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Grade 7 Earth Day Statistics with Circle and Bar Graphs

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Middle School

Math

Pace University **Year 2010**

Grade 7: Statistics and Probability

Joanne Erenberg
Pace University

Subject: Math 7

Topic: Statistics and Probability

Grade: 7

NYS Standards: 7.PS.1, 7.PS.3, 7.PS.6, 7.PS.11, 7.PS.12 – 7.PS.17, 7.RP.2, 7.CM.1 – 7.CM.5, 7.CM.9 – 7.CM.11, 7.CN.6, 7.CN.7, 7.CN.9, 7.R.1 – 7.R.8, 7.R.11, 7.S.1 – 7.S.3,

Hook: Earth Day statistics. Think globally act locally! As a class we will show how we can produce visual data representations for statistical data collected, regarding recycling and energy efficiency within our school, our homes, and our community. We will collect and organize data into graphs. We will collaborate on activities designed for multiple learning styles. Finally, we will share our results with each other and reflect on the experience.

Essential Questions:

- How do we identify and collect data using a variety of methods?
- How do we display, read, and interpret data in a circle graph?
- How do we convert raw data into bar graphs?

Understandings:

- Students should understand how parts of an object make up the whole.
- Students should understand percentages.
- Students will understand how every day data can be understood more easily with the use of graphs.

Unit Overview: This lesson makes up the first two days of a unit on communicating with data. The whole unit deals with statistics and probability. The focus of this lesson is the circle graph and bar graph portion of the unit. Later in the unit students will learn about line plots, stem and leaf diagrams, mean, median, mode, line graphs, scatter plots, and trend lines. See page 3 for the Unit details.

Pre-assessment: See the following two paged worksheet that will be given the day before the lesson in order to form tiered groups. (See pages 3 & 4)

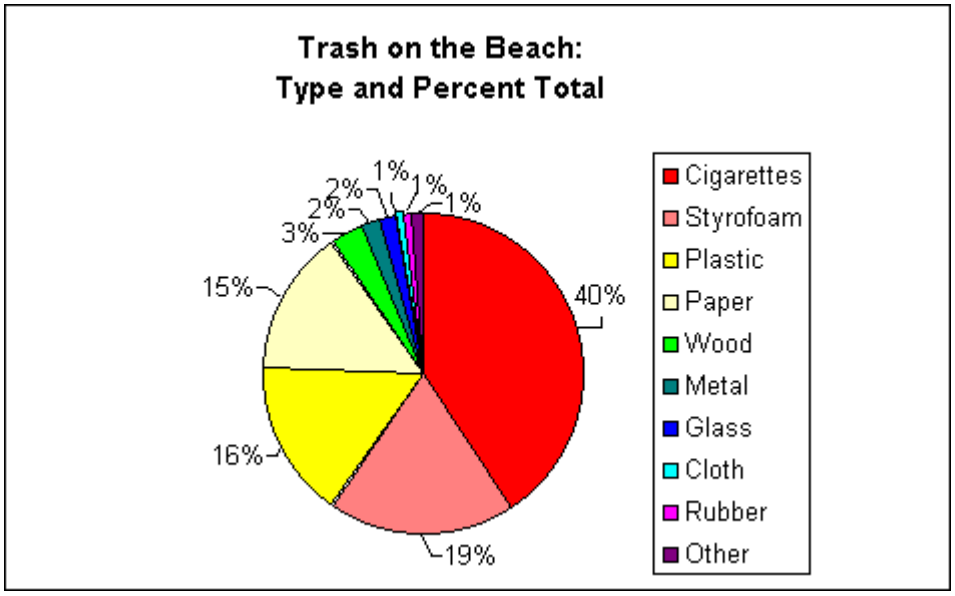
UNIT DETAILS:

Monday	Tuesday	Wednesday	Thursday	Friday
Introduction to statistics discovery streaming clip 20 minutes on: 1. Collecting Information and Using Statistics 2. Collecting Traffic Accident Statistics. 3. Finding Mean, Median, and Mode. 4. Collecting Family Statistics 20 minutes to Introduce the Earth day lesson and go over Family worksheet packet and handout poster board.	Circle and bar graph day 1 of Earth day lesson. Groups will work in small groups based on learning profile.	Circle and bar graph day 2 of Earth day lesson. Groups will work in small groups based on learning profile.	Line Graph day 3 of Earth day lesson. Groups will work in small groups based on learning profile.	Student Share day. Students will share the family data that they collected by presenting their graphs on poster board to the class. Students will share their suggestions for making energy wise improvements.
Monday	Tuesday	Wednesday	Thursday	Friday
Computer Lab discovery lesson on ideas that lead to probability. Students will explore random number generators, discuss Fair choice and play a racing game that teaches probability. Shodor.org see print out.	Computer Lab – Introduction to the concept of probability. Students will work in readiness based groups one strong one less strong learner and they will play the crazy choices game to learn what experimental probability is. (Shodor)	Computer lab day 3 complete crazy choices games and compare predicted results with actual results. Quiz on unit vocabulary and graph identification.	Misleading data day 1 PBS Kids cyberchase. Raising the bar episode 210 the exterminator tries to manipulate a graph to convince the cybrarian that he completed his job. The students have to figure out what is happening. Then a real life clip is shown displaying how two students selling candy misrepresented their sales by the scale of their graphs. See printout.	Misleading data day 2. Group activity on creating convincing graphs. Groups of 4 role play astronauts and mission control. Astronauts must convince mission control that they are NOT making too many ham radio calls. Mission control must convince congress that they are making too many calls. Students will share the data on poster board and then on the Smart Board.

