

Visualizing Changes in the Earth System

Whenever people talk about the future they form a mental image of what things will be like. They think about themselves and the things they know about, and in their imagination build a new picture of what they can expect. As we consider the impacts of global warming on the Great Lakes, there are a number of ways of visualizing those changes. Some are very personal ways, some creative and amusing, and some that we see only as clouds in the crystal ball. In this set of activities, students will be led to imagine what the Great Lakes region will be like in years to come.

Activity A: What Great Lakes factors will increase and what will decrease as a result of global warming?

The Earth Systems approach emphasizes connections and interactions. As a pretest/posttest assessment of learning, this activity will show how much growth has occurred in such concepts through use of the materials in this volume. Knowing how natural events affect their lives, students can infer a wide range of impacts of global changes in the Great Lakes.

OBJECTIVES

After the completion of this activity, students should be able to:

- List and explain many potential impacts with global warming.
- Discuss various interpretations of the possible global warming impacts.

PROCEDURE

1. Gather or construct the materials listed. Before beginning the activity, create impact cards (factors or activities which could be affected by global warming). These impact cards should include both scientific impacts and social impacts (focus on things that can go up and down). Some possible global warming impact cards might include those listed on the next page.

Earth Systems Understandings

This activity focuses on ESU #4 (interactions). Refer to the introduction of this book for a full description of each understanding.

Scenario Reference

#1, How will water resources in the Great Lakes region be affected?

Materials

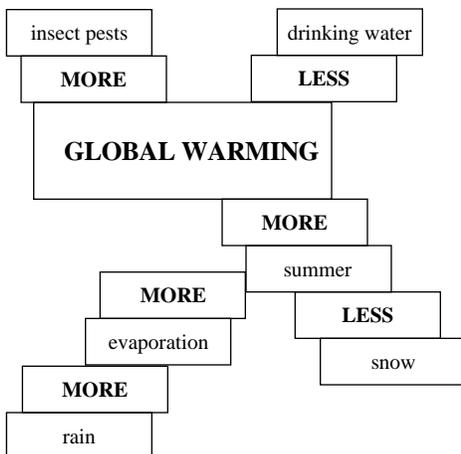
- blank wall, chalkboard, or bulletin board
- 1 card labeled GLOBAL WARMING (white or red)
- 20 cards labeled MORE (light color, such as yellow)
- 20 cards labeled LESS (same color as More cards)
- 35–40 impact cards with things that could change as a result of global warming (contrasting light color, such as green)

MAKE CARDS FOR THINGS THAT THE GREAT LAKES REGION MIGHT HAVE “MORE OR LESS” OF WITH GLOBAL WARMING, SUCH AS THESE FACTORS

- | | | |
|-----------------------|--------------------------|-----------------------|
| evaporation | income | crop production |
| snow | extinction | cooperation |
| drinking water | lake water (lake levels) | fish |
| severe storms | lakefront property | wetlands |
| insect pests | rain | tourism |
| recreation | toxic air pollution | forests |
| water pollution | electricity | drought |
| flooding | fear | debate |
| biological diversity | shipping | summer |
| winter | disease | air conditioning |
| ducks | soil moisture | weeds |
| fertilizer use | pesticide use | dredging of waterways |
| shoreline development | people | water diversion |

2. Make a large card that says **GLOBAL WARMING** and tape it in the center of a blank wall.

Make a stack for **MORE** cards and a stack for **LESS** cards. Spread the impact cards out over a large table so students can see most of the cards at one time.



3. If used as a pretest, tell students only that global warming is likely to result in lower water levels and changes in the seasons. [As a posttest, this step needs no introduction.]

Invite students to come forward one table or row at a time and select an impact card which they feel is the direct result of a previously mounted card. They should then select either a **MORE** or a **LESS** card (whichever they think to be correct for the impact that they selected). The student then tapes these to the wall, connecting them with the previously mounted card to indicate that it is the sequence of impact. For example, the first student may decide that **GLOBAL WARMING** (taped to the wall) leads to **MORE INSECT PESTS**, or **LESS DRINKING WATER**. Students must be able to justify the position of the cards they add, and their choice of **MORE** or **LESS** impact.

4. As students use these cards, it will become apparent that there are various interpretations of the impacts. For instance, more weeds and insect pests would probably invade the region, and soil moisture would probably decrease if global warming occurred. However, annual temperatures would be higher and growing seasons longer. The net result could be either more or less crop production. Much would depend on the fertility of northern soils; where and when precipitation falls; and which crops are grown. Have the class discuss all interpretations.
5. To assess student understanding, it may be helpful to have each student select a chain of at least eight cards, diagram them in a portfolio, and give a possible explanation for the links illustrated.

