ETHNOMATHMATICS

CORAL REEF, CLIMATE CHANGE, AND YOU

BY BETH KAUWE

How do we know if carbon dioxide levels are rising and what can I do about it in my personal life and in my community to affect change?

ELEMENTARY  SIXTH GRADE / MATH

TIMEFRAME  ONE - TWO 90 MINUTE PERIODS

STANDARD BENCHMARKS AND VALUES

CCSS
6SP1 - Recognize that a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.
6SP5 Summarize numerical data in relation to their context such as by:
   a. Report # of observations)
   b. Giving measures of center as well as describing any overall pattern with reference to the context in which data were gathered.
6RP3c - Find a percent of a quantity as a rate per 100.

SMP’S
MP #1 - Make sense of problems and persevere in solving them.
MP#3 Construct Viable Arguments.
MP#4 Model with Mathematics.

GLO’S
GLO #1 - Self-Directed Learner.
GLO #2 - Community Contributor-I work together with others respectfully.
GLO #3 - Complex Thinker-I use what I know to learn new things or solve problems.
GLO #4 - Quality Producer-data display.
ENDURING UNDERSTANDING
Humans are increasing carbon dioxide levels affecting our climate in many ways—raising temperatures, causing ocean temperatures to rise, killing off species. We can slow climate change by decreasing the levels of carbon dioxide emissions and exploring various ways to reduce CO2. (Next lesson)

ASSESSMENT
Students will work in groups (by year) as part of an investigative team to graph the year’s data on the various substrates found in the “ocean” (in our case, we will pretend the field is our ocean). Students will specifically look at Hard Coral, Hard Coral Bleached, and Hard Coral Diseased calculating percentages based on data gathering and mean/median for all four years. Findings will be presented to the class summarizing and displaying percentages of each category by year 2008, 2010, 2012, 2014 in large graphs on chart paper. The mean and median will be calculated to see which is a better representation (Any patterns noted? What may have caused increase or decrease? What questions would you ask to further investigate?). Each group has a work packet to organize data collected, sketch graphs, and answer questions.

LEARNING PLAN
HOOK
Watch video FortheSea.com to preview life underwater (coral, turtles, dolphins, fish) and connect prior knowledge.

DISCUSSION
• Discuss what students saw in the video/what they know about coral. Why is coral important?
• Reference Garden Island newspaper articles 4/28/15 and 4/30/15 on Coral Disease. In what possible ways may this information been gathered?
• Connect research in paper with methods used by guest speakers (Katie and Ambyr DLNR-DOAR). What statistical questions might they ask as researchers to gather data?
• Examples/non-examples.
SLIDESHOW
How and Why Do We Survey the Reefs?
1. Develop a Statistical Question (students came up with theses)
2. Types of Surveys (baseline, monitoring, rapid assessment)
3. Choose a Method (Quadrat Survey, Point Intercept Survey, Visual Census)
4. Pick a Site (representative of the area, random)
5. Slide show included real life photos of the researchers gathering information about the coral on Kauai (pictures included substrate, methods used in the ocean, gear needed, fish encountered) and a review of each category of substrate (Rock, Hard Coral, Hard Coral Bleached, Hard Coral Diseased, Limu, Sand, Silt descriptions and codes).

DATA ACTIVITY
VOCAB - Substrate, % Coverage, Transect, Quadrat, Polyps, Sooxanthellae, Climate Change, Point Intercept
Students will act as researchers pretending to survey the ocean.
Four different Point Intercepts are set up outside using a transect to mimic what the researchers may see in the ocean. Each line represents a different year - 2008, 2010, 2012, 2014. Fifty colorful cards depicting each category (above) are laid out every 0.5 meters.
Groups are given clipboards with reference page (picture/description sheet) to identify which category picture fits in. Groups also given data sheet marking every 0.5 m to write in code for picture. Members walk (“swim”) the line and indentify pictures together.
Return to class and calculate percentages for each category (out of 50 cards).
With regard to the specific year, students note observations of data collected.
- What is striking?
- Surprising?
- Any wonderings or further curiosities?
Representatives from each group come to the board and record data on a bar graph comparing years for % coverage of Hard Coral, Hard Coral Bleached, Hard Coral Diseased to see what has happened over time.
- Is there a pattern? Did you notice the same pattern in your group?
- What questions do you want to ask? (Lead them to What could have caused this to happen? to connect to ocean temperature/climate change.
- What would you like to investigate further?
- Predict what the % Coverage will be for 2016.
- How might the changes affect us?
Class calculates mean and median for all four years and decides what this means in relation to each category. Which measure is a better representation of the data?
CLOSURE
Write about 2 things that you learned today and one thing you want to investigate further. Share out.

NOTES
Next lesson begin with 2 ½ min. video on climate change and islands that are disappearing (Youtube Five Places to Visit Before They Disappear).
Intro to how we can make changes to our everyday life to help reduce our carbon footprint.

RESOURCES
YouTube For the Sea
Katie Nalscere-DLNR DOAR
Ambyr Lee-DLNR
CORAL REEF ASSESSMENT

SMP’S- STUDENT RATING
Rate your group/yourself on how well you were able to work together or on your own on the following Math Practices. Circle 1=Difficulty  2=Fairly able to complete  3=Easily able to complete

SMP 1: (GROUP)
MAKE SENSE OF PROBLEMS AND PERSEVERE IN SOLVING THEM
My group and I could explain the meaning of the problem out loud. 1 2 3
My group and I could plan a way to solve the percentages. 1 2 3

SMP 3: (YOURSELF)
CONSTRUCT Viable ARGUMENTS AND CRITIQUE THE REASONING OF OTHERS.
I was able to explain my thinking when calculating percentages or measures of center. 1 2 3
I was able to listen to and respond to others when they shared their strategies. 1 2 3

SMP 4: (YOURSELF)
CONSTRUCT Viable ARGUMENTS AND CRITIQUE THE REASONING OF OTHERS.
My group and I were able to create a graph to represent the data. 1 2 3

COMMENTS: ____________________________________________________________

GLO RATING
Please rate yourself on the following GLO’s.
1=Rarely Demonstrated; 2=Demonstrated Sometimes; 3=Demonstrated Consistently

GLO #1 SELF-DIRECTED LEARNER
I used my time well. I completed my work. 1 2 3

GLO #2 COMMUNITY CONTRIBUTOR
I worked together with my group respectfully, listening to others point of view, sharing my ideas, following class rules. I contributed to the group’s efforts. 1 2 3

GLO #4 QUALITY PRODUCER
I know what quality work is and produced a quality graph in my packet. I asked for help when I didn’t understand and looked for ways to make my work better. 1 2 3
STUDENT: Please assess yourself on the standards using pencil then turn it in so I can assess your work.

TEACHER: I will assess using pen.

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<th>CSS</th>
<th>Not Met</th>
<th>Approaching</th>
<th>Met</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>6SP1</td>
<td>Examples of statistical questions provided</td>
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<tr>
<td>6SP-5a</td>
<td>Number of observations reported</td>
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<tr>
<td>6SP-5c</td>
<td>Measures of center (mean/median) given with work. A pattern was described.</td>
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<tr>
<td>6RP3c</td>
<td>Find percent of substrates per 100</td>
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ADDITIONAL COMMENTS: