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Making Wise Environmental Decisions

Curriculum Unit 99.06.03
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Objective

The objective of this curriculum unit is to familiarize the middle grade student with environmental concerns of the modern world. In addition to the environmental survey, the student should practice using rational means to come to wise decisions concerning the environment. The student should be aware of the dangers that exist for the planet if wise environmental decisions are not achieved.

Methods

It is understood that if the student is to make wise decisions concerning the environment, she or he should be cognizant of the dangers that exist in the realm of pollutants or chemicals used for industrial and agricultural purposes. Additionally, there needs to be some awareness that there are many sides to the environmental issues that are presented for analysis. The student should also know that there might be others that may not have the same points of view or objectives as they. The student should be aware that he or she could be successful at regenerating new thoughts and ideas among fellow social members. Also, it is imperative that the pupil understands that with each environmental issue, costs will be involved with correcting any problems that may exist or there may be a cost involved with not taking an action. There may also be difficulties with not enough funds being available or the ethics of using funds that may be accessible where a vast number of choices may be available.

Classroom Activities

The length of the curriculum itself should be ten weeks and can be used as part of the science curriculum. Three days a week should be a valuable time allotment. The first week should be used to help the student obtain a vocabulary that can be used as a vehicle to the understanding of the nature of environmental difficulties and the dangers that exist if the difficulties are not addressed.

The second week should be utilized by identifying some of the environmental crises that are endangering the environment in the present day. This can be accomplished by discussing some of the present day problems that exist. They can be found in the daily newspaper or downloaded from the internet each day and distributed to the classroom for discussion about the responsibility for the clean-up and the cost and maintenance of the natural resources that are limited and not endless.

Identification of Environmental Problems

The next three weeks should be spent identifying the three main areas of concern to environmentalist: air, land, and water. Once these three topics have been addressed, the interdependence of these concerns should be examined.

The first of the areas of major concern is air pollution. The following questions should be addressed at this point. What is air pollution? What causes it? What happens as a result? What are some things that can be done to prevent air pollution? What are some of the things that have been done already to address the problem? What are some of the problems that we may face in the future in dealing with air pollution? What is the ozone? What is global warming and is there a way to prevent it? What are fluorocarbons? What is a pesticide? What is meant by after-life? How do insects become immune to the use of pesticides?

The next area of major concern is land. What do we mean by 'land pollution'? What are the causes of soil erosion? Why is the destruction of the rain forest so detrimental to the existence of mankind? How can the production of food and other natural resources be harmful to the environment? What kind of measures can be taken to prevent the misuse and the destruction of these natural resources? What is radon? Where does it come from? What is a landfill? How much solid waste do we produce? Do landfills harm the Earth? What do we mean by biodegradable? How do we solve the problem of solid waste? What is the link between pesticides and life on the face of the earth? What effect do pesticides have on the interdependency of life on earth?

Water is the next area of concern that should be explored. What is water pollution? What are some examples of water pollution? What are the causes of water pollution? What can the ramifications be if water pollution is not remedied? Why is water pollution so important to prevent? What measures can be taken to prevent the pollution of water resources? What can be done for resources that have already contaminated? Who is responsible for the clean up of polluted resources and who pays to clean it up? How can it be determined what the cost of the clean up would be? What methods can be used to calculate the cost of keeping water clean and potable and healthy for the population.

At the end of this period spent identifying and examining these three major areas of concern, time should be used to look closely how they are interdependent upon one another and how the loss of one of them affects the remaining ones. Examples should be shown how the neglect in any of these areas could have a devastating result upon human life on this planet. A thorough examination regarding the ecological system as a whole should be addressed at this time before continuing with the case studies and exercises in making ethical decisions.

Case Studies

The next three weeks of the curriculum unit should be used to look at different ecological problems that exist and some of the ways to remedy them. The case studies should be made of actual environmental problems that have arisen or are foreseen as a difficulty that may pose a problem in the future. Included at this point should be the topic of the cost of cleaning up environmental problems that may exist and the responsibility for

cleaning up the pollution and developing ways to prevent future destruction of valuable natural resources.