Piece of Cake!

A pie graph is the best way to show portions, or parts of a whole.

Pie graphs represent data in a visual, easy to read manner, which helps us to understand data more clearly. Using this pie graph, we can see just what portion of all the trash each particular type of trash represents (how big of a piece of cake each type of trash "eats"). It's as simple as that!
Even though graphs can look simple, there's a lot of information in a graph.



1.) Which item makes up the biggest portion of trash on the beach?

2.) Can we say what item is the heaviest item of trash? If yes which item?

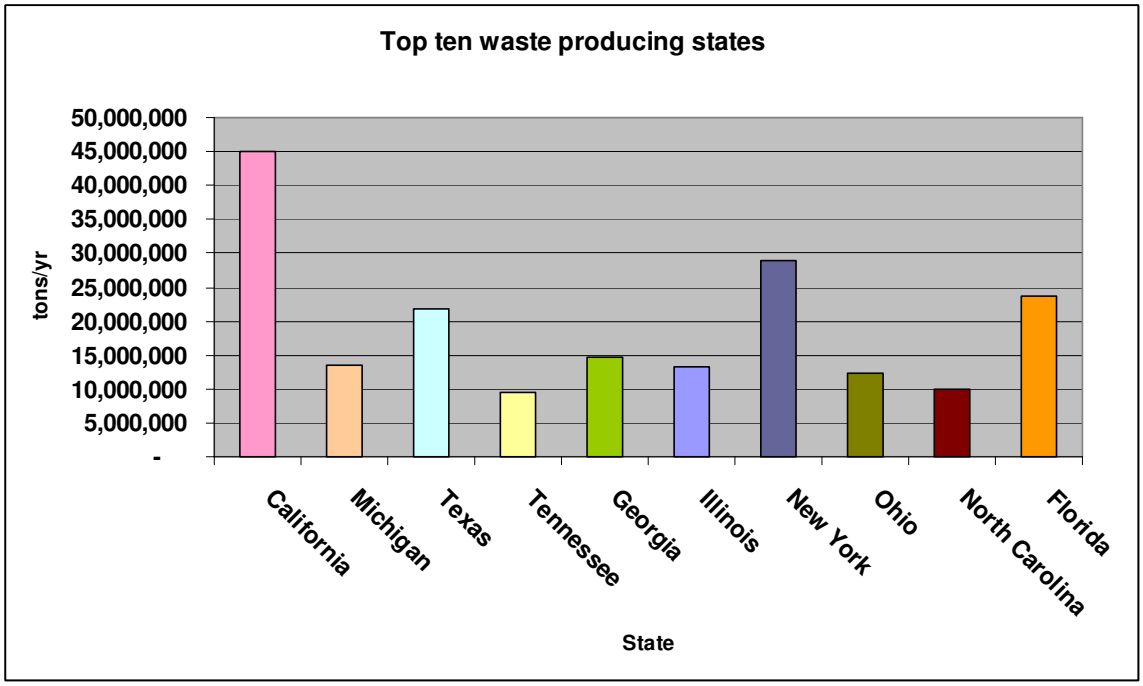
3.) Which items each represent 1% of the trash?

4.) Which three items account for ½ of the trash on the beach?

Adapted from:
© 2004 Kids Do Ecology, NCEAS, 735 State Street, Santa Barbara, California 93101
http://kids.nceas.ucsb.edu/DataandScience/pieceofcake.html

Raising the bar?

Bar graphs are good for comparing and showing the relationship between data. **K**eeping with our earth day theme lets take a look at the top ten waste producing states.



1.) Does a bar graph represent parts of a whole? Circle one: Yes No

2.) Which state produces the most garbage? _____

3.) Which state produces just less than 25 Million tons of garbage?

4.) Can you tell exactly how much waste Texas produces from this graph? If yes then what is it? If not then give your best estimate.

5.) Could you make this into a circle graph? If yes Why? If not then explain.

Graph data sourced from Zero Waste America:
http://www.zerowasteamerica.org/MunicipalWasteManagementReport1998.htm

Lesson detail: This lesson is differentiated by using three tiers of readiness via a cubing exercise.

Students will first work in their predetermined tiered groups to complete two worksheets, one pertaining to circle charts and the other will focus on bar graphs. Both worksheets follow our earth day theme and can be found at the Scholastic website under a lesson called Bars, Lines, & Pies! We are using some worksheets from Lesson 1 and Lesson 2:
http://www2.scholastic.com/browse/unitplan.jsp?id=273

Additional reference material will be used from the Energy Kids website:
http://tonto.eia.doe.gov/kids/index.cfm

Students will receive a cubing activity instruction sheet, an interview form, and rubrics for each activity. The rubrics were created at
http://rubistar.4teachers.org/ See pages 11-18.

