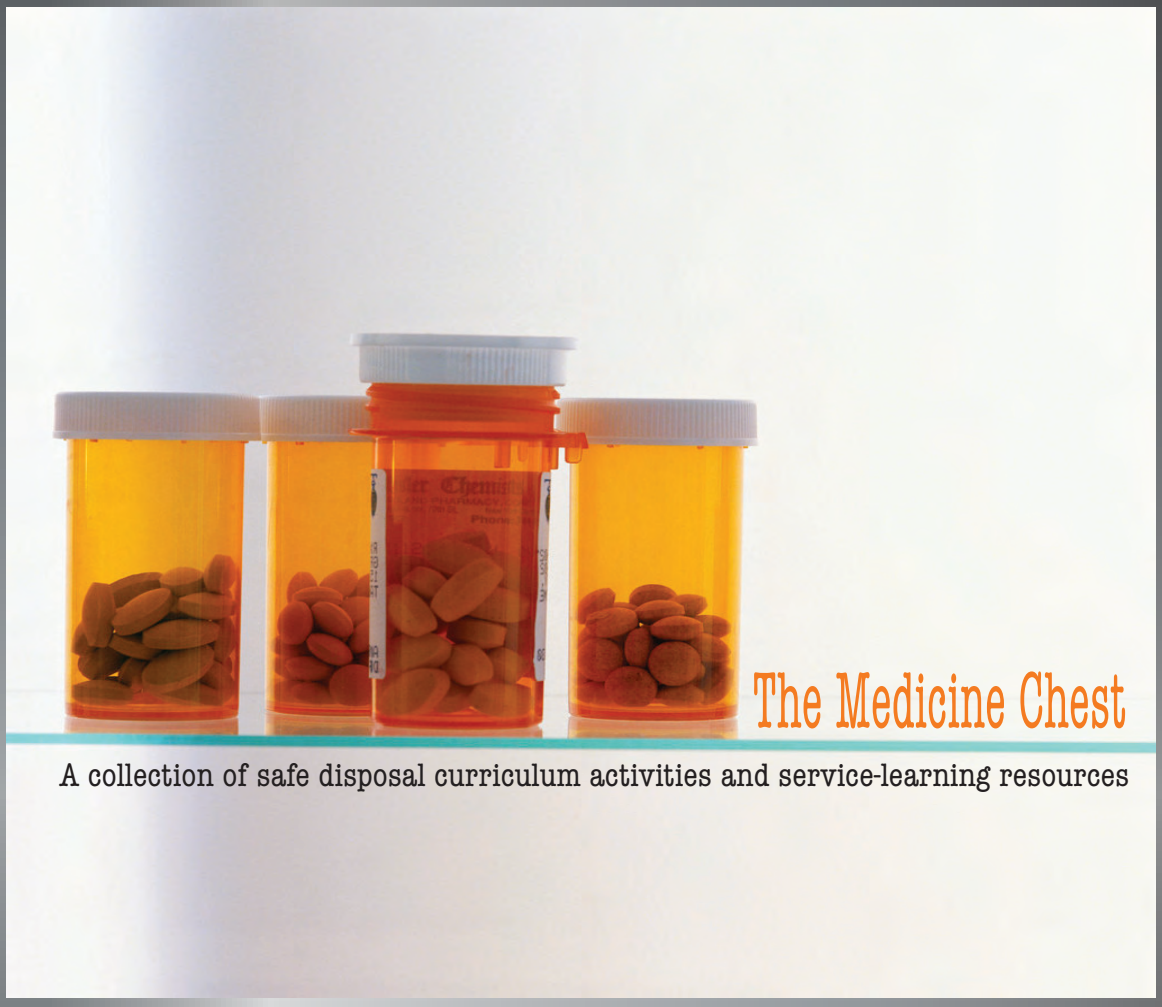
The Medicine Chest

A collection of safe disposal curriculum activities and service-learning resources

Sea Grant
ILLINOIS - INDIANA



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A collection of safe disposal curriculum activities and service-learning resources

Publication Coordinators: Robin Goettel and Terri Hallesy, Illinois-Indiana Sea Grant Program
P²D² Project Coordinators: Paul Ritter and Eric Bohm, Pontiac High School
Scientist Advisors: Elizabeth Hinchey Malloy and Susan Boehme, Illinois-Indiana Sea Grant Program
Designer: Susan White, Illinois-Indiana Sea Grant Program
Editor: Irene Miles, Illinois-Indiana Sea Grant Program

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Prescription Pill and Drug Disposal Program

University of Illinois Extension

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Also, thanks to U.S. EPA's environmental education program for coordinating the printing of *The Medicine Chest*. This will ensure a wide distribution of this resource not only in Illinois and Indiana, but throughout the Great Lakes region.

We are very grateful to Paul Ritter and Eric Bohm, teachers at Pontiac Township High School (PTHS) who co-created the innovative P^2D^2 program, which is the centerpiece for *The Medicine Chest.* They have been invaluable in providing the teaching framework from which to create a highly interactive student learning project that will result in positive impacts to the communities in which this curriculum is taught. Paul Ritter has been instrumental in bringing other teachers into the P^2D^2 education project to make it a highly effective, multi-disciplinary service-learning program.

We thank Irene Miles, Illinois-Indiana Sea Grant Communication Coordinator, for her careful editing and Susan White, Illinois-Indiana Sea Grant Graphic Design Specialist, for her creative design of the cover and section title pages. Our University of Illinois student publication production assistants, Tracy Colin and Brittanie Bright, have done a wonderful job getting each section ready for publication; fine tuning the lesson plan format; developing some of the puzzles in the supplementary lessons section; and acquiring permissions to include excellent background resources for teachers to use and incorporate.

We truly appreciate the thoughtful review and helpful comments from our team of reviewers,
Susan Boehme, Coastal Sediment Specialist , Illinois-Indiana Sea Grant Program
Elizabeth Hinchey Malloy, Great Lakes Ecosystem Specialist, Illinois-Indiana Sea Grant Program
Marti Martz, Coastal Outreach Specialist, Pennsylvania Sea Grant Program
Pat Lupo, Program Director, Lake Erie-Allegheny Earth Force
Deanna Garner, Education Coordinator, Recycling and Waste Reduction District of Porter County

We dedicate *The Medicine Chest* to our youth who are working to make a significant difference in their communities as they develop important lifelong learning skills, including leadership and civic responsibility.

-Robin Goettel and Terri Hallesy
Project Coordinators, Illinois-Indiana Sea Grant Program

ACKNOWLEDGMENTS (Cont'd)

We would like to thank the following agencies and organizations for providing permission to reprint their resources in this Medicine Chest publication.

Pharmaceuticals in Our Water Supplies (article)
Courtesy of: Arizona Water Resource, Water Resources Research Center, University of Arizona
http://ag.arizona.edu/azwater/awr/july00/feature1.htm

Meds lurk in drinking water (article)
Courtesy of: Associated Press

Tips on Student Research Projects (article) & *High School Research Projects* (article)
Courtesy of: Dorit Sasson, The New Teacher Resource Center
http://newteachersupport.suite101.com/

Chemicals, the Environment, and You: Explorations in Science and Human Health – Lesson 1 & Lesson 5 (classroom lessons)
Courtesy of: BSCS and Discovery Channel

Resource Management: Protecting your Drinking Water (classroom lesson)
Courtesy of: U.S. Environmental Protection Agency, Office of Ground Water and Drinking Water
http://www.epa.gov/SAFEWATER/kids/teachers_9-12.html

Service Learning Level 2: "Raise Your Voice" – Note to Helper, The Real Deal, and Speak Out (Three 4-H activities)
Courtesy of: The National 4-H Council

Symbiosis Newsletter Article, Vol. 4, No. 1, *"There is Medicine in These Waters"*
Courtesy of: The Teleosis Institute, http://www.teleosis.org

Home and Lawn Care Checklist: "Personal Pollutions" (activity)
Courtesy of: U.S. Environmental Protection Agency, in *The Watershed Patch Project*, 2004

Reflection Activities (activity), *Post Reflection Activities* (activity), *Reflection Activities to be Used Throughout* (activity), & *Reflection Opportunities – Segments 1-6* (activity)
Courtesy of: Earth Force, Inc. This may also be downloaded from: http://www.earthforce.org

Community Partnerships – Meeting Community Needs (fact sheet)
Courtesy of: Pennsylvania Service Learning Alliance

Building Effective Partnerships for Service Learning (classroom lesson)
Courtesy of: National Service-Learning Clearinghouse.Scotts Valley, CA: Learn and Serve America's National Service-Learning Clearinghouse, 2008.
http://www.servicelearning.org/instant_info/fact_sheets/cb_facts/build_partners/index.php

Talk It Up: Advocating for Service Learning (article)
Courtesy of: Academy for Educational Development

Curriculum Development for K-12 Service-Learning (fact sheet)
Courtesy of: RMC Research Corporation
http://www.servicelearning.org/instant_info/fact_sheets/k-12_facts/curriculum/

Give Water A Hand (fact sheet), published in the Leader Guidebook and Action Guide, 1996.
Courtesy of: Environmental Resources Center, University of Wisconsin

Table of Contents

What's in Your "Medicine Chest"?

Acquire an understanding of why safe disposal of unwanted medicine is an important issue of concern so your students can become active "agents for change" in your community.

Incorporate a model high school service-learning program, P^2D^2, which establishes a strong partnership between your school, local pharmacies, government officials, law enforcement, and water management agencies. Have your students organize community collection events based on information learned through lesson plans from multiple disciplines, including environmental science, civics, music, art, language arts, and foreign language.

Find out how this service-learning unit aligns with National Education Standards. Relevant Illinois and Indiana state standards are also included, which can provide helpful linkages to standards in other states.

Enhance your students' grasp of the content through supplemental activities that are provided. These offer multiple tools for learning, including word searches, puzzles, an experiment, a risk assessment case study, an estimation activity, an interactive service-learning activity to guide student research and action planning, and a description of a 4-H guide that offers five inquiry-based activities.

Get the latest links to science-based research and data so your students can do their fact-finding using credible background information from Websites and fact sheets. *Tox Town* and *Tox Mystery* provide great opportunities for interactive learning via the Web.

Discover what makes a service-learning project successful. Included are great prompts for student reflection activities, action plan templates, and tips for building community partnerships and organizing festivals.

Check out creative student projects that have sparked community interest, understanding, and action. You'll see examples of billboards, eco-poems, songs, designed collection boxes, a rain barrel, and student presentations.

Help us improve this educational resource by providing feedback. We will be updating the PDF files on our Website to make them more relevant and current, based on your comments. Please complete and return the *Feedback Form* at the end of this resource. Downloadable files can be accessed at www.iisgcp.org/education/safe_disposal_curriculum.html.

Introduction

The Medicine Chest is a compilation of multidisciplinary, standards-based classroom lessons, sample stewardship activities, and background information for teachers and high school students on how the improper disposal of unwanted medicines can be harmful to people, pets, and the environment. Through use of this classroom instructional resource, students will serve as "agents for change" providing useful information about medicine disposal to family members and various community sectors. Students who actively take part in the numerous activities provided in this collection will be equipped to deliver messages and help people make conscientious decisions when disposing of medications and other household chemical products.

In response to a growing national concern about improper disposal of unused or expired medicine and medicine misuse, educators from the Illinois-Indiana Sea Grant Program in University of Illinois Extension are creating a community-based campaign. This campaign involves educating youth about important actions people can take to protect local waterways, help prevent accidental poisonings, limit illegal use by teens, and reduce identification and medicine theft.

This collection of activities can be used both as a classroom resource and in more informal educational settings, such as after-school clubs or after-school programs. Youth will reap many benefits as participants in the provided authentic, problem-based learning scenarios. They will gain skills in decision-making, cooperative learning and teamwork, communication and leadership. Their involvement in this curriculum will also help protect and improve the quality of our waters.

Goals of this curriculum collection are listed on reverse side.

Introduction (cont'd)

Curriculum Goals

The Medicine Chest—A collection of safe disposal curriculum activities and educational resources

- To inform youth and their families about the harmful effects of improper disposal of medicines and other household chemicals on the aquatic life in lakes and rivers and the importance of properly disposing of these potentially toxic substances.
- To provide teachers with best practices for creating a community awareness campaign on safe medicine disposal methods aimed at adults.
- To incorporate a variety of educational approaches for instructing youth.
- To inform high school teachers about the Prescription Pill and Drug Disposal Program (P^2D^2) multi-disciplinary curriculum, created by educators at Pontiac High School in Illinois. This Program uses a creative service-learning approach to guide students as they develop community service projects about safe disposal of unwanted medicines.
- To provide additional quality lesson plans and supplemental activities, which will encourage students to become actively engaged in this timely topic.
- To support community stewardship by offering creative project examples and guidance that will inform the public about appropriate disposal practices.

Overview of the Unwanted Medicine Disposal Issue

Overview of Unwanted Medicine Disposal Issue

Prescription drug use is increasing significantly in quantity and types. In 2008, the total sales for prescription drugs reached $291.5 billion, a 1.4 percent increase from the previous year.[1] At the same time, antibiotics, anti-convulsants, mood stabilizers, and hormones have been detected in the drinking water supplies of 24 major metropolitan areas.[2]

Although the exact risk to humans from low levels of pharmaceuticals has yet to be determined, the presence of so many varied prescription drugs and over-the-counter medicines is a cause for growing concern, especially when coupled with the fact that more and more medications are being prescribed. And, these medicines have been shown to harm fish and other aquatic wildlife, according to the U.S. Geological Survey.

So how do these chemicals get into the environment? One source is direct outflow to water from wastewater treatment plants. When medicines expire or are no longer wanted, people often flush them away. Wastewater treatment plants were never designed to remove these chemicals. Unwanted medicines that are flushed can also kill beneficial waste sewage bacteria and damage septic systems.

Another possible source is from the sludge of wastewater treatment plants and the manure from medically-treated domestic animals. Sludge is typically applied to farmland as a soil amendment and might be a source of contamination of groundwater and runoff. Veterinary treatment on fish farms and direct runoff from livestock farms might be another source.

When people throw medicine in the trash, there can be a risk of leakage from old or poorly designed landfills. Even non-leaking landfills represent a potential source, since water from them is often pumped out and is usually treated by the municipal wastewater system.[3] What's more, when people place medicines in the trash without taking precautions to secure the container, disguise the content, or make the medicine inedible, this can result in children and pets being unintentionally poisoned.

The concern for proper disposal of unwanted medicine ties in closely with another growing problem. "Nearly seven million Americans are abusing prescription drugs—more than the number who are abusing cocaine, heroin, hallucinogens, Ecstasy, and inhalants, combined. That 7 million was just 3.8 million in 2000, an 80 percent increase in just six years. **Nearly 1 in 10 high school seniors admits to abusing prescription painkillers.** Approximately 40 percent of teens and an almost equal number of their parents falsely believe abusing prescription painkillers is safer than abusing "street" drugs." [4] Through the multifaceted service-learning program, presented in *The Medicine Chest*, youth will be empowered to take action that will serve as a catalyst to help reduce teenage drug abuse.

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[1] Ruiz, Rebecca. "America's Most Medicated States." Forbes.com 31, August, 2009 http://www.forbes.com/2009/08/17/most-medicated-states-lifestyle-health-prescription-drugs.html

[2] Donn, Jeff et al. "AP Probe Finds Drugs in Drinking Water." Associated Press. 10 March, 2008.

[3] K. Barnes, et al. Spring 2004 "Pharmaceuticals and Other Organic Waste Water Contaminants Within a Leachate Plume Downgradient of a Municipal Landfill" Ground Water Monitoring and Remediation 24, No.2, pages 119-126.

[4] Drug Enforcement Administration. 2009. "Prescription Drug Abuse—A DEA Focus." Online at www.usdoj.gov/dea/concern/prescription_drug_fact_sheet.html.

P^2D^2 Program Lesson Plans

Dear Fellow P²D² Collaborators,

I am eternally grateful to all of the amazing people who have worked so hard to make the P²D² program what it has become: a national endeavor. A major driving force behind this program has always been Eric Bohm. He has been involved in every aspect of the program from the beginning and has been a major influence on all of us. If it were not for the Illinois-Indiana Sea Grant Program (Robin, Terri, Susan, and Beth), and Illinois Environmental Protection Agency (Dave and Dennis) our program would never have had the tools to survive. Each of the following groups of people has been so vital to our success:

The educators whose curriculums are being showcased (Eric, Mike, Nick, Xavier, Heather, Tara, Betty, Bob, and Keith)
Pharmacists (Nick, Ken, Erika, Jen, and Ted)
Police officers (Dale, and Hugh)
Water treatment managers (Tim, and Karen)
Wastewater treatment manager (Dave)
City officials (Scott, Glenn, John, and Chris)
Hospital marketing specialists (Sue and Deann)
Family members (Mom, Dad, Jay, Baylee, Taylor, Jen, and John)
Students (all of them and Jordyn)
…and the thousands of volunteers—there are so many names that need to be mentioned, but I would not know where to end. The good thing is that all of them know who they are and what impact they have made on our society as a result of being a part of the P²D² team.

There is one name, however, that stands out. The P²D² Program would not exist if it were not for my wife Jodee, whose fundamental and yet incredibly profound question of "What do we need to do?," which still resonates strongly. This program was developed with these three philosophies:

"Think Globally, Act Locally"
"Students are the agents of change."
"If we all do our part, the world will be a better place."

Knowing that the P²D² Program is a work in progress, I realize that it will evolve in response to our global needs. I do hope that people will look at it in years to come and see that we gave everything we could to be the catalyst for inspiration, innovation, and knowledge. My life has forever changed as a result of the P²D² Program and its eye-opening impacts. Therefore, I dedicate this material to our children—they are the future of our world.