REVIEW QUESTIONS

1. List and discuss potential scientific and social factors which may be affected with increased global warming.
2. How can the variety of interpretations of global warming impacts lead to uncertainty among policy makers? How do policy makers deal with such dilemmas?

EXTENSIONS AND ALTERNATIVES

This activity can also be used at various stages of a unit. For instance, it can introduce a new topic and relate it to previous ones or it can be a culminating activity to draw all aspects of a study together. In addition, it would be an interesting evaluation to take a Polaroid photograph of the concept map created at the beginning of a unit and compare it with the map produced at the end. Some teachers use this as a group activity among 4–6 students. Instead of sheets of paper, they use 3x5 cards. This avoids the problem of students having to wait for their turn at the board, and it also results in many different maps that can be compared in group discussion. Groups can prepare a written or oral presentation of their maps, analyzing the thinking about interrelationships that produced the array.

Answers to Review Questions

1. Accept a large variety of answers for this question. Jobs would be created to help develop new crop seeds that could tolerate warmer, dryer conditions. Farmers would need to adjust their crops and farming practices to respond to the changing conditions. Recreation facilities would need to change their structure for the longer summer season, lowered water levels and warmer temperatures. Fishers and manufacturers of fishing gear would need to be flexible because spawning grounds for fish would decrease and new species would become abundant. Companies that use toxic chemicals may need to adjust their procedures because increased temperatures and incidence of severe storms would cause airborne pollutants to travel further. The lowered lake and river levels would also greatly impact the shipping industry because boats would either be unable to pass through certain areas or would be required to carry a lighter load. This would have repercussions on the companies that use this method to transport goods.
2. Because scientists disagree on what the effects of global warming will be and the severity of these effects it is not simple for policy makers to make decisions on related issues. They are forced to make difficult decisions based on differing hypothetical projections. The effects of global warming are also not straightforward; agriculture, for instance, in some areas may be improved but in other areas it will be damaged. For most changes, there would also be some groups that will come out the winners and others will be the losers. These uncertainties make decision making difficult.

[This activity is adapted from "More or Less," produced by Zero Population Growth.]

Activity B: What will people see on the long walk to the water's edge?

Teacher's Note

In this activity, students listen to the story that asks them to imagine that they have spent a lifetime visiting the Great Lakes; they are then asked to draw pictures of or describe the changes they have noticed in the Lakes during their lifetime.

When your grandparents first bought land on the shore of the Great Lakes, it was very beautiful. The forest reached almost to the beach, and ended in some low rolling sand dunes you used to run across with your bare feet flying. From the dunes to the water's edge was barely a skip or two; then your toes could wiggle in the cool water as it swished over the smooth, rounded stones. Along the beach you searched for lucky stones and interesting driftwood to put in the treasure box under your bed.

In the corner of the lot was a low area where some cattails grew, and the water was quiet and warm. Tiny fish swam there, and a green heron came every morning to find a mouthful for breakfast. A big frog once startled you with its lightning leap and a splash into the water when you came too near.

It was great then when the water was so close you could hear it from your open window at night, and the beach seemed only a step away. Whatever your grandparents paid for that place, it was worth it.

So now the old place welcomes you back with your own grandchildren. You've told them stories about how it was; the image is so vivid in their minds as they run toward the beach. Follow them.

On the porch swing that night, your daughter wants to hear what her children saw, and what YOU saw today. Tell her the two stories, and think about how things have changed since the climate got warmer. She might appreciate a picture, your mental photograph of then and now.



Activity C: How do cartoons and comics present environmental issues?

Together, cartoons and comic strips are an important and popular feature of newspapers, and readers often locate them first when reading the newspaper. Most local newspapers devote a page or more daily to comic strips (also known as comics) and several pages in separate Sunday segments. They print cartoons in the editorial section, among other places in the newspaper. Weekly news magazines are also rich sources for cartoons.

Like other sections of newspapers and other aspects of print materials, comics and cartoons can be meaningful educational tools and can become objects of study themselves. Comic strips often feature familiar and beloved characters and can be either single frame or multiple panel (i.e., two to four). They can be totally self-contained or can be part of an ongoing story in a short or continuous sequence. Editorial cartoons are self-contained and offer to the reader some sort of comment on an important and often controversial issue.

The activities that follow examine environmental cartoons and comics as objects to describe and interpret, subjects to compose and create, and as features to classify and place into categories. All are creative exercises that can be used separately or as a larger unit on how information about the environment is communicated.

OBJECTIVES

When students have completed this activity they will be able to:

- Locate and interpret cartoons on environmental issues in newspapers.
- Analyze how cartoons can communicate environmental information in subtle and/or overt ways.

