

PBL Unit Title: Hog Watch

Primary Subject Area: Science

Interdisciplinary Areas also Covered: Healthful Living, Information Skills, Math, and Technology

Grade/Age Level: 6th Grade

Description of students' role and problem situation: The staff of an Environmental Regulatory Agency must assess the extent of damage caused by hog factories and make recommendations to lessen the impact of hog factories on health and the environment.

Educational Objectives: (Indicate if unit is interdisciplinary, but only list the objectives from primary subject area) Interdisciplinary

Science: The learner will:

1. Build an understanding of the lithosphere.
2. Investigate the characteristics of matter and energy flow through the ecosystem.

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Environmental Defense Center

Steve Baker, Director

Date: 6/2/02

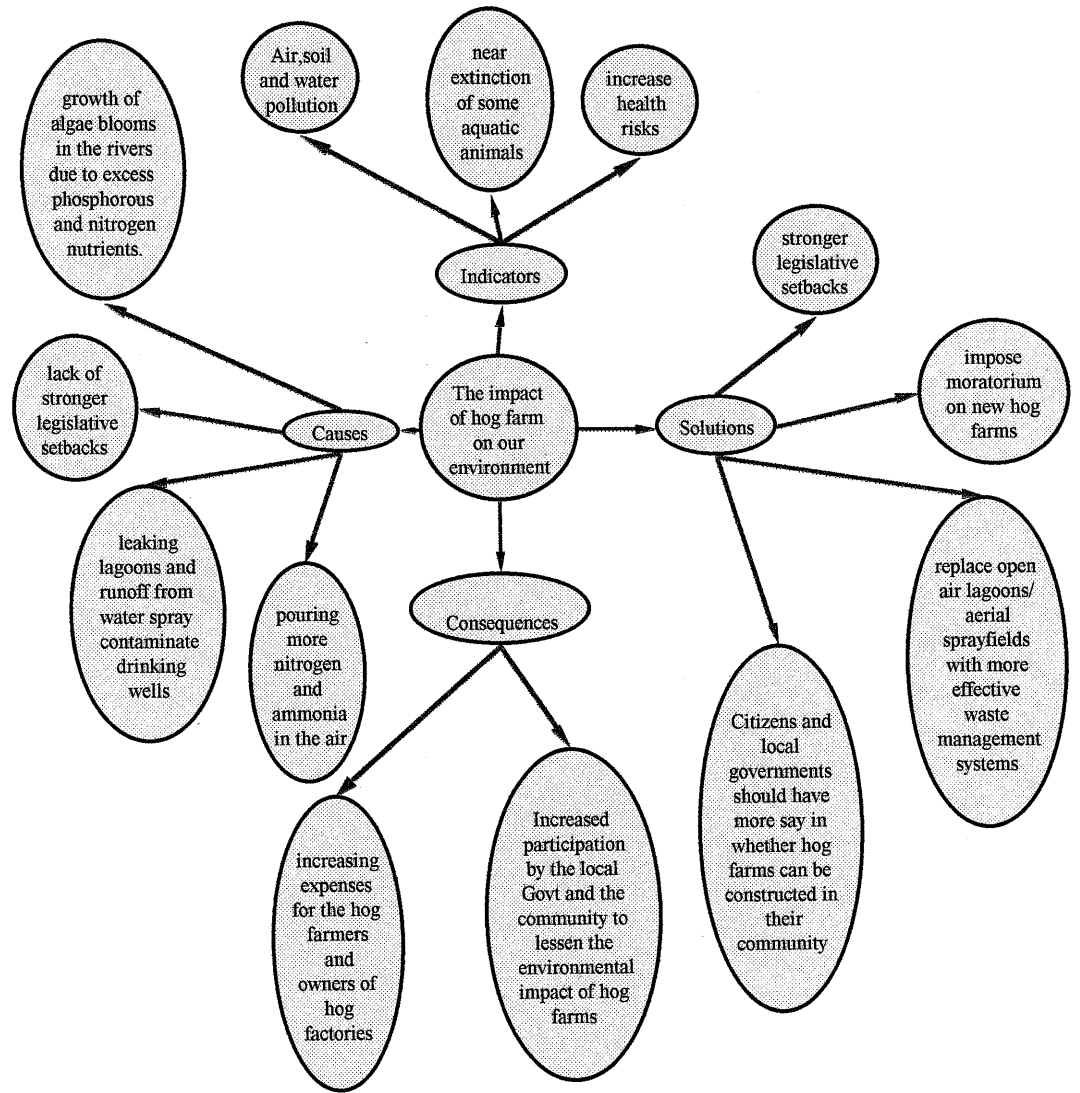
To: Staff of Environment Regulatory Agency

From: Steve Baker

Subject: Hog Watch

The attached newspaper item makes it very clear to you that in North Carolina hogs are big business. The state is now home to over 10 million hogs making it the nation's #2 producer. Currently hogs are North Carolina's number one agricultural commodities. As you can tell by the newspaper item, NC lawmakers have not yet adopted all laws necessary to control the environmental and health problems caused by the North Carolina hog factories. I would like you to assess the extent of damage caused by the hog factories and make recommendation to lessen the impact of the hog factories on our health and environment. I would like you to submit your feedback by 6/30/02.