Paul Ritter
Ecology Teacher/P²D² Program Coordinator
Pontiac Township High School
Pontiac, Illinois

The Nuts and Bolts of the P^2D^2 Program

What is the P^2D^2 Program?

The Prescription Pill and Drug Disposal Program (P^2D^2) began as a collaborative effort between local pharmacies, officials, and Pontiac Township High School students in Paul Ritter's Ecology class and Eric Bohm's Illinois Studies class. The purpose is to educate the public about the harm done to the environment due to the current prescription and non-prescription drug disposal practices and to provide the community with an alternative disposal approach that ensures the quality of our water for future generations.

History of the Program

The idea for the program started when Mr. Ritter's wife, Jodee, asked what she should do with some unused prescription pills in their medicine cabinet. Not sure about the correct method of disposal, Mr. Ritter posed the question to his Ecology students and they went right to work. The young ecologists accessed information from the Internet, books, journal articles, and through interviews with scientists. They also enlisted the help of local officials from Illinois American Water Plant Manager Tim Tuley, Pontiac's Street Superintendent Chris Brock, and Mayor Scott McCoy of Pontiac, IL. Students' hard work and research-based efforts uncovered startling information pertaining to the effect of pharmaceuticals on the quality of drinking water around the world. They found that scientists with the U. S. Geological Society have detected drugs such as antibiotics, anti-depressants, birth control pills, seizure medication, cancer treatments, painkillers, tranquilizers and cholesterol-lowering compounds in varied groundwater sources. *("National Stream Reconnaissance,"* http://toxics.usgs.gov/regional/emc/streams.html, USGS Website, May 2008)

Informing the Community through Service-Learning Activities

Students also learned that, currently, wastewater treatment methods in the United States are not designed to remove these chemicals from our water supply. Scientists are worried about the impact to humans; i.e., the chemicals in our water could increase rates of breast, testicular, and prostate cancer, as well as lower sperm counts and disrupt hormones. Furthermore, the scientists also fear that increased levels of antibiotics in our environment could lead to eventual increases in bacterial resistance. Through their investigations, students also discovered that people played a role in the introduction of these chemicals based on a lack of knowledge regarding how to properly dispose of their unwanted medicines. From their own research, the Ecology students put together presentations for their local pharmacies, including Sartoris Super Drugs, K-Mart, Wal-Mart and Walgreen's Drugstore. These retailers were asked to allow patrons to bring in unused prescription drugs for proper and safe disposal.

Civics and Engagement

The initial project inspired a host of students from other classes to get involved. For example, Mr. Bohm's Illinois Studies class led a letter-writing campaign to ask federal, state, and local officials to help educate the citizenry about the benefits of proper disposal of their prescription and non-prescription drugs. Numerous legislators, environmental groups, and educators have returned letters and stated they are encouraged by the work of

the Illinois Studies and Ecology students and hope students in their area will also initiate the program.

Media and Promotion

The student media group has played an important role on the P^2D^2 team, informing various television and radio stations, which led to a great public response. After contacting a popular radio show in Bloomington, Illinois, word of the Program spread like wildfire. This project has gained statewide attention from officials in Springfield, Illinois, the State capital. The Illinois Studies class has greatly enhanced the P^2D^2 program, furthering its goal of inspiring people of the world to be good stewards and take it upon themselves to help preserve our living (biotic) and non-living (abiotic) natural resources.

Positive Partnership with Law Enforcement

The Pontiac Police Department began the drug collection program after learning from Mr. Ritter about its benefits to the community and positive impacts on the local aquatic environment. Mr. Ritter had done extensive research on the issues of water contamination due to pharmaceutical medication being flushed down the drain in people's homes. In addition, the Salt Lake County Sheriff's Department assisted in creating the Pontiac Township High School program by providing a sample policy and ideas for the locked collection box.

In addition to the benefits associated with the environment, the Pontiac Police Department felt this program could be used to educate the community about the dangers these medications pose to our youth. This program creates a positive interaction between the community and the police force. It brings people into the police department where they are exposed to additional informational resources available to them.

The pharmaceuticals are retrieved from the locked box by the evidence officer. The Evidence Officer is the only one with keys to retrieve the discarded medications. The pharmaceuticals are retrieved, weighed, and photographed in bulk prior to placing in evidence. The items are transported for incineration with other illegal drugs when quantities dictate.

P^2D^2 Program Identity

The P^2D^2 Program has created a logo that should be incorporated into other schools' instructional and promotional materials that have incorporated this program into their local setting. Please visit the Program's homepage to access the logo. http://www.p2d2program.org

Pill Bottle Phil has been a popular costumed character used at many community events, education conferences, and other public gatherings to get the word out about the P^2D^2 Program.

If you would like to borrow the costume or create one of your own, please contact Paul Ritter at 815/844-6113 or PRitter@pontiac.k12.il.us

P^2D^2 : An Award-Winning Education Program

Proclamation by Illinois Governor Pat Quinn--P^2D^2 Day in Illinois
On May 1, 2009, Governor Quinn officially honored the P^2D^2 Program and its significant achievements through a State Proclamation.

2008 Governor's Green Youth Award for Excellence
The hard work and commitment of students to exhibit environmental leadership and stewardship was recognized. These awards, administered by the Illinois Environmental Protection Agency, acknowledged outstanding environmental protection and conservation projects by Illinois' young people. "These projects demonstrate the innovative ways young people throughout the state are working to protect Illinois' environment," said Illinois EPA Director Doug Scott. "Through these awards, we hope to teach other young people about the importance of environmental protection."

2008 Lt. Governor's Environmental Hero Award

On April 21, 2008, Lt. Governor Pat Quinn saluted the students and teachers of Pontiac Township High School who are taking immediate and preemptive action to reduce the amount of prescription and non-prescription drugs in the water supply.

"The students and teachers of Pontiac Township High School are not waiting around for tests to prove that their drinking water may contain trace amounts of drugs," said Lt. Governor Quinn. "They dove directly into the problem and surfaced with a solution. We want to salute these students and teachers for launching the P^2D^2 Program."

On October 23, 2008, PTHS received the **2008 Governor's Pollution Prevention Award**, presented by Illinois Governor Rod Blagojevich.

For full text of the press releases recognizing the positive contributions of the P^2D^2 Program, please visit this Webpage, http://www.p2d2program.org/Contacts.html.

Creating a Prescription Drug Disposal Program in Your Own Community

The following information is also described on the P^2D^2 website. An overview of the Program website follows this section.

How to Begin

- Decide which students and which classes you want to be involved in the project.
- Create a list of the pharmacies in your area.
- Have the students research problems associated with pharmaceuticals in the water.
- Instruct students to research currently accepted disposal methods of pharmaceuticals.
- Contact all area pharmacists and local officials and ask them if they would be willing to help discover possible solutions/prevention methods of improper disposal of pharmaceuticals in the environment.
- Have students provide formal presentations of their research to area pharmacists and local officials that will inform them of the possible pharmaceutical disposal methods that are available in your area.
- Develop an informational brochure/poster for display at various businesses with all contact names and numbers. In addition, create a flyer with the same information that can be easily stapled to small paper bags.
- Contact all local media outlets (both print and broadcast) to inform them of the program and its many benefits.
- Branch out to other schools, corporations, etc. and share your program. Serve as a mentor to these newly partnering schools.

Who Should You Partner With?

- Pharmacists
- Public Works Director
- Water Department and Sewage Treatment Plant Manager/Operator
- Solid Waste Management Districts
- Mayor
- County Board Member
- Local Farm Bureau Staff Member
- State Legislator
- U.S. Congressional Leaders
- University Scientists
- Government Agency Researchers
- Media Outlets (radio/tv stations, newspapers, etc.)

How to Work with Your Community to Start a Drug Collection Event

- Generate a list of the special/important people in their community who should become involved in this project.
- Have your students reach out with letters or phone calls.
- Invite these community members to the school to listen to presentations given by the P^2D^2 students.
- Combine pertinent information from everyone's PowerPoint presentations to create a comprehensive presentation to give to these important community members.
- Have students choose representatives from the various student workgroups in the class to deliver the presentations to each target group; e.g., a pharmacist, wastewater treatment plant official, police officer, representative from the Mayor's office, City Council member, County Board member, Rotary Club member, etc.
- The representatives (business members, decisionmakers, interested citizens, etc.) should be invited to the school to learn about the P^2D^2 Program because it will bring them to an "environment" that the kids are familiar with and are comfortable in. This approach also demonstrates to the community members the learning environment where the P^2D^2 Program is being taught and implemented.

In preparing their presentations and deciding who to invite, students are always encouraged to think outside the box. One interesting example of an unlikely community business partner was an ATV dealership that wanted to deliver the P^2D^2 message. They connected with Paul Ritter and got ahold of the P^2D^2 logo, which they affixed to the side of their ATV quad vehicle, which brought visibility to the Program with a new audience.

How to Branch Out to Other Schools to Get them Involved in the P^2D^2 Network

So far, the P^2D^2 Program has expanded beyond Illinois to schools and communities in Wisconsin, Washington, Texas, and Florida. Teachers at Pontiac Township High School continue to work diligently to involve schools in many more states.

"We encourage our kids to divide and conquer," says P^2D^2 Program Coordinator Paul Ritter. "We are always looking for new school partners to give away our P^2D^2 Program." Ritter and his students will communicate with a town that has expressed an interest or a school that seems to be a good, logical choice. For example, a pharmacist from LaSalle-Peru, IL, asked Ritter about the Program, so he visited him after school hours to talk about it. Ritter has contacted fellow science teachers at other schools; emailed superintendents of other school districts; and called police departments and pharmacies to describe the Program and invite their participation.

An example of P^2D^2 Program expansion is the very successful partnership between Pontiac Township High School and Westfield High School in Houston, Texas. Students in the Spanish National Honor Society learned about the P^2D^2 Program and decided to help spread the messages to the Spanish-speaking community by translating the P^2D^2

Website into Spanish. Mr. Xavier Salat-Foix was the lead teacher in that project. The description of that Spanish Web development project is found later in this section. The website is located at http://www.p2d2program.org/espanol.html.

Sometimes, a young person will become inspired after learning about P^2D^2 and work on an individual basis to implement the project. For example, a 14 year old student from Reedsburg, Wisconsin, Jordyn Schara, worked in her own community to inform the public and organize a collection event.

Paul Ritter is very interested in getting Indiana schools on board, especially because that state has a very active Household Hazardous Waste Program in each of its counties. The Indiana Department of Environmental Management engages schools to help students develop life-long recycling habits to help preserve natural resources.

Student Participation at Community Events—Getting the Word Out

It is important to get the students involved in after-school activities and public events to share their projects and spread the P^2D^2 message. For example, the Pontiac students exhibited the project at the September, 2009 Farm Progress Show in Decatur, IL. P^2D^2 students participated at *It's Our River Day Festival* held at Navy Pier, Chicago, on September 19, 2009. Students displayed the P^2D^2 rainbarrel to show that water is our most precious resource. This event gave our kids the opportunity to reach out to other young people. Art is a big part of P^2D^2. Not only does the artwork created by students get the message across, but it also provides youth with a skill they can use throughout their life.

P^2D^2 Green Day was an expansion of the Prescription Pill and Drug Disposal Program. About 500 pounds of unused prescription and over the counter medicines were collected for proper disposal in McLean County. P^2D^2 students were involved in delivering the important program messages as they helped pharmacists hand out magnets and flyers to inform visitors of proper disposal methods. They also helped evaluate the effectiveness of this collection event by counting the number of cars that came through to drop off unwanted medicines.

There are many examples of approaches to publicize these collection events found on Illinois-Indiana Sea Grant's Unwanted Medicine Toolkit Page—*Disposal of Unwanted Medicines: A Resource for Action in Your Community*. Check out these helpful approaches, including sample flyers, postcards, and other public outreach materials at http://www.iisgcp.org/unwantedmeds/ch4.html.

Pontiac Police Department's Collection Policy

Drug Collection/Disposal Program

1. The drug collection and disposal program provides a safe disposal location for citizens to properly dispose of unused prescription medications.
2. Pontiac Police Department will provide a steel mailbox style collection box in which citizens may deposit these medications.
3. The Evidence Officer will be the sole possessor of keys to the collection box.

Collection Box Specifications

Standard steel mail courier box. Pontiac High School used one that is 20" W x 49" H x 26" D. Package drop opening: 15-3/4" W x 7" H. Storage area: 19" W x 28" H x 21" D, 160 lbs. Cost: approximately $550.

Pontiac Pharmacy's Collection Policy for Non-controlled, Over-the-counter Medicine

1. Individuals take their unused and unwanted prescription and non-prescription drugs to participating pharmacies.
2. Pharmacists take the pharmaceuticals and place them into secure bins. Please note that only licensed pharmacists and assistants handle the returned pharmaceuticals.
3. When the bins fill up, pharmacists send them off to be incinerated.
4. The company that incinerates the pharmaceuticals creates energy that is used to power homes and businesses.

P²D² Program Website

www.p2d2program.org

The P²D² Program website features award-winning student projects and activity highlights, as well as the history of the program. The site links the latest news articles on the topic of impacts from improper disposal of unwanted medicines. Also included is a link to a useful background toolkit for student research—Illinois-Indiana Sea Grant's *Disposal of Unwanted Medicines: A Resource for Action in Your Community.*

The site describes the important role that pharmacists and law enforcement officials play as partners with high schools in the successful execution of the program. Through this website, helpful suggestions are provided for teachers who wish to start a P²D² service-learning program in their community.

Environmental Science

P^2D^2

Pontiac Prescription Drug Disposal:
A Cooperative Program between High School Students, Local Officials, and Pharmacies
www.p2d2program.org

Lesson Plan

Creating an Effective Presentation to Inform the Public

Objectives

Students will:

1. Understand the effects of unused pharmaceuticals on the environment, citizens, and issues surrounding people ingesting medicine that was not meant for them.
2. Learn the proper methods of pharmaceutical disposal.
3. Serve as an important agent for change to help protect and improve the quality of our waters.
4. Learn how to defend their research findings to an audience.
5. Learn how to make PowerPoint presentations, posters, and billboards or other large displays that will deliver messages to help people understand how medicines can be harmful to people, pets, and the environment.

Based on successful attainment of these objectives, the P^2D^2 Program will:
Bring awareness to every community of the potential dangers of improper disposal of pharmaceuticals.
Educate citizens in reducing and eliminating pharmaceuticals from entering our environment.
Initiate positive working relationships between schools, pharmacies, communities, local government, and city officials.
Enable communities to improve their physical environments and quality of life through environmental education.
Reduce consumer waste in the environment.
Assess quantity of household pharmaceutical waste disposed of in an area.
Engage all involved in the production, distribution, sales and consumption of medicines in Environmentally-preferable practices.
Foster community health by providing an opportunity to work together towards a common goal.

Illinois Learning Standards

The standards associated with this lesson are extensive and may be found in this publication in the "Alignment to State and National Science Standards" section.

Procedure

Day 1 – Establish four student teams. Direct the students to research problems associated with pharmaceuticals in the water. Have the students use computers, books, magazines, and leading researchers to gather any and all information about the issues related to pharmaceuticals in the water.

Day 2 – Have the students continue investigating the problem and have them keep their records in a binder. The students will also create a list of pharmacies in the area.

Day 3 - Instruct students to research current accepted disposal methods of pharmaceuticals, as they continue investigating the problem, and document findings in a binder.

Day 4 – Students will continue to research the current accepted disposal methods of pharmaceuticals. Direct the students to contact all area pharmacists and local officials and ask them if they would be willing to collaborate in determining possible solutions/prevention methods of improper disposal of pharmaceuticals in the environment. Send out formal invitations to participate in this community stewardship project.

Days 5-7 – Instruct the students on best practices for creating effective PowerPoint presentations. (This instruction can take more than one day if needed.) Have the students develop their information into a PowerPoint presentation. (Depending on the student's abilities, this can take several school days to complete.)

Day 8 - Students will give formal presentations of their research to area pharmacists and local officials that inform them of the best practices for disposal methods available in your area. (Refer to P^2D^2 Guidelines for Standard Operating Procedures regarding Collection of Unused/Expired Meds—Role of the Pharmacy.)

Day 9-10 – Students will develop an informational brochure/poster to display at local businesses. This product should include contact information for the public to learn about how and where they can bring their unwanted medicine. Participating sponsors should be acknowledged. In addition, students will create a flyer with this information that can be easily stapled to small paper bags for public distribution.

Day 11 – Students will contact local media outlets (print and broadcast) to inform them of this program and its benefits. In addition, students can create informational videos that will be linked on the P^2D^2 website and on YouTube™ for broader dissemination. (Sample descriptions of selected videos posted on YouTube can be found in the section, "Sample Student Stewardship Projects to Initiate Action.")

Day 12 – Students will develop a billboard to put up near or on the interstate, or other high-traffic area. (Ask a billboard company if they will donate a billboard; P^2D^2 teachers have found they will say yes or produce one at minimal cost.)

Day 13 – Share this project with other schools, corporations, etc. and share your program/curriculum unit(s). Identify community medicine collection events or other local festivals and events where students can distribute information to educate the public about safe disposal practices, for example Pontiac Township High School students participated in the P^2D^2 Green Day in partnership with St. Joseph Medical Center (see promotional flyer following this lesson plan).