Cube 1 (tan) - easy difficulty
Cube 2 (green) - average difficulty
Cube 3 (blue) - challenging difficulty

See the integration matrix for learning styles and which Blooms levels were used for differentiation on each question on each side of the cubes. (Pages 19 & 20)

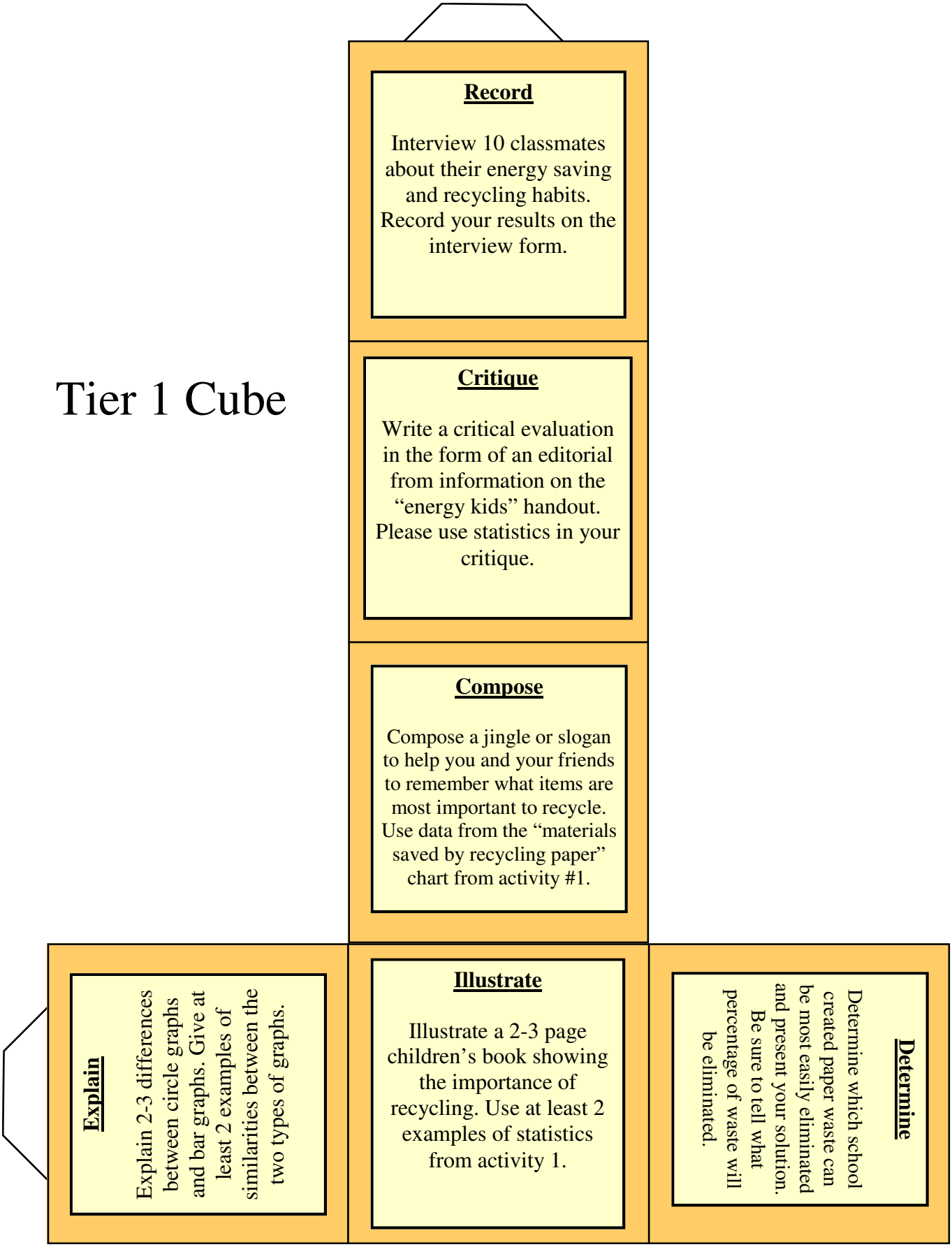
Cube 1:
1.) Record – **Interview** 10 of your classmates about their energy saving and recycling habits. Record your results on the interview form.
2.) Explain – Explain 2-3 differences between **circle graphs** and **bar graphs**. Give at least 2 examples of similarities between the two types of **graphs**.
3.) Illustrate – Illustrate a 2-3 page **children's book** showing the importance of recycling. Use at least 2 examples of statistics from activity #1.
4.) Critique – Write a critical evaluation in the form of an **editorial** from the information on the "energy kids" handout. Please use statistics in your critique.
5.) Determine – Determine which school created paper waste can be most easily eliminated and present your **solution.** Be sure to tell what percentage of waste will be eliminated.
6.) Compose - Compose a **jingle or slogan** to help you and your friends to remember what items are most important to recycle. Use data from the "materials saved by recycling paper" chart from activity #1.

Cube 2:
1.) Record – **Interview** 5 of your classmates about their energy saving and recycling habits. Record your results on the interview form.
2.) Explain – Explain the process your group used to complete either question #3 from activity #1 or question #2 from activity #2, and show the resulting **graph**.

