TO WHAT EXTENT WILL INTEGRATING THE CURRICULUM AROUND ENVIRONMENTAL THEMES OF AIR QUALITY, WATER, LAND USE AND ENERGY FOR EIGHTH GRADE STUDENTS ON TEAM R.O.C.K. (RECOGNIZING OUTRAGEOUSLY COOL KIDS) AT MARINETTE MIDDLE SCHOOL IMPROVE THEIR UNDERSTANDING AND RETENTION OF THE CONTENT TAUGHT IN SCIENCE?

by

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ABSTRACT

The purpose of this project was to measure the difference in understanding and retention of science content objectives when taught through an integrated curriculum centered on environmental themes of air quality, water, land use and energy. The study consisted of 66 eighth grade students from Team R.O.C.K. at Marinette Middle School and their teachers. All five teachers from Team R.O.C.K. were administered a pre survey to see if they would be willing to participate and receive training. All teachers on the team were willing to be part of the project and participate in all four environmental themes as well as receive training. Two science units, Know Your Watershed and Earth’s Matter were integrated with English, math and social studies/history. The environmental themes of air quality, water and land use were included in the Know Your Watershed unit, while the environmental theme of energy was included with the Earth’s Matter unit. A third unit, Plate Tectonics was used as the control. A multiple-choice survey of 30 questions was administered to the students at the completion of each of the three science units. The paired differences test was used to determine if there were significant differences in the integrated units versus the non-integrated unit. The results of the t-test indicated a significant improvement in scores on the integrated units compared to the non-integrated unit. Teachers were also given a post survey to determine if they felt the project was effective and to give recommendations for improvement. All teachers responded to the survey and felt the process was effective. Recommendations given included providing more training and background information on the environmental topics including guest speakers. Block scheduling was also suggested to make the process more effective.
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THE PROBLEM AND ITS SETTING

The Statement of the Problem

To what extent will integrating the curriculum around environmental themes of air quality, water, land use and energy for eighth grade students on team R.O.C.K. (Recognizing Outrageously Cool Kids) at Marinette Middle School improve their understanding and retention of the content taught in science?

The Subproblems

The first subproblem. To what extent will integrating the curriculum around environmental themes increase the understanding and retention of the subject area objectives in science?

The second subproblem. To what extents will teachers from team R.O.C.K. be motivated to integrate their lessons around environmental themes?

The third subproblem. Do teachers on team R.O.C.K. have the knowledge and skills to integrate their curriculum around environmental themes?
The fourth subproblem. Develop an adequate measurement tool necessary to test the understanding and content taught to the students on team R.O.C.K.

The Hypotheses

The first hypothesis. The students understanding and retention of subject area content in science will increase when taught through integrated units centered around environmental themes.

The second hypothesis. Teachers from Team R.O.C.K. will be motivated to integrate their lessons around environmental themes.

The third hypothesis. Teachers from team R.O.C.K. will be receptive to training in integrating the curriculum and in the environmental knowledge needed for the units of instruction in air quality, water, land use and energy in order to develop and teach integrated units on these topics.

The Delimitations

The study does not integrate every subject area of instruction. The subject areas included are: science, math, history and English.
The study is limited to School District of Marinette eighth grades students and teachers on Team R.O.C.K.

The study does not measure understanding and retention of content taught in math, history or English.

The Definition of Terms

Integration. Integration is the process of organizing a unit of study using a given theme to draw together subject area content and compatible process and application skills.

Team R.O.C.K. A group of approximately 100 eighth grade students at Marinette Middle School, that have the same group teachers for science, math, English, social studies and literacy, which will be participating in integrated units of instruction.

Abbreviations

EE is the abbreviation used for environmental education.
**R.O.C.K.** is the acronym used for Recognizing Outrageously Cool Kids.

**WEED** is the abbreviation used for the Wisconsin Environmental Education Board.

**WDPI** is the abbreviation used for the Wisconsin Department of Public Instruction.

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**Assumptions**

Teachers have adequate training to deliver instruction in their content areas.

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**The Importance of the Study**

The intention of this project is to integrate the content of science, math, English and social studies around environmental themes so that students will make connections to what they are being taught and the “real world”. We feel if these connections are made students will be better able to apply the knowledge and skills they learn in school to their own lives and careers. In a study conducted by Michael J. Brody (1996) to determine Oregon students environmental science knowledge related to Oregon’s marine resources it was discovered students had many misconceptions about these resources. Students had a difficult time combining knowledge from different subject areas into concepts. It is important that students understand science in the context of the environment, society and the future.
Students need to see the relationship between subject areas and their lives to make informed decisions. In another study conducted by Gerald A. Lieberman and Linda L. Hoody (1998) children who were taught using the environment as an integrating concept had significant improvements in learning. Lieberman and Hoody believe this will offer the best possible opportunity to become well educated, active and effective members of society and equipped to meet the impending challenges of the 21st century.
An Overview of Environmental Education Infusion

Wisconsin has promoted the infusion of EE into schools through varying measures. These include laws that require teacher preparation in EE, school districts to have an EE plan and support programs to help schools implement their plans. The state of Wisconsin has mandated that environmental education be infused into K-12 education. The Wisconsin Department of Public Instruction publishes a Curriculum Guide for Environmental Education to help school districts implement an EE curriculum. The Wisconsin Center for Environmental Education, located at the University of Wisconsin-Stevens Point, has a large collection of EE materials that are available for review to assist in the implementation of EE plans in school districts. In addition, the state of Wisconsin also has the Wisconsin Environmental Education Board (WEEB), which can provide grant money to organizations, including school districts, to fund environmental education projects.

The new state standards for education in Wisconsin also include environmental education. Standards are divided into content and performance standards. There are three levels of mastery, which must be met by fourth, eighth and twelfth grade. These standards are divided into five categories, which include: questioning and analysis, knowledge of environmental processes and systems, environmental issue investigation
skills, decision and action skills, and personal and civic responsibility. An interdisciplinary approach is emphasized in these standards.

Standards provide a good foundation for which to plan for environmental education in the k-12 setting. Teachers need a framework to build a comprehensive, sequential environmental education curriculum. Once a framework is established teachers may evaluate their curriculum to see where environmental education goals and objectives fit into the existing curriculum. As Simmons states "the development of environmental education standards recognizes that to be truly effective, environmental education must be consciously integrated into the curriculum." (1998, p.72-73)

Infusion of environmental education into an already over crowded curriculum in k-12 schools can be a concern for teachers and curriculum planners alike. Ramsey, Hungerford and Volk (1998) define environmental education infusion as "the integration of content and skills into existing courses in a manner as to focus on that content without jeopardizing the integrity of the courses themselves" (p. 117). In order for this to occur careful planning must take place before infusion takes place. It also needs to be supported by teachers, administrators, parents and school boards. Volk (1998) believes "teachers must be in favor of an infused environmental education curriculum, and they must be willing to work to see that it is carried out" (p.133)
Integration and Environmental Education

With the recent emphasis on standards-based curriculum, standardized tests and school accountability many educators are looking for ways to increase test scores and meet all of the state and national standards in each area of the curriculum. In Wisconsin, many of the state-mandated standards in English language arts, environmental education, mathematics, science and social studies overlap. Environmental Education can be used as an integrating concept to help students meet standards in each of these areas.

There is much confusion in the literature about the definition of integration. Terms such as thematic instruction, integration, and interdisciplinary, multidisciplinary and trans-disciplinary instruction often are used interchangeably. Wineburg and Grossman discuss this lack of a common definition. They believe this lack of agreement on a common definition “simply reflects the disorderly state of the art”. (2000, p. 10) Glasglow also discusses this confusion among the terminology. (1997, p.xxiv) Definitions of integration range from combining knowledge from sub disciplines to allowing students to choose a topic of their interest and organizing a curriculum around that theme without regards to separate disciplines. Beane defines curriculum integration as “a curriculum design that is concerned with enhancing the possibilities for personal and social integration through the organization of curriculum around significant problems and issues, collaboratively identified by educators and young people, without regard for subject-area boundaries.” (1997, p. x) For the purpose of this project integration will
refer to the process of organizing a unit of study using a given theme to draw together subject area content and compatible process and application skills.

Environmental issues are a logical choice to use as a theme to integrate curriculum. Environmental issues involve the knowledge and skills from many disciplines. An environmental issue cannot be understood or solved if one does not look at the varying aspects of the issue, from the science behind pollution to the social, political, cultural and economic implications of laws passed to alleviate such pollution. Since environmental issues are “real-life” issues, integration of these issues into the curriculum should be a main educational goal to prepare students for life beyond school.

One of the guiding principles of environmental education in the Tbilisi Declaration is that it “be interdisciplinary in its approach, drawing on specific content of each discipline in making possible a holistic and balanced perspective.” (1998, p.15) Dass argues “that school education should focus on environmental concerns to help students learn to make appropriate choices and develop the necessary skills for dealing with environmental problems.” (1999, p.147) Hungerford, Peyton and Wilke also point out that “EE is an interdisciplinary pursuit and that numerous disciplines must be reflected in the generation of any set of goals for curriculum development. Only in this manner can EE help receivers to successfully meet the challenges facing them as world citizens.” (1998, p. 93)

There are many books and journal articles relating to curriculum integration and interdisciplinary teaching. Many researchers agree to the benefits of using this approach from a theoretical perspective, however, there is little empirical data to substantiate such claims. Most of the literature on interdisciplinary curriculum, includes examples and case
studies of integration in various settings. Some of these examples include integration of curriculum around environmental themes.

There is also a lack of research on the effects of using environmental themes as an integrating concept to increase student achievement in the separate disciplines. Lieberman and Hoody, as part of the State Education & Environment Roundtable in (1997) did an extensive quantitative study on the effects of using the environment as an integrating concept (EIC). Roundtable participants coined the term EIC and define it as follows:

Education that uses the environment as an integrating concept within the curriculum to improve student learning, including general and disciplinary knowledge; problem-solving and thinking skills; and basic life skills, such as cooperation and interpersonal communications; and to help students understand the environment upon which they depend. (interim report, p. 6)

The executive summary of this study by Lieberman and Hoody, indicates positive results for schools that use the EIC approach. Data for this study was collected through site visits to EIC schools, interviews with students, teachers and administrators, surveys of the educators and comparative studies of standardized test scores, grade point averages and well as the attitudes of those involved. The results are encouraging and include the following:

Better performance on standardized measures of academic achievement in reading, writing, math, science and social studies; reduced discipline and classroom management problems; increased engagement and enthusiasm for learning; and, greater pride and ownership in accomplishments. (p. 1)
Middle schools are an ideal place to plan and implement integrative curriculum. Students are generally placed into teams with the same set of teachers for core classes in mathematics, science, language arts, and social studies. The teachers on these teams often have common planning time. The schedule is usually more flexible in this type of setting. The common planning time can allow for planning and implementing interdisciplinary units.

Many of the resources related to interdisciplinary or integrated curriculum give suggestions for effectively implementing such programs. Tchundi and Lafer suggest “one should begin cautiously, trying things out, testing them, and exploring new directions” (1996, p. 13) Lieberman and Hoody (1999, p. 21) have identified ten first steps towards implementing a successful EIC program. These steps include:

1. building a team with like-minded teachers;
2. designating one or two individuals to be the team’s hub for communications;
3. beginning planning well in advance of implementation;
4. investing ample time in formulating plans for curricular integration;
5. starting small—perhaps one teaching team and one or two month-long units;
6. building gradually, adding new team members and increasing the number of study units;
7. seeking administrative guidance and support from the inception;
8. establishing a network of support involving both community and technical resources such as parents, local businesses, other community members,
university faculty, resource management agencies (water district, parks
department, etc.), nature centers, zoos, and museums;

9. reviewing your progress through self-evaluation and asking others for
suggestions about how to improve the program;

10. being patient—it may take three to four years for teams to solidify and
programs to gain stability.

Another concern of interdisciplinary or integrated curriculum is for the rigors of
the disciplines to be maintained. Themes must be selected carefully in order for this to
occur. Ellis and Stuen stress “the main thing is to choose a theme that can draw upon all
curricular areas with authenticity and which has the capability to join the separate
disciplines as contributors to large projects and thoughtful activities” (1998, p. 36)

Marinette Middle School Team R.O.C.K. Integration

Team R.O.C.K. at Marinette Middle School consists of six teachers and
approximately 100 eighth grade students each year. Each day the team teachers meet for
one forty minute class period to plan for team activities and other school business. The
teachers are: Michelle Herness and Elizabeth Bretl (earth science in a job share position),
Beverly Schewe (math), Pat Mans (history), Karen Hurkmans (English) and Chris Siem
In previous years members of the team have planned and carried out integrated units for the students on a variety of topics.

During the 1998-1999 school year the building administrator required all teachers to become involved in an integrated unit with at least one other teacher. Beginning with the 1999-2000 school year, teachers were required to participate in an integrated unit with at least one other teacher at least once each semester. During the 4-year span of this project other changes have taken place as well. Three different people have filled the English position. During the first year of this project there was a class called academic enrichment, which was taught by a separate teacher. Due to declining enrollment in the district the class was eliminated. It was replaced with a literacy class with a section being taught by each member of the team. Beginning with the 2000-2001 school year the writer of this project began a job share position and was no longer attending team-planning time. The writer did meet with her job share partner each day to discuss what was accomplished during planning.

The School District of Marinette has an EE Integration Plan. The plan indicates that Social Studies integrates the environmental topics of conservation, man and nature, national parks and land usage into their curriculum, while science integrates the topics of conservation, pollution, clean air/water, erosion, man and nature and effect of technology. Even though the EE integration plan states that these topics were being covered in these courses, this was not always the case. Prior to this project, there were no air, energy or land use objectives or activities being taught in the eighth grade. The only water activities being taught included the development of rivers, and the location of three watersheds in Wisconsin.
Resources for Integrating Air Quality In Science, Math, Social Studies and English

There were an adequate number of resources in this area. In addition to the print resources, Al Stenstrup, from the Wisconsin Department of Natural Resources provided training on air quality and activity ideas along with information on where to obtain equipment. Following are other resources that were helpful.


This study guide is part of an interdisciplinary kit that contains the study guide, a poster, CD-ROM, and a copy of Vital Signs, a publication that discusses biomonitoring. The study guide contains 11 classroom activities and demonstrations as well as a resource list for air related books, videos, curriculum and activity guides and monitoring methods. In addition, the kit contains a chart with suggestions of how to integrate the activities in the kit within various subject areas and levels. Additional posters can be obtained from the WDNR.

Contains sixteen hands-on activities to integrate air quality into the middle school classroom. The following topics are covered: acid rain, air pollutant gases, air pollution in general, biology, criteria pollutants, greenhouse effect, health and pollution, ozone, particulate matter and physical science. Includes a glossary and fact sheets.


This book was designed for teachers to help students understand issues of global change. Includes the topic of the greenhouse effect and global warming in addition to other topics.


An excellent local resource for Wisconsin teachers. This kit contains a wealth of information and support resources. A study guide is included with teacher and student pages, including reproducible lab sheets for collection of data. A power point slide show about milkweed biomonitoring as well as slides and a script are contained within the kit. In addition there is a list of relevant websites, overheads and photo plates of milkweed, ozone injury and GIS maps, copies of articles and press releases, a list of items available
from the WDNR as well as fact sheets on milkweed and monarchs. Contact information is also included.


A collection of activities related to global change arranged for use in a binder. Topics include the following: natural climate variability, greenhouse effect, sea-level rise, ozone depletion, ecosystem response, decision making under scientific uncertainty. Also contains a bibliography.


http://www.tnrcc.state.tx.us/air/monops/lessons/awfuleightlesson.html

This lesson plan is one of many air related lesson plans on the Texas Natural Resource Conservation Commission website. Information included in the lesson plan is: a purpose, grade level, objective, focus, materials, background, procedure, closure and enrichment. A link is included for the actual play. The site also contains lesson plans for water, waste and environmental games.
Resources for Integrating Water Quality In Science, Math, Social Studies and English

This topic has a wide selection of materials available. There are many resource books for background knowledge, activity guides for students and articles from professional journals with advice from other teachers. The following were used in this project.


This activity book has taken events in history such as the sinking of the Titanic and famous floods and created lessons and activities related to the earth science behind each event. It provides reproducible pages for students.


An interdisciplinary water education activity book. This activity book contains activities related to water for students in grades k-12. Teachers need to attend a training session to receive the activity guide.

Madison, Wisconsin: University of Wisconsin-Extension.

This guide is intended to help the reader understand information about lake water quality and to interpret lake data. Major topics covered include: physical characteristics, chemical properties, dissolved gases and carbonate systems. Contains a glossary and a list of references for further reading.


This activity guide was designed for use in a binder. Pages are 3-hole punched and chapters are divided by tabs. It is arranged into five chapters covering the following topics: introduction to water, drinking water and wastewater treatment, surface water resources, groundwater resources and wetlands and coastal. Contains a glossary and numerous fact sheets on water related topics. Many additional resources are listed in the fact sheets section.

United States department of Agriculture Natural Resources Conservation Service.

(Revised February 1996). *What is a Watershed?* (Program Aid Number 420).
This pamphlet gives a brief introduction to a watershed. It answers the following questions. What is a watershed? How do watersheds work? Are all watersheds the same? Gives suggestion on actions you can do on the farm, at home and in your community to protect watersheds.


This binder on information on lakes is well organized. It contains background information on lakes as well as explains lake site monitoring methods and how to test for each of these. In addition, it contains sheets that can be used for recording lake data as it is collected.


This packet of activities was designed for volunteer groups. Eight different hands-on activities are designed to teach about protecting streams and rivers. Activities include: stream walk survey, stream or river cleanup, critter search, storm drain stenciling, watershed in a box, erosion in a bottle, the human watershed and urban runoff model. Also contains information on additional resources including books, videos, newsletters and state and federal agencies related to water.