Earth Systems Understandings

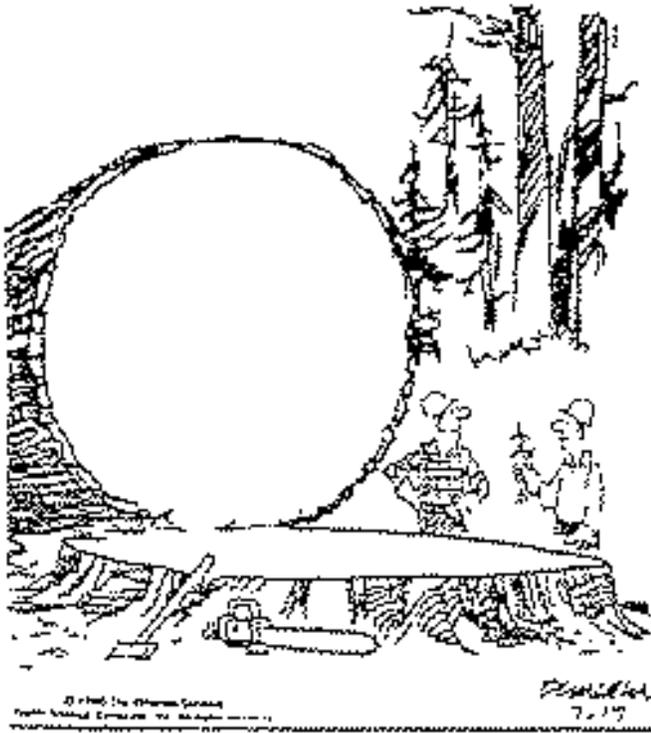
These activities focus on ESU #1, aesthetics, but could also involve all the other understandings, depending on the subject and cartoons chosen. Refer to the introduction of this book for a full description of each understanding.

Scenario Reference

Varies by choice of cartoon.

Materials

- Selected environmental editorial cartoons (some are included; substitute others as appropriate)
- Current newspaper and magazine articles for generating ideas
- Pencils, markers, other drawing tools
- Paper, scissors, glue, assorted graphics (for cut-and-paste option)



© 1987 The Thomson Group
North America Copyright by Thomson

7-17

"WELL, THAT'S THAT... DO YOU HAVE THE
REPLACEMENT READY?"

Reprinted with special permission of North America Syndicate.

Reprinted with special permission of King Features Syndicate.

DOONESBURY © G. B. Trudeau. Reprinted with permission of UNIVERSAL PRESS SYNDICATE. All rights reserved.

PROCEDURE

Working in small groups or as individuals, students do the following:

1. In a paragraph or two, describe a provided cartoon. What is happening? Where? What has happened before? Who are the main characters? Supporting characters?
2. Using one of the provided cartoons as an example, answer the following questions:
 - a. Who or what do the artist's drawings represent? Specify people, symbolic objects, concepts, *metonymical* devices. Metonymical is defined as a figure of speech in which the name of one thing is used in place of that of another associated with it, for example, "White House" when used to mean "President."
 - b. What exaggerated features or symbols make clear who or what is represented?
 - c. Discuss the language used in the caption. Is there a pun or double meaning? Is there an "ironic" quote?
 - d. How does the cartoon comment on an issue currently in the news? Can you find an editorial that verbalizes rather than illustrates the same view on the issue?
3. When the team is finished, trade cartoons with another team. After the new cartoons are analyzed, discuss any differences in interpretation. What is the basis of these differences?
4. Divide a bulletin board into several environmental categories including global warming and other environmental issues in the Great Lakes. Have students search for and select appropriate environmental cartoons and comics from newspapers and other print sources.

Answers

1. Use of satire to illustrate a point.
Call attention to aspects of issues.
Invite readers' interpretation.
2. Factors such as culture, age, or experience of the audience or cartoonist could result in an audience not fully understanding a cartoon's meaning.
3. Have students brainstorm and discuss ideas.
4. Accept any thoughtful possibilities.
Discuss results in class.

REVIEW QUESTIONS

1. How have cartoons and comics become an important form of environmental communication?
2. Explain why some cartoons do not relay the artist's intent. Discuss changes that could be made for better understanding of the cartoon.
3. As a cartoonist, you must address air toxins in your weekly comic strip. What factors and examples of those factors (i.e., use of symbols, metonymical devices, exaggeration, and irony) would you incorporate within your cartoon?
4. Develop a short essay on the value (or lack of value) of cartoons as a form of environmental communication. The discussion should include types of audiences impacted, cartoonists' expectations of the audience, and other points that could relate to cartoon impact.

