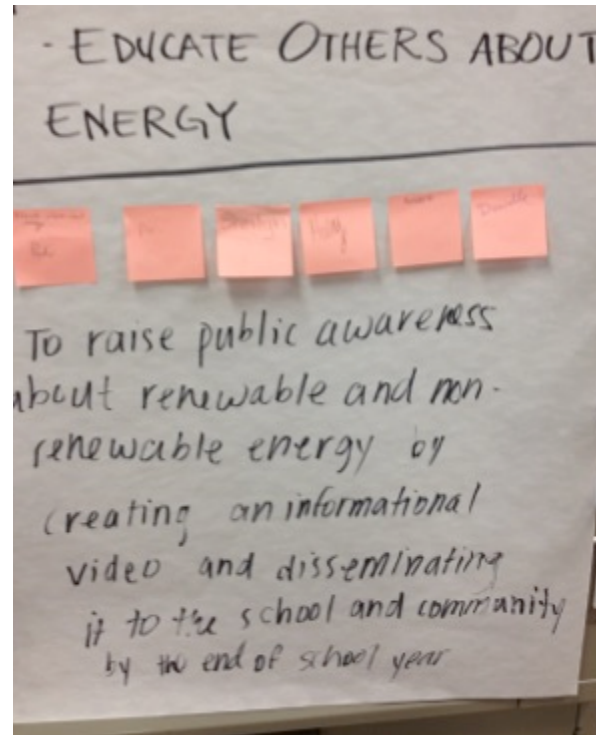
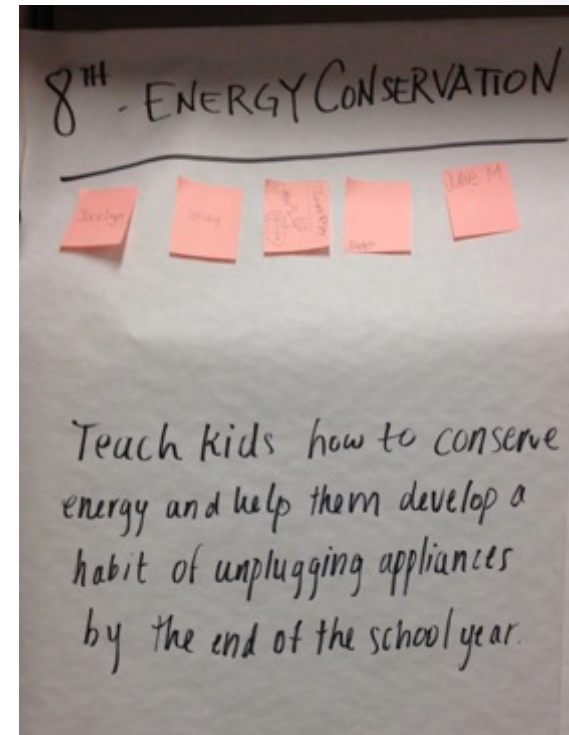
# Solar Energy

- Time: 60 minutes
- Objectives:
  - Identify the optimum temperature and angle for photovoltaic output.
  - Summarize solar panel performance in varying conditions playing the role of a solar engineer.



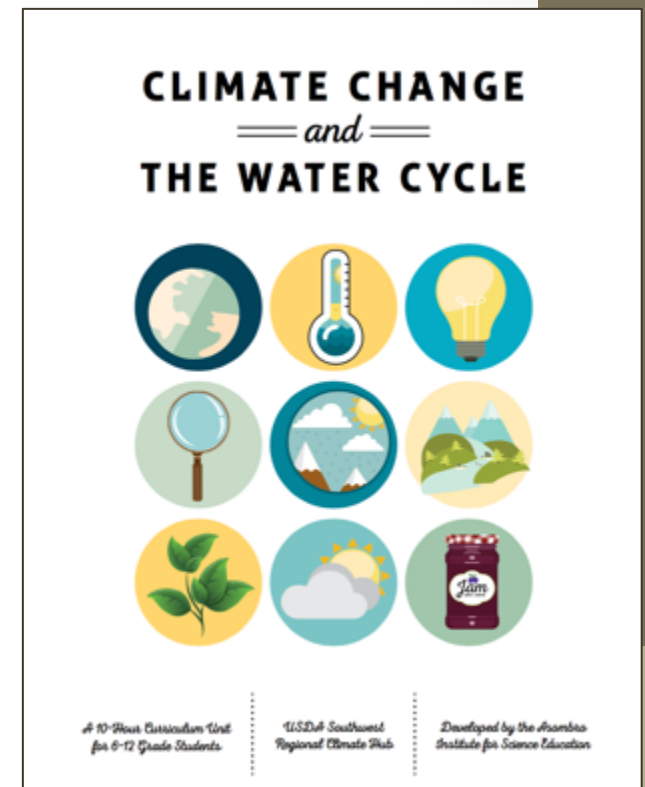


# Possible Energy Action Plans?



# Climate Change and the Water Cycle

- A Free 6th-12th Grade Unit Focused on New Mexico and the Southwest



# Workshop Reminder

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