An excellent source of background information on the Great Lakes. Includes information on both the natural and cultural aspects of the Great Lakes as well as the management of the Great Lakes. Many different maps and graphs are included in this publication. Contains a glossary and a reference page.

Council for Environmental Education & the Western Association for Fish and Wildlife Agencies. (1992). *Project wild aquatic education activity guide.* Gaithersburg, Maryland: Project WILD.

This guide contains activities that can be used with kindergarten through high school age students. The activities are specific to water and aquatic habitats. It is designed to prepare young people for decisions relating to wildlife. The activities are organized into these seven sections: awareness and appreciation, diversity of wildlife values, ecological principles, management and conservation, people, culture and wildlife, trends, issues and consequences and responsible human actions. Each activity includes an objective, a brief description of the method used, background information, materials needed, a procedure, extensions and evaluation. At the end of the guide cross-reference lists organize
activities by grade level, subject, topic, and skills. It also lists which activities can be
done indoors or outdoors.

Publications.

This curriculum is one of a series of river-based units by teachers participating in
the Rivers Curriculum Project funded by the National Science Foundation. The
curriculum guide is divided into four lessons. These include: math readiness, equations
and formulas, graphing and statistics. Each lesson has a series of activities, student
information, teacher notes, and student assessments. An extensive resource list, glossary
as well as other tips are included. Other units in the series include chemistry, biology,
geography, earth science and language arts.

**Resources for Integrating Land Use In Science, Math, Social Studies and English**

Originally this area was very difficult to find resources for. There are few activity
books devoted to this topic. Most of the activities that do exist are interspersed among
activity guides on other topics. There were many government publications that were
relevant to this topic. The following were resources used for the land use integrated unit.

This binder contains a series of pamphlets on managing your land for wildlife. The topics of these include: wildlife management basics, developing your wildlife management plan, wildlife habits and habitat, trees, shrubs and vines with wildlife values, publications, people and dollars for wildlife, managing your woodland for wildlife, managing dead wood for wildlife, managing edge for wildlife, brush piles for wildlife, shelterbelts & food plots for wildlife, restoring and maintaining grasslands for wildlife, managing stream corridors for wildlife and restoring shallow wetlands for wildlife. Each pamphlet contains background information and guidelines to help you manage your land for wildlife.

United States Department of Agriculture Natural Resources Conservation Service.


This is an excellent local resource. The information is specific to Marinette County. It contains a general description of the area, detailed soil maps of the county, descriptions of the soils and their formation and various tables that give suggestions for the suitability of the soils for certain uses such as farming, septic systems, etc. It is
available free of charge. Most counties in the United States have these available specific to their county.


This study guide features a collection of groundwater activities designed for middle school earth science students. Includes activities about the water cycle, groundwater movement, wells, septic systems and resource protection, value and conflict. Reproducible student activity sheets and overhead masters are included. The activities are applicable to other subject areas, which are suggested with each activity. Also includes a resource list of additional resources related to groundwater.


Great reference for information on groundwater in Wisconsin. In addition to background information on what groundwater is, this publication contains sections on using groundwater in Wisconsin, threats to groundwater, and protecting the resource. Includes specific information on Wisconsin’s aquifers. Words that appear in bold in the text are contained in the glossary at end of publication. A “Groundwater and land use in the water cycle” poster is included in the center of publication.
This tri-fold pamphlet discusses land use planning and the importance of considering soil in any land use plan.

A fifteen-page pamphlet that begins with a brief synopsis of the dust bowl. It explains how wind erodes soil and how to reduce wind erosion. Contains numerous representative photographs.

A fifteen-page pamphlet that explains what erosion is and than specifically addresses water erosion. A brief overview of soil formation and soil properties is included. Contains numerous representative photographs.

McGinity, J., Hannam, S. & Bault, J. Land Use Planning Unit For High Schools.

Newburg, Wisconsin: Riveredge Nature Center.
This planning unit was designed for high school students but the activities can be adapted for middle school use. The unit is aligned with Wisconsin’s Model Academic Standards. It also includes a list of land use planning resources.


This book tells you how to set up and maintain a worm composting system. Contains a glossary of related terms and an annotated reference list of earthworm books for children and adults.


Contains a series of informational sheets on how to set up and maintain a worm bin and a supplies source list. Lesson plans to use with a worm bin are also included. Gives four websites for additional information.

This book is an excellent resource for background knowledge on soil. The book is easy to read for people without a background in soil science. Chapters include: the nature and function of soil, physical properties of soils, soil and water, chemical properties of soils, plant growth and nutrition, organic matter and microbes of the soil, factors and processes of soil formation, soil morphology, soil classification, soil surveys, soil erosion and its control and soil and the environment. Also contains a glossary of soil terms.

Council for Environmental Education & the Western Association for Fish and Wildlife Agencies. (1992). Project wild k-12 activity guide. Gaithersburg, Maryland: Project WILD.

This guide consists of activities to provide children with information and experiences to make intelligent decisions regarding wildlife. The activities are organized into these seven sections: awareness and appreciation, diversity of wildlife values, ecological principles, management and conservation, people, culture and wildlife, trends, issues and consequences and responsible human actions. Each activity includes an objective, a brief description of the method used, background information, materials needed, a procedure, extensions, aquatic extensions, and evaluation. At the end of the guide cross-reference lists organize activities by grade level, subject, topic, and skills. It also lists which activities can be done indoors or outdoors.
Resources for Integrating Energy In Science, Math, Social Studies and English


Contained in a binder, this k-12 energy activity guide is arranged into four themes. These include: We Need Energy, Developing Energy Resources, Effects of Energy Resource Development, and Managing Energy Resource Use. The guide contains a conceptual framework and many cross-reference charts of the activities by grade level, subject area, etc. Activities include an objective, materials, background, procedure, assessment and extensions. Student pages may be reproduced.

Wisconsin Focus on Energy. Renewable energy: clean power for Wisconsin.

A video from Wisconsin Focus on Energy. It highlights actual homes and businesses in Wisconsin. Topics covered in this video include solar hot water, water power, ground source heat pumps, clean wood stoves, woo biomass, cool day lighting, solar electric and building with renewables.
Summary

There is a need by state mandate to infuse environmental education into the K-12 curriculum in the state of Wisconsin. Wisconsin’s Model Academic Standards in Environmental Education provide a framework for school districts to plan and evaluate a k-12 environmental education curriculum. The School District of Marinette has an EE Integration plan, which states that clean air and water are taught in eighth grade science and land usage is taught at the eighth grade level in social studies. Even though the plan states that it is occurring that is not the case. Energy, a common and important environmental issue, is not even included in the EE curriculum plan.

The middle school setting, with its “team” approach, is an ideal setting to integrate subject area content and skills. The common planning time and flexible scheduling found in many middle schools allows for the collaborative planning time to plan and implement integrative units. Environmental topics are also of interest to this age students. Research by Lieberman and Hoody (1996) has shown promising benefits to using the environment as an integrating concept. Environmental education is interdisciplinary by nature and many specialists in the field of environmental education agree that an integrated approach to environmental education is crucial to the environmental literacy of students.

There are many publications that are useful to integrating activities around environmental themes of air quality, water, land use and energy. Many of these resources can be obtained free of charge or for a minimum cost to participants in a workshop or graduate class. This is important, since most teachers have very limited budgets to purchase materials with.
With the lack of research in the area of integration in general, more studies need to be completed to determine if there are direct benefits to using environmental themes in an integrative approach to subject area standards, goals and objectives. This research project is an attempt to determine if integrating the subjects of English, mathematics, science and social studies around the environmental themes of air quality, water, land use and energy will increase the understanding and retention of content taught in science.
RESEARCH METHODOLOGY

Treatment of the subproblems:

The first subproblem. To what extent will integrating the curriculum around environmental themes increase the understanding and retention of the subject area objectives in science?

Three surveys were developed based on science objectives at the eighth grade level at Marinette Middle School. Students on Team R.O.C.K. were taught two science units through integration using the environmental themes of air, water, land use and energy resources. The two science units used for this integration project were entitled Know Your Watershed and Earth’s Matter. Each science unit was approximately twelve weeks long. Activities were integrated into math, English and social studies. A survey was administered after the completion of each unit. A third science unit entitled Plate Tectonics was used as the control in this study. No integration took place during this unit. A survey was administered after this nine-week unit.

The second subproblem. To what extent will teachers from team R.O.C.K. be motivated to integrate their lessons around environmental themes?

During the 2000-2001 school year a Pre Survey of Environmental Education Integration was administered to all teachers on Team R.O.C.K. (Appendix E) The
survey asked the subject the teacher taught, how long they have been teaching and how important they felt it was to infuse environmental education into their subject area. It also asked teachers if they would be willing to participate in integrated units on any of the following environmental themes: air, water, land use and energy. Due to a change in staff on Team R.O.C.K. during the 2001-2002 school year the survey was administered to the new staff person during the 2001-2002 school year.

A post survey of environmental education integration was administered following completion of the integrated units. (Appendix E) This survey asked teachers if they participated in the integrated units, how much time they spent planning and if they felt the process was effective. Recommendations for improvement were also noted as well as the willingness of participants to participate in other integrated units around environmental themes.

The third subproblem. Do teachers on team R.O.C.K. have the knowledge and skills to integrate their curriculum around environmental themes?

The process of developing the project began after the Marinette Education Association sent four teachers from the Marinette Middle School to an Environmental Grant Writing Workshop at Trees For Tomorrow in Eagle River, Wisconsin on December 2, 1997. The Association sent the teachers to encourage them to learn how to write grants to obtain money and resources for the Marinette School District. Since the location of the Marinette Middle School, which is located next to an industrial area, poses many air quality issues, the writer and another member from Team R.O.C.K., Beverly
Schewe focused on writing a WEBB grant on air quality entitled “In the Air”. The grant was submitted and funding was approved. The grant contained funding for student equipment, teacher training and staff development time to write an integrated unit on air quality. Only five of the team members were included in the initial training in air quality. The social studies teacher did not want to participate initially. (Appendix B)

Following the notification that funding was approved for the WEBB grant “In the Air”, the University of Wisconsin-Green Bay was recruiting teams of teachers and an administrator for a Technology Institute for Educators. (Appendix C). The principal of the Marinette Middle School, Mike Wilfer, suggested that the air quality unit that was being developed as part of the WEBB grant could be used for the Technology Institute for Educators. Six people from the Marinette Middle School attended the Institute from August 3 through August 6, 1998. Paul Okray (music), Brenda Pirlot (art), Keith Schroeder (technology), the writer (science), Beverly Schewe (math), and Mike Wilfer (principal) attended the Institute. During the institute teachers were trained in technology for the classroom and how to implement those technologies into classroom lessons. On February 15, 1999 teachers were given the afternoon to work on the unit and a substitute teacher was provided for their classroom.

On August 19, 1998 Al Strenstrup from the Wisconsin Department of Natural Resources provided air quality training to five teachers from Team R.O.C.K. Teachers were compensated at their usual staff development rate for the one-day workshop. Since the initial grant did not include the art, music and technology teacher they did not attend the training. In addition the social studies teacher did not attend the training. These teachers were given materials received at the training.
Following the training teachers began to prepare lessons on air quality for the unit. Instruction in science class took place during the astronomy unit. Earth’s changing atmosphere was compared to the atmosphere of other planets in our solar system. Some of the activities, such as the milkweed study and UV meter experiments needed to be completed early in the fall. Each teacher on the team as well as the art, music and technology teacher that attended the Technology Institute planned a project for students to complete related to their area of instruction. Students were allowed to choose which project they would like to participate in. Several work times were arranged during the school year for student groups to meet with their teacher to work on the project. The administrator to participate in the air quality unit mandated the social studies teacher. (Appendix B) The success of the project was discussed during team planning time and modifications were made for the following year.

Additional classes were taken by the writer through the University of Wisconsin-Stevens Point to gain more background information and resources related to air quality. During the summer of 1999, Natural Resources 605 Global Environmental Change Education followed by Natural Resources 610 Air Quality Issues- Local & Global during the summer of 2000.

During the spring of 1998 three of the team members, the writer, the learning disabled teacher and the academic enrichment teacher enrolled in the KEEP course that was offered at a nearby school. The cost of the course was covered by a grant so the teachers received a free graduate credit and a stipend for completing the course. An energy unit was planned as part of the class. (Appendix D) These activities were piloted in the science and the academic enrichment classes that year and the following year.

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During the 2000/2001 school year a modified version of the unit was piloted during a literacy class rotation. Students rotate through different teachers for each grading period with a different focus for each rotation.

After completion of the KEEP course teachers received a Promising Practices Guide from KEEP. A house building design was described by Pamela Lucas, a teacher from Grand Avenue High School in Milwaukee, Wisconsin. (Appendix C) The writer wrote to this teacher and received a disk of the plan. This was used to modify the existing energy unit. During the 2001-2002 school year the house-building unit was implemented.

Following completion of the air quality unit the writer began to look for resources for an integrated water unit. On March 20, 1998 the writer attended a one-day workshop Water Works/Project WET workshop at WESTfest '98. This provided the Project WET activity book. Some of the activities were piloted during science class following completion of the air quality unit.

During the summer of 1999 the writer enrolled in Natural Resources 603 Environmental Education Curriculum Resources: Wildlife Education Resources for K-12 Educators, Natural Resources 605 Selected Topics in Natural Resources: Wildlife Management Issues Field Experience and Wildlife 740 Wildlife Issues Investigation. As part of the assignments from these courses a wildlife field trip plan was developed for Seagull Bar Wildlife Area, which is within walking distance of Marinette Middle School. (Appendix D) During the 1999-2000 school year the writer introduced the plan to the teachers on team R.O.C.K. The teachers were willing to participate in the field trip and
the students were taken to the area in October. Greg Cleereman from the Marinette County Land & Water Conservation Department assisted with the field trip.

During the summer of 1999 the writer also enrolled in a graduate course at UWSP entitled Natural Resources 603 Environmental Education Curriculum Resources: Water Education Resources for K-12 Educators. A water unit was developed as part of this course. (Appendix D) This unit was combined with the field trip and was piloted into the curriculum during the 1999-2000 school year.

On September 24 and 25, 1999 the writer and two of her students attended an Adopt-a-Lake workshop at Upham Woods in Wisconsin Dells, Wisconsin. The students and teacher were instructed in water quality testing methods and received free water quality testing equipment as part of the workshop. The writer approached the vice-principal of the Middle School, Wendy Dzurick to approve the funding. The writer was asked to write a rationale that was approved. (Appendix C) The Marinette Middle School budget covered the cost of the workshop, transportation, lodging, meals and the cost of a substitute teacher.

During the winter of 1999 a wish list request (Appendix C) was submitted to the PTSA of the Marinette Middle School. Funding was approved for the purchase of D-frame aquatic nets, rakes, storage totes, specimen trays and waders. The Marinette County Land & Water Conservation Department offered to assist with the water quality testing. The original date was cancelled because of rain and they were unable to attend the day the testing occurred. After the integrated water activities were completed students and teachers were asked for feedback to determine their effectiveness and modifications were implemented the following year.
During the summer of 2000 Water 750 Water Resource Issues. This course provided more background information on water. On February 12, 2002 Elizabeth Bretl and the writer attended a Groundwater Workshop in Green Bay Wisconsin. The workshop was offered by the WDNR. A sand-tank groundwater flow model, the cost of a substitute teacher, and supporting classroom materials were provided free of charge to participating groups. (Appendix C)

Work on the land use unit began after the writer completed the University of Wisconsin- Stevens Point course Soils 763 Soil Resource Issues during the summer of 2000. As part of the class an activity was developed using the Soil Survey of Marinette County, Wisconsin. (Appendix D) This activity and others were piloted into the science class during the fall of 2000. In addition, some land use activities were piloted during a shortened schedule day. (Shortened schedule days are when teachers at the Marinette Middle School have a scheduled afternoon inservice and students are released around one p.m. instead of the usual three p.m. A modified schedule is run on those days where students have approximately thirty minute classes instead of forty-two. Students are usually very excited on these days and it is difficult to conduct normal classroom activities.) Since shortened schedule days were not really productive days in the eyes of the teachers on team R.O.C.K. the writer suggested running a modified schedule within the team and conduct some land use activities. The team students and teachers all participated. Students and teachers deemed the day successful and it was repeated the following year. Additional land use activities were incorporated into other classes the following year.

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During the four-year span of this project revisions were made to many of the middle school curriculums. Wisconsin Model Academic Standards were reviewed to look for any gaps in the curriculum. After revisions to the entire middle school science curriculum were made new textbooks were selected. Science Insights: Exploring Earth and Space by Scott Foresman Addison Wesely was selected to fit the eighth grade curriculum. The new textbook series was used during the 2001-2002 school year.

During the fall of 2001 air quality, water quality and land use activities were integrated into math, science, English and social studies subject areas. Due to the nature of some of the air quality and water activities, they needed to be completed in the fall. It was decided to move the astronomy unit to the spring of the year and include the air quality, water and land use activities in the Know Your Watershed Unit instead, which was taught in the fall this year. Since land use, water and air quality are dependent on each other, this seemed to be a better fit with the curriculum. During the winter, energy was integrated into all subject areas as part of a house-building unit.

Subproblem four: Develop an adequate measurement tool necessary to test the understanding and content taught to the students on team R.O.C.K.

Three surveys were developed using the science objectives for eighth grade students at Marinette Middle School. Each survey consisted of 30 multiple-choice questions. The surveys were developed for the following science units: Know Your Watershed, Earth’s Matter and Plate Tectonics. The environmental themes of air, water and land use were integrated into the Know Your Watershed unit while energy was
integrated into the Earth’s Matter Unit. No integration took place during the Plate Tectonics unit. (Appendix F)

Surveys were administered to the students at the completion of each unit. Students were not told of the survey in advance. Once surveys were completed they were scored out of a possible 30 points. Each correct multiple-choice answer yielded one point. A level of .01 was used to determine whether significant gains occurred.
RESULTS

Introduction

Results from this project include the pre and post survey administered to teachers on team R.O.C.K., the integrated units that were developed as part of this project, and analysis of student scores on the multiple choice surveys administered to the students after the completion of three science units during the 2001-2002 school year. Billie Earl Sparks, Ph.D. Professor of Mathematics at the University of Wisconsin – Eau Claire and Co-Project Director of the Wisconsin Academy Staff Development Initiative assisted with the statistical analysis of the data.