Week six should be a case study dealing with air pollution. This can be the causes of acid rain, smog, or problems with the ozone layer. The first case study may deal with acid rain. Where does it come from? Who is responsible? How do we clean it up? What are some of the levels that are acceptable and how do we pay for the clean up? Who pays for the cleaning of the air from pollutants? How do we prevent pollution from being continuously introduced into the atmosphere? What are some of the alternative forms of energy that may be used in place of the fuels that produce sulfur and nitrous oxides that are used by industry? What may be the advantage and disadvantages to other forms of energy? What would their cost be

The next case study should be about smog and what causes it. There should be discussions as to what is meant by acceptable levels of contamination and who pays for the maintenance of the described levels of acceptance. Who decides what the acceptable levels are? What are some of the things that can be done to prevent smog? Are there alternative fuels that may be used in place of the ones that are polluting the air? An example that could be used here is the smog that covers the Los Angeles basin. What are some of the steps that have been taken by Los Angeles County and the State of California to relieve this problem? What are some of the costs that have been involved in taking the necessary steps to solve the problem? How is the problem unique to the area and are there other cities in the world that have been afflicted in the same way.

The next case study should be an examination of the problem dealing with the O-zone levels. What is the problem with the O-zone and how does it affect us? What are some of causes of the problems that exist? How can we prevent further destruction of the O-zone? What will eventually happen if nothing is done to prevent the destruction of the O-zone? Again, decisions as to who decides what should be done, how much of it should be done and who is going to pay for what needs to be done should be discussed.

The seventh week should deal with case studies involving land pollution? What are some of the ways to prevent the destruction of valuable farmland and its use to feed the human race? What are some of the problems with using pesticides and herbicides? Do they affect more than just the crop that they are being used on? If so, how does that happen and what can be done to alleviate the problem? What is erosion and what are some of the ways to prevent it? What are some of the other forms of land abuse and destruction by misuse? How can this be prevented? What is radon?

The first case study that can be used can be the problem with the destruction of the rain forest. Where are the rain forests found throughout the world? Why are they so important for the health of the Earth and the health of mankind? Who is responsible for the destruction of the rain forests and how is their destruction taking place? Who is to decide what is to be done with them? What are the issues and the ethics behind the destruction of the rain forest? What will the result be if nothing is done to prevent its demise? What are the costs of keeping the rain forests from being destroyed both in terms of dollars and esthetic value?

Another case to be dealt with in the area of land pollution should be the problems of dealing with landfills. Here a lot of communities can be used as examples of poor land management and overfilled landfills

The third case study should deal with the actual chemical pollution of the land. How does it become polluted? Are there any safe chemicals that can be used and still be effective for the purposes that they were intended for? How many chemical substances are being used and what are they being used for? What are their effects? How do these chemicals affect the soil and do they affect other environmental areas of the planet such as drinking water or food grown from the soil? What are pesticides and how are they used? What are the benefits of using pesticides and how do we weigh the benefits against the negative results of their use? What is radon

and where does it come from? How can it be prevented or if the soil has been contaminated how can it be cleaned up or changed back to its original composition?

The eighth week should be used to look at case studies that deal with water pollution, usage and conservation. The questions should promote the idea that the amount of usable water that is available for human use is insignificant. This should include places where water has been deemed unusable and unsafe to drink. The issue of acid rain may be reviewed at this time. Is the water from the Connecticut River or the Housatonic River safe for human use? How do they determine when shellfish from the Connecticut shoreline is safe for human consumption? How do you determine whether or not the well water in your yard is safe to use? A good case study here for the week could be the Exxon Valdez incident.

The ninth week should be a discussion on finding out how each of the three main areas previously mentioned is dependent on one another and what may happen if any of these areas is neglected. Specific examples should be given and discussed in the classroom. For instance, the spraying of pesticides on crops in the United States may be carried by the wind over the Pacific Ocean. From there the sea life of the ocean becomes contaminated by the pesticide. Then the Polar Bear feed on this ocean life and become infected by the pesticides. Thus, this becomes an example of how interconnected the ecological systems are to one another.