Sincerely yours,
Steve Baker



Know/Need to Know Template

Know	Need to know
The students are the staff of ERA	Who is the Nation's #1 hog producer
Hogs are a big business in NC.	What laws has NC adopted to control the problems caused by the hog factories
10 million hogs live in NC.	What laws have not been adopted by NC to control the problems caused by the hog factories.
Nation's #2 producer of hogs	What kind of environmental and health problems are caused by the hog farms.
hogs are number one agricultural commodity in NC.	How to assess the extent of damage caused by the hog factories
NC has not adopted all laws to control health and environmental problems caused by hog factories	What is an environmental regulation agency?
hog farms causes health and environmental problems	What does the staff of the ERA generally do? (need to know the job description associated with their role.)
submit feedback by 6/30/02	How is ERA related to the Environment Defence center
Come up with solutions to lessen the impact of hog farms on health and environment	
Steve Baker is the director of EDC in Washington, D.C.	

Curriculum Alignment Guide

My PBL product is built around the following competency goals in the 6th grade curriculum.

Science

Competency Goal 1: The learner will build an understanding of the lithosphere.

Objective 1:03 - Evaluate ways in which human activities have affected Earth's pedosphere and the measure taken to control the impact.

Competency Goal 2: The learner will investigate the characteristics of matter and energy flow through an ecosystem.

Objective 2:03 - Describe ways in which organisms interact with each other and with non-living parts of the environment.

Objective 2:04 - Evaluate the consequences of disrupting food webs

Healthful living

Competency Goal 4: The learner will apply relationship skills to the promotion of health and prevention of risk.

4.03 Describe behaviors conducive to and counterproductive to group functioning.

Information Skills

Competency Goal 4: The learner will explore and use research processes to meet information needs.

4.01 Identify information needs and formulate questions about those needs.

4.05 Gather information from the most effective resources.

Math

The learner will demonstrate an understanding and use of graphing, probability, and data analysis.

4.01 Create and evaluate graphic representations of data.

4.05 Construct convincing arguments based on analysis of data and interpretation of graphs

Technology

Competency Goal 2: The learner will demonstrate knowledge and skills in the use of computer and other technologies.

Characteristics of learners in the Sixth grade

1. A strong sense (sometimes biased) of right and wrong.
2. Concrete learners who need to be encouraged to delve deeper into the subject.
3. Taken in by the physicality of things-teacher will need to redirect their focus because some elements of the hog scenario like the poop counter can be a real detractor.
4. Interpret simple graphics quite accurately.
5. Perceive group activities as opportunities to socialize.

Problem Statement related to hog farms

How can we as the advisory panel to the ERA, determine the impact of the hog farms on our lives and propose a solution by 6/30/02 in such a way that we address:

- a) Air pollution, water pollution and destruction of aquatic food chains
- b) Legislative setbacks
- c) Health risks
- d) Local government and citizens having more say in what happens in their community.
- e) The budget required to offset the problems caused by the hog farms .

Capstone Performance Description

The Sixth graders, as the Staff of the Environmental Regulatory Agency, will electronically present a proposal that outlines recommendations to resolve the problems caused by the hog farms in North Carolina. The presentation will be made to an audience made up of a local environmental specialist, their peers, and their teacher. The specialist's role is to judge each group presentation and have them clarify their thinking process as they work through a problem.

Each student group will be expected to use Hyperstudio to make their final presentation. Since they have had prior experience using this software, they will be required to use their prior knowledge of hypertext links, hidden links, and buttons to create a presentation with very smooth transitions. The students will use this mode of presentation in order to understand that professionals in a real life setting use such electronic modes of presentation to make an effective presentation.

Each group will also provide to their assessors a written packet of information that will include problem related indicators, causes, solutions, and the consequence of implementing the solutions. Students will be given a rubric outlining, while they are in the process of creating their final product, what elements their presentation should contain in order to be effective. All students and the assessors will be given a list of academic goals (see attached) the teacher hopes to have her students accomplish as a result of doing the PBL project.