Developed By: Paul Ritter, Science Department, Pontiac Township High School

Information for Student Presentations to Pharmacists: P^2D^2 Guidelines for Standard Operating Procedure for Pharmacists Regarding Collection of Unused/Expired Meds

Role of the Pharmacy

- Individuals take their unused and unwanted prescription and non-prescription drugs to participating pharmacies.
- Pharmacists take the pharmaceuticals and place them into secure bins. Please note that only licensed pharmacists and assistants handle the returned pharmaceuticals.
- When the bins fill up, pharmacists send them off to be incinerated.
- The company that incinerates the pharmaceuticals creates energy that is used to power homes and businesses.

1. Have a three-vial box system in place
   A. The first box is for pills.
      - Take the tablets or capsules out of the vials or container.
      - Pour into a lined vial box.
   B. The second box is for creams and ointments.
      - Most liquids are stable with others.
      - Pour out similar products into one bottle, making it full.
      - Cough meds can be added together; over-the-counter products like Pepto Bismol can be combined.
      - Inhalers like Nasonex and Flonase: Take off the caps or mouthpiece to free up space.
      - This should be in a lined vial box also.
   C. The third box is for blister packs.
      - Take the product out of the box.
      - Do not put in PPI or other papers.
      - This should be in a vial box.
   D. You can also have a fourth and fifth smaller box; one for mercury thermometers and one for aerosol products.
      - Keep these separate from the rest.
      - With any inhaler, remove the mouthpiece to free up space.
2. You can drop the boxes off to the designated area at the collection site for proper placement in the EPA-provided drums.

Returned medication is separated at the pharmacy counter into four basic classifications for disposal. Boxes and containers are removed and can be added to normal recycling.

1. Pills and Tablets

2. Liquids, Creams, and Ointments

3. Blister packs

4. Pressurized Inhalers

Rubric: Creating an Effective P^2D^2 Power Point Presentation (Days 5-7)

Maximum Points: 50

Student Name: _____

CATEGORY	5	3	1	0
6-7 slides	6-7 slides	4-5 slides	2-3 slides	under 2 slides
Color and Font	Font is readable and color on all pages.	Font is readable and color on all pages on at least 5 pages.	Font is readable and color on all pages on at least 3 pages.	Font is readable and color on all pages under 3 pages.
Creativity and Animation	Slides are unique in creativity and show animation.	Slides are unique in creativity and show animation on at least 5 pages.	Slides are unique in creativity and show animation on at least 3 pages.	Slides are unique in creativity and show animation under 3 pages.
Reasons for P^2D^2	More than five reasons.	Five reasons.	Three reasons.	Under three reasons.
Pictures of Pharmaceuticals	More than five pictures.	Five pictures.	Three pictures.	Under three pictures.
Participation	Participated all days.	Participated four out of five days.	Participated three out of five days.	Participated under three days.
Time	Finished on time.	Took one extra day.	Took two extra days.	Took more than two extra days.
Research	More than five sources.	At least five sources.	At least three sources.	Under three sources.
Organization	More than five slides are organized and have no grammar errors.	At least five slides are organized and have under three errors.	At least three slides are organized and have under five errors.	under three slides are organized and have more than five errors.
Effort	Effort out of everyone all five days.	Effort out of everyone for three days.	Effort out of everyone for one day.	No effort was shown.

Rubric: Creating an Effective P^2D^2 Poster Project (Days 9-10)

Maximum Points: 50

Student Name: _____

CATEGORY	5	3	1	0
Quote	There is a quote about pharmaceuticals with author.	There is a quote about pharmaceuticals with no author.	There is no quote about pharmaceuticals.	No quote
Color	Color is on entire poster.	Color is on 3/4 of poster.	Color is on 1/2 of poster.	No color
Picture	There is a picture of a pharmaceutical.	N/A	N/A	No picture
Creativity	Poster is unique and creative in design.	Poster shows creativity but not unique.	Poster shows little creativity and not unique.	No creativity
Sponsors	All sponsors are listed.	More than 1 sponsor is missing.	More than 2 sponsors are missing.	No sponsors are listed.
Acknowledgment of the high school ecology class	Pontiac Township High School Ecology class is on poster.	N/A	N/A	Pontiac Township High School Ecology class is not on poster.
Student group identified	Student names are acknowledged.	N/A	N/A	No Name
P^2D^2 Program Acknowledgment	Prescription Pill and Drug Disposal Program is on the poster.	N/A	N/A	Prescription Pill and Drug Disposal Program is not on the poster.
Use of attention-getter to effectively deliver the message	Catch phrase is on the poster.	N/A	N/A	No Catch phrase is on the poster.
Grammar	All Grammar is correct.	One Grammatical Error	Two Grammatical Errors	More than two Grammatical Errors

Illinois Studies*

P^2D^2

Pontiac Prescription Drug Disposal:
A Cooperative Program between High School Students, Local Officials, and Pharmacies
www.p2p2program.org

Lesson Plans

* **This can be easily adapted for civics/social studies classes.**

Lesson 1

The Powers and Duties of Illinois Government

Objectives

Students will:

1. Explain how the various levels of government work together to solve problems.
2. Discuss the role of citizens and the press in the operation of government, especially as types of government work together.
3. Explain the concept of "separation of powers."
4. Describe the basic function of each branch of government.
5. Explain some of the basic services that Illinois provides.

Illinois Learning Standards

14.A.4 Analyze how local, state, and national governments serve the purposes for which they were created.

14.A.5 Analyze the consequences of participation and non-participation in the electoral process.

14.D.5+ Interpret a variety of public policies and issues from the perspectives of different individuals and groups.

Materials

Whiteboard

"Why Do We Need Government" from the *Governing Illinois* Textbook, 2003

Procedure

1. Ask students to come up with a list of reasons why we need government. ("Why Do We Need Government?" pp. 19-20)
   Have students write their reasons on the whiteboard.
   Discuss as a class.
2. Ask students to list the three branches of government on the whiteboard
   Ask students: Why are the powers of government separated?
   Review the powers of each branch
3. Ask students what kind of complaints they have heard about the government.
   Think, pair, share.
4. Discuss the services provided by the government.

Assessments

1. Ask students if the above services could be provided privately (by corporations, for instance).
   What would be the advantages? The disadvantages?
2. Have students read pp 17-29 in *Governing Illinois* and complete the accompanying study guides.
   Discuss answers as a class.

Developed By: Eric Bohm, Social Studies Department, Pontiac Township High School

Lesson 2

Local Governments of Illinois

Objectives

Students will:

1. Understand the importance of local government on their lives.
2. Explain the different types of local governments in Illinois, and how they can and do work together (and sometimes against each other).
3. Discuss how local government is influenced, and how individuals, like the students themselves, can be effective in doing so.

Illinois Learning Standards

14.A.4 Analyze how local, state, and national governments serve the purposes for which they were created.

17.D.4 Explain how processes of spatial change have affected human history.

14.B.5 Use methods of social science inquiry to study the development and functions of social systems and report conclusions to a larger audience.

Materials

A Plat book

Governing Illinois Textbook

Procedure

1. List the units of local government in Illinois.
   Discuss each governmental unit.
2. Discuss the advantages and disadvantages of having so many units of local government.
   Ask students: Do the advantages outweigh the disadvantages, or vice-versa?
3. Inform students that in other states, local government units take on larger ranges of function.
   Ask students: Can they, then, do these multiple jobs as well?
4. Ask students: How can the units of local government affect us (the class) as we sit here (in the classroom) right now? What rule has each governing unit made that affects us (the class) right now?
   Have students come up with a list.
   Think, pair, share.
5. Ask students: What services are provided by our local government? Are there any services you wish were improved upon? How would you improve them if you were in a leadership position?
6. Ask the mayor to come in and discuss his/her role in the local government. Make sure students have prepared questions prior to the event.

Assessments

1. Have students look in a Plat book and find out what township they live in, describe the geographical features, and explain the jobs of all the township trustees.
2. Have students read pp 93-110 in *Governing Illinois* and complete the accompanying study guides.

Lesson 3

Getting Involved: Beginning the Process of the Prescription Pill and Drug Disposal Program

Objectives

Students will:

1. Understand the importance of individual participation to the function of our democracy.
2. Describe the ways in which students can participate in government.
3. Understand government in terms of it being our possession vs. a mysterious entity unattached to us.

Illinois Learning Standards

14.A.4 Analyze how local, state, and national governments serve the purposes for which they were created.

14.A.5 Analyze the consequences of participation and non-participation in the electoral process.

15.B.4b Analyze the impact of current events on consumer prices.

15.C.4b Explain the importance of research, development, invention, technology and entrepreneurship to the United States economy.

15.E.4a Explain why government may intervene in a market economy.

16.A.4a Analyze and report historical events to determine cause and effect relationships.

17.B.4a Explain the dynamic interactions within and among the Earth's physical systems including variation, productivity and constructive and deconstructive processes.

17.B.5 Analyze international issues and problems using ecosystems and physical geography concepts.

17.D.5 Analyze the historical development of a current issue involving the interaction of people and geographic factors.

18.B.5 Use methods of social science inquiry to study the development and functions of social systems and report conclusions to a larger audience.

Materials

Whiteboard
U.S. Geological Survey article

Procedure

1. Have students read U.S. Geological Survey article.
   Have students write down main points of the article.
   Have students write down main points on the whiteboard.
   Discuss as a class.
2. Ask students what they can do to help keep water safe for future generations.
   Brainstorm ideas.

Assessments

1. Ask students pointed questions about the article.
2. Have students create a list of ways they can reduce, reuse, or recycle products.
   Discuss as a class.

Developed By: Eric Bohm, Social Studies Department, Pontiac Township High School

Lesson 4

Getting Involved: Beginning the Prescription Pill and Drug Disposal Program

Objectives

Students will:

1. Understand the importance of individual participation to the function of our democracy.
2. Describe the ways in which students can participate in government.
3. Understand government in terms of it being our possession vs. a mysterious entity unattached to us.

Illinois Learning Standards

14.A.4 Analyze how local, state, and national governments serve the purposes for which they were created.

14.C.5 Analyze the consequences of participation and non-participation in the electoral process.

15.B.4b Analyze the impact of current events on consumer prices.

15.C.4b Explain the importance of research, development, invention, technology and entrepreneurship to the United States economy.

15.E.4a Explain why government may intervene in a market economy.

16.A.4a Analyze and report historical events to determine cause and effect relationships.

17.B.4a Explain the dynamic interactions within and among the Earth's physical systems including variation, productivity and constructive and destructive processes.

17.B.5 Analyze international issues and problems using ecosystems and physical geography concepts.

17.D.5 Analyze the historical development of a current issue involving the interaction of people and geographic factors.

18.B.5 Use methods of social science inquiry to study the development and functions of social systems and report conclusions to a larger audience.

Materials

Whiteboard
"Creating an Action Plan" Guideline worksheet
Governing Illinois

Procedure

1. Inform students of the Prescription Drug and Disposal program and its benefits.
2. Ask students who should be informed about the program.
   Make a list on the whiteboard.
3. Break class up into the following groups:
   - Research and Development
   - Media
   - Documentation
   - IL Representatives
     - Republicans
     - Democrats

IL Senators
    Republicans
    Democrats
U.S. Representatives
    Committee Members
    Subcommittee Members
U.S. Senators
    Committee Members
    Subcommittee Members

4. Discuss the roles of committees and subcommittees. Show students how to access information pertaining to committee and subcommittee assignments.
5. Discuss what an Action Plan is and how it is important when working on a project.

Assessment

1. Have students get into their groups and develop an Action Plan.
    Discuss with each group.

Creating an Action Plan

Team Names

Action Plan Title

Final Goal

List a goal for each week spent on this project. (How will you *plan your work and work your plan*?)

List 5 or more actions steps that you plan to take to help accomplish your goals.

What are some possible problems that you think could make it difficult for you to accomplish your project goals?

What actions will help you overcome these obstacles?

List the community partner/s that will work with your team.

What role will each team member be responsible for? List the person's name and job title.

Answer the following questions with your team. Be prepared to share your responses with the larger group.

What went well and what needs improvement?

How did the experience affect you?

What impact will it have on your future actions?

This Action Plan Template was developed by Terri Hallesy, Illinois-Indiana Sea Grant Program.

Lesson 5

Getting Involved: Preparing an Informational Letter and Fax to Get the Word Out about the Prescription Pill and Drug Disposal Program

Objectives

Students will:

1. Understand the importance of individual participation to the function of our democracy.
2. Describe the ways in which students can participate in government.
3. Understand government in terms of it being our possession vs. a mysterious entity unattached to us.

Illinois Learning Standards

14.A.4 Analyze how local, state, and national governments serve the purposes for which they were created.
14.C.5 Analyze the consequences of participation and non-participation in the electoral process.
15.B.4b Analyze the impact of current events on consumer prices.
15.C.4b Explain the importance of research, development, invention, technology and entrepreneurship to the United States economy.
15.E.4a Explain why government may intervene in a market economy.
16.A.4a Analyze and report historical events to determine cause and effect relationships.
17.B.4a Explain the dynamic interactions within and among the Earth's physical systems including variation, productivity and constructive and destructive processes.
17.B.5 Analyze international issues and problems using ecosystems and physical geography concepts.
17.D.5 Analyze the historical development of a current issue involving the interaction of people and geographic factors.
18.B.5 Use methods of social science inquiry to study the development and functions of social systems and report conclusions to a larger audience.

Materials

Computer
Paper
"Letter Writing Evaluation Sheet" rubric

Procedure

1. In the computer lab, have students find the names, addresses, e-mail addresses, phone numbers, and other contact information for each of their assigned groups determined in the previous lesson.
2. Have each group create a spreadsheet with all the contact information. (This will be vital to stay organized.)
3. Have the Documentation Group work on a letter that can be sent out to all members of the Illinois General Assembly.
4. Students who are in groups that will be contacting U.S senators and representatives will need to track down fax numbers.

Assessments

1. Have students explain, in a paragraph, what they have specifically done in their group.
2. Refer to “Letter Writing Evaluation Sheet” for sample rubric.

Developed By: Eric Bohm, Social Studies Department, Pontiac Township High School

Lesson 6

Getting Involved: Class Critique of an Informational Letter and Fax about the Prescription Pill and Drug Disposal Program

Objectives

Students will:

1. Understand the importance of individual participation to the function of our democracy.

2. Describe the ways in which students can participate in government.

3. Understand government in terms of it being our possession vs. a mysterious entity unattached to us.

Illinois Learning Standards

- **14.A.4** Analyze how local, state, and national governments serve the purposes for which they were created.
- **14.C.5** Analyze the consequences of participation and non-participation in the electoral process.
- **15.B.4b** Analyze the impact of current events on consumer prices.
- **15.C.4b** Explain the importance of research, development, invention, technology and entrepreneurship to the United States economy.
- **15.E.4a** Explain why government may intervene in a market economy.
- **16.A.4a** Analyze and report historical events to determine cause and effect relationships.
- **17.B.4a** Explain the dynamic interactions within and among the Earth's physical systems including variation, productivity and constructive and destructive processes.
- **17.B.5** Analyze international issues and problems using ecosystems and physical geography concepts.
- **17.D.5** Analyze the historical development of a current issue involving the interaction of people and geographic factors.
- **18.B.5** Use methods of social science inquiry to study the development and functions of social systems and report conclusions to a larger audience.

Materials

Computer
Paper
Address labels
Envelopes
Fax forms
"Letter Writing Evaluation Sheet" rubric

Procedure (on reverse side)

Procedure

1. Hand out a copy of the letter created by the Documentation Group.
   Review as a class.
   Make changes as needed.
   Save on shared drive
2. In the computer lab, have groups access letter on the shared drive and set it up as a form letter using their spreadsheet.
3. Have students print out their letters and sign.
4. Have students create address labels.
5. Have students prepare the letters to be sent out.
6. U.S. Senators and Representatives Groups will need to fill out a fax form as they will not be sending via USPS.

Assessments

1. Have students write an essay rating each of their group members and explain how they have contributed to the goals of the group.
2. Have students write an essay explaining the importance of a program such as P^2D^2.
3. Refer to the "Letter Writing Evaluation Sheet" for sample rubric.

Developed By: Eric Bohm, Social Studies Department, Pontiac Township High School

Rubric for Lessons 5 and 6

Letter Writing Evaluation Sheet

Name: _____

Subject: _____

Date: _____

Focus: Score _____

- Introductory section (main idea) is in proper format and appropriate length.
- Topic (subject matter) is clearly stated.
- Purpose is clearly implied.
- Unity or oneness is maintained throughout.
- Conclusion brings sense of finality.

Comments:

Support/Elaboration: Score _____

- Each idea is fully addressed.
- Support is valid and effective.
- Details or elaboration and/or examples are given.
- Relevant vocabulary is used effectively.

Comments:

Organization: Score _____

- Composition is logically organized.
- Clarifying devices or transitions are used effectively.

Comments:

Conventions: Score _____

- No major grammatical errors are made.
- Minor mechanical errors are avoided.
- No slang or nonstandard English is included in dialogue.

Comments:

Integration: (Point value is often doubled.) Score _____

- All elements combine for a strong overall effect.
- Generally strong writing occurs throughout.
- Goal of assignment is achieved.
- Students' evaluation of the effectiveness of their project as a whole.