The first subproblem. To what extent will integrating the curriculum around environmental themes increase the understanding and retention of the subject area objectives in science?

Since the observations for this project were on the same individuals, and therefore the groups were not independent, the paired differences test was used to determine if there was an effect of the different treatments. Scores were used for only the 66 subjects having scores recorded for all three units. First, the paired differences test (t-test) was run on the Explore Your Watershed (W) score minus the Earth’s Matter (M) score. The mean difference was 0.12 and the standard deviation of differences was 3.72. The t-value
was 0.26. This t-value is not significant (p=0.01) indicating that there is no significant difference in how the students scored between the two integrated units.

The same paired differences test (t-test) was conducted for the average of the two integrated unit scores minus the Plate tectonics score, which was not integrated. The t-value was 6.47. This t-value is significant (p<0.01) therefore indicating that the students performed significantly better on the tests for the integrated units than on the non-integrated unit. The mean difference was 2.79 while the standard deviation of differences was 3.50 for this comparison.

### Student Survey Results

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The second subproblem. To what extents will teachers from team R.O.C.K. be motivated to integrate their lessons around environmental themes?

A pre survey and post survey were administered to all members of Team R.O.C.K. The purpose of the pre survey was to see if teachers would be willing to participate in this project and any concerns they may have so they could be addressed before the project began. Teachers on team R.O.C.K. responded very positively to the idea of the project as is shown by their responses.

Teachers on team R.O.C.K. have been teaching between two and fifteen years. They felt it was important to extremely important to infuse environmental education into their subject area. When asked if they would infuse environmental education into their subject area if it were not required all teachers responded yes. All teachers also responded they would participate in integrated units even if it were not required by their administrator. All team members indicated they would be willing to participate in all of the integrated units centered around environmental themes of air quality, water, land use and energy.

Pre Survey Results

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<th>1. What subject do you teach?</th>
<th>English</th>
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<td>2. How long have you been teaching?</td>
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<td>5-10 years</td>
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4. Would you infuse environmental education into your subject area if it were not required?

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<td>x</td>
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5. If not required by your administrator would you participate in integrated units?

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6. Would you be willing to participate in an integrated unit on any of the following environmental themes?

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Additional Comments:

"English can be and is used everywhere. It can be made more meaningful through integrating units!"

Results of the post survey were also positive. All teachers from team R.O.C.K. participated in integrated units centered around environmental themes of air quality, water, land use and energy while they all felt the process was effective. Teachers spent at least 2 hours to over five hours planning for the units. Teachers requested more training in background knowledge and block scheduling to make the process more effective. They also indicated they would be willing to participate in more integrated units centered around environmental themes.
Post Survey Results

1. What subject do you teach?

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<tr>
<td>English</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>math</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>science</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Social studies</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>other</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

2. Did you participate in an integrated unit on any of the following environmental themes?

<table>
<thead>
<tr>
<th>Theme</th>
<th>English</th>
<th>math</th>
<th>science</th>
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<th>other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Water</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Land Use</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Energy</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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</tr>
</tbody>
</table>

3. If you answered yes to any of the above topics, how much time did you spend planning for the unit?

<table>
<thead>
<tr>
<th>Planning Time</th>
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<th>math</th>
<th>science</th>
<th>Social studies</th>
<th>other</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 hour</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-3 hours</td>
<td>x</td>
<td>x</td>
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<tr>
<td>3-4 hours</td>
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<tr>
<td>5+ hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
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</table>

4. Was the process effective?

<table>
<thead>
<tr>
<th>Process Effectiveness</th>
<th>English</th>
<th>math</th>
<th>science</th>
<th>Social studies</th>
<th>other</th>
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</thead>
<tbody>
<tr>
<td>yes</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>no</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

5. What could be changed to make the process more effective?

- I would like more background/training in each of the various subject areas to have more of a basis for teaching.
- It could be warmer on the day we had the activities.
- Guest speakers to inservice teachers with background information
- Block scheduling
6. Are there any other environmental themes you would be interested in participating with an integrated unit? If yes—What?

- I would like to find some more local environmental issues to research and discuss, ex) paper industry
- Yes, any

The third subproblem. Do teachers on team R.O.C.K. have the knowledge and skills to integrate their curriculum around environmental themes?

Two science units were integrated centered on environmental themes with math, English and social studies. The Know Your Watershed Unit was integrated around environmental themes of air quality, water and land use. The Earth’s Matter Unit was integrated around the environmental theme of energy.

EE activities relating to air, water and land use were integrated into English, math, science and social studies for the Know your Watershed Unit. A major component of the unit was the field trip to Seagull Bar Wildlife Area. Students completed water testing, a macro invertebrate survey, and a plant and animal survey of the wildlife area. Prior to the field trip day, land use activities were conducted on a shortened schedule day. A land auction simulation game and migratory bird game were completed. In addition to these activities, students wrote in their journals in English class, students worked with graphs in math class, and students worked with maps in social studies class as well as discussed political issues related to these topics. In science class students completed many labs and
activities related to air, watersheds, groundwater, soils, and land use. Some of these activities include: milkweed monitoring, UV meter experiments, groundwater labs, and soil survey lab.

The WEEB grant "In the Air" project that was in conjunction with the Technology Institute For Educators received an honorable mention from the National Middle School Association.

The Earth's matter Unit centered around the environmental themes of energy. In science class students learned about different types of energy, including renewable and non-renewable energy. They also learned about energy efficiency. In math class students learned about area and developed floor plans for a house. In English class students wrote descriptions about their house and in social studies students discussed energy policy and the Enron scandal.

There were many resources available to assist with the development of integrated units centered around environmental themes of air quality, water, land use and energy. It took some time to locate appropriate resources and there was a very limited budget to purchase materials with. The Wisconsin Center for Environmental Education located at the University of Wisconsin-Stevens Point, was an excellent resource for reviewing EE materials, while the Wisconsin Department of Natural Resources was an excellent resource for EE materials that were free and charge or very inexpensive and locally relevant. The writer developed other activities that were integrated as part of class requirements for graduate coursework.

In addition there were other free resources available to teachers. The difficult part was becoming aware of them. The writer became aware of many of the resources through
graduate courses that were taken through the University of Wisconsin-Stevens Point as part of the requirements for the master's degree. During a graduate course on soils, this writer became aware of soil surveys that were available through most county courthouses. Fifteen copies of the Soil Survey of Marinette County, Wisconsin were delivered to the writer's school free of charge after the writer called the county courthouse to inquire about them. In another case, the writer wrote to the Great Lakes National Program Office and received 40 copies of *The Great Lakes: An Environmental Atlas and Resource Book* free of charge. (Appendix C)

When teachers on team R.O.C.K. were given activities that were already prepared they were very receptive to participating in them. Chris Siem helped create materials that were needed for various activities and located carpet squares from local carpet stores that were donated to us free of charge.

**The fourth subproblem.** Develop an adequate measurement tool necessary to test the understanding and content taught to the students on team R.O.C.K.

Three multiple-choice surveys were developed based on science content objectives. Each survey contained 30 questions. The surveys were organized according to the chapters in the science textbook. The results are reported with subproblem one.
CONCLUSIONS AND RECOMMENDATIONS

The first subproblem. To what extent will integrating the curriculum around environmental themes increase the understanding and retention of the subject area objectives in science?

There was a significant improvement on survey scores on the integrated units in comparison to the non-integrated unit. This would indicate that integrating the curriculum around environmental themes did increase the understanding and retention of the subject area objectives in science.

Based on these results, recommendations include continuing with the integrated units centered around environmental themes on Team R.O.C.K. The team members all felt that it was important to extremely important to infuse environmental education into their subject areas and they were willing to integrate with additional environmental themes. Team planning time allows for this to happen.

In addition to team R.O.C.K. continuing the integrated units, share results and integrated unit plans with other eighth grade team. They are also required to integrate with someone else each semester. If the unit has already been written and tested they may be interested in trying it. The Marinette County Land & Water Conservation Department is willing and able to help school groups. This may help alleviate some apprehension from the staff as well.
The second subproblem. To what extents will teachers from team R.O.C.K. be motivated to integrate their lessons around environmental themes?

All teachers reported they would be willing to participate in the integrated units on environmental themes of air quality, water, land use and energy in the pre survey. All teachers did participate in each of the units.

Even though the social studies teacher did not initially want to participate in the integrated unit on air quality he eventually participated in all the integrated units on environmental themes. In his survey he felt that it was very important to infuse EE into his subject area and this may have been why he eventually decided to participate in all of the units. Perhaps he felt uncomfortable with integration prior to the air quality unit, since he did not have any prior experience with it. He did not indicate why he initially did not want to be included on his survey.

Results of the post survey also indicated that teachers would be willing to participate in additional integrated units on environmental themes. This included the social teachers who initially did not want to participate in the air quality unit. He was willing to participate in any additional environmental theme integrated units.

Since teachers on team R.O.C.K. are willing to participate in additional units, develop a literacy rotation that integrates math and science and focuses on environmental issue investigation for the Marinette Middle School. Nine weeks would not be enough time to complete, but if math and science were combined into a semester long course it would be feasible to complete. Literacy objectives, such as research skills could be
combined with science knowledge and data collection to complete an entire environmental investigation and action plan.

The third subproblem. Do teachers on team R.O.C.K. have the knowledge and skills to integrate their curriculum around environmental themes?

Teachers on team R.O.C.K. were receptive to training in integration and environmental themes. They helped prepare integrated units on these environmental themes and made modifications from year to year based on their experiences with the implementation of the units.

It was very difficult to arrange for time to plan and implement the unit with the teachers that did not have the same planning time as Team R.O.C.K. The music, art and technology teachers were not included in the “In the Air” project after the initial year due to the difficulty and frustration with the scheduling conflicts. The activities in technology, art and music were still offered to the students, just not under the direction of those teachers.

As is suggested in the article by Lieberman and Hoody (1999) I would suggest starting small with one or two short units as well as building a team with like-minded individuals. I do not feel this project would have been successful without the support from team R.O.C.K. members and their feeling of the importance of environmental education.
The team members were very receptive to training in background knowledge. It was even requested in the post survey by two of the five, team members to have additional training in background knowledge. The English teacher was new to the district and our team the year the project was fully implemented and did not have the training or experience that had taken place the previous three years.

In addition to the survey comments other team members have demonstrated their commitment to training. Even after the water unit was completed the writer and the other science teacher attended a groundwater workshop in Green Bay where they received training and equipment.

Based on these results, the writer recommends that team R.O.C.K. and others in the district continue to write grants and obtain other funding to train teachers in environmental topics. Teachers requested more training in background knowledge. The district has limited funds, but these funds could be combined with money from grants and other resources to provide for adequate training and materials to effectively implement integrated environmental units. District inservice time could possibly be used to have training in the background knowledge of environmental topics or, if no money is available to pay teachers for their time district inservice hours could be granted.

When developing new integrated units start slowly. One or two units are enough for the first year. Do not try and add too many new things to the curriculum in one year. If a school is piloting many new programs in the same year the integration may not be as successful as it could. Teachers need time to plan for new instruction as well as have time to reflect on the effectiveness of their instruction and make any necessary changes.
It is important to realize that positive team dynamics may take awhile to develop and when possible align teams with like-minded people.

In addition, develop a more comprehensive Environmental Education Integration Plan K-12 for the School District of Marinette. Even though the district has an EE plan, it is not necessarily being followed. It was written many years ago and should be updated to meet the new state standards. An audit should be completed first to see what EE standards are being met by all teachers at each grade level, followed by curriculum development to infuse EE activities into the curriculum to meet all the state standards. This can be accomplished through some integrated units centered around environmental themes at the elementary and middle school levels. Encourage teachers to connect with community resources such as the Marinette County Land & Water Conservation Department and the DNR to assist with programs.

Promote the use of interdisciplinary curriculum centered around environmental themes at conventions. Many of the resources used for this program were obtained by attending conferences such as WESTfest and WSST conventions. Many teachers are looking for new ideas to meet the state standards and increase test scores. This is an efficient way to do both.

The fourth subproblem. Develop an adequate measurement tool necessary to test the understanding and content taught to the students on team R.O.C.K.
The questions on the survey were developed based on the unit objectives for each unit. Although the survey took many students longer to complete than was anticipated, the scores of individual students generally were consistent with that of classroom performance in comparison to the other students in the study. Thirty questions were needed to capture the depth of the twelve-week units.
REFERENCES


United States Department of Agriculture Natural Resources Conservation Service.


United States department of Agriculture Natural Resources Conservation Service.

(Revised February 1996). What is a Watershed? (Program Aid Number 420).


Appendix A
## ENVIRONMENTAL EDUCATION INTEGRATION

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>WHERE TAUGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conservation</strong></td>
<td>K,1,2,4,5, 6,7,8,H.S.</td>
</tr>
<tr>
<td><strong>Pollution</strong></td>
<td>K,1,2,4,5, 6,7,8,H.S.</td>
</tr>
<tr>
<td><strong>Clean air/water</strong></td>
<td>Elem. K,1,2,4,5, 6,7,8,H.S.</td>
</tr>
<tr>
<td><strong>Endangered species</strong></td>
<td>1,2,3,4,5, 6,7,H.S.</td>
</tr>
<tr>
<td><strong>Erosion</strong></td>
<td>3,4,5,8,H.S. 6,7,H.S.</td>
</tr>
<tr>
<td><strong>Man and Nature</strong></td>
<td>Elem., H.S.  K,1,2,3,4, 6,7,8,H.S.</td>
</tr>
<tr>
<td><strong>Effect of Technology</strong></td>
<td>1,4,6,7,8, H.S.</td>
</tr>
<tr>
<td><strong>National Parks</strong></td>
<td>H.S. 3,H.S.    3,5,6,8,H.S.</td>
</tr>
<tr>
<td><strong>Urban Sprawl</strong></td>
<td>H.S.            3,5,7,H.S.</td>
</tr>
<tr>
<td><strong>Recycling</strong></td>
<td>M.S., H.S. K,1,4,6,7, H.S.</td>
</tr>
<tr>
<td><strong>Ozone, greenhouse effect, changing climate</strong></td>
<td>Elem. 4,5,6,7, H.S.</td>
</tr>
<tr>
<td><strong>Aesthetic pollution</strong></td>
<td>H.S.</td>
</tr>
<tr>
<td><strong>Camp Bird Outdoor Ed.</strong></td>
<td>H.S.</td>
</tr>
<tr>
<td><strong>Endangered species</strong></td>
<td>K,6,H.S.</td>
</tr>
<tr>
<td><strong>Erosion</strong></td>
<td>3,4,5,8,H.S. 6,7,H.S.</td>
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<tr>
<td><strong>Man and Nature</strong></td>
<td>Elem., H.S.  K,1,2,3,4, 6,7,8,H.S.</td>
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<td><strong>Effect of Technology</strong></td>
<td>1,4,6,7,8, H.S.</td>
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<td><strong>National Parks</strong></td>
<td>H.S. 3,H.S.    3,5,6,8,H.S.</td>
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<td><strong>Urban Sprawl</strong></td>
<td>H.S.            3,5,7,H.S.</td>
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<td><strong>Recycling</strong></td>
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<td><strong>Ozone, greenhouse effect, changing climate</strong></td>
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<td>H.S.</td>
</tr>
<tr>
<td><strong>Camp Bird Outdoor Ed.</strong></td>
<td>H.S.</td>
</tr>
</tbody>
</table>
Appendix B
Wisconsin Environmental Education Board
110B CNR, University of Wisconsin-Stevens Point, Stevens Point, WI 54481

GRANT AWARD ACCEPTANCE FORM 98-99

Project Title: In the Air
Grant Award: $3,965 Log Number: 66

Beverly Schewe
Marinette School District
1010 Main Street
Marinette, WI 54143

The undersigned hereby accepts a grant in the amount indicated above, and certifies that:

1) The services and products described within the applicant’s 1998-99 grant proposal to the Wisconsin Environmental Education Board will be carried out as proposed. Itemization (rate diem or per hour) for project director, teacher, and air quality instructor shall be submitted to Board along with this signed Grant Award Acceptance form.

2) No grant funds will be used to replace or supplant existing funding from other sources.

3) The matching requirement will be met as indicated in the project proposal.

4) No funds will be encumbered prior to receipt of the official Notification of Grant Award form funds must be encumbered or expended on or before December 31, 1999.

5) Budgetary changes not to exceed 10% of a budget category may be made without the advance approval of the Wisconsin Environmental Education Board (WEEB). Budget variances over 1 must be approved in advance by WEEB.

6) Original receipts and documentation for expenditures will be kept by grant recipient for 5 years after grant period ending date.

7) Interim reports will be prepared according to WEEB format for the periods ending December March 1, and July 1 and submitted by the 15th of the corresponding month.

8) A final report will be prepared and submitted within 60 days of the end of the project or January 31, 2000 whichever is earlier. The final report will include three copies of:
   - The End of Year Summary Report form
   - A narrative discussing the level of achievement of the project’s goals and objectives, with two or three photographs of representative activities
   - The final Budget Expense Summary and Program Fiscal Report (PI 1086) forms
   - Copies of all written, visual, or audio materials produced.

9) All materials produced under the grant shall be copyright of the Wisconsin Environmental Education Board, and bear the citation “Produced under a 1998-99 grant from the Wisconsin Environmental Education Board.”