EXTENSION: CREATING CARTOONS AND COMICS

With some planning and encouragement, students can create and produce their own cartoons and comic strips on such topical areas as global change, toxins in the Great Lakes, and other important environmental issues. This is a creative as well as motivational activity that has great potential for actively involving the students in their learning and in the overall educational process.

A considerable amount of time will need to be devoted to planning before actually drawing and producing the final product. Students should find an ample source of ideas in the Scenarios. To alleviate any drawing phobia and other artistic anxieties that may exist and surface in some students, stick figures and cut-outs from existing comics are acceptable.

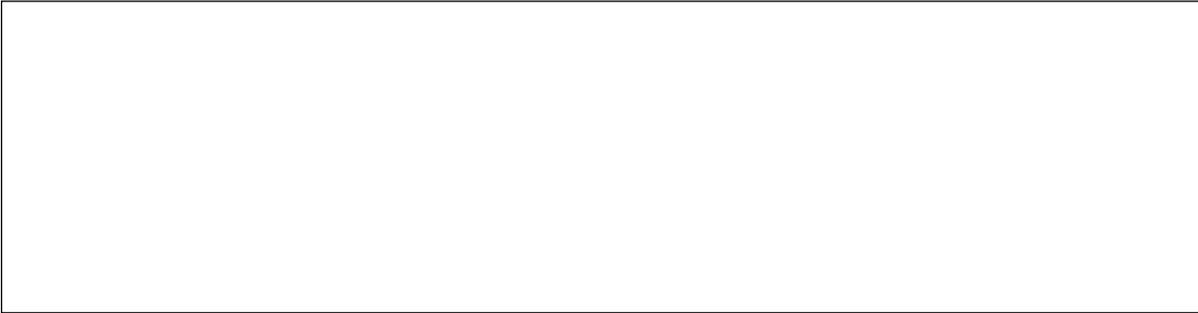
For successful cartooning, follow this detailed ten-step process.

1. *Brainstorming*: Either individually or in a small group, brainstorm different cartoon or comic strip ideas that you may have. Take extensive notes during this process, as small ideas may be expanded at some point, and more complete ideas may be used as is or adapted later.

2. *Storyboarding*: Using the storyboard sheet example, roughly sketch several cartoon or comic strip design layout possibilities. The storyboard is a pre-drawing document that you can use to create rough sketches, outlines, and text ideas and can be used in planning for the final drawing.

COMIC STRIP STORYBOARD FOR _____

Instructions: Use this storyboard for planning both your drawings and accompanying text for your comic strip. Add vertical lines as needed to create a two- to four-panel strip.



Text line, Panel 1: _____

Text line, Panel 2: _____

Text line, Panel 3: _____

Text line, Panel 4: _____

3. *Revision*: Before actually doing any drawing, share your ideas for your cartoon or comic strip with others. This can provide feedback and input and can help you to refine your ideas.
4. *Drawing*: Cartoons and comic strips are usually drawn up to 150 percent oversize in pencil, which can then be easily erased to eliminate unwanted features and any possible drawing errors. Complete the drawing phase before the lettering phase.
5. *Lettering*: Next, apply lettering in pencil in legible text. Compare many comic strips and cartoons to see how the lettering appears.
6. *Inking*: Carefully trace the pencil lines with a fine-tipped black marker. Avoid blue ink as it does not reproduce well.

7. *Credit:* Be sure to date the work and give yourself credit somewhere in the illustration. Examine professional artists' signatures and/or initials that are often hidden or carefully placed within an artwork. A title and artist label may also be placed above the final illustration.
8. *Cleanup:* Carefully erase any pencil marks that remain after inking. Carefully and slowly erase any unwanted lines that still exist.
9. *Reduction:* Cartoons and comic strips that have been previously drawn oversize should be reduced 25 percent to 50 percent on a photocopier. Reduction will remove any unwanted erasures and improve the quality and overall appearance of the drawing. By adjusting the contrast control, lines can be made even darker, which is important for final reproduction.
10. *Reproduction:* Duplicate the final cartoon or comic strip at a local printer or on a photocopier. Distribute to an audience in a class booklet for environmental communication.

TEACHER BACKGROUND INFORMATION

Barrett, T. 1990. *Criticizing Photographs: An Introduction to Understanding Images*. Mountain View, CA: Mayfield Publishing Co.

An art criticism and art education book that provides extensive information on describing and interpreting photographic and other images.

REFERENCES

Heitzmann, W.R. 1986. *The Newspaper In the Classroom* Washington, D.C.: National Education Association.

Thomas, J.L. (ed.) 1983. *Cartoons and Comics In the Classroom: A Reference for Teachers and Librarians* Littleton, CO: Libraries Unlimited, Inc.