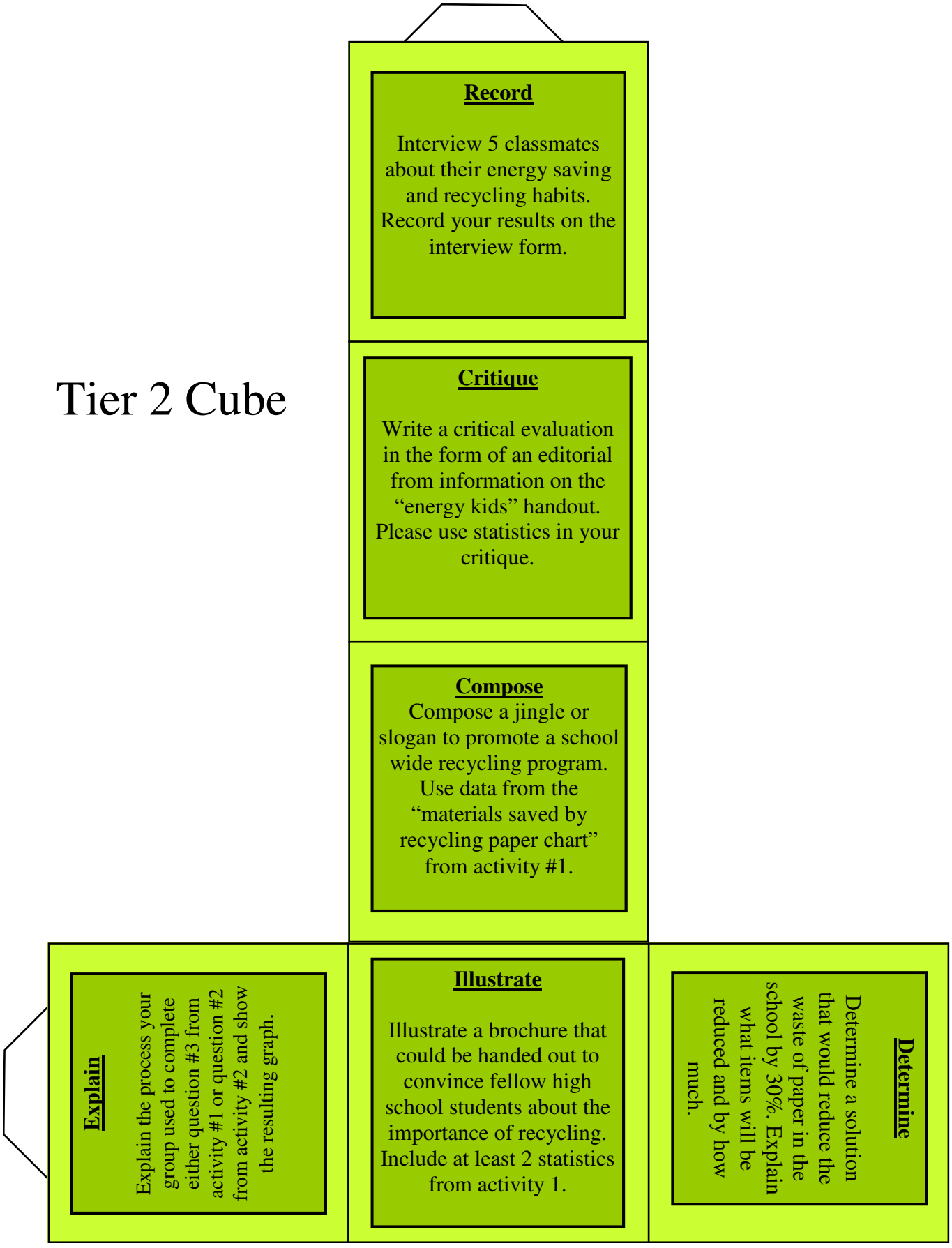
3.) Illustrate – Illustrate a **brochure** that could be handed out to convince fellow students about the importance of recycling. Include at least 2 statistics from activity #1.
4.) Critique – Write a critical evaluation in the form of an **editorial** from the information on the "energy kids" handout. Please use statistics in your critique.
5.) Determine – Determine a **solution** that would reduce the waste of paper in schools by 30%. Explain what items will be reduced and by how much.
6.) Compose – Compose a **jingle or slogan** to promote a school wide recycling program. Use data from the "materials saved by recycling paper" chart from activity #1.

Cube 3:
1.) Record – **Interview** 8 of your classmates about their energy saving and recycling habits. Record your results on the interview form.
2.) Explain – From energy kids, explain why a bar graph was used for the "types of energy…" graph and why a circle graph was used for the "how energy is used in homes" graph.
3.) Illustrate – Illustrate a **brochure** that can convince parents and school board members of the importance of recycling program. Include at least 2 examples of statistics from activity #1.
4.) Critique – Write a critical evaluation in the form of an **editorial** from the information on the "energy kids" handout. Please use statistics in your critique.
5.) Determine – From energy kids, determine at least one **solution** to save energy in single family homes, and estimate what percentage you could reduce the energy consumption by.
6.) Compose – Compose a **jingle or slogan** for a company that wants your school to use their recycling services. Use data from the "materials saved by recycling paper" chart from activity #1.