The tenth week could be used for assessment purposes. Assessment should be as unconventional or conventional as the presenter decides. Part of the assessment process should be used to help the student use the social skills that may have been introduced during the case studies in the previous lessons. New alternatives can be used to assess the student's knowledge in environmental studies. For example, a poster contest in any of the three main areas that have been discussed in class may be a good approach to traditional standards of assessment. Of course, a good poster would not be based only on the artistic ability of the student but also on the understanding of the environmental principles behind the poster. Another approach could be for the students to write to their local, state or congressional representatives asking them to take care of a certain ecological problem that affects their area where they live.

Classroom Activities should be varied and present a real matter of making important decisions involving responsibilities to future generations and yet knowing that there is not a never ending supply of resources either natural or economic. Group discussions and decisions on what to do or how much to spend on situations that arise should help with student understanding of limitations and the difficulties of coming to a general consensus that is democratic and not overburdening on one particular group.

Identifying Environmental Issues

Fundamental to the curriculum is the student's ability to identify environmental problems and their particulars. There should be activities that promote awareness of not only of the issues involved but also ways to evaluate their importance when making decisions on how to solve the problem and how much economic resources should be used on that specific environmental dilemma. It is important that the student recognizes and is aware that environmental problems do exist.

Determining Economic Resources

There is a vast array of activities that may be available to help students come to an understanding of limited resources and many of these activities can come straight from math lessons dealing with simple addition and subtraction. Another good area of math in this particular instance could be problem solving. What could be

advantageous here are lessons involving alternative resources. The student should be aware that there are more ways than one to reach objectives.

Applying Democratic Principles to Solve Environmental Issues

Here is a golden opportunity to present democratic ideals and principles on how democracy works and some of the fundamental ideas involved in using the process to make decisions. Making activities using small groups should be exciting when students are asked to identify what they should do to solve their economic situation. It is important that the student recognizes that there will be others that may have different ideas of what may be important or not important. Other people may prefer different ways to solve the same problems. Or their way may be different because their resources are more or less. The lesson should involve how decisions in a democratic society are brought about and how decisions come about in the real world when decisions involving public monies are concerned.

Using Conflict Resolution to Come to a Consensus

Once again a great opportunity presents itself for elaboration. This part of the curriculum is especially vulnerable to valuable lessons on the art of compromise and the use of sophisticated communications to come to an understanding. The student should be able to become integrated with using communications as an instrument of concordance.

Interdisciplinary Approaches

This curriculum should lend itself to be useful in multi-faceted activities both in the classroom and out. Each discipline has many activities that can be extremely useful and can facilitate ideas and objectives that are consistent with the curriculum. There are many different approaches that can be employed here.

Reading

There is an abundance of materials available for use in the classroom that directly deals with environment and ethics. Science news publications are available for use in the classroom. Newspaper and magazines that are at hand can keep the student current with environmental problems of the day. Each and every day new material is put on the internet and can be downloaded for examination on a daily basis and can even be used as a reading assignment if the facilitator wishes to expand the classes knowledge of environmental issues. In addition, materials can be downloaded daily to help supplement each group in the classroom to help them with any special assignments that they be assigned or decide to look into.

Math

The development of lessons using math as a primary mode is exceptionally lucrative. Simple addition and subtraction can be used in calculating the number of losses due to environmental catastrophes that may have occurred recently. Lessons may include comparing numbers and place values, using multiplying concepts, estimating reasonable answers and using mathematical reasoning to do problem solving involving environmental problems. Another areas that can be especially helpful with the application of math problems could be making up budgets for the cost of cleaning up particular problem that may exist as a result of environmental neglect. When looking at items like the pH scale, it produces a great opportunity for using

algorithms.

Science

This curriculum is based on the premise that science will provide the impetus for examining the issues of making environmental decisions. The foundation of the curriculum cannot exist without this essential discipline. Lessons can provide the identification of pollutants and toxins that are harmful to the environment in several inappropriate ways. The student can enhance skills in scientific inquiry by using their observational powers, doing classification, using metric systems, predicting outcomes using trends in data and conducting scientific investigations. An excellent opportunity for the student to understand global patterns of water, soil and atmospheric movements and compare and contrast the variety of species and describe their interdependence as part of the ecosystem should be allowed here. One example here could be the acidity or alkalinity of water and what the pH balance of water is and how to measure it and how to read a pH scale and what it means. From this another whole new lesson on how the acidity of rain can affect the forest and the soil. A close examination on how sulfur and nitrogen oxides react with moisture in the atmosphere to form sulfuric and nitric acids and cause acid rain is an elementary lesson that should be used.