Apart from the local environmental specialist assessing the students, two other additional assessments will be used. First assessment will be a peer assessment sheet that will be filled out by group members. Members of the group will give their input about each group member's contribution to the project. The second assessment will be a teacher assessment that will be used to judge the final product. The teacher assessment will use criteria like introduction, research, technology, presentation, and group effort to assess the final product. Lastly students will fill out a Talk Back Sheet to give the teacher input on the project. The teacher will use this input to make any necessary changes to the project.

Rubric for Hyperstudio presentation and handouts

A		B
1	Criteria	Level 4
2	Introduction	introduce themselves to the audience.
3		Present a precise account of what to expect in the report.
4		
5	Research	Address at least 3 problems caused by hog farms.
6		provide 4 reasons analyzing the connection between the indicators and causes
7		Present at least 4 justifiable solutions to counteract the problems.
8		Present at least 4 rational consequences of implementation of the solution
9		Provide enough evidence to justify 3 answers to the questions posed by the audience
10		
11		
12	Technology	Uses 6 pages to make a stack. The stack should indicate a separate page for the following-
13		title, indicators, causes, solutions, consequences and a Bibliography page with at least 5 resource
14		Use of at least four hypertext links and 2 hidden links.
15		Appropriate images (graphs and pictures) and buttons to move back and forth in the stack.
16		
17	Presentation	Length of presentation will not exceed 15 minutes
18		Use of correct English
19		Makes eye contact with the audience while speaking
20		
21		
22		
23		

Rubric for Hyperstudio presentation and handouts

		C
1	Level 3	
2		Introduce themselves to the audience.
3		Presents too much information about the report.
4		
5		Address at least two problems caused by the hog farms.
6		Provide three reasons-2 of them analyze the connection between the indicator and causes.
7		Provide 3 solutions to the problem- out of the 3, two of them are good explanations.
8		Present at least 2 rational consequences of implementation of their solutions.
9		Wordy answers to the question posed by audience.
10		
11		
12		Uses 6 pages to make an appropriate stack for the presentation.
13		Only four resources presented in the bibliography page.
14		Use of at least three hypertext links and 1 hidden link.
15		Most of the images are appropriate. Most of the buttons function well.
16		
17		Length of presentation is greater than 15 minutes or less than 15 minutes
18		3- 5 grammatical errors in the presentation
19		consistently does not look at the audience while presenting
20		
21		
22		
23		

Coaching Questions

Meeting the Problems

- C 1. What is the problem that North Carolina is currently facing?
- M 2. Is this problem easy or hard to solve? Why?
- E 3. Do you think that problems connected hog farming can occur in real life? Explain your reasons.

Know/Need to Know Board

- M 4. What information do you need to know about your problem?
- C 5. Can you say more about what an environmental regulatory agency does?
- E 6. Would you consider the information important? If so, why? (Starts off as C question but turns into an E question.)

Writing Problem Statement

- C 8. What is your role in the problem?
- M 9. Why do you think that the hog farms are central to the issue?
- E 10. Have you considered the needs and the interests of all the people involved in this problem?

Information Gathering and Sharing

- M 11. How have you divided the work amongst the members in the group? How did you come to this decision?
- E 12. How can you verify that water pollution is linked to hog farming?
- C 13. What does it mean to have more nitrogen and ammonia in the air?

Generating Solutions

- E 14. Rate your solutions. Why did you rate your solutions in the manner that you did?
- M 15. How did your group arrive at the solutions?
- C 16. What does it mean to have more nitrogen and ammonia in the air?

Alternative Solutions

The first solution to combat the problems caused by hog farming in North Carolina is: **Stronger legislative setbacks;**

Pros:

The following legislations, if enforced correctly will reduce the pollution and health risks caused by hog farms. However the very same legislations will have adverse effects because of the arbitrary manner in which it is enforced.

Pros of legislative regulations	Cons of the same legislative regulations
Hog farm operators will have to obtain a Clean Water Act Permit	No agency to oversee if the hog operators are implementing the standards required of them, once they get their permit. Research shows that at present only 10% of factory farms have enforceable Water Act Permits.
Waste lagoons for hog operations will be required to be covered in order to prevent overflow caused by rain water	practice is unenvironmentally sound, according to environmentalist/concerned citizens because they think that the ultimate solution to the health and environment risks posed by waste lagoons is to ban them or phase them out
Impose limits on the amount of animal wastes that can be applied to the fields.	The animal wastes are untreated so the toxins, pathogens and antibiotic residues still pose a threat to the health of the residents. The proposed legislation contains a gaping exemption-during rainy weather hog farms can spread unlimited amount of wastes o
Holding large Corporations accountable for environmental problems caused by their local growers and contractors.	The government will have to face legal challenges by hog farms

The consequences of imposing the legisaltive regulations are as follows:

1. Many independent farmers will have to look for another job because maintaining hog farms under such regulations can be exceeding expensive. Their efforts to get technical and financial assistance from the government so far has failed.
2. Since the legislations are so arbitrarily enforced, they do not guarantee a reduction in the health and environmental risks posed by the hog farms.