Comments:

Total Score _____

Lesson 7

Getting Involved: Sending an Informational Letter and Fax about the Prescription Pill and Drug Disposal Program

Objectives

Students will:

1. Understand the importance of individual participation to the function of our democracy.

2. Describe the ways in which students can participate in government.

3. Understand government in terms of it being our possession vs. a mysterious entity unattached to us.

Illinois Learning Standards

14.A.4 Analyze how local, state, and national governments serve the purposes for which they were created.
14.C.5 Analyze the consequences of participation and non-participation in the electoral process.
15.B.4b Analyze the impact of current events on consumer prices.
15.C.4b Explain the importance of research, development, invention, technology and entrepreneurship to the United States economy.
15.E.4a Explain why government may intervene in a market economy.
16.A.4a Analyze and report historical events to determine cause and effect relationships.
17.B.4a Explain the dynamic interactions within and among the Earth's physical systems including variation, productivity and constructive and destructive processes.
17.B.5 Analyze international issues and problems using ecosystems and physical geography concepts.
17.D.5 Analyze the historical development of a current issue involving the interaction of people and geographic factors.
18.B.5 Use methods of social science inquiry to study the development and functions of social systems and report conclusions to a larger audience.

Materials

Computer
Stamps
Fax machine
"Assessment Guide for Oral Presentation" rubric

Procedure

1. Send out letters to all members of the Illinois General Assembly.
2. Have students go to the office and send out the faxes to all members of the committees and subcommittees they selected.

Assessments

1. Have groups create a PowerPoint presentation that explains, in detail, the processes they went through to complete their group's objectives.
2. Refer to "Assessment Guide for Oral Presentations" for sample rubric for this lesson.

Developed By: Eric Bohm, Social Studies Department, Pontiac Township High School

Rubric for Lesson 7

Assessment Guide for Oral Presentations

Group Assignment: _____
Group Members: _____
_____

Group Assessment	*Excellent*	*Good*	*Average*	*Needs Improvement*	*Unsatisfactory*
1. The group made good use of its preparation time.	5	4	3	2	1
2. The presentation reflected analysis of the issues under consideration.	5	4	3	2	1
3. The presentation was coherent and persuasive.	5	4	3	2	1
4. The group incorporated relevant sections of the background reading into its presentation.	5	4	3	2	1
5. The group's presenters spoke clearly, maintained eye contact, and made an effort to hold the attention of their audience.	5	4	3	2	1
6. The presentation incorporated contributions from all the members of the group.	5	4	3	2	1
Individual Assessment					
1. The student cooperated with other group members.	5	4	3	2	1
2. The student was well-prepared to meet his or her responsibilities.	5	4	3	2	1
3. The student made a significant contribution to the group's presentation.	5	4	3	2	1

Health Education

P^2D^2

Pontiac Prescription Drug Disposal:
A Cooperative Program between High School Students, Local Officials, and Pharmacies
www.p2d2program.org

Lesson Plan

Health Education Prescription Drug Lesson—P²D²

Objectives

Students will:

1. Describe the factors that influence people to use prescription drugs.

2. Understand the effects of the use of different prescription drugs on the body and on developing fetuses.

3. Learn about the programs that will help a person overcome their addictions.

[Note: Detailed objectives are listed under the individual lessons for Days 1-5.]

Illinois State Goals

1. State Goal 22: Understand principles of health promotion and the prevention and treatment of illness and injury.
    a. 22.A.4b: Analyze possible outcomes of effective health promotion and illness prevention.
    b. 22.A.5a: Explain strategies for managing contagious, chronic and degenerative illness.
    c. 22.B.4: Explain social and economic effects of health problems on individuals and society.
2. State Goal 23: Understand human body systems and factors that influence growth and development.
    a. 23.A.4: Explain how body systems functions can be maintained and improved.
    b. 23.B.4: Explain immediate and long-term effects of health habits on the body systems.
    c. 23.B.5: Understand the effects of healthy living on individuals and their future generations.
3. State Goal 24: Promote and enhance health and well-being through the use of effective communication and decision-making skills.
    a. 24.B.4: Explain how decision making affects the achievement of individual health goals.
    b. 24.B.5: Explain immediate and long-term impacts of health decisions to the individual, family, and community.
    c. 24.C.4: Formulate a plan to achieve individual health goals.
    d. 24.C.5: Evaluate progress toward the attainment of a health goal.

MPOs:

1,2,7,8,9,10,12,21,23

Procedure

Day 1

Objective 1: Identify reasons why people use prescription drugs.

- Prevent disease
- Relieve pain
- Fight pathogens
- Promote health

Duration: 10 minutes
Format: Lecture
Assessment: Teacher observation

Objective 2: Identify factors that influence teens to abuse prescription drugs.

- Peer pressure
- Family members
- Role models
- Media messages
- Perceptions of drug behavior
- Misleading information

Duration: 10 minutes
Format: Lecture
Assessment: Teacher Observation

Objective 3: Define substance abuse.

- Any unnecessary or improper use of chemical substances for non-medical purposes

Duration: 5 minutes
Format: Lecture
Assessment: Teacher Observation

Objective 4: Describe the dangers of substance abuse.

- Physical health
  - Tolerance
  - Physiological dependence
  - Addiction
  - Increased high risk behaviors
- Mental health
  - Psychological dependence
  - Depression
  - Suicide
- Social health
  - Loss of interest and goals
  - Increased violence and crime

Duration: 20 minutes
Format: Lecture
Assessment: Teacher observation

Day 2

Objective 1: Define prescription drugs.

- A drug prescribed to a patient by a doctor or licensed health professional that requires government control
- Non-food substances that alter the functions of the body and/or mind

Duration: 5 minutes
Format: Lecture
Assessment: Teacher observation

Objective 2: Differentiate between responsible and irresponsible prescription drug use.

- Responsible prescription drug use
  - Taking a prescription drug as it is intended
    - To promote good health
- Irresponsible prescription drug use
  - Selling prescription drugs
    - Jail time
    - Fines
    - Loss of social network
  - Sharing prescription drugs
    - Cause of overdose
    - Death
    - Disease
      - HIV
      - Hepatitis B
  - Using prescription drugs not prescribed
    - Overdose
    - Death
    - Disease
      - HIV
      - Hepatitis B

Duration: 20 minutes
Format: Lecture
Assessment: Teacher observation

Objective 3: Explain ways prescription drugs can enter the body.

- Implantation
  - Drugs placed under the skin
    - Absorbed in the bloodstream
- Mouth
  - Swallowing
    - Absorbed in the bloodstream after reaching the stomach and small intestines
- Injection
  - Syringe and needle use
    - Absorbed in the bloodstream immediately after being injected into muscle or blood vessel
    - High risk of HIV and hepatitis B if syringes are shared

Day 2 (cont'd)

- Absorption
  - Buccal
    - Oral absorption between the cheek and gum
      - Enters the bloodstream through the skin or mucous membranes
  - Sublingual
    - Oral absorption under the tongue
      - Enters the bloodstream through the skin or mucous membranes
  - Skin patch
    - Enters the bloodstream through the skin or mucous membranes
  - Suppository
    - Anal absorption
      - Enters the bloodstream through the skin or mucous membranes
    - Vaginal absorption
      - Enters the bloodstream through the skin or mucous membranes
  - Topical
    - Enters the bloodstream through the skin or mucous membranes
      - Cream
      - Lotions
      - Ointment
      - Sprays
- Inhalation
  - Nasal passage
    - Enters the bloodstream in the lungs
  - Oral passage
    - Enters the bloodstream in the lungs

Duration: 20 minutes
Format: Lecture
Assessment: Teacher observation

Day 3

Objective: Discuss factors that determine prescription drug effects.

- Age
  - Drug effects will vary for:
    - Infants
    - Teens
    - Adults
    - Elderly
- Albumin concentration
  - Protein found in the bloodstream and urine
- Alcohol intake
  - Alcohol mixed with drugs can produce a multiplier effect
    - Antagonism
      - Occurs when each drug's effect is canceled out or reduced by another
    - Synergism
      - Occurs when drugs interact to produce effects greater than those that each drug would produce alone
- Amount or dosage of drug(s) used
  - Prescription drugs are prescribed according to the patients size and weight
- Barometric pressure
  - Changes drug action
  - Changes metabolism
- Behavior
  - Violent
  - Depression
  - Anger
  - Hyperactivity
- Body fat of user
  - Prescription drugs are prescribed according to the patients size and weight
- Body weight of user
  - Prescription drugs are prescribed according to the patients size and weight
- Cardiovascular function
  - Heart health
- Dietary factors
  - Amount of food eaten
  - Types of foods eaten
- Disease
  - Alters how the body would normally use the drug
- Fever
  - Alters how the body would normally use the drug
- Gastrointestinal function

Day 3 (cont'd)

- Absorption capabilities
- Presence of acids

- Gender
  - Lean versus fat body tissue
    - Males
    - Females
- Immunologic function
  - Presence of white and red blood cells
- Infection
  - Alters how the body would normally use the drug
- Lactation
  - Nursing mothers
  - Alters how the body would normally use the drug
- Liver function
  - The rate at which the liver can breakdown and absorb the drug
- Marijuana intake
  - Marijuana mixed with drugs can produce a multiplier effect
    - Antagonism
      - Occurs when each drug's effect is canceled out or reduced by another
    - Synergism
      - Occurs when drugs interact to produce effects greater than those that each drug would produce alone
- Mood
  - Stress
  - Anger
  - Fear
  - Anxiety
  - Joy
- Nicotine intake
  - Nicotine mixed with drugs can produce a multiplier effect
    - Antagonism
      - Occurs when each drug's effect is canceled out or reduced by another
    - Synergism
      - Occurs when drugs interact to produce effects greater than those that each drug would produce alone
- Pregnancy
  - Alters how the body would normally use the drug due to an increase in hormones

Day 3 (cont'd)

- Presence of other drugs in the body
  - Drugs mixed with other drugs can produce a multiplier effect
    - Antagonism
      - Occurs when each drug's effect is canceled out or reduced by another
    - Synergism
      - Occurs when drugs interact to produce effects greater than those that each drug would produce alone
- Renal function
- Speed at which the drugs were taken
- Sunlight
  - Increased metabolism
  - Increased coagulation
- Type of drug/s used
  - Antibiotic
  - Antidepressant
  - Antiepileptic
  - Antihypertensive
  - Antiulcer
  - Bronchodilator
  - Hypnotic
  - Lipid Lowering
  - Prescription Analgesic
  - Sedative

Duration: 20 minutes
Format: Lecture
Assessment: Teacher observation

Day 4

Objective 1: Discuss common types of prescription drugs.

- Antibiotic
  - Used to treat bacterial infections
    - Aminoglycosides, Carbapenems, Cephalosporins (1st Generation, 2nd Generation, 3rd Generation, 4th Generation, 5th Generation), Fluoroquinolones, Glycycline, Macrolides, Monobactam, Penicillins, Polypeptides, Sulfonamides, Tetracyclines, Miscellaneous Antibiotics
- Antidepressant
  - Used to treat depressive disorders
    - Asendin, Cymbalta, Desyrel, Dexedrine, Effexor, Elavil, Lexapro, Ludiomil, Luvox, Norpramin, Nardil, Pamelor, Parnate, Paxil, Pertofrane, Prozac, Remeron, Ritalin, Serzone, Sinequan, Surmontil, Tofranil, Wellbutrin, Zoloft
- Antiepileptic
  - Used to control and prevent epileptic seizures
    - Celontil, Cerebex, Convulex, Depakene, Depakote, Diacomit, Diamox, Dilantil, Epanutin, Epilim, Felbamate, Felbatol, Fosphenytoin, Frisium, Gabapentin, Gabitril, Gemonil, Keppra, Klomopin, Lamictal, Lamotrigine, Lyrica, Mesatoin, Milontil, Mysoline, Neptazane, Neurontin, Peganone, Rivotril, Sabril, Tegretol, Topamax, Topiramate, Tridione, Trileptal, Valium, Zarotin, Zonegran
- Antihypertensive
  - Used to reduce elevated blood pressure
    - Accupril, Altac, Aceon, Adalat CC, Anhydron, Apa-Doxazosin, Aquatag, Aquatensen, Atacand, Atenolol, Avapro, Benicar, Blocadren, Calan, Capoten, Cardene, Cardizem, Cardura, Cartrol, Coreg, Corgard, Cozaar, Diovan, Diucardin, Diuril, Doxaloc, DynaCirc, Enduron, Esidrix, Exna, Gen-Doxazosin, HydroDiuril, Hytrin, Inderal, Isoptin, Kerlone, Levatol, Lopressor, Lotensin, Marazide, Mavik, Med-Doxazosin, Metahydrin, Micardis, Minipress, Monopril, Naqua, Naturetin, Nimotop, Normodyne, Norvasc, Plendil, Prinivil, Procardia XL, Renese, Renormax, Saluron, Sectral, Sular, Tenormin, Teveten, Tiazac, Trandate, Univasc, Vascor, Vasotec, Verelan, Visken, Zebeta, Zestril, Ziac
- Antiulcer
  - Used to treat ulcer discomfort
    - Axid, Carafae, Cytotec, Pepcid, Prilosec, Tagamet, Zantac
- Bronchodilator
  - Opens airways for those with asthma
    - Albuterol, Bitolterol, Epinephrine, Fenoterol, Formoterol, Isoetharine, Isoproterenol, Metaproterenol, Pirbuterol, Procaterol, Racepinephrine, Salmeterol, Terbutaline
- Hypnotic
  - Sleep Aids
    - Abilify, Adapin, Adderall, Akineton, Ambien, Ambien-CR, Amytal, Anafranil, Antabuse, Aquachloral, Aropax, Artane, Asendin, Atarax, Ativan, Aurorix Provigil, Aventyl, Benadryl, Buspar, Butisol, Campral, Catapres, Celexa, Centrax, Cibalith-S, Cipram, Cipramil, Citopam, Clozaril, Cogentin, Compazine, Concerta, Cylert, Cymbalts, Cytomel, Dalmane, Decadron, Depakene, Depakote, Deprax, Deroxat, Desoxyn, Desyrel, Dexedrine, Dobupal, Dolophane, Doral, Dutonin, Edronax, Effexor, Elavil, Eldepryl, Emsam, Equanil,

Day 4 (cont'd)

Equetro, Eskalith, Eufor, Faverin, FazaClo ODT, Felbatol, Fluanxol, Fluctine, Fluocim, Gabitril, Geodon, Gladem, Halcion, Haldol, Imovane, Inderal, Invega, Kemadrin, Keppra, Klonopin, Lamictal, Lexapro, Lexomyl, Lexotan, Lexotanil, Librium, Litarex, Lithane, Litonate, Litotabs, Loxitane, Ludiomil, Lunesta, Lustral, Luvox, Manerix, Marplan, Mellaril, Metadate-CR, Metadate-ER, Methylin, Miltown, Mirapex, Moban, Modiodal, Nalorex, Nardil, Navane, Nefadar, Nembutal, Neurontin, Niravam, Norebox, Norpramin, Nortilen, Nozinanan, Odranal, Orap, Pamelor, Parnate, Paxil, Periactin, Pertrofran, Pexeva, Phaltrexia, Placidyl, Prisdal, Prolixin, Prosom, Prozac, Psiquial, Reapam, Remeron, Restoril, ReVia, Risperdal, Ritalin, Ritalin-LA, Rivotril, Rozerem, Saroten, Seconal, Serax, Sercerin, Serentil, Seresta, Serlect, Seropram, Seroquel, Serotax, Serzone, Sinequan, Somnote, Sonata, Stesolid, Strattera, Subutex, Surmontil, Symmetrel, Synthroid, Tegretol, Temesta, Tenormin, Thorazine, Tofranil, Tolre, Topamaxn, Tranxene, Trexan, Trilafon, Trileptal, Trypitzol, Typtanol, Urecholine, Valium,Veritina, Versed, Vestra, Visken, Vistaril, Vivacil, Vivitrol, Wellbutrin, Wellbutrin-SR, Wellbutrin-XL, Xanax, Zoloft, Zonegran, Zyban, Zyprexa

- Lipid-lowering
  - Lowers blood cholesterol levels
    - Advicor, Altocor, Antara, Atromid-S, Colestid, Crestor, Lescol, Lipitor, Lipofen, Lopid, Lovaza, Mevacor, Niacor, Omacor, Pravachol, Questran, Simcor, Tricor, Triglide, Vitorin, Welchol, Zetia, Zocor
- Prescription analgesic
  - Pain Reliever
    - Damason-P, Darvon Compund-65, Empirin with Codeine No. 3, Empirin with Codeine No. 4, Endodan, Lortab ASA, Panasal 5/500PC-Cap, Percodan, Percodan-Demi, Propoxyphene Compound-65, Roxiprin, Synalgos-DC Talwin Compound
- Sedative
  - Slows down the central nervous system
    - Calms behavior
      - Ambien, Carisoma, Equinail, Hypnoge, Ivadal, Lunata, Meprospan, Miltown, Myslee, Nimadorm, Nitrest, Sanoma, Sanval, Soma, Somit, Stella, Stilnoct, Stilnox, Zodorm, Zoldem, Zolfresh, Zolt

Duration: 20 minutes
Format: Lecture
Assessment: Teacher observation

Objective 2: Discuss prescription drug guidelines.

- Keep prescription drugs in their original containers.
- Never take prescription drugs that have been prescribed for another person.
- Keep prescription drugs out of the reach of children.
- Follow instructions for storing the prescription drug.
- Do not use a prescription drug if it is expired.
- Never take prescription drugs if that appear to have been tampered. with, are discolored, or have a suspicious odor.
- Carefully follow the instruction on the label.
- Do not stop taking the drug if you start feeling better.
- Report new or unexpected symptoms to a physician.
- Contact a physician if the drug does not seem to be producing the desired effects.

Duration: 25 minutes
Format: Lecture
Assessment: Teacher observation

Day 5

Objective 1: Discuss off-label drug use.

- Prescription drug not approved by the FDA
  - Drugs commonly prescribed off-label
    - Albuterol, Aripiprazole, Gabapentin, Lamictal, Lisoderm, Modafinil, Propranolol, Risperidone, Tiagabine, Topiramate, Trazodone, Viagra

Duration: 10 minutes
Format: Lecture
Assessment: Teacher observation

Objective 1: Describe what is involved in making a commitment to be drug-free.