Language Arts

Lessons on using sentences and making paragraphs involving the reporting of scientific data as a result of investigation provide a vehicle for language arts lessons. Ideas on how to put together reports and findings and proposals should enhance the child's ability to use grammar and skills in writing. The student may also find it necessary to write letters to community representatives about environmental problems that their communities may be experiencing and what is being done to meet the challenges of solving those environmental problems. Other language arts experiences can deal with writing observations in a scientific journal and the sharing of the journal with classmates can be a beginning aide to help the child to be comfortable speaking in public situations or before large groups of peers and friends.

Social Studies

The curriculum will provide lessons on the democratic process and the achievements and failures of compromise and negotiation. It will investigate the process by which public monies are appropriated and used. There should be a forum where the pros and cons of economic policies for environmental issues can be identified and discussed.

Many other social study lessons are self-evident. The geography lessons available are abundant. The student will find it more meaningful to know state capitals because they may write to many of them to get information about the environmental problems or programs that may exist in a particular state. Where places are located will become of great import to the child that is involved with environmental studies.

Topography will be another area looked into throughout the curriculum. Oceans, rivers, lakes, springs and water cycles should be examined carefully. The climate is another area of intense concern and examination. Land forms and types are looked at carefully ranging from continents, regions, political landscapes including countries, states, cities, small towns and villages including clans and tribes.

Resources

The resources for this curriculum should be available from a vast array of sources. A great way to start the curriculum would be to take the students outside of the school and have them examine carefully the grounds of the school and make a list of the things that they may find, good or bad, just to get an idea of the things that they may see every day but fail to notice because it's an everyday occurrence. Environmental information can be found in newspapers, magazines, environmental societies, public-minded corporations, books, government environmental groups and on the information highway, the Internet.

Applications

Word Bank

Environmental Definitions

| | | |
|----------------|---------------------------|------------------------------------|
| Environment | Ecology | |
| Conservation | Pollution | |
| Energy | | Fossil Fuel |
| Nuclear Fuel | Toxins | |
| Acid Rain | | Erosion |
| Ecosystem | | Contaminate |
| Insecticide | | Pesticide |
| Herbicide | | Solid Waste |
| Recycle | | Interdependence |
| Habitat | | Oxygen/Carbon Dioxide Relationship |
| Organism | | Endangered |
| Biodegradable | Ozone | |
| Acid Rain | | Nature |
| Lead | | Radon |
| Global Warming | Environmental Stewardship | |
| Carcinogen | | Chemical |
| Nature | | Wilderness |

1. An inert gas formed by the radioactive decay of radium is _____.
2. _____ are poisonous chemicals.
3. Any solid material that is thrown away can be called _____.
4. A type of air pollution that is formed when oxides of sulfur and nitrogen combine with atmospheric moisture that sulfuric and nitric acids is called _____.
5. Living things that are faced with extinction is known as _____.
6. The _____ is the area or environment in which an organism or ecological community normally

lives or occurs.

7. Things that are harmful to living things by the addition of waste matter is called _____.
8. _____ means to make impure or unclean by contact or mixture.
9. A _____ is a chemical used to kill pest, especially insects.
10. A blue gaseous allotrope of oxygen or pure fresh air is called the _____.
11. A soft bluish-gray, malleable metal that is toxic to humans is _____.
12. An ecological community together with its environment, functioning as a unit is called an _____.
13. _____ is a substance produced by or used in a chemical process.
14. The process of being worn away destroyed gradually is called _____.
15. An _____ is a living being.
16. _____ means to reprocess and use again
17. _____ is an increase in the earth's temperature due to the use of fossils fuels and other fuels that produces carbon dioxide, methane and other chemicals.
18. Being mutually dependent upon one another is called _____.
19. The act of managing the environment and all of its affairs is called _____.
20. The relationship between the amount of the oxygen and the amount of carbon dioxide on a planetary scale is called the _____.
21. A _____ is a cancer causing substance or agent.
22. A substance used to kill insects is an _____.
23. The capacity of matter to perform work is called _____.
24. The capacity of being decomposed by natural processes is called _____.
25. An _____ is a chemical substance used to destroy plants.
26. The circumstances or conditions that surround one is called the _____.
27. The controlled use and systematic protection of natural resources is known as _____.
28. _____ is the kind of fuel used to create a nuclear reaction to produce work.
29. The world of living things and the outdoors is called _____.