Solution 2

Citizen groups should have more say in the legislative setbacks created by the government to lessen the negative impact of hog farms on the environment.

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Pros	Cons
A well informed group consisting of environmentalist, scientists, and educators	The group perceived as being antigovt, and a threat to farmers whose livelihood is at stake.
Making sure that EPA (Environmental Protective Agency) plays its part in reducing the water and air pollution posed by hog farms of North Carolina.	construed as politically motivated agendas; so sometimes the citizen group's lawsuits against EPA are thrown out.
These watchdog groups document the unsound environmental practices of large scale hog operators and file lawsuits against them to make them accountable.	long protracted legal battles in which farmers think that the group should be suing the EPA instead does not offer any solution to the problem at all.
The group's demand that waste lagoons be phased out completely is an ideal solution	Lot of farmers lose their livelihood and source of income

Consequences

1. Hog farmers who do practice environmentally sound practices feel that these environmental groups should trace the contamination to the specific point sources rather than penalizing all large hog farms.
2. If open waste lagoons are phased out or banned, citizens of North Carolina will have to pay more taxes to take care of farmers who will be displaced and not have a job. So if the government offers them to take care of these farmers, then in order to do good on their promise, it is just naturally logical for them to hike up our taxes.

I prefer the second solution because the citizen groups are so watchful that they will not let the government get away with arbitrary legislations that do nothing to solve the problem at hand. So far the citizen group has been able to prove that the EPA is not stringently imposing the Clean Water and Air Act regulations on the hog farmers. This group's solution to phase out and ban open waste lagoons is a good solution; Even though the government will raise our taxes to increase their revenue in order to support farmers without a job, it is going to be a short term imposition on us. Besides all hog farmers will not suffer under such a regulation- it only the large-scale hog corporations and their

subsidiaries, who have not paid much attention to the call of the environmentalists who will be inconvenienced. I do not feel sorry for them because they have imposed a lot of environmental and health risks on the citizens of North Carolina on account of their careless actions. I think ultimately having a cleaner environment to live in as a result of the ban on open waste lagoons is surely worth all the short-term trouble we, as citizens, will have to experience.

Debriefing session

For debriefing the hog problem, we will have a whole-group discussion led by the teacher involving the whole class. Each group will present to the whole class the content analysis and the process analysis (i.e. difficulty in having to make a choice between competing solutions) that went into the formulation of their solution. Based on the group's presentation, the whole class will participate in assessing the pros and cons of the solution.

Based on the information the class obtains from the group presentation, we can have the groups vote on the best solution, after they answer the following questions in their group:

1. What are the advantages and disadvantages of the best solution that your group picked?
2. What led you to choose the solution rather than one of alternatives?
3. What criteria did you use to choose the solution from its alternatives?
4. What values entered in your choice of solution?

Once again we can have the group present their choice of the best solution and their response to the question. The teacher, on her part, can draw a table on the blackboard and list all the solutions in it and she/he can put a check against the one chosen by the group. The procedure can be repeated till all the groups in the class have had an opportunity to voice their preference. Based on a majority vote, the best solution can be chosen. If there is a tie, have a quick open-ended discussion with the whole class to help them assess which one is a better solution; they can once again rate the pros and cons of each solution and choose the one with the least disadvantages.

The teacher can coach the students through the debriefing process by having each student write a debriefing paper in which they should answer the following questions:

1. What lesson did you learn from this PBL experience that changed your knowledge and understanding of the problem?
2. How was a problem resolved in your group? Give an explanation to clarify your thinking process.
3. Can you see a connection between the PBL problem and any other problem? Explain why or why not?
4. How can you apply the information that you learned in this PBL experience in other situations?
5. What did you learn about teamwork and problem solving in a cooperative learning situation?
6. Have any of your strongly held beliefs and opinions changed as a result of the PBL project?
7. What questions or issues remain unresolved in this project?
8. If you had a chance to ask the local environment specialist who judged your presentation a question about any aspect of the problem, what might that question be?

Once again the teacher has the option of sharing the answers to the questions in the debriefing paper depending upon how much it is valued by the whole class. Open ended discussions with the whole class and having students write a debriefing paper are

some of the tools that I would use to help students reflect together on what they have learned.