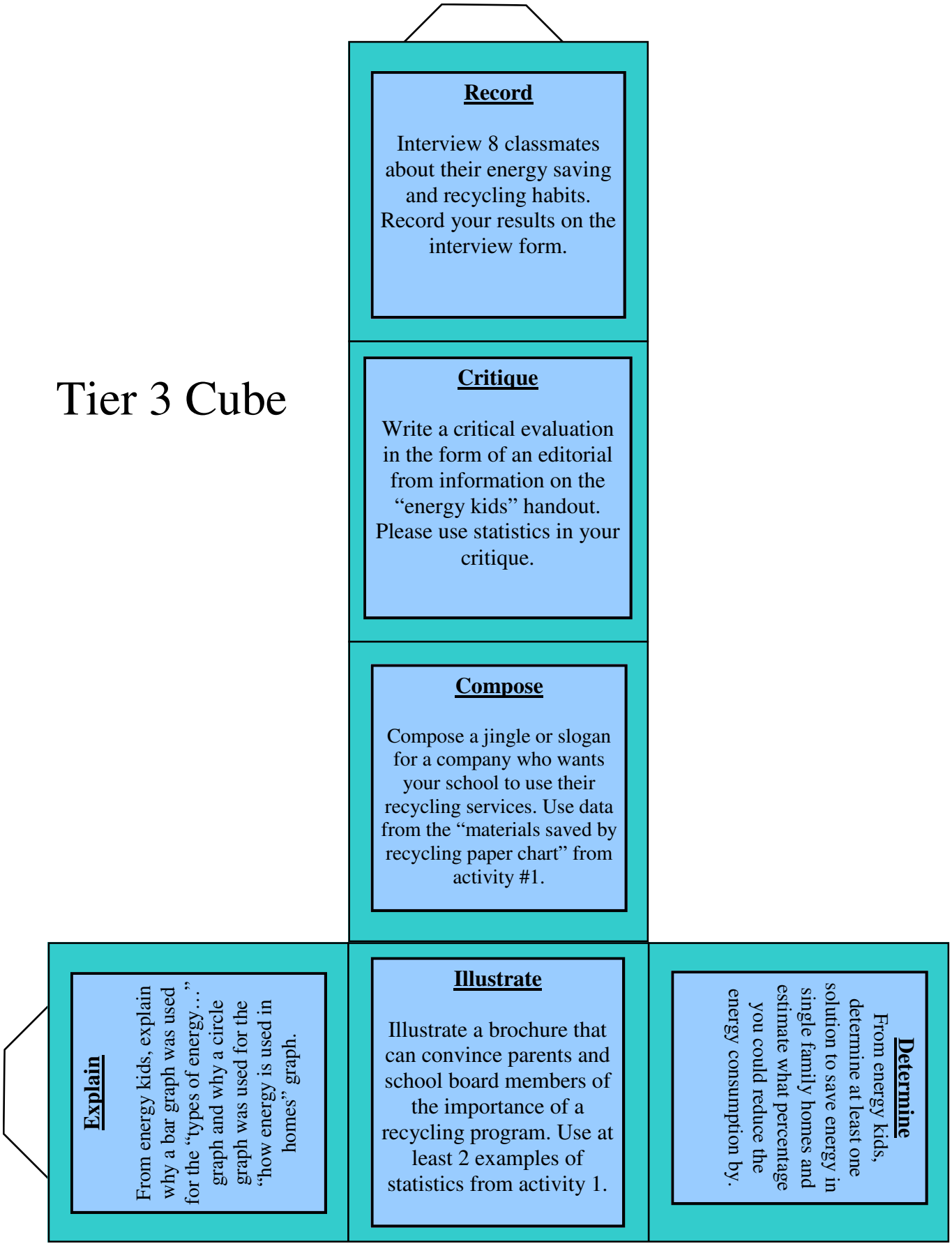
Tier 1 Cube


Record
Interview 10 classmates about their energy saving and recycling habits. Record your results on the interview form.
Critique
Write a critical evaluation in the form of an editorial from information on the "energy kids" handout. Please use statistics in your critique.
Compose
Compose a jingle or slogan to help you and your friends to remember what items are most important to recycle. Use data from the "materials saved by recycling paper" chart from activity #1.
Explain
Explain 2-3 differences between circle graphs and bar graphs. Give at least 2 examples of similarities between the two types of graphs.
Illustrate
Illustrate a 2-3 page children's book showing the importance of recycling. Use at least 2 examples of statistics from activity 1.
Determine
Determine which school created paper waste can be most easily eliminated and present your solution. Be sure to tell what percentage of waste will be eliminated.

Tier 2 Cube


Record
Interview 5 classmates about their energy saving and recycling habits. Record your results on the interview form.
Critique
Write a critical evaluation in the form of an editorial from information on the "energy kids" handout. Please use statistics in your critique.
Compose
Compose a jingle or slogan to promote a school wide recycling program. Use data from the "materials saved by recycling paper chart" from activity #1.
Explain
Explain the process your group used to complete either question #3 from activity #1 or question #2 from activity #2 and show the resulting graph.
Illustrate
Illustrate a brochure that could be handed out to convince fellow high school students about the importance of recycling. Include at least 2 statistics from activity 1.
Determine
Determine a solution that would reduce the waste of paper in the school by 30%. Explain what items will be reduced and by how much.