- Working on refusal statements
- Finding healthy alternatives
- School efforts
- Community efforts

Duration: 10 minutes
Procedure: Lecture
Assessment: Teacher observation

Objective 2: Identify help that is available for individuals who presently use drugs.

- Sources in the community
  - Counselors
  - Support groups
  - Outpatient drug-free treatment
  - Short-term treatment
  - Maintenance therapy
  - Therapeutic communities
- Friends
- Family

Duration: 10 minutes
Format: Lecture
Assessment: Teacher observation

Objective 3: Discuss the costs of drug use to the user, the user's family and friends, and to society in general.

- Individual
  - Physical health
    - Tolerance
    - Physiological dependence
    - Addiction
    - Increased high risk behaviors
  - Mental health

        - Psychological dependence
        - Depression
        - Suicide
    - Social health
        - Loss of interest and goals
        - Increased violence and crime
- Family and friends
    - Stop spending time with family and friends
    - Emotional betrayal
    - Financial loss
- Society
    - Rise of drug related crime and violence
    - Cost to U.S economy due to:
        - Jail time
        - Accidents
        - Deaths
        - Health care costs
        - Legal fees
        - Law enforcement costs
        - Insurance costs
        - Drug-related damages

Duration: 25 minutes
Format: Lecture
Assessment: Teacher observation

Developed by: Heather Christenson, Betty Murphy, Health Education Department, Pontiac Township High School and Tara Hanson, Graymont Grade School

Language Arts

P^2D^2

Pontiac Prescription Drug Disposal:
A Cooperative Program between High School Students, Local Officials, and Pharmacies
www.p2d2program.org

Lesson Plan

Language Arts Lesson—P^2D^2

The Eco-ku

Objectives

Students will:

1. Work in a cooperative learning environment to employ figurative language, written in haiku format, to express a message of ecological importance to a greater audience.

2. Confer with classmates regarding format, message, and editing issues.

3. Present their "eco-ku" orally to the class along with appropriate illustrations, graphics, and explanations.

Illinois State Goals

The lesson plan addresses, but is certainly not limited to, the following Illinois Learning Standards:
2A4a, 2b4a, 3A4, 3B4b, 3B4c, 3C4b, 4B4a, 4B4b

Materials

Notebook paper
Pen
Magazines
Construction/printer paper
Markers or other drawing/writing utensils
Tape or glue
Scissors
Stapler

Procedure

Background and Overview of the Lesson:

Eco-kus are a hybrid of ancient Japanese poetry and a contemporary awareness of environmental needs in our community. Written in haiku form, eco-kus are created to carry ecology-oriented messages to the public. The eco-ku lesson plan was inspired by the P^2D^2 project and conceived as a device to interest students who were not ordinarily high achievers in language arts courses, but were heavily invested in local ecology projects. Through their efforts in writing eco-kus, students will be simultaneously exposed to a new form of critical and creative writing as well as given an opportunity to articulate the pro-environmental message of programs such as P^2D^2.

In its initial run, the eco-ku lesson was an astounding success, generating interest from both the governor of Illinois and school districts state-wide. Although this lesson plan was designed primarily for high school sophomores and keyed accordingly to the appropriate Illinois Learning Standards, modifications can easily be made for different age levels.

1. The lesson will begin with a teacher led-discussion of the haiku format:

   <u>Haiku Rules</u>

   - Has three lines
   - Has 17 syllables
   - Has five syllables in the first line, seven in the second, and five in the third

2. Next, analyze and discuss an original composition from the instructor:

Example Haiku written by Mr. Soares

Sitting in the sand.
Wave touches foot and pulls back.
Old sand trades for new.

4. Using the Smartboard, explore haikus further on http://www.haikusociety.com, discussing content and counting syllables.

5. Eco-ku Explanation: "Haiku-writing is an ancient Japanese practice that tries to capture a 'moment in time,' much like a snapshot. For this project, you will consider what you have learned about our environment today and programs such as P^2D^2. Ultimately, you will create 'eco-ku' based on those concepts. You will either cut out or create three pictures and write an eco-ku poem for each. These three poems need to be turned in as a book with your name on the cover."

6. In groups of two or three, students should begin discussing haiku and ecology, culminating in the creation of eco-ku. Magazines should be available for students to find pictures that will accompany their eco-ku; conversely, they may create their own pictures by drawing them (or creating them on a computer). For verification purposes, the students will confer with each other on format and syllable count. When a student has created three eco-kus, he or she should use available materials to construct a "book," gluing or creating a picture for each eco-ku. In addition, the student should add a cover incorporating his or her name into a title.

7. Before students submit their eco-ku books, they will have their work peer reviewed by those in their groups. Any corrections can be made at this time.

8. Finally, students will use their eco-ku books to facilitate an oral presentation replete with any explanations necessary. Students making the oral presentations should be prepared to answer any questions from fellow students concerning the message of their eco-ku. Please see student-created haikus in the section "Sample Student Stewardship Projects to Initiate Action."

Rubric

Timely Completion: Was it done on time? Yes No _____(5 pts)

Basic Criteria Met: Did it follow the prescribed pattern? Yes No _____(5 pts)

Creativity: Is it imaginative? Eye-catching? Colorful? Neat? _____(5 pts)

Correctness: Are there errors in spelling? Grammar? Syllables? _____(5 pts)

(Total) _____(20 pts)

Developed by Michael Soares, English Department, Pontiac Township High School

Pontiac Township High School Student Examples, 2009

Eco-ku: Ecology-inspired poems written in haiku form.

Old meds with no clue?
Just send to P^2D^2.
Make safe energy. By Myles Rich

Don't do wrong, instead
Be eco-smart, re-claim meds
P^2D^2 saves. By Marcus Fultz

Got old, unused drugs?
Turn them in while you still can.
Improve our future! By Chase Alford

Pharmaceuticals?
Be responsible with them.
P^2D^2 works! By Megan Schmoeger

To make energy
Send your expired pills to
Local pharmacies. By Jake Heller

Do you have old pills?
Take them to a pharmacy.
Save our planet now! By Alex DeMattia

Don't flush medicine.
Take them to a pharmacy.
Go P^2D^2! By Jacqui DeFrees

Got old medicine?
P^2D^2 will take them.
Let's save the planet. By Jacqui DeFrees

Get rid of old pills.
Let's start saving the planet.
Go P^2D^2! By Jacqui DeFrees

And the winner:

Take back your old pills
Before fish have many more gills.
Save the water now. By Liz Howard

Music

P^2D^2

Pontiac Prescription Drug Disposal:
A Cooperative Program between High School Students, Local Officials, and Pharmacies
www.p2d2program.org

Lesson Plan

Project Plans: Creating a Radio Jingle

Objectives

Students will:

1. Collaborate within the class and offer input to create an effective jingle.
2. Incorporate the use of composition, ear training, music theory, and music technology knowledge and skills, as well as an understanding of how the final musical product will reflect and promote the message or product.
3. Use technology through computer notation and sequencing software.
4. Learn to consider performance by creating melody and harmony vocal lines, and creation of appropriate sound effects and instrumental parts.
5. Gain "real-world" music experience and record tracks in a studio environment.
6. Create a radio jingle to reinforce the goals of the P^2D^2 Program.

Illinois State Goals

25: Know the language of the arts:
Students should understand the sensory elements, organizational principles and expressive qualities of the arts. Students will analyze and evaluate student and professional works for how aesthetic qualities are used to convey intent, expressive ideas and/or meaning.

26: Through creating and performing, understand how works of art are produced:
Students will understand the processes, traditional tools and modern technologies used in the creation of their work. They will analyze and evaluate how the choice of media, tools, technologies and processes support and influence the communication of ideas. Students will apply the skills and knowledge necessary to create and perform their jingle. Students will create and perform a complex work of art using a variety of techniques, technologies and resources and independent decision making.

27: Understand the role of the arts in civilizations, past and present:
Students will analyze how music functions in history, society and everyday life. They will see how careers in the arts are expanding based on new technologies and societal changes. They will also see how music shapes and reflects ideas, issues or themes.

Procedure

1. Students will research the P^2D^2 project to understand its unique goals and purposes. Students will learn about the methods used to deliver relevant science and stewardship messages. By listening to and discussing real radio jingles, they will gain understanding about the impact the lyrics may have on the listener and the possible musical reasons for this impact.
2. From their own concept of the product and the project, students will create their own lyrics for a thirty-second radio jingle.
3. Students will individually create a melody and lead sheet for the lyrics. These student-created melodies may change or alter the original lyrics, but must maintain the integrity of the message.
4. Students will brainstorm possible tunes from any style of music (classical, jazz, rock, pop, etc) that have already been written that might fit the chosen lyrics.
5. From a recording of the tune selected, students will transcribe all parts to computer music notation in score format. Adaptations to the original in length, timbre, and style

may be made once the transcription has been created.

6. After assembling all of the potential jingles from all classmates, the class will make the final decision for the chosen jingle (lead sheet) they should continue to pursue. Students will then create in computer notation all appropriate parts necessary for the performance and recording of the jingle. [See the final P^2D^2 jingles, "Cleaner Water" and "We Love $P^2D^{2"}$ in this publication in the "Sample Student Stewardship Projects to Initiate Action" section.]
7. Students will rehearse the performance of the vocal and instrumental parts to the music.
8. Students will use a music sequencing software program to create and record all parts, instrumental and vocal, for the finished product. If a local recording studio is available, students will record to CD the instrumental and vocal tracks.
9. The jingle will be then tested and feedback drawn from students and adults as to its possible impact and usefulness in a real world situation.

Developed By: Keith Schmink, Music Department, Pontiac Township High School

Art Design

P^2D^2

Pontiac Prescription Drug Disposal:
A Cooperative Program between High School Students, Local Officials, and Pharmacies
www.p2p2program.org

Lesson Plans

Art Lesson Plan - P^2D^2

P^2D^2 T-shirt design

Objectives

Students will:

1. Use art skills and practices to create a design for a t-shirt that represents the message being conveyed through the P^2D^2 program.

2. Receive an overview of the program and discuss possible designs.

3. Learn balance and composition, which will be encouraged in the design.

Illinois State Goals

Visual Arts: Analyze and evaluate how tools/technologies and processes combine to convey meaning.

Materials

P^2D^2 poster
Photo of P^2D^2 mailbox design
Handout of P^2D^2 design
Performance Assessment(s) Rubric

Procedure

Students will examine a poster of a student-created P^2D^2 drug disposal project and brainstorm and sketch out ideas for a t-shirt to promote the program. Through a handout, students will also learn general design requirements (e.g., one color, good balance, P^2D^2 logo, year, and school). When the t-shirt designs are completed, the science department will choose one to represent the P^2D^2 program.

Details, Process, Practice, Method, Course of Action, Formula:

Anticipatory Set - Introduce the lesson by showing a poster of the P^2D^2 drug disposal program created by students. Discuss the background goals of the P^2D^2 program, and its benefits. This will provide a foundation for creating a design that will best illustrate and promote the P^2D^2 program messages.

Input - (Teacher-guided) Students brainstorm and sketch out ideas for the P^2D^2 t-shirt designs. Once the ideas have been discussed with the instructor, students can move on to the final design.

Closure - Review keys to the t-shirt design.

Assessments

Personal communication(s)
Observation
Whole group instruction
One-on-one instruction
Performance assessment(s) rubric

Potential Accommodations

Students with disabilities will receive extra time on their drawings.

Developed by: Nick Vogt, Art Department, Pontiac Township High School

P^2D^2 T-shirt Design

Students will create a design for the P^2D^2 prescription drug program. Included in the design will be the name of the school, and the year. Special attention should be paid to design and layout. Pill Bottle Phil should be incorporated in some way to advertise the logo. Design should be balanced. This project is worth 50 points.

P^2D^2 Design Rubric

Focus (15pts)

Design incorporates P2D2
Interesting creative design/ Interesting layout
Design has year/logo

Elements of Design (15pts)

Design has good balance
Good use of line/shapes/ Pill Bottle Phil drawn accurately
Good use of color

Creativity effort (20pts)

Spent time wisely
Did not rush/put effort in design
Unique unlike any others/ did not trace/transfer images
Worked to develop to full potential
Solved problems

Art Lesson Plan - P^2D^2

P^2D^2 Drop-off Box Lesson

P^2D^2 Drop-off box design

Objectives

Students will:

1. Use art and design skills to create a graphic design for the prescription drug drop-off box. The drop-off box is an old mailbox that has been painted white.
2. The students will hear an overview of the purpose of the program, and discuss the purpose of the drop-off box with Mr. Ritter.
3. After completing their design, the students will write about their design proposal, explaining how their design expresses the intent of the P^2D^2 program and the purpose of the drop-off box.
4. The students will present their final design to the class.

Illinois State Goals

25.A.4 – Analyze and evaluate the effective use of elements, principles and expressive qualities in a composition/performance in the visual arts.
26.B.4d – Demonstrate knowledge and skills that communicate clear and focused ideas based on planning, research, and problem solving.
27.A.4b – Analyze how the arts are used to inform and persuade through traditional and contemporary art forms.
26.A.5 – Analyze and evaluate how the choice of media, tools, technologies and processes support and influence the communication of ideas.

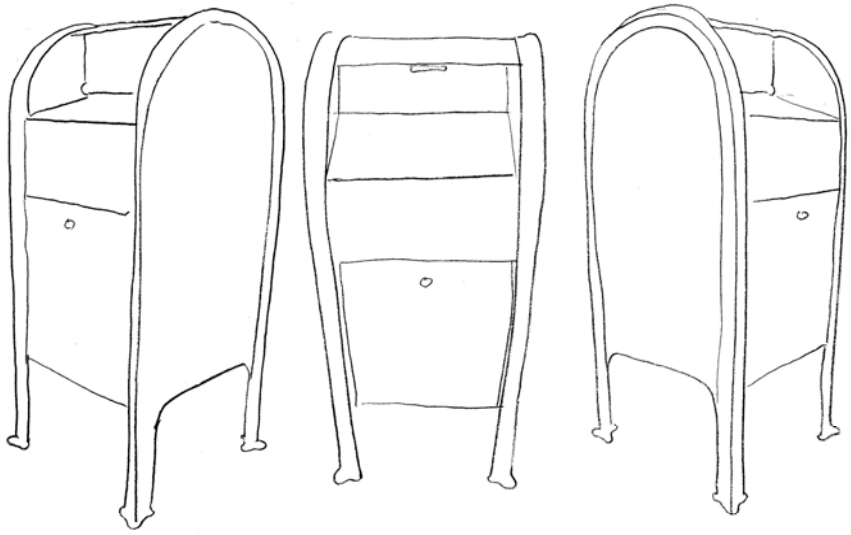
Materials

Mailbox
List of people or groups that need to be recognized on the mailbox:
Illinois Environmental Protection Agency (logo)
Illinois Indiana Sea Grant (logo)

PTHS Ecology class
PTHS Illinois Studies class
PTHS Music Theory class
LACC Commercial Art class
LACC Welding class
Local Auto Body Shop
Local Sign Company
Illinois State Police, State Police (patch)

Artwork of Pill Bottle Phil

Drawing paper, colored pencils, etc.
A drawing template of the mailbox with three views for sketches



Procedures

Day 1, 2, and 3: Introduction to the graphic design assignment, P^2D^2 drop-off box. P^2D^2 program and information are introduced, and the purpose of the drop-off box. Students can also find information at the web site, www.p2d2program.org. Students are given handouts that provide the information that must appear on the box. The front and sides of the mailbox will be used in the design. The students will create a list of their own ideas and use the template to sketch out a minimum of five different concepts for their design. These are done quickly. These are due at the beginning of the 4th day.

Day 4 and 5: The students will do their final design based on their sketches, changing and altering them as needed. The final design will show the three sides, be in color, and show the placement of the necessary elements for the design. The design can be done by hand or on the computer. They must also write a one-page paper with an explanation of their design concept.

Day 6: Students present their designs to the class. The class discusses the various designs with the intent to come to a consensus of the best design possibilities.

Closure

Our goal was to have a student-generated design for the mailbox/drop box that could be repeated on many other mailboxes. Rather than have the students paint the mailbox, a time consuming project, you can take the design to a local sign company. They assisted us with the final design so it looked professional. It could be then printed on a wrap, or template and used on as many mailboxes as needed. If desired, students can paint the design on the drop-off box themselves. Our final design was a combination of 3-4 ideas by the students. The sign company shared the design with us, and after the graphics were added to the mailbox, it was returned to the art room for final discussion by the class. It was then taken out to the State Police Headquarters where it is being used.

Assessments

Observation and communication with students while working on the assignment

Thumbnail sketch ideas (50 points)

- Minimum of five different ideas for design
- Interesting design concepts
- Required elements are present in the designs
- On task during class

Final Design (50 points)

- Has all required elements in the design
- On task during class
- Design shows development from one or more of the thumbnail sketches
- Design is appropriate for the use of the drop-off box
- Skill and knowledge of color, drawing skills, etc. are evident
- Final design demonstrates effort, care, and concern

Writing and presentation (20 points)

- Ideas presented clearly with elaboration
- Conventions, grammar used correctly
- Presentation was done

Students with disabilities will receive extra time if necessary.

Our Final Design

Commercial art students designed the mailbox for the drugs that were collected by the police department. This mailbox was one that was completed and is now located at a state police headquarters. (News release about use of these drop-off boxes follows.)