Beverly Schewe

Date 4/23/98

s115.375(2)(b), Wisconsin statutes

Please sign and return this form before May 1, 1998

Phone (715) 346-4973  Fax (715) 346-3025  Email weeb@uwsp.edu
Application Cover Page

WI Legislative Districts
Assembly District(s).
89th

Nonprofit or LEA ID No.
3311

3. Administering Organization
Marinette School District

Project Director/Contact Person
Beverly Schewe

Mailing Address (Street, City, State, Zip)
1010 Main Street, Marinette, WI 54143

4. Project Director/Contact Person

5. Mailing Address (if different from above) Street, City, State, Zip

6. If different addresses, send mail to:

7. Project Title

In The Air

8. Has the project been submitted before?

9. Grant Request
$3,965.00

Matching Funds
$1,095.00

Percent Match: 27.6 % (25% minimum)

10. Projected Start Date
July 1998

Projected End Date
July 1999

Duration
12 mon

Certification
If this project is approved, the undersigned certifies that the organization will participate as indicated in the narrative and will provide the matching dollars by cash, services, or in-kind contributions. None of these grant funds will be used to supplant existing funding.

Chief Executive Officer
Hollister DeMotts

Signature

Title
Superintendent

Date signed
1-16-98

Abstract
Limit to space provided.

One hundred twenty five eighth grade students and their math, science, English, academic enrichment, and learning disabled teachers will participate in an air quality project spanning the 1998-1999 school year entitled "In The Air".

This program will be devoted to teaching both the teachers and subsequently their students how to use air quality equipment and interpret the data results. The teachers and their students will then communicate the information amassed to the public.
A. Project Title: In The Air  
Applicant: Marinette School District

B. Statement of Need

1. Target audience: A math, science, learning disabled, academic enrichment and English teacher from Team ROCK (Recognizing Outrageously Cool Students) and their respective students.

2. Need: These Team ROCK teachers need to develop the skills necessary to create an integrated unit about air quality and learn to use the air quality equipment necessary to carry it out. Their students need to experience the unit to understand the critical connections between each discipline that enhance understanding about our world.

3. Evidence of Need: Educational research states that integrated curriculum increases retention of skills. The Team ROCK teachers have limited experience integrating curriculum and are not skilled in using innovative technology in science. The eighth grade students have had limited exposure to multidisciplinary teaching and no experience in working with air quality instruments and interpreting their data.

4. Previous efforts: Teachers on this team have tried interdisciplinary teaching on a small scale and have seen greater retention of skills in students. They have also attended various conferences which gave evidence of the benefits of technology.

5. Priorities: This project addresses priorities A-1, A-2, B-1 and B-2. It promotes community environmental education while increasing the number of individuals involved and allows the community to know about the air quality of their environment. It also trains staff and makes use of existing resources and successful projects, because it will use the environmental curriculum and serve as a model of interdisciplinary teaching in the district.

C. Project Goals, Objectives, Evaluations, Activities

Goal 1: To help the teachers gain the skills needed to develop an interdisciplinary unit on air quality.

Objective 1.1: To increase the teachers' knowledge about developing an integrated unit concerning the condition of air quality. The teachers will evaluate the effectiveness of the unit on students through observation, written work, and formal testing of the students participating.

Activity 1.1.1: The project director will work with the teachers involved in July 1998 teaching them the skills necessary to develop an interdisciplinary unit on air quality.

Activity 1.1.2: Teachers will identify individual curriculum objectives that will be covered in the unit and how the objectives can be met.

Activity 1.1.3: Teachers will develop and distribute a survey to collect data from local residents concerning their experiences with air quality in Marinette and use this knowledge in developing the unit in August 1998.

Activity 1.1.4: Teachers will develop a set of criteria and means of assessment that demonstrate that each student participating in "In the Air" has learned the curriculum objectives.

Activity 1.1.5: Teachers will finalize the unit to be implemented in the 1998-1999 school year incorporating the knowledge attained in previous activities in August 1998.

Objective 1.2: Teachers learn how to study air quality using air quality instruments. They will evaluate the validity of the unit in each subject area as to how well the students perform.

Activity 1.2.1: Al Stenstrup will instruct the teachers proper procedures in the use of air quality equipment in August 1998.

Activity 1.2.2: Al Stenstrup will give instruction on how to interpret the data received from the air quality equipment.

Activity 1.2.3: Each teacher will reassess their activities to ensure that they will enhance the probability the unit will be a success.
Activity 1.2.4: Each teacher will develop benchmarks as a means of self-assessment to assure the success of the unit.

Goal 2.0: To empower students with the ability to measure, interpret, and communicate the affects pollution has on the quality of air. This project goal relates to knowledge, attitude/environmental ethics, and citizen action skills and experiences.

Objective 2.1: To help the students gain knowledge in the use of air quality equipment. Students will evaluate their success from grades received and overall satisfaction in personal performance.

Activity 2.1.1: Students will receive training in the use of air quality equipment. This is will be an on-going project throughout the year.

Activity 2.1.2: Students will test air quality periodically throughout the school year using milkweed, ultraviolet monitor colorimeters and an air pump.

Objective 2.2: Students will receive the critical experiences necessary to empower them to interpret the data received from the air quality equipment. Students/teacher interviews will evaluate this objective.

Activity 2.2.1: Students will be trained to read the data output from the air quality equipment.

Activity 2.2.2: Students will learn how to construct graphs using computer software and interpret the central tendencies.

Objective 2.3: To increase the students knowledge about writing with numbers to communicate.

Activity 2.3.1: Students will receive instruction on writing with numbers.

Activity 2.3.2: Students will interpret data into a written account. These writings will be submitted to the local newspaper for publishing.

Activity 2.3.3: Students will also deliver a lecture followed by a question/answer session to the sixth and seventh grade classes as means of closure and evaluation.

Project Evaluation: Assessments will be made continually throughout the school year with final staff assessments made in a forum type setting. Students will write their overall assessment of the project and submit it to the school board.


E. Innovation: This project is innovative not only through the integrated curriculum, but through the partnership established between the teachers, students, and community. This project will serve as a model for the development of integrated units in the district.

F. Continuation: This project will establish a better working relationship between the teachers from Team ROCK. We hope to encourage other grade levels in the effort to bring environmentally based science issues to life by involving multiple disciplines and the numerous environmental experts. All involved will continue to gain knowledge about our environment and add new units to address these issues.
### BUDGET SUMMARY

<table>
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<td>(Be specific. Identify &amp; quantify anything over $100.)</td>
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### End of Year Summary Report Form

<table>
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<th>Title</th>
<th>In the Air</th>
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<td>Audience/ Focus</td>
<td>8th Grade students, general public</td>
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#### Synopsis (Background & Purpose)

**Background:** Teachers on Team R.O.C.K. had done limited integration in the past. After an environmental survey completed by students in 1997, in which air quality was rated the number one environmental concern in the community, teachers on Team R.O.C.K. decided to create an integrated unit on air quality in Marinette. Teachers from science, math, English, social studies, academic enrichment and learning disabled classes did activities in their classes with all the students. Then students were divided into smaller groups to complete projects related to air quality. Drama, art and music teachers were also included in the projects.

**Purpose:** To instruct teachers on integration and air quality so they are able to design a unit on air quality in Marinette for eighth grade students.

#### Dates of Project
7/01/98 to 6/01/99

#### Products (Workshops, materials, skills developed) & Product Availability

In August 1998, teachers from Team R.O.C.K. were instructed about air quality by Al Stenstrup from the Wisconsin Department of Natural Resources. During August and September teachers met to develop a unit on air quality.

#### Evaluation

Evaluation was done throughout the project. At the end of the project students presented their projects to their parents and the community. The response from students, parents and the community was positive. Although it was very difficult to arrange schedules among staff to work on the individual projects, the students liked being able to choose.
In the Air

The following contains how the goal and objectives of the “In the Air” unit were met:

**Goal 1.0:** To help the teachers gain the skills needed to develop an interdisciplinary unit on air quality.

**Objective 1.1:** To increase the teachers' knowledge about developing an integrated unit concerning the condition of air quality. The teachers will evaluate the effectiveness of the unit on students through observation, written work, and formal testing of the students participating.

**Objective 1.2:** Teachers learn how to study air quality using air quality instruments. They will evaluate the validity of the unit in each subject area as to how well the students perform.

**Goal 2.0:** To empower students with the ability to measure, interpret, and communicate the affects pollution has on the quality of air.

**Objective 2.1:** To help the students gain knowledge in the use of air quality equipment. Students will evaluate their success from grades received and overall satisfaction in personal performance.

**Objective 2.2:** Students will receive the critical experiences necessary to empower them to interpret the data received from the air quality equipment. Student/teacher interviews will evaluate this objective.

**Objective 2.3:** To increase the students knowledge about writing with numbers to communicate.

During August teachers from Team R.O.C.K. met with Al Stenstrup from the Department of Natural Resources for training in air quality. This training provided the teachers with the knowledge and resources to create and implement a unit on air quality with nine teachers and 130 students. Each teacher in math, science, English and social studies covered objectives about air quality in their classes (see appendix A- The Invitation/Abstract). Next students were allowed to choose one of the nine projects listed below. Each student then developed a presentation about air quality using technology to present at parent/teacher conferences.

**Summaries of In the Air Projects**

A. In this project, you will be required to research the cost to companies for air quality assurance. You will need to interview at least one company representative in charge
of air quality and ask the cost to them to ensure that the air in and around their company is clean and safe. You will need to compare the air quality of the State of Wisconsin to other neighboring states air quality and to at least one other state from each part of the United States. Using this information you can: prepare a Power Point presentation using the information that you gathered, create a commercial to use in a news program, put your information on a web site for the Marinette School District, create a pamphlet, or come up with a comparable project of your own. We will use any technology appropriate to your project.

B. As a segment of the “60 minutes” program, we will use a panel format to have a discussion about air quality. Students will film other students hosting an interview of DNR and local business people who hold licenses from the EPA. The object of the panel discussion is to inform the public about the process and procedures of ensuring air quality and how different segments work together to ensure that our air is safe. We will begin by brainstorming questions and doing research about air quality laws so we can ask the DNR person and plant managers informed questions. Then we will have the participants exchange views, opinions or stories about what happens “In the Air” of our city. We may also create a commercial and film it as part of the TV show. Students will work with Mr. Schroeder to edit and put together the interview and commercial, which will air on Cable TV.

C. In this project you will conduct scientific experiments on air quality and present the findings. The experiments will be designed using the scientific method and incorporate technology. The experiments will be conducted by you and you will present your findings using technology.

D. In this project, students will perform a one-act play in which TV reporters interview the eight major pollutants picketing in front of the EPA. Students will be required to memorize lines, type out programs, make props and costumes, create sound effects, and videotape the performance as part of their grade.

E. The project issues in this section will take an in-depth look at automobiles and how we rely on them. In just a few years, you will be driving. Why is it important to know how an automobile impacts the quality of our air? There are some exciting major projects in this section that include creating information for a web page, producing a news program, imaginatively making a television commercial or a radio advertisement, illustrating and establishing a pamphlet/flyer informing the public about autos, and conducting a Power Point presentation about all the jazzy facts from too much weight in your tank to why you should car pool and other driving tips.

F. Students in this section will put together a paper covering air quality. Research will be done using a variety of resources including the Internet, library, interviews of local businesses, DNR and EPA. We will learn what air is made of, define air pollution, give local and global sources of air pollution, how air quality is monitored, and what the standards are for clean air. We will describe and name legislation concerning air quality and discuss possible solutions to air pollution. We will present our findings in a
variety of ways using current and available technology.

G. In this project you will be required to research topics on the Internet such as murals, artists, air quality, and environmental issues. You will need to keep all information neatly organized in a binder for use as a reference. You will need to use creativity in designing and painting a mural on a 4x8 foot piece of wood which will reflect your community, state, country or world. The mural will be painted in an artist’s style you have chosen and will include an air quality theme. You will also use a word processing program to write a description of your mural. When the mural is complete, we may send in a photo to the Wisconsin Department of Natural Resources for them to include on their EEK web site.

H. In this section, students will work on one of the following:
   Students will use creative writing, interviewing, video editing, and technical design to write a news story or interview a person who has something to do with air quality. Students will then video tape their work and edit it into the proper format. These stories will then be put into a 20/20 format.
   Students will take some aspect of what was learned through the “In the Air” unit and present their findings on a web page for Marinette Public Schools.
   Students will combine creative writing, scanning, digital pictures and technical design to develop a public service type announcement for TV or radio.

I. In this project students will write the music and words for a blues song. The sound will have 3 verses and a chorus. A basic piano accompaniment will be provided, but each student will need to provide one or more instruments to the song. The song will then be performed by the computer and the student, or I will take the singing part if they are nervous.

Students worked on the projects at various times over the span of three months. During this time students worked individually, in groups and with their teachers and parents to complete the projects. Evaluations were completed throughout the projects (see appendix B).
THE INVITATION/ABSTRACT

THIS INTERDISCIPLINARY UNIT IS PLANNED FOR GRADE 8 MATH, SCIENCE, ENGLISH, SOCIAL STUDIES, ACADEMIC ENRICHMENT, DRAMA, ART, LEARNING DISABLED AND MUSIC. THE COLLABORATING TEACHERS HEADED BY THEIR PRINCIPAL, MICHAEL WILFER, ARE: KEITH SCHROEDER, BEVERLY SCHEWE, MICHAEL WILFER, PAUL OKRAY, BRENDA PIRLOT, CORRY LAMBIÉ, CAROL HERMAN, PAT MANS AND CHRIS SIEM.

UTILIZING A WEEB GRANT, A WATF GRANT, AND FUNDS AND EQUIPMENT DONATED BY EMERSON ELECTRIC-MENOMINEE, THE STUDENTS WILL INVESTIGATE AIR QUALITY IN MARINETTE AND THE SURROUNDING AREA.

IN EVERY CLASS THE STUDENTS WILL

- IDENTIFY ENVIRONMENTAL AIR QUALITY ISSUES
- INVESTIGATE AIR QUALITY USING RESOURCES AND EQUIPMENT AVAILABLE
- USE THE SCIENTIFIC METHOD TO INVESTIGATE THIS ENVIRONMENTAL ISSUE
- COLLECT AND ANALYZE DATA WHICH WILL BE REPRESENTED USING APPROPRIATE TABLES, GRAPHS, ETC.
- RECOGNIZE THE ECONOMIC IMPLICATIONS/BENEFITS OF AIR QUALITY LEGISLATION
- DESCRIBE THE RELATIONSHIP BETWEEN ENVIRONMENTAL ISSUES AND THEIR IMPACT ON A COMMUNITY
- ANALYZE REAL WORLD SITUATION BY MODELING, ILLUSTRATING, GUESSING, SIMPLIFYING, GENERALIZING, ETC.
- DIFFERENTIATE CAUSE AND EFFECT
- USE AND INCORPORATE A VARIETY OF TECHNOLOGY TO COMPLETE LEARNING PROJECTS

LEARNING CONCEPTS BY DISCIPLINE

ENGLISH

- EXPRESS DATA IN A NARRATIVE FORMAT
- RECOGNIZE BIAS/PREJUDICE
- ORGANIZE INFORMATION
- DELIVER ORAL PRESENTATION ON FINDINGS
- DEVELOP TECHNICAL WRITING SKILLS

MATH
• Understand the principals of percentage, central tendencies, formulas, measurement, statistics

• Utilize reasoning abilities to validate findings

• Read, interpret, and express the data output of the air quality equipment

• Use the TI-83 graphing calculator and CBL labs

SCIENCE

• Understand and use the scientific method

• Understand the elements of atmosphere

• Be able to use air quality equipment

• Use the TI-83 graphing calculator and CBL labs

SOCIAL STUDIES

• Understand the principal of cause and effect

• Recognize relationships

• Give examples of causes/consequences of local air quality issues

• Analyze the use of the local environment and explain the effect of air quality on the environment

• Analyze and interpret data

• Understand the role of local government, agencies

• Understand the role of the EPA, Department of Health, OSHA

• Understand how individuals in society influence laws, legislation

• Compare and contrast how adjacent communities address environmental issues

ART

• Understand the basic elements of design

• Recognize the elements of composition and design in advertising

• Research and create an environmental themed mural

• Become familiar with art software and image scanning

• Create an original art work using technology

MUSIC
• UNDERSTAND STYLE OF BLUES
• UNDERSTAND THE ELEMENTS AND COMPOSITION OF BLUES
• PERFORM BLUES MUSIC
• RESEARCH BLUES MUSIC HISTORY
• USE THE ELECTRONIC KEYBOARD AND SEQUENCING PROGRAMS TO CREATE ORIGINAL MUSIC AND SONGS
• WRITE ORIGINAL LYRICS FOR A BLUES COMPOSITION

DRAMA
• UTILIZE VARIOUS DRAMATIC FORUMS TO COMMUNICATE A THEME
• CREATE STORYBOARDS
• UNDERSTAND SCRIPT WRITING
• UNDERSTAND THE BASIC OPERATIONS OF A NEWS PROGRAM
• PREPARE A NEWS PROGRAM/COMMERCIAL FOR A TARGET AUDIENCE

TECHNOLOGY UTILIZED
• CREATE A WWW PAGE
• ART SOFTWARE
• TI-83 AND CBL'S
• SCANNERS
• DIGITAL CAMERAS
• ELECTRONIC KEYBOARDS
• COMPOSITION SOFTWARE
• GRAPHING SOFTWARE
• SEQUENCING SOFTWARE
• AIR QUALITY EQUIPMENT
• WORD PROCESSING SOFTWARE
• INTERNET
• DIGITAL EDITING EQUIPMENT
• CD PLAYERS
• OVERHEADS
• PROJECTORS
• TELEPHONE
Air Quality Project

Time table (due dates)

Due by: Dec 11
- Questions for interview of air quality person

Due by: Dec 18
- Interview of air quality person (video taped)

Due by: Jan 2
- Individual portions of group paper (include list of sources of information, graphs, and tables)

Due by: Jan
- completed group paper (should be covered and written on a computer)

Good luck !!!