Tier 3 Cube


Record
Interview 8 classmates about their energy saving and recycling habits. Record your results on the interview form.
Critique
Write a critical evaluation in the form of an editorial from information on the "energy kids" handout. Please use statistics in your critique.
Compose
Compose a jingle or slogan for a company who wants your school to use their recycling services. Use data from the "materials saved by recycling paper chart" from activity #1.
Explain
From energy kids, explain why a bar graph was used for the "types of energy…" graph and why a circle graph was used for the "how energy is used in homes" graph.
Illustrate
Illustrate a brochure that can convince parents and school board members of the importance of a recycling program. Use at least 2 examples of statistics from activity 1.
Determine
From energy kids, determine at least one solution to save energy in single family homes and estimate what percentage you could reduce the energy consumption by.

Cube activity instructions and checklist

Step	Instructions	Check here when complete
1.	Move into assigned groups.	
2.	Read instruction sheet and rubrics.	
3.	Complete worksheets labeled activity 1 and activity 2 as a group.	
4.	Choose three activities from your cube to work on with your group.	
5.	Choose one activity to do for homework out of the remaining two activities on the cube.	
6.	Be prepared to share the results from an activity. Decide who will own which activity for the presentations. You should each have your own activity to present between the three you worked on as a group and also from the homework assignment.	
7.	Complete the group reflections below.	

Group reflections:

What worked well in your group?

What, if anything, could have been improved within your group?

What did you learn from each other about the lesson during the group activities?

Did you all cooperate? Rate on a scale of 1-5:
1 2 3 4 5

Did you all participate equally? Rate on a scale of 1-5:
1 2 3 4 5

What did you like the most about this lesson?

What did you like the least about this lesson?

Interview ___ classmates and ask them following question:
Pick one environmentally smart habit from below that you think is the most important. (Put a tick next to each choice, then total the ticks, and figure out the percentage it represents)

Saving water: _____

Total tally: _____ Percentage: _____

Recycling: _____

Total tally: _____ Percentage: _____

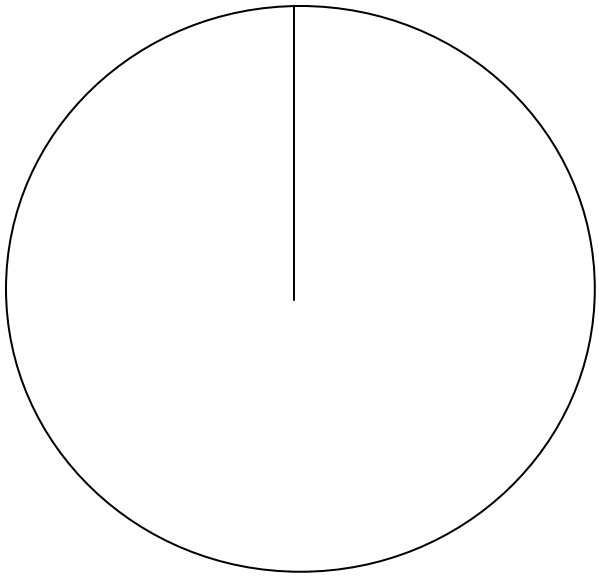
Conserving electricity _____

Total tally: _____ Percentage: _____

Other: _____

Total tally: _____ Percentage: _____

Please show your final results as a circle graph below and label the graph with a key (use colored markers).



Graphing : Interview your classmates about their conservation habits

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Teacher Name: **Mrs. Erenberg**

Student Name: _____

CATEGORY	4	3	2	1
Units	All units are described (in a key or with labels) and are appropriately sized for the data set.	Most units are described (in a key or with labels) and are appropriately sized for the data set.	All units are described (in a key or with labels) but are not appropriately sized for the data set.	Units are neither described NOR appropriately sized for the data set.
Neatness and Attractiveness	Exceptionally well designed, neat, and attractive. Colors that go well together are used to make the graph more readable. A ruler and graph paper (or graphing computer program) are used.	Neat and relatively attractive. A ruler and graph paper (or graphing computer program) are used to make the graph more readable.	Lines are neatly drawn but the graph appears quite plain.	Appears messy and "thrown together" in a hurry. Lines are visibly crooked.
Form completion	Interview form is completely filled out.	Interview form is mostly filled out.	Interview form is partially filled out.	Interview form has little or no recorded information.
Mathematical Errors	90-100% of the steps and solutions have no mathematical errors.	Almost all (85-89%) of the steps and solutions have no mathematical errors.	Most (75-84%) of the steps and solutions have no mathematical errors.	More than 75% of the steps and solutions have mathematical errors.