At the State Police Headquarters

Developed by: Robert Sear, art instructor, Livingston Area Career Center, Pontiac Township High School

Illinois State Police NEWS

Larry G. Trent • Director

FOR IMMEDIATE RELEASE

January 13, 2009

Contact:
Trooper Joseph Dittmer
815-844-1500
Illinois State Police
District Six Headquarters

The Illinois State Police District Six provide pharmaceutical disposal.

PONTIAC – The Illinois State Police District Six and the Students and staff of Pontiac Township High School in Pontiac have teamed together to provide a safe location for prescription drug disposal. The lobby of the Illinois State Police District Six headquarters has been equipped with a prescription drug disposal box. The disposal box will be maintained and operated by Illinois State Police personnel.

In the past year, the students and staff of the Pontiac Township High School took part in establishing the Prescription Pill and Drug Disposal Program (P^2D^2). The program focuses on a cleaner environment by providing the public with a safe and secure means of disposing of unused pharmaceuticals. The P^2D^2 program has been successful in collecting and properly disposing of thousands of pounds of medications. The program has also been adopted in the city of Fife, Washington.

The Illinois State Police supports the environmental efforts and is proud to provide a safe and secure disposal location at the Illinois State Police headquarters located at 800 South Old Airport Road in Pontiac.

Foreign Language

P^2D^2

Pontiac Prescription Drug Disposal:
A Cooperative Program between High School Students, Local Officials, and Pharmacies
www.p2d2program.org

Lesson Plan

P²D² Program Website: Spanish National Honor Society Translation Project*

Objectives

Students will:

1. Undertake a collaboration project with the P^2D^2 program to provide a Spanish version of the website.

2. Be responsible for translating a section of the P^2D^2 program.com website, either as part of a group, or individually.

3. Implement a similar (P^2D^2) program in our community.

4. Be awarded community service hours.

Learning Standards - Texas Essential Knowledge and Skills (TEKS) alignment

This project aligns with the 5 Cs as follows:

1. Communication
   1.c Present information and convey short messages on everyday topics to listeners and readers.
2. Cultures
   2.b Use the language to demonstrate understanding of products and how they are related to the perspectives of cultures.
3. Connections
   3.b Use language to obtain, reinforce, or expand knowledge of other subject areas.
4. Comparisons
5. Communities
   5.a Use the language beyond the school setting through activities, such as participating in cultural events and using technology to communicate.

Procedure

The translation of the entire website shall be completed in no more than one month. (The following schedule assumes that there are two meetings per month):

Meeting 1: The first meeting will consist of distribution of the tasks. Tasks will be distributed based on preferences of the student. After tasks are assigned, students will deliver a rough draft to be edited (if necessary) and approved by the rest of the Spanish National Honor Society members in attendance.

Meeting 2: Students will complete the translation process during a two-week period between meetings. A completed translation must be turned in at the second meeting.

Assessment

The completed website will be verified by the teacher for accuracy.

* Mr. Salat-Foix's class became involved in this project as a result of talking to the P^2D^2 Coordinator Paul Ritter.

Developed By: Xavi Salat-Foix, Spanish Teacher, Carl Wunsche Senior High School (Spring Texas)

Alignment to State (Illinois and Indiana) and National Science Standards

Ecology/Environmental Science
Illinois State Learning Standards

STATE GOAL 11: Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.

Illinois Learning Standards:

LEARNING STANDARD A. Know and apply the concepts, principles and processes of scientific inquiry.
LEARNING STANDARD B. Know and apply the concepts, principles and processes of technological design.

Illinois Assessment Framework Objectives:

BENCHMARK:

- 11.A.4a Formulate hypotheses referencing prior research and knowledge.
- 11.A.4b Conduct controlled experiments or simulations to test hypotheses.
- 11.A.4c Collect, organize and analyze data accurately and precisely.
- 11.A.4e Formulate alternative hypotheses to explain unexpected results.
- 11.A.4f Using available technology, report, display and defend to an audience conclusions drawn from investigations.
- 11.B.4a Identify a technological design problem inherent in a commonly used product.
- 11.B.4b Propose and compare different solution designs to the design problem based upon given constraints including available tools, materials and time.
- 11.B.4d Determine the criteria upon which the designs will be judged, identify, advantages and disadvantages of the designs and select the most promising design.
- 11.B.4e Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.
- 11.B.4f Evaluate the test results based on established criteria, note sources of error and recommend improvements.
- 11.B.4g Using available technology, report to an audience the relative success of the design based on the test results and criteria.
- 11.A.5a Formulate hypotheses referencing prior research and knowledge.
- 11.A.5b Design procedures to test the selected hypotheses.
- 11.A.5c Conduct systematic controlled experiments to test the selected hypotheses.
- 11.A.5d Apply statistical methods to make predictions and to test the accuracy of results.
- 11.A.5e Report, display and defend the results of investigations to audiences that may include professionals and technical experts.
- 11.B.5a Identify a design problem that has practical applications and propose possible solutions, considering such constraints as available tools, materials, time and costs.
- 11.B.5b Select criteria for a successful design solution to the identified problem.
- 11.B.5c Build and test different models or simulations of the design solution using suitable materials, tools and technology.
- 11.B.5d Choose a model and refine its design based on the test results.
- 11.B.5e Apply established criteria to evaluate the suitability, acceptability, benefits, drawbacks and consequences for the tested design solution and recommend modifications and refinements.
- 11.B.5f Using available technology, prepare and present findings of the tested design solution to an audience that may include professional and technical experts.

BENCHMARK:

13.A.5a Design procedures and policies to eliminate or reduce risk in potentially hazardous science activities.

13.A.5b Explain criteria that scientists use to evaluate the validity of scientific claims and theories.

13.A.5c Explain the strengths, weaknesses and uses of research methodologies including observational studies, controlled laboratory experiments, computer modeling and statistical studies.

13.A.5d Explain, using a practical example (e.g., cold fusion), why experimental replication and peer review are essential to scientific claims.

13.B.5a Analyze challenges created by international competition for increases in scientific knowledge and technological capabilities (e.g., patent issues, industrial espionage, technology obsolescence).

13.B.5b Analyze and describe the processes and effects of scientific and technological breakthroughs.

13.B.5c Design and conduct an environmental impact study, analyze findings and justify recommendations.

13.B.5d Analyze the costs, benefits and effects of scientific and technological policies at the local, state, national and global levels (e.g., genetic research, Internet access).

13.B.5e Assess how scientific and technological progress has affected other fields of study, careers and job markets and aspects of everyday life.

STATE GOAL 12: Understand the fundamental concepts, principles, and interconnections of the life, physical, and earth/space sciences.

Illinois Learning Standards:

LEARNING STANDARD: A. Know and apply concepts that explain how living things function, adapt and change.

LEARNING STANDARD B. Know and apply concepts that describe how living things interact with each other and with their environment.

Illinois Assessment Framework Objectives:

BENCHMARK:

12.B.4a Compare physical, ecological and behavioral factors that influence interactions and interdependence of organisms.

12.B.4b Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns).

12.A.5a Explain changes within cells and organisms in response to stimuli and changing environmental conditions (e.g., homeostasis, dormancy).

STATE GOAL 13: Understand the relationships among science, technology and society in historical and contemporary contexts.

Illinois Learning Standards:

LEARNING STANDARD A. Know and apply the accepted practices of science.

LEARNING STANDARD B. Know and apply concepts that describe the interaction between science, technology and society.

Illinois Assessment Framework Objectives:

BENCHMARK:

13.A.4a Estimate and suggest ways to reduce the degree of risk involved in science activities.

13.A.4b Assess the validity of scientific data by analyzing the results, sample set, sample size, similar previous experimentation, possible misrepresentation of data presented and potential sources of error.

13.A.4c Describe how scientific knowledge, explanations and technological designs may change with new information over time (e.g., the understanding of DNA, the design of computers.

13.A.4d Explain how peer review helps to assure the accurate use of data and improves the scientific process.

13.B.4a Compare and contrast scientific inquiry and technological design as pure and applied sciences.

13.B.4b Analyze a particular occupation to identify decisions that may be influenced by a knowledge of science.

13.B.4c Analyze ways that resource management and technology can be used to accommodate population trends.

13.B.4d Analyze local examples of resource use, technology use or conservation programs; document findings; and make recommendations for improvements.

13.B.4e Evaluate claims derived from purported scientific studies used in advertising and marketing strategies.

Ecology/Environmental Science
Indiana State Science Standards

Principles of Environmental Science-- Standard 1

Environmental Systems

Env.1.4 Understand and explain that human beings are part of Earth's ecosystems and give examples of how human activities can, deliberately or inadvertently, alter ecosystems.

Env.1.8 Recognize/ describe the difference between systems in equilibrium and systems in disequilibrium.

Env.1.10 Identify and measure biological, chemical, and physical factors within an ecosystem.

Natural Resources

Env.1.28 Understand and describe the concept and the importance of natural and human recycling in conserving our natural resources

Environmental Hazards

Env.1.31 Understand and explain that waste management includes considerations of quantity, safety, degradability, and cost.

Env.1.34 Differentiate between natural pollution and pollution caused by humans; give examples of each.

Principles of Biology-- Standard 1

Ecology

B.1.41 Recognize that and describe how human beings are part of Earth's ecosystems. Note that human activities can, deliberately or inadvertently, alter the equilibrium in ecosystems.

B.1.43 Understand that and describe how organisms are influenced by a particular combination of living and nonliving components of the environment.

B.1.44 Describe the flow of matter, nutrients, and energy within ecosystems.

B.1.45 Recognize that and describe how the physical or chemical environment may influence the rate, extent, and nature of the way organisms develop within ecosystems.

Advanced Life Science: Animals Standards—Standard 4
Animal Genetics and the Environment

Ecology

AS.4.20 Explain the role of resources in every ecosystem. Define trophic level. Explain the concept of energy flow: primary producers, primary consumers, secondary and tertiary consumers, and decomposers.

AS.4.21 Describe the impact humans have on the capacity of any system to support life. List the factors that limit the capacity of an ecosystem. Discuss the interactions that occur between birth rate, population growth, and carrying capacity of the ecosystem.

AS.4.22 Explain difference between exponential and logistic growth curves. Define carrying capacity. Describe the impact of carrying capacity on an ecosystem (community ecology). Predict the impacts of overcrowding, disease, and waste on animal health

Ecology/Environmental Science
Alignment with National Science Education Standards

Science as Inquiry

Content Standard A--As a result of their activities in grades 9-12, all students should develop understanding of:

- Abilities necessary to do scientific inquiry
    - Identify questions and concepts that guide scientific investigations.
    - Design and conduct scientific investigations.
    - Formulate and revise scientific explanations and models using logic and evidence.
    - Communicate and defend a scientific argument.

- Understandings about scientific inquiry

    - Scientists usually inquire about how physical, living, or designed systems function. Conceptual principles and knowledge guide scientific inquiries. Historical and current scientific knowledge influence the design and interpretation of investigations and the evaluation of proposed explanations made by other scientists.
    - Scientists conduct investigations for a wide variety of reasons. For example, they may wish to discover new aspects of the natural world, explain recently observed phenomena, or test the conclusions of prior investigations or the predictions of current theories.
    - Scientists rely on technology to enhance the gathering and manipulation of data. New techniques and tools provide new evidence to guide inquiry and new methods to gather data, thereby contributing to the advance of science. The accuracy and precision of the data, and therefore the quality of the exploration, depends on the technology used.
    - Mathematics is essential in scientific inquiry. Mathematical tools and models guide and improve the posing of questions, gathering data, constructing explanations and communicating results.
    - Scientific explanations must adhere to criteria such as: a proposed explanation must be logically consistent; it must abide by the rules of evidence; it must be open to questions and possible modification; and it must be based on historical and current scientific knowledge.
    - Results of scientific inquiry—new knowledge and methods—emerge from different types of investigations and public communication among scientists. In communicating and defending the results of scientific inquiry, arguments must be logical and demonstrate connections between natural phenomena, investigations, and the historical body of scientific knowledge. In addition, the methods and procedures that scientists used to obtain evidence must be clearly reported to enhance opportunities for further investigation.

Life Science

Content Standard C--As a result of their activities in grades 9-12, all students should develop understanding of:

- Interdependence of organisms
    - Human beings live within the world's ecosystems. Increasingly, humans modify ecosystems as a result of population growth, technology, and consumption. Human destruction of habitats through direct harvesting, pollution, atmospheric changes, and other factors is threatening current global stability, and if not addressed, ecosystems will be irreversibly affected.

Science in Personal and Social Perspectives

Content Standard F--As a result of their activities in grades 9-12, all students should develop understanding of:

- Natural resources
  - The earth does not have infinite resources; increasing human consumption places severe stress on the natural processes that renew some resources, and it depletes those resources that cannot be renewed.
  - Humans use many natural systems as resources. Natural systems have the capacity to reuse waste, but that capacity is limited. Natural systems can change to an extent that exceeds the limits of organisms to adapt naturally or humans to adapt technologically.

- Environmental quality
  - Natural ecosystems provide an array of basic processes that affect humans. Those processes include maintenance of the quality of the atmosphere, generation of soils, control of the hydrologic cycle, disposal of wastes, and recycling of nutrients. Humans are changing many of these basic processes, and the changes may be detrimental to humans.
  - Materials from human societies affect both physical and chemical cycles of the earth.
  - Many factors influence environmental quality. Factors that students might investigate include population growth, resource use, population distribution, overconsumption, the capacity of technology to solve problems, poverty, the role of economic, political, and religious views, and different ways humans view the earth.

- Natural and human-induced hazards
  - Human activities can enhance potential for hazards. Acquisition of resources, urban growth, and waste disposal can accelerate rates of natural change.
  - Natural and human-induced hazards present the need for humans to assess potential danger and risk. Many changes in the environment designed by humans bring benefits to society, as well as cause risks. Students should understand the costs and trade-offs of various hazards—ranging from those with minor risk to a few people to major catastrophes with major risk to many people. The scale of events and the accuracy with which scientists and engineers can (and cannot) predict events are important considerations.

- Science and technology in local, national, and global challenges
  - Understanding basic concepts and principles of science and technology should precede active debate about the economics, policies, politics, and ethics of various science- and technology-related challenges. However, understanding science alone will not resolve local, national, or global challenges.
  - Individuals and society must decide on proposals involving new research and the introduction of new technologies into society. Decisions involve assessment of alternatives, risks, costs, and benefits and consideration of who benefits and who suffers, who pays and gains, and what the risks are and who bears them. Students should understand the appropriateness and value of basic questions—"What can happen?"—"What are the odds?"—and "How do scientists and engineers know what will happen?"
  - Humans have a major effect on other species. For example, the influence of humans on other organisms occurs through land use—which decreases space available to other species—and pollution—which changes the chemical composition of air, soil, and water.

History and Nature of Science

Content Standard G--As a result of their activities in grades 9-12, all students should develop understanding of:

- Science as a Human Endeavor
    - Individuals and teams have contributed and will continue to contribute to the scientific enterprise. Doing science or engineering can be as simple as an individual conducting field studies or as complex as hundreds of people working on a major scientific question or technological problem. Pursuing science as a career or as a hobby can be both fascinating and intellectually rewarding.
    - Scientific explanations must meet certain criteria. First and foremost, they must be consistent with experimental and observational evidence about nature, and must make accurate predictions, when appropriate, about systems being studied. They should also be logical, respect the rules of evidence, be open to criticism, report methods and procedures, and make knowledge public. Explanations on how the natural world changes based on myths, personal beliefs, religious values, mystical inspiration, superstition, or authority may be personally useful and socially relevant, but they are not scientific.
    - Because all scientific ideas depend on experimental and observational confirmation, all scientific knowledge is, in principle, subject to change as new evidence becomes available. The core ideas of science such as the conservation of energy or the laws of motion have been subjected to a wide variety of confirmations and are therefore unlikely to change in the areas in which they have been tested. In areas where data or understanding are incomplete, such as the details of human evolution or questions surrounding global warming, new data may well lead to changes in current ideas or resolve current conflicts. In situations where information is still fragmentary, it is normal for scientific ideas to be incomplete, but this is also where the opportunity for making advances may be greatest.

Government--Illinois State Learning Standards

GRADE LEVEL: High School

State Goal 14: Understand political systems, with an emphasis on the United States.

14.A.4 Analyze how local, state, and national governments serve the purposes for which they were created.
14.C.4 Describe the meaning of participatory citizenship (e.g., volunteerism, voting) at all levels of government and society in the United States.
14.C.5 Analyze the consequences of participation and non-participation in the electoral process (e.g., women's suffrage, voter registration, effects of media).
14.D.4 Analyze roles and influences of individuals, groups and media in shaping current debates on state and national policies.
14.D.5 Interpret a variety of public policies and issues from the perspectives of different individuals and groups.

14.F.5 Interpret how changing geographical, economic, technological and social forces affect United States political ideas and traditions (e.g., freedom, equality and justice, individual rights).

State Goal 15: Understand economic systems, with an emphasis on the United States.

15.C.4b Explain the importance of research, development, invention, technology and entrepreneurship to the United States economy.

15.E.4b Describe social and environmental benefits and consequences of production and consumption.

State Goal 17: Understand world geography and the effects of geography on society, with an emphasis on the United States.

17.A.4b Use maps and other geographic instruments and technologies to analyze spatial patterns and distributions on earth.

17.B.4a Explain the dynamic interactions within and among the Earth's physical systems including variation, productivity and constructive and destructive processes.

17.C.5b Describe the impact of human migrations and increased urbanization on ecosystems.

17.C.5c Describe geographic factors that affect cooperation and conflict among societies.

State Goal 18: Understand social systems, with an emphasis on the United States.