Possible sources of information on the “internet”

www.epa.gov/ttn/oarpg/ramain.html
- gives lists of air quality legislation (laws about air quality)

halstm@dnr.state.wi.us
- you can E-mail this person (name is Mike Halstaed) he is a DNR air quality specialist and he can give you information on air quality in Wisconsin

Search topics for surfing the Net about air quality:
1. EPA
2. DNR
3. air
4. (air quality)
5. pollution
6. atmosphere
Air Quality Research Project

Students will put together a paper covering air quality. Students may work together in groups of up to six people. Research should be done using a variety of sources including, but not limited to:

1) internet
2) library
3) Interviews of:
   - local businesses
   - Department of Natural Resources
   - Environmental Protection Agency

The paper should include the following information:

1) tell what air is made of
2) define air pollution
3) give some local and global sources of air pollution
4) information gained from the interview with a DNR or EPA spokesperson including:
   - how they monitor air quality
   - what the standards for clean air are
5) name and describe some legislation concerning air quality
6) discuss some possible solutions to air pollution

The interviews will be videotaped and edited into a 60 minutes type program on air quality.
POSSIBLE QUESTIONS TO ANSWER IN YOUR WRITTEN REPORT OR PRESENTATION

1. What is the source of the pollution?  
2. Who does it affect the most?  
3. Does it damage plants or animals or humans?  
4. Is it harming the ozone layer?  
5. Is anyone managing the production of the pollution?  
6. Who pays for the clean up of the pollution?  
7. Are you directly affected by the pollution?  
8. How can we prevent further pollution?  
9. How many people, plant, or animals are affected by the pollution?  
10. What is being done about the pollution?  
11. What are your thoughts on the subject?  
12. What can you do to help?  
13. What damage has been done that can be fixed?  
14. What damage has been done that cannot be fixed?  
15. Could you do a survey to get people's opinion on the subject?

Your report should be at least 5 pages in length double spaced. It is due on December 21 and it MUST include statistics.

PLEASE COME IN AND LET ME REVIEW YOU WORK AS YOU GO ALONG. I WILL BE MORE THAN WILLING TO HELP YOU ANYWAY THAT I CAN.
Group or individual presentation.

What type of presentation are you going to do?
Describe it.

What are the main points that you want to get across to your audience?

What can you add to your presentation that will make an audience listen, read, watch, etc.
your presentation?

How can you explain why you think that what you are “selling” is important?

What technology are you going to use?
How is it available to you?
Set up a timeline with dates that say how much of your presentation will be complete on
each date shown.

Your final presentation is due to me by Monday, January 18. You will be
presenting your information to your peers on the 22\textsuperscript{nd}, so we want to be ready.

LET ME KNOW HOW I CAN HELP!!!!!!!!!!!
The Awful Eight
Written Assignment

PARTICULATES
(GRIME, SOOT, DUST)

Your assignment, if you choose to accept it (and you will!) will be to TYPE a one page paper on one of the eight major air pollutants. It will be double spaced and typed in a size 14 font. Please include the following information in your report:

Common Name:

Scientific Name:

Where it is found:

What causes it:

Negative effects:

Positive effects:

Possible ways to eliminate the pollutant:
In the Air-Group D
Chris Siem

The one act play “The Awful Eight” depicts the eight major air pollutants picketing in front of the E.P.A. (Environmental Protection Agency). Students will be asked to:

- audition for a role of their choice before peers
- memorize lines
- create props, costumes and set
- create a program for guests
- research and write a one page paper on the pollutant character they played in the play (see attached writing guide)
- create note cards, based on the research done, to answer the following questions:
  1. What have you learned about the importance of the air we breath?
  2. What have you learned about the technology used in your air quality project?
  3. What advice would you give someone with regard to air quality, who doesn’t have the background information you do?

- orally respond to the above questions following the live performance.

Students were given grades based on:

- participation
- preparation
- presentation
A one-act play about the major air pollutants.

Dirty Air!

Dirty Way?

Dirty Air!

Let's Keep Air!

Dirty Way?

Dirty Air!
Cast of Characters

Connie Lung, reporter
Harry Wheezer, reporter
The Particulates
Carbon Monoxide
The Toxics
Sulfur Dioxide
Nitrogen Oxides (The Nitros)
Bad Ozone
Good Ozone
Chlorofluorocarbons Mindy LaCombe
EPA Scientists

Carbon Dioxides
Sandra Kitzinger
Jesse Rhoades

Commercials

Tootsie Pop:
Brian Dieck, Mindy Lacombe, Amanda Sieman, Tina Adkins

Toys 'R' Us:
Nicole Schmidt, Tracy Reisewyk, Jenny Meyer

Program Typed By: Brian Dieck
Air Quality Supervisor: Mrs. Slem
This project combines elements of creative writing, music theory, and music history.

I. Presentation

A. I will give a computer presentation to the English classes which will give a short history of the Blues. I will then perform an original blues song for the class and give an overview for the assignment.

II. The Assignment

A. The students will provide words and music for a twelve bar blues song.
   1. The song will have 3 verses and a chorus.
   2. A basic piano accompaniment will be provided, but each student will need to provide one or more instruments to the song.
   3. The song will then be performed by the computer and the student, or I will take the singing part if they are nervous.

B. The song will be graded equally in three(four) categories.
   1. Originality of the words for the song.
   2. Ability to identify the blues form and add their words to the formula.
   3. The addition of instruments to the song.
   4. The final performance
WHERE’S THE AIR? NEWS PROGRAM PROJECT

This project combines creative writing, interviewing, video editing and technical design.

1. Students will decide on a news story or a person to interview who has something to do with air quality
2. Students will videotape their presentation
3. Students will take their videotaped presentation and edit into the proper format
4. Students will assemble their individual presentations into one log presentation with narration in between the news stories — much like 20/20

The projects will be graded in categories
Individual project
1. Initial interview planning
2. Actual Interview
3. Final individual presentation
4. Group project organization
5. Group final news show

WHERE’S THE AIR? WEB PAGE PROJECT

This project combines creative writing, interviewing, scanning, digital pictures and web page design.

Students will take some aspect of what was learned through the “Where’s the Air” unit and present their findings on a web page for Marinette Public Schools.

The pages can be typed with ClarisWorks or Microsoft Word but must be saved in HTML format for upload to the WEB server.

The projects will be graded on
1. Content
2. Arrangement of information
3. Visual appeal
4. Use of pictures/graphics
5. Overall impression

WHERE’S THE AIR? RADIO/TV AD PROJECT

This project combines creative writing, scanning, digital pictures and technical design.

Students will take something that was learned through the “Where’s the Air” unit and put it into the form of a public service type of announcement for TV or radio.

The projects will be graded on
1. Content
2. Originality
3. Use of medium
Mural Project
Art and Air Quality
Brenda Pirlot - Art Instructor
Marinette Middle School

Purpose:
For eighth grade students to be involved in an integrated project with art and other subjects, all surrounding the theme of air quality.

Objective:
Students will work in a cooperative group (3 to 4 students) to create a mural on a 4' x 8' piece of Luann plywood. The mural will reflect a particular artist's technique and style. (ex. Picasso, Monet, Kandinsky, etc.) Students will also base the mural on the theme of air quality and environmental issues in our community, state, country or world.

Procedure:
1. In their groups students will need to begin by researching murals and artists who paint murals. (ex. Diego Rivera) This may be done through the library (books, magazines and videos), on the Internet, or using software which includes encyclopedias or art-related topics. A discussion about materials found will include myself and the students.
2. As a group the students will need to choose one artist to research and demonstrate techniques within the mural. The artist's style will be as important in the mural as the air quality theme.
3. Discussions and research will continue on the artist chosen for each group. Practice sketches and paintings of the artist's style will be done.
4. There will be 4 murals which will be about one universal topic air quality and environmental issues. Each group will be assigned an area of focus for their mural. Mural 1 will address community issues; Mural 2 will address state issues; Mural 3 will address country issues and Mural 4 will address world issues.
5. Once each group has researched murals, chosen an artist, and have been assigned a focus for their mural the group will begin brainstorming ideas and researching the topic of air quality.
6. Each student will be responsible for some ideas and drawing of the mural. A small drawing will be done on 8" x 16" white paper. The drawing will then be blown up to scale using an opaque or overhead projector and transferred onto the 4' x 8' piece of Luann plywood.
7. The remainder of the project will consist of elbow grease and the students of the group working on painting their mural. Depending on the artist that was chosen, some groups may have 3-dimensional elements in the mural.
8. When the mural is complete the students will need to use a word processing program to write a one page description of their mural. The description should include information about the artist's style which as demonstrated and why that artist was chosen. The description should also include information about the focus of the painting (community, state, country or world) and what environmental issues are displayed in the mural. This description will be framed and will hang next to the mural.

Assessment:
Peer Evaluation 25 points
Self Evaluation 25 points
Instructor Evaluation 25 points
- organization and research 5 points
- creativity and originality of mural idea 5 points
- neatness of art media application (painting, drawing, etc.) 5 points
- effort and behavior 5 points
- overall presentation of final project 5 points

Gathering of Materials 25 points
- research of murals/artists who paint murals 5 points
- research of Artist chosen 10 points
- research of air quality and environmental issues 10 points

Organization of Materials and Project 25 points
• group research materials organized in binder 20 points
• organization and clean up of art materials 5 points

Technology Evaluation 50 points

• use of internet in researching of materials 20 points
• use of other technologies (video, projector, software) 10 points
• one page description using a word processing program 20 points

Total Points 200 points

*A break down of peer and self evaluations will be discussed between myself and the students in each group.*
In the Air- Technology Project

This project combines scientific experiments and technology.

A. The students will conduct an experiment on air quality and present their findings.
   1. The experiment will be designed following the scientific method.
   2. The experiment will incorporate the use of technology.
   3. The experiment will be conducted by the student.
   4. The experiment and results will be presented using technology.

B. The final product will be graded on:
   1. Use of the scientific method in designing the experiment.
   2. Technique in carrying out the experiment.
   3. Integration of technology.
   4. The final presentation.

C. Rubric

peer evaluation 25
self evaluation 25
Instructor evaluation 25
Gathering of Materials 25
Organization 25
Presentation 25
Use of Technology 25
Exploring Air Issues through a Community Survey

by Al Stenstrup, Education Outreach Coordinator, Wisconsin Department of Natural Resources

Is air pollution a problem in your community? What is your community's average vehicle occupancy? How do students travel to school? What do your neighbors think of carpooling? What are they willing to do to reduce pollution? How does your community compare to others in the state?

One method for investigating air issues in your school and community is through the use of a survey. It is an interactive process that requires preparation, involvement, and interpretation. The results can help lead students to take an active role in solving or reducing a problem in their community.

Several different methods can be used to study environmental issues. Here are three of them:

Surveys. A survey can be used to collect information about environmental conditions in your school and community. They focus on information about a specific problem in a certain area. Example: How many cars are in the school parking lot?

Questionnaires. These sets of questions focus on a particular subject and are given to a carefully selected population of people. They collect only the facts—not the person's opinion. Example: How many teachers carpool to school?

Opinionnaires. Opinionnaires are similar to questionnaires except that they measure the beliefs or opinions of people on certain subjects at a specific time. Example: Do you consider air pollution to be a problem in your community? Yes—No—Undecided

Before a method is selected it is important that students carefully decide the exact information that needs to be collected, the geographic area, and the target population that will be surveyed. A combination of methods can also be used. Accurate collection of the information is next. The students should prepare a data summary sheet to record their information.

Once the data has been collected, students will be challenged to interpret the information and suggest recommended actions that need to be taken.

A valuable book to assist you in developing and utilizing surveys is, Investigating and Evaluating Environmental Issues and Actions: Skill Development Modules by Harold Hungerford and others, Stipes Publishing Company, 10-12 Chester Street, Champaign, IL 61820

A Model Opinion Poll

Hello, my name is _______________________.

I am a student at ______________________ School. I am doing research on air and transportation issues in our community. I would like to ask you several questions about this subject.

Person Responding: □ Male □ Female Age ______

1. Do you consider air pollution to be a major health problem in your community? □ Yes □ No □ Undecided

2. Do you consider industry to be a major contributor to air pollution in your community? □ Yes □ No □ Undecided

3. Do you consider vehicles to be a major contributor to air pollution in your community? □ Yes □ No □ Undecided

4. Do you consider other states to be a major contributor to air pollution in your community? □ Yes □ No □ Undecided

For each of the following statements, tell me whether you strongly agree, agree, neutral, disagree, or strongly disagree.

5. People traveling to work should be required to carpool or take public transportation if it is available.
   □ Strongly Disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

6. Students should be required to carpool or take public transportation to school.
   □ Strongly Disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

7. The gasoline tax should be increased and the money used to support mass transit programs.
   □ Strongly Disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

8. The government should increase research support for the electric car.
   □ Strongly Disagree □ Disagree □ Neutral □ Agree □ Strongly Agree

9. Auto makers need to increase fuel mileage on all their cars and trucks.
   □ 1 □ 2 □ 3 □ 4 □ 5

10. Laws should be established to stop all open burning.
    □ 1 □ 2 □ 3 □ 4 □ 5

11. Developing countries need to address air pollution as a major environmental problem.
    □ 1 □ 2 □ 3 □ 4 □ 5

12. Communities should increase their construction of bike trails for workers and students to use.
    □ 1 □ 2 □ 3 □ 4 □ 5

Thank you.

Send your survey and results to: EE News, IE/6, P.O. Box 7921, Madison, WI 53707. They may be included in a future issue. Here's a sample opinion poll that you can use if you don't want to make up one of your own. 

Test Yourself: How Much Do You Know About Motor Vehicle Usage?

1. What percentage of trips by United States and Canadian residents are made by private car?
   __40% __60% __80%

2. In the United States, what percentage of all car trips are for commuting to work, school, or business-related matters?
   __30% __50% __70%

3. How many miles each way do most U.S. commuters drive to and from work?
   __5 miles (8 kilometers) __10 miles (16 kilometers) __25 miles (40 kilometers)

4. What percentage of Canadians walk or bike to work?
   __3% __9% __25%

5. What percentage of U.S. commuters have free parking at work?
   __15% __50% __90%

6. Most workers who commute by car drive from (check one):
   __suburb to city __city to city __suburb to suburb

7. What percentage of workers in the United States commute to work by public transportation?
   __5% __20% __60%

8. What percentage of the passenger vehicles sold in the United States today are light trucks, vans, or jeeps?
   __10% __30% __50%

9. Since 1988, average fuel economy of new cars in the United States has:
   __increased __stayed the same __decreased

10. Automobiles account for what percentage of the oil consumed in the United States?
    __25% __50% __75%

11. In the United States, gasoline is
    __less expensive __more expensive __about the same
    compared with Europe and Japan.
Test Yourself: How Much Do You Know About Motor Vehicle Usage? (continued)

12. Since the oil embargo of 1973, is the United States:
   ___ less dependent ___ more dependent ___ equally dependent
   on oil from other countries?

13. In 1990, payments for imported oil accounted for what percentage of the U.S. trade deficit?
   ___ 10% ___ 25% ___ 60%

14. Older, poorly maintained cars make up 10% of the cars in the United States, but they account for what percent of all emissions?
   ___ 10% ___ 50% ___ 90%

15. Which human activity is the largest contributor to air pollution?
   ___ industry ___ motor vehicle use ___ the worldwide burning of forests

16. More land in the United States is used for roads, driveways, parking lots, and garages than is used for housing.
   ___ True ___ False

17. The three United States cities with the worst traffic congestion are:
   ___ Los Angeles, New York, and Chicago
   ___ San Francisco, Los Angeles, and Washington, D.C. ___ Miami, Los Angeles, and Detroit

18. The number of motor vehicles in the United States are increasing at:
   ___ about the same rate as the population ___ twice the rate of population growth
   ___ three times the rate of population growth

19. Per capita, United States residents are driving:
   ___ more miles each year ___ fewer miles each year ___ same as previous years

20. Compared with drivers from other industrialized countries, the average United States resident drives:
   ___ twice as many miles per year ___ three times as many per year
   ___ the same number of miles per year

21. What percentage of all the automobiles in the world are in the United States (tip: the United States has 5 percent of the world’s population)?
   ___ 9% ___ 34% ___ 65%
The A/C consumes nearly a gallon of gas per tankful to keep you cool. Auto air conditioners contain about three pounds of CFC12, compared to just a few ounces in a typical home refrigerator. The use of CFC12 in cars has been limited by international agreement, with a goal of eliminating it worldwide by year 2000. Have it checked frequently. If it is leaking and must be recharged, bring it to a reputable service station that collects and recycles the remaining CFC's rather than releasing them into the air.

Nitrous oxides and other compounds notably sulfur dioxide, contribute to acid rain. The US has improved pollution standards since 1970, offsetting any pollution reductions.

Besides oil and gas there are three essential automobile fluids: Antifreeze, brake fluid, and transmission or power steering fluid. Check all three regularly. When they need to be changed, collect the old fluid in a leak proof container with a lid and bring it to a service station.

When you step on the gas pedal, volatile, flammable gasoline, one of the many products refined from crude oil, is mixed with air. The vaporized gasoline is channeled into a cylinder, a tube sealed at one end and blocked at the other end by a movable plug called a piston. Most cars have four, six, or eight cylinders. As the piston moves up the cylinder, it compresses the gas/air mixture. When the mixture is tightly compressed, the spark plug produces a spark which ignites the mixture trapped in the cylinder. The gas explodes, increasing pressure on top of the piston and forcing it down. As the piston moves up the second time, an exhaust valve opens at the top of the cylinder and gases created from the burning gasoline vapor rush out with a loud noise. This cycle is repeated several hundred times a minute in each cylinder.