30. _____ is an area or region left in its natural state.

The answers for the previous fill-in blank sentences.

1. radon 2. Toxins 3. solid waste 4. acid rain 5. endangered 6. habitat 7. pollution 8. Contaminate 9. pesticide
10. Ozone 11. Lead 12. Ecosystem 12. Chemical 14. Erosion 15. Organisms 16. Recycle 17. Global Warming
18. interdependence 19. Environmental Stewardship 20. Oxygen/carbon dioxide Relationship 21. Carcinogen
22. Insecticide 23. Energy 24. Biodegradable 25. Herbicide 26. Environment 27. Conservation 28. Nuclear fuel
29. nature 30. Wilderness

The second week is the application of identifying some of the present day problems concerning the environment. This can include but is not limited to the ozone problem, oil spills or the deformation of the frogs around the world. These are just some examples and could be adapted to whatever present day problems exist at the time of the presentation. Some research may have to be done ahead of time but material is always available every day, whether it is from a weekly newsmagazine like Time or Newsweek or a daily newspaper or a website such as the Environmental Protection Agency or other similar kind of agency.

In the next week, the problems in the area of air pollution should be examined and discussed. This should include but should not be limited to acid rain and where it comes from. The student should be presented with some of the ways that can be used to prevent its occurrence. It is very important that the student realizes what some of the problems that may arise if the problem is not addressed such as trees dying or crops that may be affected or human health or buildings or statues, such as the Statue of Liberty, that may be corroded. It should be determined who is responsible for the acid rain and how the problem can be addressed. Of course, what does it cost and who is going to pay to correct the problem should also be a subject of inquiry. It should be easy to use two plants of identical species and growth and health. Perform an experiment using normal water and a solution of acidic rain (made slightly more acidic than normal rain which is between 5.0 and 5.6 on the pH scale) at about 4.0 pH. This experiment should be started in the first week of the course and the class should be directed to make careful observations and notes in a journal each day. Special attention should be given to describing the qualities of the plant's leaves, its color and its strength. The pH of the water used on both of the plants should be tested and observed and recorded. It is important that this is done, otherwise the student will not understand the significance of the experiment.

The fourth week should be spent examining land pollution. Some figures on landfills should be presented. There are always new figures being updated continuously. The scars left by strip mining should be a topic of discussion. Recycling, why and how it works, is an activity that is of great importance. It should not be difficult to find out about the recycling program of the community and see how it may compare to the surrounding communities. The student should be able to identify where the landfills are in their community and what condition they are in. They may want to find out if there are any communities that do not recycle and why not. An observation on how recycling works and why it is important may be an issue that is part of each groups discussion and report.

The problem facing New York City can be easily used as an example for classroom discussion and how to make wise decisions about what to do about an environmental problem. There are a lot of materials available about the dilemma that the city faced and the teacher may want to compare the choices made by the City of New York and the students in the classroom.

The fifth week should deal with water pollution. The closing of some of the beaches on Long Island Sound during the summer at the peak of the swimming season is an example of how water pollution can affect our

every day living. The focus here should be on how the waters became polluted and how it can be prevented. They may also ask what kind of pollution affected the water. How did it affect the shellfish that live in the area? What was done to correct the situation?

In the sixth, seventh and eighth week application should be applied to case studies in each of the three kinds of pollution.