Date Created: **May 04, 2010 02:01 am (UTC)**

Explaining graphs

Teacher Name: **Mrs. Erenberg**

Student Name: _____

CATEGORY	4	3	2	1
Mathematical Concepts	Explanation shows complete understanding of the mathematical concepts used to solve the problem(s).	Explanation shows substantial understanding of the mathematical concepts used to solve the problem(s).	Explanation shows some understanding of the mathematical concepts needed to solve the problem(s).	Explanation shows very limited understanding of the underlying concepts needed to solve the problem(s) OR is not written.
Explanation	Explanation is detailed and clear.	Explanation is clear.	Explanation is a little difficult to understand, but includes critical components.	Explanation is difficult to understand and is missing several components OR was not included.
Mathematical Reasoning	Uses complex and refined mathematical reasoning.	Uses effective mathematical reasoning	Some evidence of mathematical reasoning.	Little evidence of mathematical reasoning.
Neatness and Organization	The work is presented in a neat, clear, organized fashion that is easy to read.	The work is presented in a neat and organized fashion that is usually easy to read.	The work is presented in an organized fashion but may be hard to read at times.	The work appears sloppy and unorganized. It is hard to know what information goes together.

Date Created: **May 04, 2010 01:41 am (UTC)**

Making A Brochure : Illustrating a brochure or children's book about recycling

Teacher Name: **Mrs. Erenberg**

Student Name: _____

CATEGORY	4	3	2	1
Statistical examples	All statistical examples in the brochure/booklet are accurate.	99-90% of the statistical examples in the brochure/booklet are accurate.	89-80% of the statistical examples in the brochure/booklet are accurate. Only one example is used.	Fewer than 80% of the statistical examples in the brochure/booklet are accurate. Or they do not appear at all.
Attractiveness & Organization	The brochure/booklet has exceptionally attractive formatting and well-organized information.	The brochure/booklet has attractive formatting and well-organized information.	The brochure/booklet has well-organized information.	The brochure/booklet's formatting and organization of material are confusing to the reader.
Knowledge Gained	All students in the group can accurately answer all questions related to facts in the brochure/booklet and to technical processes used to create the brochure/booklet.	All students in the group can accurately answer most questions related to facts in the brochure/booklet and to technical processes used to create the brochure.	Most students in the group can accurately answer most questions related to facts in the brochure/booklet and to technical processes used to create the brochure.	Several students in the group appear to have little knowledge about the facts or technical processes used in the brochure/booklet.
Writing - Organization	Each section in the brochure/booklet has a clear beginning, middle, and end.	Almost all sections of the brochure/booklet have a clear beginning, middle and end.	Most sections of the brochure/booklet have a clear beginning, middle and end.	Less than half of the sections of the brochure/booklet have a clear beginning, middle and end.
Graphics/Pictures	Graphics go well with the text and there is a good mix of text and graphics.	Graphics go well with the text, but there are so many that they distract from the text.	Graphics go well with the text, but there are too few and the brochure seems "text-heavy".	Graphics do not go with the accompanying text or appear to be randomly chosen.

Date Created: **May 04, 2010 12:57 am (UTC)**

Critique in the form of an editorial

Teacher Name: **Mrs. Erenberg**

Student Name: _____

CATEGORY	4	3	2	1
Position Statement (your viewpoint on the subject)	The position statement provides a clear, strong statement of the author's position on the topic.	The position statement provides a clear statement of the author's position on the topic.	A position statement is present, but does not make the author's position clear.	There is no position statement.
Support for Position	Includes 3 or more pieces of evidence (facts, statistics, examples, real-life experiences) that support the position statement. The writer anticipates the reader's concerns, biases or arguments and has provided at least 1 counter-argument.	Includes 3 or more pieces of evidence (facts, statistics, examples, real-life experiences) that support the position statement.	Includes 2 pieces of evidence (facts, statistics, examples, real-life experiences) that support the position statement.	Includes 1 or fewer pieces of evidence (facts, statistics, examples, real-life experiences).
Accuracy	All supportive facts and statistics are reported accurately.	Almost all supportive facts and statistics are reported accurately.	Most supportive facts and statistics are reported accurately.	Most supportive facts and statistics were inaccurately reported.
Evidence and Examples	All of the evidence and examples are specific, relevant and explanations are given that show how each piece of evidence supports the author's position.	Most of the evidence and examples are specific, relevant and explanations are given that show how each piece of evidence supports the author's position.	At least one of the pieces of evidence and examples is relevant and has an explanation that shows how that piece of evidence supports the author's position.	Evidence and examples are NOT relevant AND/OR are not explained.
Audience	Demonstrates a clear understanding of the potential reader and uses appropriate vocabulary and arguments. Anticipates reader's questions and provides thorough answers appropriate for that audience.	Demonstrates a general understanding of the potential reader and uses vocabulary and arguments appropriate for that audience.	Demonstrates some understanding of the potential reader and uses arguments appropriate for that audience.	It is not clear who the author is writing for.

Date Created: **May 04, 2010 01:09 am (UTC)**

Determine a solution to a conservation problem

Teacher Name: **Mrs. Erenberg**

Student Name: _____

CATEGORY	4	3	2	1
Strategy/Procedures	Typically, uses an efficient and effective strategy to solve the problem(s).	Typically, uses an effective strategy to solve the problem(s).	Sometimes uses an effective strategy to solve problems, but does not do it consistently.	Rarely uses an effective strategy to solve problems.
Mathematical Reasoning	Uses complex and refined mathematical reasoning.	Uses effective mathematical reasoning	Some evidence of mathematical reasoning.	Little evidence of mathematical reasoning.
Explanation	Explanation is detailed and clear.	Explanation is clear.	Explanation is a little difficult to understand, but includes critical components.	Explanation is difficult to understand and is missing several components OR was not included.
Strategy/Procedures	Typically, uses an efficient and effective strategy to solve the problem(s).	Typically, uses an effective strategy to solve the problem(s).	Sometimes uses an effective strategy to solve problems, but does not do it consistently.	Rarely uses an effective strategy to solve problems.
Neatness and Organization	The work is presented in a neat, clear, organized fashion that is easy to read.	The work is presented in a neat and organized fashion that is usually easy to read.	The work is presented in an organized fashion but may be hard to read at times.	The work appears sloppy and unorganized. It is hard to know what information goes together.