The 20-year-old law cleared much of the smoke from America's skies, but we can't stop there. Amended in 1990 the act sets tougher limits on auto emissions and proposes transportation controls, especially for southeastern WI and other urban areas where ozone is a problem.
RUBRIC FOR EVALUATING MY PROJECT

DIRECTIONS:

Using this rubric, evaluate the different elements of your project with your teacher.

STUDENT NAME ______________________________ TEACHER NAME ______________________________

DATE OF EVALUATION __________________ PROJECT TOPIC __________________

RATE EACH OF THE ELEMENTS OF YOUR PROJECT USING THIS ANALYTIC RATING SCALE:

3 = Excellent 2 = Good 1 = Fair 0 = No Evidence

ELEMENTS OF PROJECT TO BE EVALUATED:

1. Choice of topic
2. Guiding questions or objectives
3. Quality of research
4. Organization
5. Knowledge of topic
6. Imagination or creativity
7. Use of visuals
8. Degree of effort

STUDENT ______________________________ TEACHER ______________________________

WHAT DO YOU THINK WAS THE BEST THING ABOUT THIS PROJECT?

Student ______________________________

Teacher ______________________________

WHAT DO YOU THINK COULD BE IMPROVED MOST ON THIS PROJECT?

Student ______________________________

Teacher ______________________________

HOW DOES THIS PROJECT COMPARE WITH OTHERS YOU HAVE COMPLETED IN PAST CLASSES OR YEARS?

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

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Air Quality Group Contract

I agree to do my part for the air quality project I am about to begin. I know that I have chosen to work in a group and my work and effort will effect the others in the group. I will have my work done on the agreed upon date. I will listen to advice about my work from the others in my group and give my advise to them about their work. I will inform Mr. XXXX if any of my team members are not doing their part immediately. I know that the grade I receive as a group is the final grade and that I have agreed to accept it.

Group member are:
1. 
2. 
3. 
4. 

Student signature: ___________________________ Date ____________
Parents signature: ___________________________ Date ____________

Air Quality Group Contract

I agree to do my part for the air quality project I am about to begin. I know that I have chosen to work in a group and my work and effort will effect the others in the group. I will have my work done on the agreed upon date. I will listen to advice about my work from the others in my group and give my advise to them about their work. I will inform Mr. XXXXX if any of my team members are not doing their part immediately. I know that the grade I receive as a group is the final grade and that I have agreed to accept it.

Group member are:
1. 
2. 
3. 
4. 

Student signature: ___________________________ Date ____________
Parents signature: ___________________________ Date ____________
Peer Evaluation—25 points

- Does s/he complete activities on time? 0 1 2 3 4 5
- Does s/he contribute and participate? 0 1 2 3 4 5
- Does s/he stay focused? 0 1 2 3 4 5
- Does s/he consider others feelings? 0 1 2 3 4 5
- Does s/he persevere? 0 1 2 3 4 5

Self Evaluation—25 points

- Do I complete my activities on time? 0 1 2 3 4 5
- Do I contribute and participate? 0 1 2 3 4 5
- Do I stay focused? 0 1 2 3 4 5
- Am I careful to consider my classmates feelings? 0 1 2 3 4 5
- Do I persevere? 0 1 2 3 4 5

Instructor Evaluation—25 points

- organization and research 0 1 2 3 4 5
- creativity and originality 0 1 2 3 4 5
- neatness 0 1 2 3 4 5
- effort and behavior 0 1 2 3 4 5
- overall presentation of final project 0 1 2 3 4 5

Gathering of Materials—25 points

- applicable? 0 2 4 6 8 10
- ample? 0 1 2 3 4 5
- too much? 0 1 2 3 4 5
- use of various sources? 0 1 2 3 4 5

Organization of materials for project—25 points

- flow 0 1 2 3 4 5
- get point across 0 2 4 6 8 10
- provide an outline with key points and supporting information 0 1 2 3 4 5
- group research materials together in a binder 0 1 2 3 4 5
Presentation of project and information—25 points

- professional 0 1 2 3 4 5
- boring 0 1 2 3 4 5
- did all contribute 0 1 2 3 4 5
- beginning 0 1 2 3 4 5
- end 0 1 2 3 4 5

Technology Evaluation of individual effort, group work and other observations—50 points

- use of medium (radio, TV., etc.) 0 2 4 6 8 10
- varied use of technology 0 2 4 6 8 10
(scanner, digital camera, etc.)
- respects equipment 0 2 4 6 8 10
- demonstrates complete understanding of technology used 0 2 4 6 8 10
- understands the potential of the medium 0 2 4 6 8 10
Appendix C
UNIVERSITY OF WISCONSIN-GREEN BAY  
PROFESSIONAL PROGRAMS IN EDUCATION  

Technology Institute for Educators

DATES:  
SECTION 1: August 3-6, 1998; 006-795-6, 732 #0107B  
SECTION 2: August 10-13, 1998; 006-795-6, 733 #0120B

CREDITS:  
2 Graduate Credits

INSTRUCTOR:  
Dr. Ted Korithoski  
UW-Green Bay  
Ph. 920-465-2076  
Email: korithot@uwgb.edu

DESCRIPTION:  
This course is part of a technology institute for educators and has been developed to address the educational needs of classroom professionals. Teams of professional educators will explore information and technology literacy, digital information, research, and design and assessment strategies for integrating instructional technology into classroom curricula. Teams will develop and implement curricular projects.

GOALS:  
1. Examine how information and technology literacy changes curriculum and learning.  
2. Acquire technical skills needed to integrate instructional technology into curriculum.  
3. Explore how software enhances curriculum and learning and provides flexibility across subject areas.  
4. Enhance team building skills to design, communicate, and implement your instructional technology project.  
5. Model ethical and competent use of instructional technology for students and colleagues.  
6. Develop a collegial network for future project development and consultation.

REQUIREMENTS:  
Final grades will be based upon a scale of A, B, C, D, F  
1. Class participation in all classes  
2. Completion of a personal journal  
   (A) recording the development of the project via monthly e-mail, July through December  
   (B) responding to statements or questions presented by the instructor, such as  
   "What information and technology literacy skills will students use in this project?"  
   "How can the technology products be applied in other content areas?"  
Criteria: The instructor will use the journal entries to check for understanding.
3. Development, implementation and presentation of a project that integrates instructional technology into the classroom.

(A) development of the project will be done as a team
(B) implementation in the classroom will be documented on tape
(C) presentation will be the team’s choice of a presentation package, such as Power Point, ClarisWorks or Aldus Persuasion and will be made available on a webpage

4. Each individual will develop his/her own presentation on a curricular topic of their choice. Must include graphics from Internet and/or CD-Rom and textual materials.

Criteria: Fulfillment of all requirements.
Successful implementation of the project
Thoughtful reflection and setting goals for improvement in future projects

**CONTENT OUTLINE**

Day 1  
Overview  
Information literacy supported by technology modeling  
Issues in technology and information literacy  
Creating authentic curricular projects  
Wisconsin Model Academic Standards  
Design of projects, expectations

Day 2  
Demonstrations of selected software and technology tools  
Discussion of instructional technology integration and classroom applications  
Project assessment and student evaluation issues  
Hands-on technology lab

Day 3  
Team project development  
Handling logistical issues in the classroom and school  
Hands-on technology lab  
Developing team action plans

Day 4  
Team project development, continued  
Additional hands-on technology lab as needed  
Preparation of action plan and project time line  
Sharing of action plans  
Class discussion of plans

Fall, 1998  
Team develops and implements the action plan in the classroom with the course facilitators as guidance and support. Times - to be arranged.

Spring, 1999  
Showcase of projects. Time(s) - to be arranged.
Teacher:
Pamela Lucas
Grand Avenue
High School,
Milwaukee

Grades: 9-10

Preparation:
Subject to teacher’s timeframe
and student cooperation

Activity duration:
15 weeks

Subject areas:
General science, Technology
education, Environmental edu­
cation, Mathematics, Fine arts,
Architectural design, Language
arts

Concept areas:
Management of energy
resource use, Future outlooks
for the development and use of
energy resources

More information:
Pamela Lucas
Grand Avenue High School
2430 West Wisconsin Ave
Milwaukee, WI 53233
School phone: (414) 933-9900
pjlucas@execpc.com

Design Your Own
Energy Efficient
Home

Want to “build” your own dream home and design it to be energy efficient? Students are challenged to design an energy efficient home using everything they have learned about energy use, heating, and cooling. Design challenges include:

- Create exterior and interior designs that are energy efficient for the climate in which the home is “built”
- Design each of the rooms to include energy efficient lighting, windows, window decorations, flooring, heating, and cooling appliances
- Landscape the exterior to provide additional energy efficiency
- Estimate the cost of building the home
- Prepare a final report that describes the design and an explanation for why students decided to design the home using the materials they selected
- Give a presentation to peers about the design

Working in groups of up to eight, students choose the roles of architect, carpenter, insulation installer, window installer, heating/cooling contractor, flooring specialist, landscape artist, electrician, and plumber. Home designs are required to fit within a space of 24 x 24 inches. Early models are made of construction and manila paper, with the final model constructed of foam core board. Throughout the course of fifteen weeks, students learn about careers in home building from visiting local professionals who speak on professions such as insulating, window installation, and landscaping. Students take extra steps to research the design of their homes by collecting information from the local home improvement show, contacting building centers and other professionals, and using the Design Your Own Home Suite Programs.

This intensive project requires students to make decisions, work cooperatively in groups, solve problems, use community resources, and use their creativity and knowledge of energy and technology to make their “dream home” as energy efficient as possible.
September 9, 1999

Great Lakes National Program Office
U.S. Environmental Protection Agency
77 West Jackson Blvd
Chicago, Illinois 60604

Dear Great Lakes National Program Office:

We are currently updating the Earth Science curriculum at the Marinette Middle School in Marinette, Wisconsin. While looking for local resources I came across your publication entitled The Great Lakes: An Environmental Atlas and Resource Book.

Since our city is situated on Green Bay of Lake Michigan, this publication provides valuable local information for our students that they wouldn't find in their textbooks. If possible, please send us a classroom set of this resource. Forty copies would be ideal for our classroom use, but we will gladly accept any amount you could send.

If you need any additional information please call or fax me at the above numbers. Thank you for your help.

Sincerely,

Michelle Herness
Leap Into Lakes Workshop
September 23-25

Attended by

Michelle Herness (8th Grade Science Teacher)
and
Jake Gruzynski and Stephanie Wheeler (8th Grade Students)

Two youth and an adult leader are invited to attend a Leap into Lakes Workshop as a team. The workshop will provide each team with a set of water quality testing equipment and the background and knowledge to use it. This is an excellent opportunity for students to get involved in their community and to collect actual scientific data.

Upon return, the team will instruct other students how to use the equipment and then test a local lake. The Marinette County Land & Water Conservation Department will assist with this part.
"Leap into Lakes and Get WET!" Workshop Agenda
Friday-Saturday, September 24-25, 1999
Upham Woods, Wisconsin Dells

FRIDAY, September 24th

8:00-9:00am Registration
(Main Lodge)

9:00-9:45 Introductions, Ice-Breaker Activity, Program Overview

9:45-10:15 Making the Lakes Connection!
(Laura Feldo, UWEX)

10:15-10:30 Break

10:30-12:00 Concurrent Sessions: Project WET Activities (Choose 3 of 4)
(Playing Field/Main Lodge)

* "Incredible Journey"
* "Lake Sense"
* "Sum of the Parts"
* "Common Water"

(Laura Feldo, UWEX)
(Ilene Grossman, UWEX)
(Dorothy Snyder, UWEX)
(Susan Tesarik, Fond du Lac Co. LCD;
Kathy Lane-Browne, Stevens Point Area School District)

12:00-1:00pm LUNCH

1:00-1:30 Overview of Taking Action & Program Planning
(Al Stenstrup, DNR)

1:30-2:00 Designing Lake-Related Action Research Projects, Leadership, & Team Building
(Al Stenstrup, Laura Feldo)

(Outside Exploration)

2:00-3:30 Lake Investigations
* Visual Surveys Human Impacts
Aquatic Plants and Aquatic Exotics

(Laura Herman, DNR)
(Sandy Wickman, DNR)
(Cathy Cleland, DNR)

3:30-5:00 Duck Boats Tour...Human Impacts

5:00-6:00 Dinner
Friday Evening Programming

7:00-8:00 Equipment Preparation for Field Studies
   Make and Take Rainsticks!

8:00-9:30 Campfire Ring...Networking and sharing

SATURDAY, September 25th

7:30-8:00am Breakfast

8:00-9:00 Monitoring in the Mornin’ with Laura Herman!
   (Laura Herman, Water Resource Management Biologist, DNR)

9:00-11:30 Monitoring Stations (Each station will run 45 minutes with a 10 minute break)
   * Dissolved Oxygen/Temperature
   (Sandy Wickman)
   * Water Clarity/pH
   (Brad Johnson, Scott Szymanski)
   * Maco-invertebrates (Aquatic Insects)
   (Laura Herman)

11:30-12:00pm Liminology keeping records
   (Laura Herman, DNR)

12:00-12:30 LUNCH

12:30-1:00 Workshop Wrap-up
   Each Generation....

1:00 “On the Road Again”
PTSA Wish List Request

Please consider the following items for your wish list:

2 D-Frame Aquatic Nets (Wards) $88
2 Rakes (Walmart) $16
2 Storage Totes (Walmart) $10
2 Specimen Trays (Wards) $30
2 Pairs of Waders $66

Total $210

**Rationale:** These items would be used for water testing. During the fall of 1999, two students (Jake Gruzyński and Stephanie Wheeler) and I attended an Adopt-A-Lake workshop where we were instructed on water quality testing procedures and given most of the equipment to do it. Jake and Stephanie, along with myself will instruct the other students on how to use this equipment in order to collect water quality data. We still need the items listed in order to complete the testing. All of our students would then be able to participate in the water testing. The Marinette County Land and Water Conservation Department will assist us in the collection of data and will be able to help with transportation of students to the site.

Thank you for your consideration.

Michelle Herness
8th Grade Science Teacher
December 12, 2001

Michelle Herness
Liz Bretl
Marinette Middle School
1011 Water Street
Marinette, WI 54143

SUBJECT: February 12th, 2002 teacher workshop at the Bay Beach Wildlife Sanctuary

Dear Michelle and Liz:

Congratulations! You and your school have been selected from 44 applicants as recipients of a groundwater model through federal wellhead protection funds provided to the Wisconsin Department of Natural Resources (DNR). The two of you are asked to attend a day-long workshop to learn about the model and share ideas with other teachers. The workshop will be held Tuesday, February 12, 2002 from 9 a.m. to 4 p.m. at the Bay Beach Wildlife Sanctuary in Green Bay. On that day, you will receive the groundwater model for your school. Before that date, you will be sent an agenda, a list of other recipients, details on the workshop location, and background materials on groundwater to review. Six DPI equivalency clock hours have been approved for this workshop.

One of the activities in the afternoon of the workshop will be a panel discussion by several DNR regional staff to answer questions about local groundwater issues. If you have questions about local geology, local groundwater conditions, land use concerns or pollution problems, please send them to me by January 10th so they can be addressed during the panel discussion. You can mail or email them to me.

I am looking forward to meeting you on February 12th! If you have any questions before then, please feel free to contact me by phone at 877-268-9355 (toll free) or by email at lindod@dnr.state.wi.us.

Sincerely,

David E. Lindorff, Hydrogeologist
Groundwater Section
Bureau of Drinking Water and Groundwater

cc: Mike Wilfer - Principal
Agenda
Groundwater Model Teacher Training Workshop
February 2002

8:30 Registration, coffee and rolls.

9:00 Meet the staff, other teachers, and resource people, and discuss the goals for the day.

Models will be presented to chosen schools by the Wisconsin Department of Natural Resources

Learn about groundwater and the sand-tank groundwater flow model through exploration, demonstration, and experimentation. See how experienced users demonstrate the model. Work with your partner teacher and resource person to develop a demonstration appropriate for your students' grade level.

12:20 Lunch (provided)

1:00 Ask the “expert panel” about local groundwater issues. Learn what “wellhead protection” means. Try a wellhead protection activity you can implement, or share your favorite groundwater lesson with other teachers.

Receive your own copy of the Wisconsin Groundwater Study Guide, and explore other groundwater curriculum materials and resources. Learn about useful groundwater web sites. Discover what groundwater data is available for your area.

Learn about our requirements for followup and evaluation. Clean up your model and prepare it for transport.

4:00 Adjourn.
Goal: Students will become aware of the various energy resources and the effects their use has on the environment. Students will then be able to make better educated decisions in the future regarding their energy consumption and choice of energy source.

Energy Concepts Addressed:

- 7. Second Law of Thermodynamics
- 10. Energy flows through many nonliving systems
- 16. Society needs energy to organize and maintain themselves
- 19. Primary energy sources come from nature
- 20. Secondary energy sources come from primary resources using technology
- 21. Energy sources serve societal needs and wants
- 22. The process of obtaining energy resources has evolved
- 23, 24. Earth's energy resources are unevenly distributed
- 25. Some resources are renewable while others are nonrenewable
- 26, 27. Wisconsin energy resources
- 28, 29. Supply and demand effects resources
- 48-51. Energy use has affected the environment and the health of the organisms in that environment
- 55, 56. Citizen Action
- 57, 58. New energy resources
- 59. Energy resource management and the future of the environment

KEEP Activities Used:

- Energy Debate
- Energy Divide
- Digging for Coal
- Dealing With Nuclear Waste
Energy

(Chapter 18-Merrill Earth Science text)

I. Intro Activity--Energy Sources (Text pg. 479)

II. Introduce Energy Debate Project (KEEP Activity D 158--Energy Debate)

III. Non-Renewable Resources--evolution of fossil fuels (Text pg. 480-484)
   A. Coal (Fact Sheet-F5)
      1. Advantages
      2. Disadvantages (KEEP Activity D 19--Digging for Coal)
   B. Petroleum (F29)
      1. Advantages
      2. Disadvantages (Oil Spill Activity-enclosed)
   C. Natural Gas (F18)
      1. Advantages
      2. Disadvantages
   D. Conservation

IV. Renewable Resources (Text pg. 486-496)
   A. Solar (F36 & F39)
      1. Advantages
      2. Disadvantages
   B. Wind (F42)
      1. Advantages
      2. Disadvantages
   C. Biomass (F2 &F46)
      1. Advantages
      2. Disadvantages
   D. Hydroelectric (F15)
      1. Advantages
      2. Disadvantages
   E. Nuclear (F23)
      1. Advantages
      2. Disadvantages (KEEP Activity E41--Dealing with Nuclear Waste)
   F. Conservation

V. Concluding Activities
   A. KEEP Activity D76--Energy Divide
   B. Keep Activity D158--Energy Debate
Energy

I. Intro. Activity--Energy Sources (text pg. 479)

Students will identify all the ways they have used energy and the sources of them for one day.