18.B.5 Use methods of social science inquiry (pose questions, collect and analyze data, make an support conclusions with evidence, report findings) to study the development and functions of social systems and report conclusions to a larger audience.

Health Education--Illinois State Learning Standards

SUBJECT AREA: Health

Illinois State Goals

State Goal 22: Understand principles of health promotion and the prevention and treatment of illness and injury.

BENCHMARK:

22.A.4b: Analyze possible outcomes of effective health promotion and illness prevention.

22.A.5a: Explain strategies for managing contagious, chronic and degenerative illness.

22.B.4: Explain social and economic effects of health problems on individuals and society.

State Goal 23: Understand human body systems and factors that influence growth and development.

BENCHMARK:

23.A.4: Explain how body systems functions can be maintained and improved.

23.B.4: Explain immediate and long-term effects of health habits on the body systems.

23.B.5: Understand the effects of healthy living on individuals and their future generations.

State Goal 24: Promote and enhance health and well-being through the use of effective communication and decision-making skills.

BENCHMARK:

24.B.4: Explain how decision making affects the achievement of individual health goals.

24.B.5: Explain immediate and long-term impacts of health decisions to the individual, family, and community.

24.C.4: Formulate a plan to achieve individual health goals.

24.C.5: Evaluate progress toward the attainment of a health goal.

Language Arts--Illinois State Learning Standards

SUBJECT AREA: Language Arts
GRADE LEVEL: Early High School

BENCHMARK:

3.A. 4 Use standard English to edit documents for clarity, subject/verb agreement, adverb and adjective agreement and verb tense; proofread for spelling, capitalization and punctuation; and ensure that documents are formatted in final form for submission and/or publication.

3.B.4a Produce documents that exhibit a range of writing techniques appropriate to purpose and audience, with clarity of focus, logic of organization, appropriate elaboration and support and overall coherence.

3.B.4b Produce, edit, revise and format work for submission and/or publication (e.g., manuscript form, appropriate citation of sources) using contemporary technology.

3.B.4c Evaluate written work for its effectiveness and make recommendations for its improvement.

3.C.4a Write for real or potentially real situations in academic, professional and civic contexts (e.g., college applications, job applications, business letters, petitions).

3.C.4b Using available technology, produce compositions and multimedia works for specified audiences.

BENCHMARK:

4.A.4a Apply listening skills as individuals and members of a group in a variety of settings (e.g., lectures, discussions, conversations, team projects, presentations, interviews).

4.A.4b Apply listening skills in practical settings (e.g., classroom note taking, inter-personal conflict situations, giving and receiving directions, evaluating persuasive messages).

4.A.4c Follow complex oral instructions.

4.A.4d Demonstrate understanding of the relationship of verbal and nonverbal messages within a context (e.g., contradictory, supportive, repetitive, substitutive).

4.B.4a Deliver planned informative and persuasive oral presentations using visual aids and contemporary technology as individuals and members of a group; demonstrate organization, clarity, vocabulary, credible and accurate supporting evidence.

4.B.4b Use group discussion skills to assume leadership and participant roles within an assigned project or to reach a group goal.

4.B.4c Use strategies to manage or overcome communication anxiety and apprehension (e.g., developed outlines, notecards, practice).

4.B.4d Use verbal and nonverbal strategies to maintain communication and to resolve individual and group conflict.

BENCHMARK:

5.A.4a Demonstrate a knowledge of strategies needed to prepare a credible research report (e.g., notes, planning sheets).

5.A.4b Design and present a project (e.g., research report, scientific study, career/higher education opportunities) using various formats from multiple sources.

5.B.4a Choose and evaluate primary and secondary sources (print and nonprint) for a variety of purposes.

5.B.4b Use multiple sources and multiple formats; cite according to standard style manuals.

5.C.4a Plan, compose, edit and revise information (e.g., brochures, formal reports, proposals, research summaries, analyses, editorials, articles, overheads, multimedia displays) for presentation to an audience.

5.C.4b Produce oral presentations and written documents using supportive research and incorporating contemporary technology.

5.C.4c Prepare for and participate in formal debates.

BENCHMARK:

1.B.5a Relate reading to prior knowledge and experience and make connections to related information.

1.C.5c Critically evaluate information from multiple sources.

1.C.5d Summarize and make generalizations from content and relate them to the purpose of the material.

1.C.5e Evaluate how authors and illustrators use text and art across materials to express their ideas (e.g., complex dialogue, persuasive techniques).

1.C.5f Use tables, graphs and maps to challenge arguments, defend conclusions and persuade others.

BENCHMARK:

3.B.5 Using contemporary technology, produce documents of publication quality for specific purposes and audiences; exhibit clarity of focus, logic of organization, appropriate elaboration and support and overall coherence.

3.C.5a Communicate information and ideas in narrative, informative and persuasive writing with clarity and effectiveness in a variety of written forms using appropriate traditional and/or electronic formats; adapt content, vocabulary, voice and tone to the audience, purpose and situation.

3.C.5b Write for real or potentially real situations in academic, professional and civic contexts (e.g., applications, job applications, business letters, resume, petitions).

BENCHMARK:

4.A.5a Use criteria to evaluate a variety of speakers' verbal and nonverbal messages.

4.A.5b Use techniques for analysis, synthesis, and evaluation of oral messages.

4.B.5a Deliver planned and impromptu oral presentations, as individuals and members of a group, conveying results of research, projects or literature studies to a variety of audiences (e.g., peers, community, business/industry, local organizations) using appropriate visual aids and available technology.

4.B.5b Use speaking skills to participate in and lead group discussions; analyze the effectiveness of the spoken interactions based upon the ability of the group to achieve its goals.

4.B.5c Implement learned strategies to self-monitor communication anxiety and apprehension (e.g., relaxation and transference techniques, scripting, extemporaneous outlining, repetitive practice).

4.B.5d Use verbal and nonverbal strategies to maintain communication and to resolve individual, group and workplace conflict (e.g., mediation skills, formal and informal bargaining skills).

BENCHMARK:

5.A.5a Develop a research plan using multiple forms of data.

5.A.5b Research, design and present a project to an academic, business or school community audience on a topic selected from among contemporary issues.

5.B.5a Evaluate the usefulness of information, synthesize information to support a thesis, and present information in a logical manner in oral and written forms.

5.B.5b Credit primary and secondary sources in a form appropriate for presentation or publication for a particular audience.

5.C.5a Using contemporary technology, create a research presentation or prepare a documentary related to academic, technical or occupational topics and present the findings in oral or multimedia formats.

5.C.5b Support and defend a thesis statement using various references including media and electronic resources.

Fine Arts—Illinois State Learning Standards

SUBJECT AREAS: Music and Visual Arts

Music

BENCHMARK:

26.A.4c **Music**: Analyze ways in which musical sounds are produced and how they are used in composing, conducting and performing.

26.A.4d **Music**: Demonstrate the ability to read written notation for a vocal or instrumental part.

26.B.4c **Music**: Create and perform music of challenging complexity and length with expression.

Visual Arts

BENCHMARK:

26.A.4e **Visual Arts**: Analyze and evaluate how tools/technologies and processes combine to convey meaning.

26.B.4d **Visual Arts**: Demonstrate knowledge and skills that communicate clear and focused ideas based on planning, research and problem solving.

Common to all the Arts

State Goal 25: ***Know the language of the arts.***

BENCHMARK:

25.A.4 Analyze and evaluate the effective use of elements, principles and expressive qualities in a composition/performance in dance, drama, music and visual arts.

25.A.5 Analyze and evaluate student and professional works for how aesthetic qualities are used to convey intent, expressive ideas and/or meaning.

25.B.4 Analyze and evaluate similar and distinctive characteristics of works in two or more of the arts that share the same historical period or societal context.

25.B.5 Understand how different art forms combine to create an interdisciplinary work (e.g., musical theatre, opera or cinematography).

State Goal 26: ***Through creating and performing, understand how works of art are produced.***

BENCHMARK:

26.A.5 Analyze and evaluate how the choice of media, tools, technologies and processes support and influence the communication of ideas.

26.B.5 Create and perform a complex work of art using a variety of techniques, technologies and resources and independent decision making.

State Goal 27: ***Understand the role of the arts in civilizations, past and present.***

BENCHMARK:

27.A.4a Evaluate how consumer trends in the arts affect the types and styles of art products.

27.A.4b Analyze how the arts are used to inform and persuade through traditional and contemporary art forms.

27.A.5 Analyze how careers in the arts are expanding based on new technologies and societal changes.

27.B.4a Analyze and classify the distinguishing characteristics of historical and contemporary art works by style, period and culture.

27.B.4b Understand how the arts change in response to changes in society.

Supplemental Lesson Plans

Supplemental Lesson Plans

These engaging supplemental activities and games offer a preliminary background on how to protect and improve the quality of our waters. Diverse learning styles are accommodated using a multidisciplinary approach. A variety of teaching methods are included and offer multiple ways to improve student action, decision making, and cooperative learning skills. Flexible supplemental materials integrate science with other disciplines including math, social studies, geography, earth science, and environmental studies. These inquiry-based activities offer students real-world, relevant experience that is essential to high-quality service-learning.

Disposal of Unwanted Medicines—A 4-H Guide
A 4-H guide, developed by Purdue University, to help 4-H members understand why chemicals from medication are being found in the environment, the harm these chemicals can cause, and what can be done about it. Five inquiry-based activities are included, along with a community stewardship component.

Puzzlers and Word Search
Theme-based word searches and puzzlers to help students creatively enhance vocabulary, spelling, and reading skills, while also learning new science concepts.

Chemicals, Chemicals, Everywhere
An engaging experiment, developed by the National Institute of Environmental Health Sciences, that teaches students how to determine what constitutes a chemical and what precautions they should take when handling an unknown substance.

The Minamata Case Study
A case study, sponsored by the National Institute of Environmental Health Sciences, to help students apply their understanding of important scientific concepts to their classroom discussion of the 1950s tragedy in Minamata, Japan. Through this study, students learn how to assess people's risk to specific chemical hazards and how to make decisions about managing that risk.

Resource Management--Protecting your Drinking Water
An estimation activity, developed by the Office of Water, Environmental Protection Agency, in which students apply process skills to estimate the vulnerability of a small town's water supply and decide what must be done to ensure safe drinking water for the community.

Speak Out
An engaging community stewardship activity template, developed by the National 4-H Council, to help students obtain input and ideas from community members.

The Real Deal
An interactive service-learning activity, created by the National 4-H Council, using a strategic model to guide students through their collected research and formulate a plan for action.

Watershed Patch Project
A checklist, created by U.S. EPA, to assess how one's family disposes of unwanted medicines and actions steps needed to implement safe disposal methods. Students determine what practices around their house contribute to water contamination due to unwanted household products being flushed down the drain.

Disposal of Unwanted Medicines—A 4-H Guide

This guide is a collaborative project of Purdue Extension and the Illinois-Indiana Sea Grant Program.

The *Disposal of Unwanted Medicines* 4-H guide has been developed to help high school youth understand why chemicals from medications are being found in the environment, the harm these chemicals can cause, and what can be done about it. Five inquiry-based lessons are included:

- So, what's the big deal?
- What are the issues?
- What should I be concerned about?
- What are my options?
- How can I let other people know about these issues?

These lessons are intended to be introduced and led by an adult instructor (4-H volunteer, Extension Educator, teacher, or other educator) but with the youth increasingly taking leadership as they progress. Students will gain important life skills including teamwork, communicating with others, information gathering, informal analysis, and decision-making.

Some highlights include:

- A filtration experiment that teaches about wastewater disposal and uses the scientific method to study how a porous media can remove some contaminants from water, but not others. This will help students understand why some medications are entering surface or groundwater.

- Conducting research to learn about the history of disposal of unused and expired medicine. Taking a poll of citizens' activities regarding disposal of their medicine to learn what stewardship activities they can engage in to share what they learned about proper disposal of pharmaceuticals.

- Using online resources to acquire the latest government data and national news stories to learn about the medications of primary concern that are affecting our water resources. Preparing a report to acknowledge the contaminants that have been found in water in the students' local community.

- Investigating alternatives for proper disposal of expired and unused medicine and brainstorming ways to provide community education and to explore how to get a community collection event started.

- Suggestions for how youth can share their acquired knowledge through projects including, but not limited to, speeches and demonstrations, displays, 4-H Junior Leader activities, mentoring a younger 4-H member, and outreach to older adults.

The authors of this guide are Natalie Carroll, Extension Specialist and Professor of Youth Development and Ag Education and Whitney Siegfried, Graduate Student, Purdue University Extension.

Learn About Unwanted Medicines

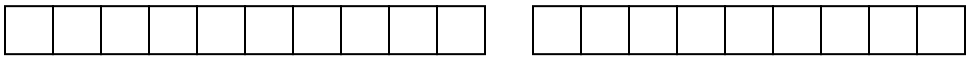
Key Concepts Related to Safe Disposal Methods for Unwanted Medicines

Accidental Poisoning	*Did you know…* that accidental poisoning occurs when any substance interferes with normal body functions after it is inadvertently swallowed, inhaled, or absorbed?
Chemical Compound	*Did you know…*that a chemical compound is a distinct and pure substance formed by the union or two or more elements in definite proportion by weight?
Contaminant	*Did you know…*that a contaminant is a substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects?
Ecological harm	*Did you know…*that ecological harm occurs when an action results in habitat alteration and degradation or directly harms native animals, such as altering the endocrine system of a species?
Effluent	*Did you know…*that effluent is wastewater--treated or untreated--that flows out of a treatment plant, sewer, or industrial outfall, and generally refers to wastes discharged into surface waters?
Feminization of Fish	*Did you know…*that feminization of fish occurs when compounds released into water systems affect how male fish develop, causing them to produce eggs?
Identity theft	*Did you know…*that obtaining a person's personal and financial information through illegal means is a crime called identity theft?
Medicine Collection Programs	*Did you know…*that medicine collection programs allow people to turn in unwanted medications for proper disposal to improve public safety and ecosystem health?
Pharmaceutical	*Did you know…*that a pharmaceutical is any drug or medicine that is prepared or dispensed in pharmacies and used in medical treatment?
Stewardship	*Did you know…*that stewardship is an ethic that embodies the care and/or management of resources for which one has no ownership?

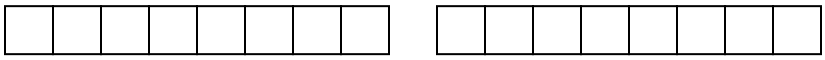
Learn About Proper Disposal of Medicines

Unscramble the words below. Each one has a clue.
Then use the numbered letters to solve the message below.

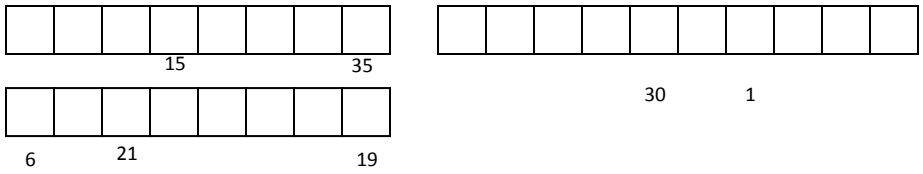
1. CAADENCTIL OSNIGNOPI
Clue: Can occur when a substance is inadvertently swallowed.



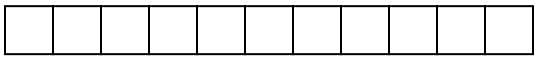
2. MCHLICAE UCNOPMDO
Clue: It is formed by the union or two or more elements.



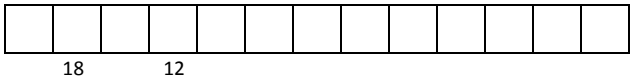
3. EIDMCNEI CLTNIOLEOC ORPGMSRA
Clue: Events held allowing people to turn in unwanted medications for proper disposal.



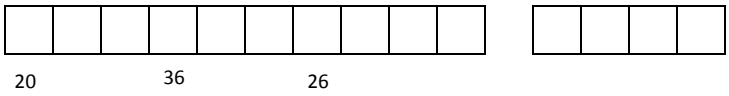
4. HRTSPISEAWD
Clue: The care or management of resources for which one has no ownership.



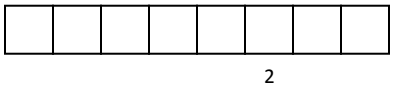
5. ONCTAIMANITON
Clue: A substance that is present at levels that might cause harmful health effects.



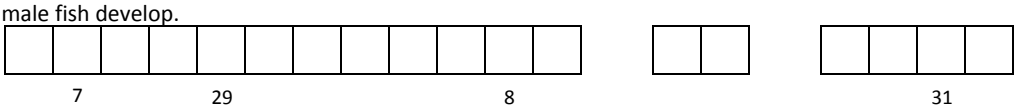
6. OCLGOIELAC AHMR
Clue: Occurs when an action results in habitat alteration or directly harms a native species.



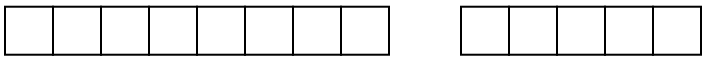
7. TELFUNFE
Clue: Generally refers to wastes discharged into surface waters.



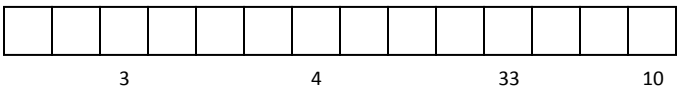
8. EFAINZMNOITI FO IHFS
Clue: Occurs when compounds released into water systems affect how male fish develop.