Date Created: **May 04, 2010 01:50 am (UTC)**

Rubric Made Using:

Compose a jingle/slogan

Teacher Name: **Mrs. Erenberg**

Student Name: _____

CATEGORY	4	3	2	1
Accuracy of Facts	All facts presented in the slogan or jingle are accurate	Almost all facts presented are accurate.	Most facts presented are accurate (at least 75%).	There are several factual errors in the slogan or jingle.
Focused on Assigned Topic	The entire slogan or jingle is related to the assigned topic and allows the reader to understand much more about the topic.	Most of the slogan or jingle is related to the assigned topic. It wanders off at one point, but the reader can still learn something about the topic.	Some of the slogan or jingle is related to the assigned topic, but a reader does not learn much about the topic	No attempt has been made to relate the slogan or jingle to the assigned topic.
Organization	The slogan or jingle is very well organized. One idea or follows another in a logical sequence with clear transitions.	The slogan or jingle is pretty well organized. One idea or scene may seem out of place. Clear transitions are used.	The slogan or jingle is a little hard to follow. The transitions are sometimes not clear.	Ideas seem to be randomly arranged.
Creativity	The slogan or jingle contains many creative details and/or descriptions that contribute to the reader's enjoyment. The author has really used his imagination.	The slogan or jingle contains a few creative details and/or descriptions that contribute to the reader's enjoyment. The author has used his imagination.	The slogan or jingle contains a few creative details and/or descriptions, but they distract from it. The author has tried to use his imagination.	There is little evidence of creativity. The author does not seem to have used much imagination

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http://rubistar.4teachers.org/index.php?screen=TermsOfUse

Integration Matrix

Unit/Theme:_____

Unit Questions:

Bloom's Taxonomy	**Knowledge**	**Comprehension**	**Application**	**Analysis**	**Evaluation**	**Synthesis**
Gardner's Multiple Intelligences	*tell, list, define, label, recite, memorize, repeat, find, name,* ***record****, fill in, recall, relate*	*locate,* ***explain****, summarize, identify, describe, report, discuss, review, paraphrase, restate, retell, show, outline, rewrite*	*demonstrate, construct, record, use, diagram, revise, reformat,* ***illustrate****, interpret, dramatize, practice, organize, translate, manipulate, convert, adapt, research, calculate, operate, model, order, display, implement, sequence, integrate, incorporate*	*compare, contrast, classify,* ***critique****, categorize, solve, deduce, examine, differentiate, appraise, distinguish, experiment, question, investigate, categorize, infer*	*judge, predict, verify, assess, justify, rate, prioritize,* ***determine****, select, decide, value, choose, forecast, estimate*	***compose****, hypothesize, design, formulate, create, invent, develop, refine, produce, transform*
Verbal/Linguistic poetry, debate, storytelling, essay, checklist, journal						
Visual/Spatial drawing, model, poster, photograph, storyboard, illustration, board game			Students will **illustrate** according to tier level. Tier 1 – **Children's book** Tier 2 – **Brochure** to school Tier 3 – **Brochure** to parent's All will include statistical evidence.			
Logical/ Mathematical diagram, outline, timeline, chart, critique, **graph**		Each tier is asked to **explain** characteristics of **graphs** from examples they are given. Tier 1 – explain similarities and differences. Tier 2 – explain process. Tier 3 – explain why particular graphs are used for different types of data.				

Continued ➡

Bloom's Taxonomy	Knowledge	Comprehension	Application	Analysis	Evaluation	Synthesis
Naturalist classification, collection, **solution to problem**, display, observation, forecast, investigation, simulation, exhibit, identification					Each tier will **determine** a **solution to** a conservation **problem**. The problems are tiered according to difficulty.	
Musical song, rap, lyrics, composition, **jingle/slogan**, melody						Each tier will **compose** a **jingle/slogan**. Tier 1 – to remember items that are important to recycle. Tier 2 – to promote a school wide recycling program. Tier 3 – Posing as a company vying for the schools recycling business.
Bodily/Kinesthetic role play, skit, pantomime, dance, invention, lab, improvisation, prototype						
Intrapersonal journal, log, goal statement, belief statement, self-assessment, **editorial**				Students will write a **critique**, critical evaluation, in the form of an **editorial** from the information on the "energy kids" handout. Please use statistics in your critique. Each tier has a handout with a varied difficulty level.		
Interpersonal discussion, roundtable, service learning, conversation, group activity, position statement, **interview**	**Interview** __ classmates about their energy saving and recycling habits. **Record** your results on the interview form. The number of classmates interviewed increases or decreases the difficulty level of the math problems. 10 is the easiest, 5 is a little harder and 8 is difficult.					

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