II. Energy Debate-KEEP Activity D 158

Students will be able to
-describe what is involved in developing energy resources to generate electricity;
-critically analyze the advantages and disadvantages of various energy resources; and
-use persuasive arguments to present and defend an energy resource.

III. Nonrenewable Energy sources (Text pages 480-484)

Students may complete study guide/reinforcement sheets if needed.

1. Describe the evolution of fossil fuels coal petroleum and natural gas
2. Explain why fossil fuels are called nonrenewable energy sources
3. Discuss how you can help conserve fossil fuels.

KEEP Activity D 19, Digging for Coal

Students will be able to:
-describe how coal is formed;
-identify how coal deposits are found and show that they are unevenly distributed throughout the United States;
-identify how coal is used in Wisconsin and the United States;
-simulate coal mining and its effects using chocolate chip cookies; and
-state the benefits and problems associated with mining and using coal.

IV. Renewable Energy Sources and Others /Nuclear Energy Science and Society (Text pages 486-496)

Students may complete study guide/reinforcement sheets if needed.

1. List the Advantages of using solar power, wind power, and hydroelectric power.
2. List the disadvantages of using solar power, wind power, and hydroelectric power.
3. Describe how nuclear energy is made.
4. List the drawbacks and advantages of nuclear energy.
KEEP Activity E 41-Dealing With Nuclear Waste
Students will be able to
-identify three types of nuclear waste and their sources;
-describe the decay pattern of radioactive isotopes using the concept of half-life; and
-assess different options for disposing of high-level nuclear wastes and select the disposal option they think is best.

V. Concluding Activities
A. KEEP Activity D76--Energy Divide
Students will be able to
-explain why they might concern themselves with the needs of future energy users;
-demonstrate how conservation practices can promote the long-term availability of a resource;
-appreciate how increased population places a strain on energy resources; and
-distinguish between renewable and nonrenewable resources

B. KEEP Activity D 158--Energy Debate
See objectives in section II
Modifications to Energy Lesson

--Text to be read independently will be highlighted
--Text to be read out loud as needed
--Students will be grouped cooperatively during activities
--Time constraints will be removed for tests and quizzes
--Students will be given a copy of the teacher's concept map
--Students will be given a copy of the teacher's outline
Upper Green Bay Watershed Unit Outline

I. Hydrology of the Watershed

A. Identify the amount of water on the earth and the percent of that water that is available for drinking and growing crops.
   • A Drop in the Bucket (Project Wet)

B. Describe the Water Cycle
   • 'Round and 'Round it Goes (Groundwater Study Guide)
   • The Incredible Journey (Project Wet)

Wisconsin's Model Academic Standards for Environmental Education

A.8.4 Use critical-thinking strategies to interpret and analyze gathered information
B.8.5 Give examples of human impact on various ecosystems
B.8.10 Explain and cite examples of how human shape the environment

II. Geology of the Watershed

A. Explain what a drainage basin is and identify your local watershed.
   • Watershed in a Box (Water Action Volunteers)
   • Map your Local Watershed (Action Guide)

B. Identify movement of water through the watershed.
   1. Surface Water
      • Stream Table Studies
2. Groundwater

- How Groundwater Moves (Groundwater Study Guide)
- Porosity and Permeability (Groundwater Study Guide)
- Well, Well, Well (Groundwater Study Guide)
- Wisconsin's Major Aquifers (Groundwater Study Guide)

Wisconsin's Model Academic Standards for Environmental Education

A.8.4 Use critical-thinking strategies to interpret and analyze gathered information
B.8.5 Give examples of human impact on various ecosystems
B.8.10 Explain and cite examples of how human shape the environment
C.8.2 Use environmental monitoring techniques; such as, observations, chemical analysis, and computer mapping software to collect data about environmental problems

III. Human Impact of the Watershed

A. Identify ways human activities impact a watershed.

1. Surface Water

- Urban Runoff Model (Water Action Volunteers)
- Erosion in a Bottle (Water Action Volunteers)
- Sum of the Parts (Project Wet)
- It'll Go With the Flow (Groundwater Study Guide)
- Field trip to local area to complete water quality testing (Field Trip Activity Packet)

2. Groundwater

- How Septic Systems Work (Groundwater Study Guide)
- A Plume of Contamination (Groundwater Study Guide)
Wisconsin's Model Academic Standards for Environmental Education

A.8.4 Use critical-thinking strategies to interpret and analyze gathered information
B.8.5 Give examples of human impact on various ecosystems
B.8.10 Explain and cite examples of how human shape the environment
C.8.2 Use environmental monitoring techniques; such as, observations, chemical analysis, and computer mapping software to collect data about environmental problems
C.8.3 Use questioning and analysis skills to determine beliefs, attitudes, and values held by people involved in an environmental issue
D.8.5 Explain how personal actions can impact an environmental issue
Title: Soil Survey Lab

Description: Students will examine a soil survey of their county. Then using the information contained on the maps and in the tables of the soil survey, students will be able to describe soil in a given area and determine suitable uses of a piece of land.

Grade Level/Subject: Grade 8 Earth Science

Objectives: Students will:
1. Become familiar with the information contained in a soil survey.
2. Describe the type of soil located in an area using a soil survey.
3. Determine if a piece of land is suitable for building on using a soil survey map and soil survey tables.

Background: A good reference for this activity is *Soil Science Simplified* by Helmut Kohnke and D.P. Franzmeier. It contains basic information on soils and a section on soil surveys. Students should be familiar with legal land descriptions or you will need to review this with them.

State Standards:
C.8.1 Identify questions they can investigate using resources and equipment they have available.
C.8.2 Identify data and locate sources of information including their own records to answer the questions being investigated.
C.8.6 State what they have learned from investigations relating their inferences to scientific knowledge and to data they have collected.

Materials:
1. Copy of Soil Survey of your county for each lab group.
2. Pencil and copy of Soil Survey Lab for each student.

Procedure:
1. Review the chemical and physical properties of soils with students.
2. Pass out a soil survey lab sheet to each student and a copy of the Soil Survey of your county to each lab group. Have students review the lab sheet and browse through the Soil Survey to determine the type of information contained in it.
3. Have students practice finding a location in the soil survey, determining the type of soil located there and how to find the description of that type of soil.
4. Once students are familiar with how to use the soil survey they may complete the soil survey lab sheet.

Assessment: Students will be assessed using the soil survey lab sheet.
Marinette County Soil Survey Lab

You are looking at buying 40 acres of land with the legal description of S/E¹⁄₄, S/E¹⁄₄, S26, T.32N., R.22E. Currently there are no buildings on the property. The property will be used as a retreat for now and will serve as your retirement home in the future. You would also like to grow Christmas trees on the property for a little extra cash.

Complete the following questions using the Soil Survey of Marinette County, Wisconsin.

Locate your property using the township and range system on the Index to Map Sheets located just before the soil maps. This will give you the number of the soil map where the property is located. Then locate the correct soil map for the property and find the location of the property on the soil map. There will be upper and lower case letters representing the soil types. Once you have figured out the soil type for the property you may find the description on pages 20-94 (Use the Index to Map Units on pages iv-v to find the location of your particular soil).

1. What types of soil(s) are located on the piece of property?
2. Give a brief description of that type of soil(s).

Use the tables on pages 169-263 to answer the following questions.

3. Is your soil considered prime farmland?
4. What trees would likely grow the best there?
5. What is the seedling mortality?
6. How difficult would it be to harvest your trees?
7. Would it be a good idea to build a house with a basement on the property?
8. What types of problems may you encounter when landscaping?
9. Will you encounter many problems with a septic system? What kind?
10. Based on the above information do you still want to purchase this property for the use you intended? Why or why not?
Field Trip Activity Packet

Seagull Bar State Natural Area

Background Information:

Seagull Bar is the only true dune complex along Green Bay and is an important migratory bird staging area. It is located at the southeast side of Marinette and can be accessed through Red Arrow Park. It was designated as a state natural area in November of 1962. (More information is contained in Seagull Bar State Natural Area (No.37) flyer attached)

Summary of Discussion with Wildlife Biologist John Huff:

Since Seagull Bar is managed as a natural area, human management is kept to a minimum. Normal natural processes are allowed to take place. The sand spit leads into Green Bay and shelters a lagoon and a large area of shallow water with emergent vegetation. There are some exotics in the area including carp, purple loosestrife and zebra mussels. They are attempting to remove the purple loosestrife from the area by manually pulling it out. It is thought the area would contain wild rice if the carp were not there.

The area changes in size due to the fluctuations in water level. Waterfowl use the lagoon during the spring and fall migrations. The area is heavily used and the day to day use is destructive to the area. All terrain vehicles have been used in the area and ducks blinds were once common and have been removed. Rip Rap was put on the beach at Red Arrow Park to stop erosion and is causing erosion in other areas of the dune. There are some land use issues in Seagull Bar concerning wildlife. Some people want to close off the area to use during the migration and breeding seasons to protect the wildlife, while some people want some coyotes removed since the area is so close to the city of Marinette.
Field Trip Activities

Pre-Activities:

Shorelines, Sand Dunes and Erosion

- Complete earth science lecture and labs related to shorelines, erosion and sand dune formation

Invasive Species

- Complete Aquatic Roots Activity from Project Wild Aquatic Activity Guide

Students will use reference materials to research various species of local aquatic plants and animals to find out whether they are natives or exotics and to investigate their impacts on people, other animals and the environment.

On-Site Activities:

Introduction:

The introduction to the area can be done by the teacher or a wildlife biologist or game warden if available.

Discuss the history of Seagull Bar and give general information about the area including any management issues. You may use this time to point out the shoreline erosion, invasive species and land-use conflicts over the area.

Break students into groups for the following sessions:

Session I

Water Quality Testing (Lagoon and Bay)

- Complete Water Canaries Activity from Project Wild Aquatic Activity Guide.

Students will investigate the lagoon and bay using sampling techniques including water temperature, pH, and the presence of a diversity of organisms.
Session II

Wildlife Habitat Studies

- Complete Bird Song Survey or Environmental Barometer from Project Wild Activity Guide.

Students will observe and count the wildlife in the area (plants and animals).

Session III

Human Impact on Wildlife

- Complete Too Close for Comfort from Project Wild Activity Guide.

Students experiment with physical distance and levels of comfort with humans, estimate appropriate distances between humans and wildlife under various conditions, hypothesize about indicators of animal discomfort, and summarize reasons to avoid animal discomfort through crowding.

- Complete Migration Headache from Project Wild Aquatic Activity Guide.

Students will role play migrating water birds traveling between nesting habitats and wintering grounds and are subject to hazards at either end of the migration path as well as along the way.

Wrap-Up

Students come together and discuss what they saw and did during the day. Instruct students to keep their data and bring to class the following day.

Post-Activities:

Land Use

- Complete Wildlife Issues: Community Attitude Survey from Project Wild Activity Guide.

Students develop a questionnaire and conduct a community survey.

- Complete Planning for People and Wildlife from Project Wild Activity Guide.

Students imagine and research what the area in which they live was like before a
community was developed; design planned communities; and build and evaluate models of their community designs. The community must be one which people live and work with the least possible negative impact on the existing vegetation, air quality, water, soil and wildlife.


SEAGULL BAR
STATE NATURAL AREA (No. 37)

Acreage, Location, and Boundary: Acres - 120; Quadrangle - Marinette 7.5'; County - Marinette; Township - 30N Range - 24E; Sections - 9 and 16.

Natural Division: Eastern Mesic Forest of Lake Michigan Shorelands.

Access: At the southeast edge of Marinette, via Leonard Street to Red Arrow Park. Walk southeast into the natural area.

Reason for Preservation: The site contains the only true dune complex along Green Bay and is an important migratory bird staging area.

Description: Seagull Bar is a sand spit that leads into Green Bay and shelters a lagoon and a large area of shallow water with emergent vegetation. The eastern edge of Seagull Bar is a system of sand ridges and dunes resulting from wave action and sand deposition. The rich dune flora ranges from emergent to xeric and includes marram grass, Canada rye, beach pea, and several rush species in wetter areas. The remainder of the area consists of mud flats and emergent aquatic. Acreage is always changing due to the bay's water level fluctuations. During some spring and fall migrations, shorebirds by the thousands congregate here. The lagoon area in particular is attractive to waterfowl. Small passerines are "trapped" occasionally by unfavorable weather conditions and then are seen in large numbers searching the flotsam.

<table>
<thead>
<tr>
<th>Communities or Features Present</th>
<th>Acres</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergent Aquatics</td>
<td>90</td>
<td>State</td>
</tr>
<tr>
<td>Lake Dune</td>
<td>24</td>
<td>State</td>
</tr>
<tr>
<td>Beach</td>
<td>6</td>
<td>State</td>
</tr>
<tr>
<td>Depositional Feature-Sand Spit</td>
<td></td>
<td>State</td>
</tr>
<tr>
<td>Bird Species Preserve</td>
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<td>State</td>
</tr>
</tbody>
</table>

Compatible Uses: Group Use, Research Use, Individual Nature Study.

Land Control and Management: Land Control - DNR Wildlife Management. Manager - Area Wildlife Manager, DNR Area Office, Industrial Parkway, Box 16, Marinette 54143. This area does not require community management. Periodic site inspections and monitoring are conducted.

Site History: The site has received some all-terrain vehicle use. Duck blinds were quite common but have been removed. Fluctuating lake levels have resulted in the periodic breakup and reformation of the spit. Riprapping along the shoreline north of the natural area during the 1985-1987 high water levels may have caused a permanent break between the mainland and the spit. The site was designated a state natural area in November 1962. A breeding bird census is on file.

WISCONSIN DEPARTMENT OF NATURAL RESOURCES--BUREAU OF ENDANGERED RESOURCES
BOX 7921, MADISON, WI 53707

February 1989
Appendix E
Pre Survey
Environmental Education Integration

Please answer the following questions. Your responses will be used for research purposes. Thank you for your assistance.

1. What subject do you teach?
   English  math  science  social studies/history  other

2. How long have you been teaching?
   1 year  2-5 years  5-10 years  10-15 years  15-20 years  20+ years

3. How important do you feel it is to infuse environmental education into your subject area?
   Not Important  Important  Very Important  Extremely Important

4. Would you infuse environmental education into your subject area if it were not required?
   yes  no  unsure

5. If not required by your administrator would you participate in integrated units?
   yes  no  unsure

6. Would you be willing to participate in an integrated unit on any of the following environmental themes?
   Air  yes  no
   Water  yes  no
   Land Use  yes  no
   Energy  yes  no

7. If you answered no to any of the above topics, what are the factors that would prevent you from participating? Circle all that apply.
   Lack of background information on topics
   Lack of time to find/develop lessons
   Does not fit into curriculum
   Other (please list)
Post Survey
Environmental Education Integration

Please answer the following questions. Your responses will be used for research purposes. Thank you for your assistance.

1. What subject do you teach?

   English  math  science  social studies/history  other

2. Did you participate in an integrated unit on any of the following environmental themes?

   Air  yes  no
   Water  yes  no
   Land Use  yes  no
   Energy  yes  no

3. If you answered yes to any of the above topics, how much time did you spend planning for the unit?

   0-1 hour  2-3 hours  3-4 hours  5+ hours

4. Was the process effective?

   yes  no

5. What could be changed to make the process more effective?

6. Are there any other environmental themes you would be interested in participating with an integrated unit?

   If yes—What?
Appendix F
Explore Your Watershed

Please answer the following questions by writing the letter of the correct response in the blank next to the number.