The first area that was discussed in the third week was that of air pollution. Here is a good situation for the class to look at real facts and materials. This is a good opportunity for the class to do some research into how much of the nitrogen oxide that is introduced into the atmosphere is caused by motor vehicles. Another of the activities that they may get involved in could be finding out what kind of laws have been passed by congress to make sure that the manufactures of automobiles follow the guidelines and meet the standards that have been set by the law makers. The students may also want to find out what some of the car manufacturers have been doing to meet those standards including changing the way the automobiles are powered and what some of the alternative sources may be. The class may want to find out how much of the cost of the production of alternative powered cars will be absorbed by the manufacturer and how much the consumer will take out of his pocket for that car to be developed. In this particular instance, they may want to look at some of the new cars that have been developed with multiple sources of power.

The seventh week should be applied to case studies involving land pollution. This is a great opportunity to have the class investigate whether or not their community recycles or not. If not, why don't they or better yet why should they. If the community does recycle, how is it done and where are the landfills and what are the conditions they are in. Have the class decide in small groups what they will do when the landfills that they are using are full. What kinds of alternatives are available to them could be one of the questions that the small group may decide. It may be a good idea for them to get in contact with community leaders to find out what they have planned for the future concerning landfills. They may also want to consider the packaging of products as to whether or not they may have been 'overpackaged' and whether or not there is something that can be done to have the manufacturer use a more simple packaging approach.

The eighth week should be dedicated to water pollution. This is a good chance to set up the classroom into small groups and assign groups different tasks and decisions to make. Using the Exxon Valdez incident as a focus point, the small groups should make decisions regarding the following. Decide who is responsible for the oil spill and who should pay for the clean up. It will be important that all parties that are involved in any way should be looked at closely. This may include the management of the oil company, the command and crew of the Exxon Valdez, the Coast Guard and even the ship manufacturer should be taken into consideration. It would be interesting to see how many different answers come about and how each group looks at the situation differently. It is suggested that each group be assigned a record keeper that would organize all the information into one file along with a person that would be responsible to speak for the group.

This is a good example of being able to use several disciplines for teaching. The first example should be obvious. American geography is a good lesson to be used here. Alaskan topography and production of natural resources, who the people are that inhabit the area and how they make a living. A study in biology using the listing of the animals that are indigent to the area of Prince William Sound and how they have been affected by the Exxon Valdez oil spill. Geology or Earth Science can be used here when talking about where oil comes from how it is formed and about how it is extracted from the Earth and used as fossil fuel.

This is a good chance to sharpen math skills using estimation on how much it cost to clean up the damage from the spill. Be sure that each group includes all costs such as supplies, materials and cleaning supplies and

the cost of personnel to clean up the affected area. Ask them how they will decide on what the loss of all the animals that have died as a result of the incident will be measured.

Reading list

An Outline for Teaching Conservation in Elementary Schools. U.S. Department of Agriculture. 1971. U.S. Government Printing Office. Global Warming. Assessing the Greenhouse Threat. Laurence Pringle. 1990. Arcade Publishing. New York. Environmental Education in Action. U. S. Department of Agriculture. August 1973. U.S. Printing Office. What Price Clean Air? A Market Approach to Energy and Environmental Policy. 1973. Research and Policy Committee of the Committee for Economic Development. Project Wild. Various Contributors. 1983. Western Regional Environmental Education Council. Project Learning Tree. Western Regional Environmental Education Council. 1988. American Forest Council. Science under Siege. Balancing Technology and the Environment. Michael Fumento. 1993. William Morrow, Inc. New York. Our Children's Toxic Legacy. How Science and Law Fail to Protect Us from Pesticides. John Wargo. 1996. Yale University Press. New Haven, CT 50 Simple Things You Can So To Save The Earth. The Earth Works Group. 1989. Earthworks Press. Berkeley, CA Too Much Garbage. Patricia Lauber. 1974. Gerrard Publishing Company. Champaign, Illinois. Recycling. Joan Kalbacken and Emilie U. Lepthien. 1991. Childrens Press. Chicago. Sea Otter Rescue. The Aftermath of an Oil Spill. Roland Smith. 1990. Cobblehill Books. Dutton. New York. Acid Rain. John Mc Cormick. 1986. Gloucester Press. New York. Toronto. Water. Frank Asch. 1995. Harcourt Brace & Company. New York. The Water We Drink. Jill Wheeler. 1990. Abdo & Daughters. Edina, Minnesota.

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