Air

1. The gas in the stratosphere that absorbs ultraviolet radiation is
   a. argon  b. ozone  c. oxygen  d. nitrogen

2. The layer of the atmosphere that supports all life is the
   a. mesosphere  b. exosphere  c. troposphere  d. stratosphere

3. The most common gases in the atmosphere are
   a. nitrogen and oxygen  c. oxygen and carbon dioxide
   b. ozone and oxygen  d. nitrogen and carbon dioxide

4. Overexposure to UV radiation can result in
   a. sunburn  b. skin cancer  c. eye cataracts  d. all of these

5. A type of air pollution that is a result of the burning of fossil fuels and causes burning eyes, headaches and respiratory problems is
   a. global warming  c. ozone depletion
   b. smog  d. greenhouse effect

6. Milkweed biomonitoring is useful in monitoring pollution from
   a. tropospheric ozone  c. stratospheric ozone
   b. acid rain  d. ultraviolet radiation

7. The ancient atmosphere of the earth was probably made up of mostly
   a. ammonia  b. carbon dioxide  c. nitrogen  d. oxygen

8. An activity that does not help reduce air pollution is
   a. biking  b. car-pooling  c. walking  d. snowmobiling

9. Solving air pollution problems is the responsibility of
   a. government  b. factories  c. citizens  d. all of these

10. Ozone found in the troposphere causes
    a. burning eyes  c. both a and b
    b. stippled on milkweed plants  d. neither a or b
Water

1. The amount of water on the earth that is fresh water
   a. 97.2%    b. 25.1%    c. 37.4%    d. 2.8%

2. Water moves continuously from one place to another on earth because of the
   a. aquifers    b. water table    c. watersheds    d. water cycle

3. The amount of water a rock or soil can hold depends on its
   a. porosity    b. permeability    c. density    d. mass

4. An area of land that supplies runoff to streams and rivers is a/an
   a. aquifer    b. divide    c. watershed    d. tributary

5. The driving force behind the water cycle is energy from the
   a. wind    b. transpiration    c. precipitation    d. sun

6. The type of soil that has the highest permeability is
   a. sand    b. silt    c. clay    d. topsoil

7. When water slows down, the first sediments to drop out are
   a. clay    b. silt    c. sand    d. pebbles

8. A layer of permeable rock that contains moving groundwater is called a/an
   a. water table    b. aquifer    c. zone of saturation    d. zone of aeration

9. Groundwater is essential to
   a. industry    b. tourism    c. citizens    d. all of these

10. Groundwater can be contaminated by
    a. leaking underground storage tanks
    b. overuse of fertilizers and pesticides on lawns
    c. chemicals being dumped on the ground
    d. all of these

Land Use

1. Oxidation, water, carbonic acid, sulfuric acid, and plant and fungal acids are examples of
   a. chemical weathering    c. plant weathering
   b. mechanical weathering    d. animal weathering
2. The action of picking up and moving materials is known as
   a. erosion  b. deposition  c. weathering  d. mass movement

3. The four agents of erosion are
   a. slump, creep, landslides and mudflows  c. wind, water, ice and gravity
   b. deltas, dunes, till and outwash  d. sand, silt, clay and gravel

4. Small channels in the dirt that are formed by rainwater flowing down a slope are
   a. outwash  b. till  c. meanders  d. rills

5. A factor that affects the amount of erosion in an area is the
   a. type of soil  b. terrain  c. amount of vegetation  d. all of these

6. The decayed plant and animal matter in soil is called
   a. regolith  b. humus  c. parent rock  d. leaching

7. Soil affects our everyday lives because
   a. we breathe oxygen from plants grown in the soil
   b. we eat plants that are grown in the soil
   c. many animals build their home in the soil
   d. all of these

8. A cross section of the layers of soil is called a
   a. horizon  b. humus  c. soil profile  d. regolith

9. Factors that determine the type of soil that forms in an area include
   a. parent rock and climate
   b. terrain and time
   c. amount of organic matter
   d. all of these

10. Land use planning is important to a community
    a. to preserve land for future use
    b. to protect prime farmland
    c. to protect water quality and keep use suitable to type of land
    d. all of these

Please answer the following question on a separate sheet of paper.

1. Describe how people can influence the quality of their watershed including the air, water and land.
### Activities

*Please rate the following activities on a scale of 1 to 5 as to how helpful they were to your understanding of the lessons taught in this unit.*

<table>
<thead>
<tr>
<th>Activity</th>
<th>Rating</th>
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<tbody>
<tr>
<td>1. Air poster activity</td>
<td>1 2 3 4 5</td>
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<tr>
<td>2. UV Meter Experiments</td>
<td>1 2 3 4 5</td>
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<tr>
<td>3. Milkweed Monitoring</td>
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<tr>
<td>4. The Incredible Journey (Water Molecule Journey Game)</td>
<td>1 2 3 4 5</td>
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<tr>
<td>5. Percent of Water Demonstration</td>
<td>1 2 3 4 5</td>
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<tr>
<td>Seagull Bar Wildlife Area Field Trip (6-8)</td>
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<td>6. Critter Search</td>
<td>1 2 3 4 5</td>
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<tr>
<td>7. Wildlife Survey</td>
<td>1 2 3 4 5</td>
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<tr>
<td>8. Water Quality Testing</td>
<td>1 2 3 4 5</td>
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<tr>
<td>9. Watershed Map Activity</td>
<td>1 2 3 4 5</td>
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<tr>
<td>10. Watershed in a Box Activity</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>11. Groundwater Flow Lab (Porosity/Permeability)</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>12. Stream Table Demonstration</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>13. Soil Survey Lab</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>14. Land Use Simulation Game</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>15. Migration Headache Activity</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>16. Land Use Plan Activity</td>
<td>1 2 3 4 5</td>
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</tbody>
</table>

Comments or Suggestions:
Earth’s Matter

Please answer the following questions by writing the letter of the correct response on the blank next to the number.

Earth Chemistry

1. An element is identified by the number of _____ in its nucleus.
   a. protons  
   b. neutrons  
   c. electrons  
   d. ions

2. The most common element in the earth’s crust is 
   a. nitrogen.  
   b. oxygen.  
   c. silicon.  
   d. carbon.

3. All organic matter contains the element 
   a. iron.  
   b. carbon.  
   c. oxygen.  
   d. nitrogen.

4. The earth’s atmosphere is a (an) _____ of many different gases.
   a. compound  
   b. mixture  
   c. isotope  
   d. ion

5. A liquid ______ to form a gas.
   a. evaporates  
   b. melts  
   c. condenses  
   d. freezes

Minerals

6. Shiny minerals that reflect light are described as having a _____ luster.
   a. metallic  
   b. nonmetallic  
   c. greasy  
   d. pearly

7. According to Moh’s hardness scale the hardest mineral is 
   a. talc.  
   b. quartz.  
   c. halite.  
   d. diamond.

8. Minerals containing ______ are attracted to a magnet.
   a. silicon  
   b. iron or nickel  
   c. carbon and lithium  
   d. oxygen

9. The color of the powder a mineral leaves on an unglazed porcelain tile is called the mineral’s 
   a. luster.  
   b. color.  
   c. cleavage.  
   d. streak

10. ______ is not a mineral because it does not have the five properties of a mineral.
    a. magnetite  
    b. oil  
    c. talc  
    d. quartz
11. The _____ of a mineral is determined by comparing the density of the mineral to the density of water.
   a. specific gravity  b. streak  c. luster  d. hardness

12. Garnet, jade opal and topaz are examples of _________.
   a. precious gems  b. metals  c. jewelry  d. semiprecious gems

13. A mineral commonly used in baby powder is _________.
   a. quartz  b. talc  c. hematite  d. gypsum

14. Minerals that contain Si + O plus one or more metals are classified as _________.
   a. silicates  b. oxides  c. carbonates  d. halides

15. Bauxite is an ore of _________.
   a. quartz  b. aluminum  c. sulfur  d. copper

Rocks and the Rock Cycle

16. Intrusive rocks form from _________.
   a. magma  b. lava  c. oxygen  d. silicon

17. The process in which water is squeezed out from between sediments allowing the particles to pack more tightly together is
   a. metamorphism  b. compaction  c. cementation  d. lithification

18. Erosion is directly involved with the formation of _________. rocks.
   a. igneous  b. sedimentary  c. metamorphic  d. intrusive

19. Heat and pressure form _________. rocks.
   a. intrusive  b. extrusive  c. sedimentary  d. metamorphic

20. Granite, basalt and obsidian are examples of _________.
   a. igneous rocks  b. sedimentary rocks  c. metamorphic rocks  d. minerals

21. Metamorphic rocks can be classified as either _________. based on the arrangement of grains in parallel bands or random arrangement of grains.
   a. clastic or non-clastic  b. intrusive or extrusive  c. foliated or nonfoliated  d. organic or chemical
22. Intrusive igneous rocks have a ________ texture because they cooled slowly below the earth’s surface.
   a. coarse  b. fine  c. glassy  d. foliated

23. The process of a mineral filling the spaces between sediments to bind them together is called ________.
   a. lithification  b. sedimentation  c. compaction  d. cementation

24. Coal is an example of ________ sedimentary rock.
   a. clastic  b. chemical  c. organic  d. foliated

25. A metamorphic rock can change into an igneous rock by
   a. heat and/or pressure  b. melting, cooling and solidification  
   c. weathering and erosion  d. burial, compaction and cementation

**Mineral and Energy Resources**

26. ________ is an example of a renewable resource.
   a. coal  b. oil  c. wind  d. most minerals

27. World demand for energy is ________.
   a. decreasing  b. increasing  c. staying the same  d. over

28. Coal formed over millions of years from
   a. plant and animal remains  b. the mantle  c. fossil fuels  d. mineral deposits

29. The windows in a home heated by passive solar energy face
   a. north  b. south  c. east  d. west

30. A mining area is returned to its original condition in a process called
   a. preservation  b. recycling  c. restoration  d. reclamation

Please answer the following question on a separate sheet of paper.

1. Imagine you are a little blob of magma floating beneath the earth. Describe all the possible changes you could go through during your very long life.
Activities

*Please rate the following activities on a scale of 1 to 5 as to how helpful they were to your understanding of the lessons taught in this unit.*

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<tr>
<td>1. Atom Modeling</td>
<td>1</td>
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<td>2. Crystal Models Lab</td>
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<td>3. Rock Forming Minerals Lab</td>
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<td>5. Igneous Rock Lab</td>
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<td>6. Sedimentary Rock Lab</td>
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<td>7. Metamorphic Rock Lab</td>
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<td>8. Mabel the Marble Activity</td>
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<td>9. Cookie Mining Lab</td>
<td>1</td>
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<tr>
<td>10. Every Stone Has a Story Video</td>
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<td>11. Splendid Stones Video</td>
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<tr>
<td>12. What’s the Earth Made Of? Video</td>
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<td>13. Renewable Energy Video</td>
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<td>14. Minerals in My Home Activity</td>
<td>1</td>
<td>2</td>
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<td>15. Home Energy Efficiency Activity</td>
<td>1</td>
<td>2</td>
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</tbody>
</table>

Comments or Suggestions:
Plate Tectonics

Please answer the following questions by writing the letter of the correct response on the blank next to the number.

Structure of the Earth

1. The cool, solid part of the earth that includes the crust and part of the upper mantle is called the _________.
   a. core  
   b. lithosphere  
   c. asthenosphere  
   d. mantle

2. The region of the earth composed of the least dense rock material is the _________.
   a. continental crust  
   b. oceanic crust  
   c. asthenosphere  
   d. core

3. A shadow zone that occurs during an earthquake is a region on the earth’s surface where
   a. light is not detected.  
   b. only P waves are detected.  
   c. only S waves are detected.  
   d. no seismic waves are detected.

4. As the depth below the earth’s surface increases,
   a. temperature and pressure increase.  
   b. temperature and pressure decrease.  
   c. temperature decreases and pressure increases.  
   d. temperature increases and pressure decreases.

5. When seismic waves move from a material of one density into a material with a different density, they always
   a. speed up.  
   b. slow down.  
   c. change direction.  
   d. stop moving.

Time and Change

6. The earth’s age is estimated to be about _________.
   a. 2.6 million years  
   b. 200 million years  
   c. 4.6 billion years  
   d. 500 billion years

7. Past life forms preserved in rock are called _________.
   a. minerals  
   b. grains  
   c. deposits  
   d. fossils

8. The fact that the same processes that shaped the earth are still at work today illustrates the principle of _________.
   a. stratigraphy  
   b. relativity  
   c. uniformitarianism  
   d. sedimentation

9. The uppermost layer of sedimentary rock is _________. the layers of rock below it.
   a. younger than  
   b. older than  
   c. the same age as  
   d. denser than
Plate Tectonics

10. The driving force for plate movement is most likely provided by ______ within the mantle.
   a. subduction  
   b. convection  
   c. sea-floor spreading  
   d. drift

11. The movement of one plate under another is called ________.
   a. subduction  
   b. convection  
   c. mid-ocean ridge  
   d. trench

12. The first suggestion of moving landmasses was the theory of ________.
   a. sea-floor spreading  
   b. continental drift  
   c. plate tectonics  
   d. evolution

13. Convergence of two plates may result in the formation of ________.
   a. volcanic islands  
   b. trenches  
   c. mountain ranges  
   d. all of these

14. A plate boundary where two plates slide past each other is called a ________ boundary.
   a. convergent  
   b. divergent  
   c. transform  
   d. subduction

15. All of the Earth’s landmasses were once joined in a supercontinent called ________.
   a. Pangaea  
   b. Gondwanaland  
   c. Laurasia  
   d. Antarctica

16. Evidence from fossils, land formations and glacial movement is used to support the theory of ________.
   a. sea-floor spreading  
   b. continental drift  
   c. plate tectonics  
   d. evolution

Movement of the Crust

17. A rift valley is produced as a result of ________.
   a. tension  
   b. shear  
   c. isostasy  
   d. compression

18. An elevated area of crust that is relatively flat is called a ________.
   a. plain  
   b. plateau  
   c. valley  
   d. mountain

19. The type of stress that squeezes rocks together is ________.
   a. isostasy  
   b. shear  
   c. tension  
   d. compression

20. Mountains formed from compressional stress when two continental plates collide are ________ mountains.
   a. fault-block  
   b. plutonic  
   c. volcanic  
   d. folded
Earthquakes and Volcanoes

21. Most earthquake damage is caused by ________ waves.
   a. primary  b. secondary  c. surface  d. tidal

22. Readings from at least ________ seismograph station are needed to pinpoint the
    epicenter of an earthquake.
   a. two  b. three  c. five  d. seven

23. Most earthquakes occur
   a. near mountain ranges.  b. along transform faults.
   c. in the middle of continents.  d. near plate boundaries.

24. The major zone of volcanic activity is found
   a. around the Pacific Ocean basin.  b. along the Mid-Atlantic Ridge.
   c. in Antarctica.  d. in Central Asia.

25. A shield volcano is produced by
   a. explosive eruptions.  b. the buildup of cinder and ash.
   c. lava flows  d. erosion of a cinder cone

Topography and Geography

26. On a topographic map, hachures are used to indicate
   a. the steepness of a slope.  b. the direction of stream flow.
   c. elevation above sea level.  d. a depression or crater.

27. On a map with a scale of 1 cm = 20 km, a distance of 5 cm on the map would be equal to
    ________ on the earth’s surface.
   a. 4 km  b. 100 km  c. 50 km  d. 200 km

28. Contour lines that cross a ________ are V-shaped.
   a. hill  b. hole  c. lake  d. river

29. Over a distance of 400 meters, the elevation of a hill rises from 50 meters to 250 meters.
   The average slope of the hill is ________.
   a. 500%  b. 200%  c. 5%  d. 50%

30. Contour lines that are far apart indicate a ________ slope.
   a. gentle  b. steep  c. large  d. none of these
Please answer the following question on a separate sheet of paper.

1. Describe how the earth has changed over time including the processes that have caused these changes.

Activities

Please rate the following activities on a scale of 1 to 5 as to how helpful they were to your understanding of the lessons taught in this unit.

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<td>3. What is the Mantle Like? Lab</td>
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<td>12. Remembering Mount St. Helens Video</td>
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<td>13. Topographic Map Labs</td>
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<td>14. Creating a Contour Map Lab</td>
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<td>15. Making Your Own Land Activity</td>
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Comments or Suggestions:
Exploring Your Watershed

Grade Level: 8  Est. Instr. Time: 7 weeks

Unit Objectives

Students will:

1. Compare and contrast physical and chemical weathering.
2. Describe some processes that cause each type of weathering.
3. Explain how soil evolves from rock including the three soil horizons.
4. List and explain five agents of erosion and deposition.
5. Identify the results of erosion and deposition by the following agents:
   a. Wind
   b. Water
   c. Glaciers
   d. Gravity
   e. Groundwater
6. Describe how erosion can be reduced in some high risk areas.
7. List four factors that determine the amount of erosion in a stream.
8. Identify the characteristics for the stages of youth, maturity and old age in streams.
9. Locate and describe at least three Wisconsin watersheds.
10. Describe the impact humans have on a watershed.
11. Describe career possibilities related to soils, water and erosion and the technology these careers utilize.
Earth's Matter

Grade Level: 8                      Est. Instructional Time: 9-10 weeks

Unit Objectives

Students will:

1. Identify matter as anything that has mass and takes up space.
2. Describe the internal structure of an atom.
3. Discuss several ways atoms combine to form compounds.
4. List the five properties of a mineral
5. List the eight tests for identifying a mineral
6. Identify twenty important minerals
7. Explain the rock cycle
8. Explain how igneous rocks form
9. List the characteristics of intrusive and extrusive igneous rocks
10. List the minerals in a sample of igneous rock
11. Identify six major igneous rocks
12. Explain how sediments are deposited and how these sediments are changed into rock
13. Identify four major sedimentary rocks.
14. Describe how metamorphic rocks are formed.
15. List the parent materials for these metamorphic rocks:
   a. Slate
   b. Gneiss
   c. Marble
   d. Schist
   e. Quartzite
16. Identify five metamorphic rocks.
17. Make a list of rocks and minerals useful to man.
18. Explain how the use of earth's resources by humans have caused efforts to conserve those resources.
19. Describe careers related to the use of rocks and minerals.
Plate Tectonics

Grade Level: 8

Unit Objectives

1. Explain and demonstrate the theory of plate tectonics.
2. Draw and explain how convection currents in the mantle cause seafloor spreading.
3. Contrast three types of plate boundaries and their associated surface features.
4. List and explain at least three evidences of crustal movement.
5. Draw and explain three kinds of forces causing crustal movement.
6. Describe how crustal movements can build mountains.
7. Describe the human risks related to plate tectonics, which areas are at highest risk, and ways to minimize those risks.
8. Identify possible careers related to plate tectonics and the technology these careers would utilize.

Topography

Grade Level: 8

Unit Objectives

1. Give the complete legal description of a parcel of land down to 40 acres using the township and range system.
2. Use certain important map symbols to interpret a map.
3. Use the scale of miles to determine distance on a map.
4. Use the 16 compass points.
5. Determine elevation through the interpretation of contour lines.
6. Compute the gradient of slope.
7. Draw a profile from contour lines.
8. Make an enlargement of a section or part of a section.
10. Use various geologic maps to determine information about an area (type of land forms, potential for use, etc.)
11. Distinguish between plains, plateaus and mountains.
12. Identify and explain the physiographic regions in the U.S.