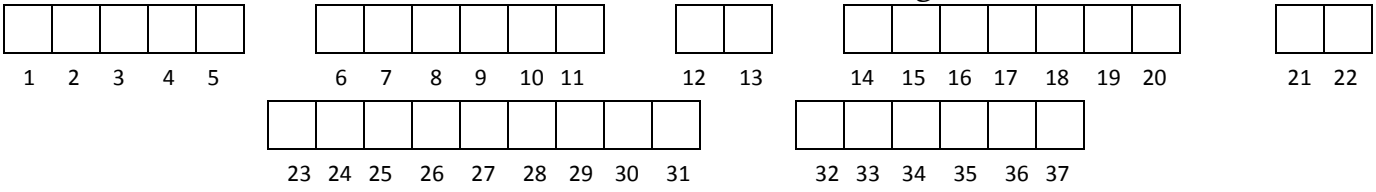
9. ITDTNEYI HTETF
Clue: Illegally obtaining a person's personal and financial information.



10. HPRAMUCEATCIAL
Clue: A substance used in the treatment or Prevention of disease.



Use the numbered letters to solve the message below:



Created By: Tracy Colin, Illinois-Indiana Sea Grant, University of Illinois at Urbana-Champaign

Learn About Proper Disposal of Medicines

Wordscramble-Teacher Answer Key

1. CAADENCTIL OSNIGNOPI	Accidental Poisoning
2. MCHLICAE UCNOPMDO	Chemical Compound
3. EIDMCNEI CLTNIOLEOC ORPGMSRA	Medicine Collection Programs
4. HRTSPISEAWD	Stewardship
5. NATCTNONIMA	Contaminant
6. OCLGOIELAC AHMR	Ecological Harm
7. TELFUNFE	Effluent
8. EFAINZMNOITI FO IHFS	Feminization of Fish
9. ITDTNEYI HTETF	Identity Theft
10. HUAMCLCEPARIAT	Pharmaceutical

Message: Teach People to Dispose of Medicines Wisely

Learn About Proper Disposal of Medicines

U T O B T Y P V T F S C E M A G Z M E W C K Q V J N X
M N D Y Q R R H G C O B O E A T M Y D Q D D X N X J L
T E A S L O E U A N A E Z D O W M U F N A V F R Q F X
J U Q J D S Q K T R G P B I V L J H U M S J F G U Z W
H L F J Z E B A U E M F M C B O Y O E W E Y X R W H U
Q F T H Z B M Q J X E A H I R E P W U T O E W W O S N
B F X T H I Z R B S U H C N L M N X Y W Y F G N K I S
D E O I N G E X E F U U O E O A D H A V B B F A X F P
T J K A U N M Y M P R C B C U X T C Z B C L Q E M F J
I A N Z T U F F T D P G L O H T C N P A U L Z Q T O P
D T T U G J C I E B Q A Y L U I I B E E X P A P A N K
E L F W V L J E Z A C Y Q L D D F C R M T C S G B O L
N U T R I E R W E I Q R C E Y H B E A M N R B S F I S
T W Y W Y L L Y M J W O N C R Y V U B L Y O K J O T E
I D K D M D Y E Z R U T P T T Q I Y U M C U R B K A N
T G P E X D H H O Y A T P I H S D R A W E T S I L Z J
Y Z U H N C D A Q L B C M O Q Y Y V B Q M Q S T V I Z
T T N B E O A Q P G D U L N R V F F P M F P O O G N V
H A V X R E I O O C C G I P B T U O E F G W M V Z I E
E F X O K P I P G F F T B R B G K C F F L N W X N M Z
F K P Z L S U O L E C O L O G I C A L H A R M W O E J
T F F B O S Z Q S C Z V I G A E Z W Y B O S X X Z F T
B W F N D V N O I T U B I R T S I D E S R E V E R G M
I O I K C L S P P V B D F A F Y C E K J Y R Y B I E S
E N V N M Q I M H J Y K J M K O X E N H V J B G I X X
G A R K D D V M L Y U U E S E B K G E J S Z H R G C E
Q W E N V I R O N M E N T A L E D U C A T I O N G U O

ACCIDENTAL POISONING
CHEMICAL COMPOUND
CONTAMINANT
ECOLOGICAL HARM
EFFLUENT
ENVIRONMENTAL EDUCATION
ENVIRONMENTAL IMPACT
FEMINIZATION OF FISH
IDENTITY THEFT
MEDICINE COLLECTION
PROGRAMS
PHARMACEUTICAL
REVERSE DISTRIBUTION
STEWARDSHIP

Created By: Tracy Colin, Illinois-Indiana Sea Grant Program, University of Illinois at Urbana-Champaign

Learn About Proper Disposal of Medicines

Wordsearch-Teacher Answer Key

U **T** O B T Y **P** V **T** F S **C** E **M** A G Z M E W C K Q V J N X
M **N** D Y Q R R **H** G **C** **O** B O **E** A T M Y D Q **D** D X N X J L
T **E** A S L O E U **A** **N** **A** E Z **D** O W M U F **N** A V F R Q F X
J **U** Q J D S Q K **T** **R** G **P** B **I** V L J H **U** M S J F G U Z W
H **L** F J Z E B **A** U E **M** F **M** **C** B O Y **O** E W E Y X R W **H** U
Q **F** T H Z B **M** Q J X E **A** H **I** R E **P** W U T O E W W O **S** N
B **F** X T H **I** Z R B S U H **C** **N** **L** **M** N X Y W Y F G N K **I** S
D **E** O I **N** G E X E F U U O **E** **O** **A** D H **A** V B B F A X **F** P
T J K **A** U N M Y M P R C B **C** **U** X **T** **C** Z B C L Q E M **F** J
I A **N** Z T U F F T D P G **L** **O** H **T** **C** **N** P A U L Z Q T **O** P
D **T** T U G J C I E B Q **A** Y **L** U **I** **I** B **E** E X P A P A **N** K
E L F W V L J E Z A **C** Y Q **L** **D** D F **C** R **M** T C S G B **O** L
N U T R I E R W E **I** Q R C **E** Y H B E **A** M **N** R B S F **I** S
T W Y W Y L L Y **M** J W O **N** **C** R Y V U B **L** Y **O** K J O **T** E
I D K D M D Y **E** Z R U **T** P **T** T Q I Y U M C U **R** B K **A** N
T G P E X D **H** H O Y **A** T **P** **I** **H** **S** **D** **R** **A** **W** **E** **T** **S** **I** L **Z** J
Y Z U H N **C** D A Q **L** B C M **O** Q Y Y V B Q M Q S T **V** **I** Z
T T N B E O A Q **P** G D U L **N** R V F F P M F P O O G **N** V
H A V X R E I **O** O C C G I **P** B T U O E F G W M V Z **I** **E**
E F X O K P **I** P G F F T B **R** B G K C F F L N W X N **M** Z
F K P Z L **S** U O L **E** **C** **O** **L** **O** **G** **I** **C** **A** **L** **H** **A** **R** **M** W O **E** J
T F F B **O** S Z Q S **C** Z V I **G** A E Z W Y B O S X X Z **F** T
B W F **N** D V **N** **O** **I** **T** **U** **B** **I** **R** **T** **S** **I** **D** **E** **S** **R** **E** **V** **E** **R** G M
I O **I** K C L S P P V B D F **A** F Y C E K J Y R Y B I E S
E **N** V N M Q I M H J Y K J **M** K O X E N H V J B G I X X
G A R K D D V M L Y U U E **S** E B K G E J S Z H R G C E
Q W **E** **N** **V** **I** **R** **O** **N** **M** **E** **N** **T** **A** **L** **E** **D** **U** **C** **A** **T** **I** **O** **N** G U O

ACCIDENTAL POISONING

CHEMICAL COMPOUND

CONTAMINANT

ECOLOGICAL HARM

EFFLUENT

ENVIRONMENTAL EDUCATION

ENVIRONMENTAL IMPACT

FEMINIZATION OF FISH

IDENTITY THEFT

MEDICINE COLLECTION

PROGRAMS

PHARMACEUTICAL

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Lesson 1
Engage

Chemicals, Chemicals, Everywhere

At a Glance

Overview
Students divide substances into categories: made of chemicals / not made of chemicals, synthetic / naturally occurring, and toxic / nontoxic. When the teacher reveals that all the substances are made of chemicals, students discuss how their concept of what a chemical is might differ from the scientific definition. Students observe a mystery chemical and determine what precautions they might need to take when handling an unknown substance. Then, students read case studies of real exposures to chemicals.

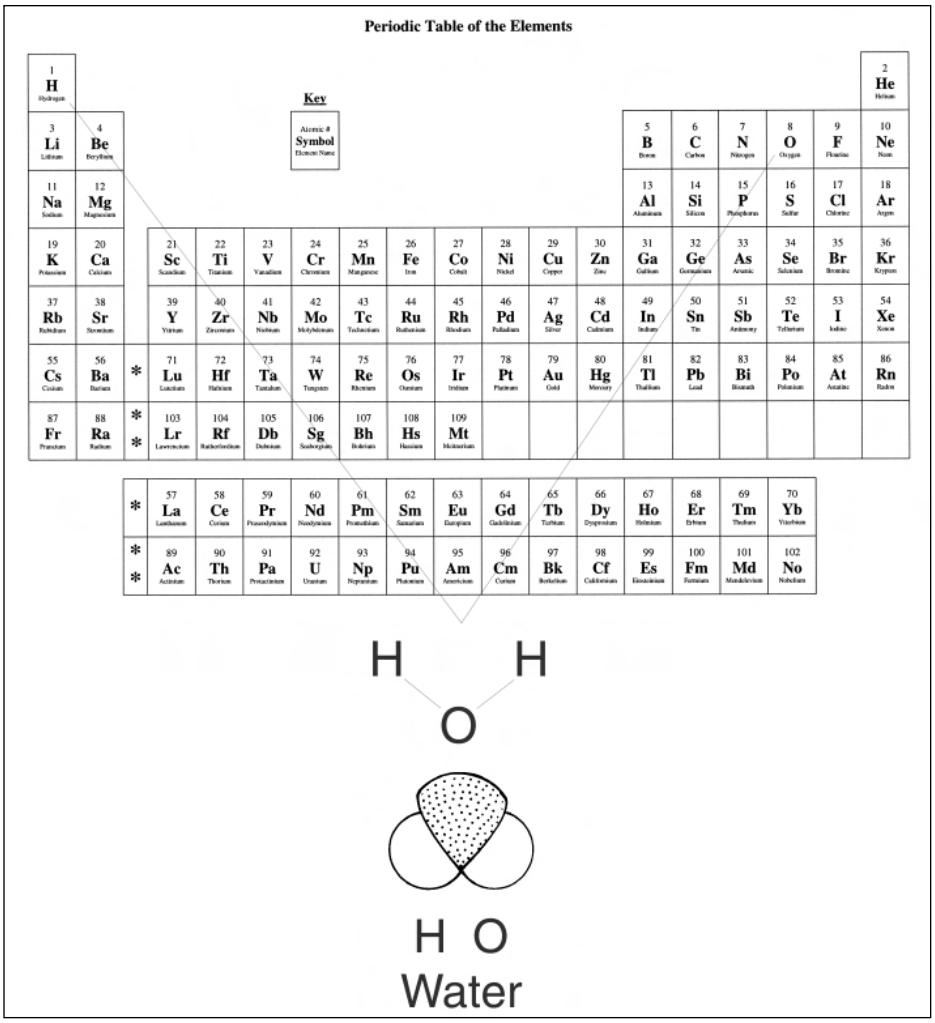
Major Concepts
Everything in the environment is made of chemicals. Both naturally occurring and synthetic substances are chemical in nature. People are exposed to chemicals by eating or swallowing them, breathing them, or absorbing them through the skin or mucosa, and they can protect themselves from harmful chemicals by blocking these routes of exposure.

Objectives
After completing this lesson, students will

- understand that everything in their environment is made of chemicals;
- indicate that both naturally occurring and synthetic substances are chemical in nature;
- recognize that their view of a chemical as “bad” or “good” relates to their perception of a chemical’s potential toxicity to humans or other living organisms;
- realize that toxicologists study chemicals to find out if they are harmful to living organisms;
- understand that people are exposed to chemicals by eating or swallowing them, breathing them, or absorbing them through the skin or mucosa; and
- demonstrate that people can protect themselves from harmful chemicals by blocking these routes of exposure.

Background Information

What Is a Chemical?
Simply stated, **a chemical is any substance that has a defined molecular composition**. Molecules, which are the smallest units into which a compound can be divided and still be that compound, can be made up of one or more elements. Sometimes, the elements are the same, such as in oxygen: Two oxygen atoms are chemically bonded together to form the gas, oxygen, or O_2. Sometimes, the elements that form molecules are of different types, such as those in water: Two hydrogen atoms combine with one oxygen atom to form a molecule of water, or H_2O. All forms of matter are made of one or more of the more than 100 elements combined in many different molecular combinations. This means that all forms of matter are made of chemicals.



The Science of Toxicology

Long ago, humans observed that some chemicals derived from nature were poisonous. Poisonous chemicals produced naturally by living organisms (such as plants, animals, and fungi) are called **toxins**. Historically, knowledge of toxins was a powerful tool to use against enemies: many murderers in ancient Greece and later throughout Europe used toxins.[1] A significant contribution to the field of toxicology was made by the scientist Paracelsus (1493–1541). He recognized that the same chemical could have both therapeutic (medicinal) and toxic (poisonous) properties depending on how much of it was used. His work paved the way for the concept of the dose-response relationship (see Lesson 3 for more information about dose and response).[1]

Paracelsus

With the onset of the industrial revolution and the emergence of the science of synthetic chemistry, a variety of new chemicals was made by humans. It is estimated that more than 65,000 chemicals have been manufactured for commercial use in industrialized countries.[1] Whether on purpose or not, humans come into contact with these chemicals during manufacture, handling, or consumption. Exposure to a vast array of synthetic chemicals can occur when a person ingests

food or drink, works in an agricultural setting with pesticides, or lives in a home among solvents, paints, plastics, and fuels. Although many of the chemicals greatly benefit us, some can have a toxic effect on human systems. These substances are called **toxicants**, a broad category that includes naturally occurring toxins.

How do people know if a chemical is toxic? The science of **toxicology** informs them of the nature of poisons. A **toxicologist** is a scientist who is trained to study the harmful effects of chemicals on living organisms. These harmful effects can include death, but not all toxicants are lethal. Some other harmful effects that toxicologists study are disease, tissue damage, genetic alterations, and cancer. Because there are so many ways that toxicants can affect living things and there are so many different kinds of chemicals in the environment, toxicology is a very broad science and there are many different kinds of toxicologists.[2]

What Do Toxicologists Do?

Descriptive toxicologists evaluate the toxicity of drugs, food additives, and other products. They ask the question, What happens if…? about the amount of a toxicant and the response that a living system has to the toxicant. The descriptive toxicologist might work in a pharmaceutical laboratory or in an academic setting doing data analysis, animal testing, and/or human clinical trials.[3]

Photo: Corel

Mechanistic toxicologists study how a chemical causes toxic effects on living organisms. They study biomedical research, biochemistry, and physiology to understand how a chemical is absorbed, distributed, and excreted. A mechanistic toxicologist uses information about how a chemical harms an organism in order to develop antidotes. This kind of toxicological work often is done in an academic setting or in private industry.[3]

Clinical toxicologists usually are physicians interested in the prevention, diagnosis, and treatment of poisoning cases. Clinical toxicologists specialize in toxicology issues concerning drugs used for treatment, such as side effects and overdoses; drugs of abuse, such as alcohol and cocaine; and accidental poisonings. These toxicologists have specialized training in emergency medicine and poison management. Veterinarians also can be clinical toxicologists who study poisons in animals.[3]

Photo: Cameron Davidson

Forensic toxicologists study the application of toxicology to the law. They work with pathologists and law enforcement officers at a crime scene. The forensic toxicologist uses chemical analysis to help establish the cause of death and determine the circumstances of death in a postmortem investigation.[2]

Environmental toxicologists study the effects of pollutants on organisms, populations, ecosystems, and the biosphere. Toxicologists concerned with the effects of environmental pollutants on human health fit into this group. Most commonly, however, environmental toxicologists study the impacts of chemicals on nonhuman organisms such as fish, birds, terrestrial animals, and plants.[2]

Regulatory toxicologists use scientific data to decide how to protect humans and animals from excessive risk. Regulatory toxicologists aim to protect the public from chemical exposure by establishing regulatory standards for food, drugs, water, air, and insecticides, to name only a few. Government bureaus such as the U.S. Food and Drug Administration (FDA) and the U.S. Environmental Protection Agency (EPA) employ regulatory toxicologists.[2,3]

Routes of Exposure

Toxicants can harm an organism only if they are absorbed by the organism and reach the organs that are the target of their toxicity. This can happen through three routes:

- ingestion
- inhalation
- absorption through the skin

In humans and other animals, toxicants usually affect one or more target organs such as the lungs, skin, or gastrointestinal tract. For example, if a person inhales asbestos fibers, the fibers get stuck in the airways of the lungs and irritate the lung lining, causing lung impairment over time. Dermatitis can result if the asbestos fibers irritate skin cells.

Sometimes the toxicant crosses from the external environment of the lung, skin, or gastrointestinal tract into the bloodstream.[1] Many parts of the human body are designed to absorb chemicals quickly and effectively. The stomach, intestines, and colon absorb nutrients from our diet. These organs easily absorb nutrients and other chemicals because of their large surface area, thin diffusion distance, and high blood flow. The lungs also are designed for rapid absorption. Chemicals that are inhaled are quickly absorbed into the bloodstream through the thin walls of the air sacs in the lungs. The skin protects the body from harmful agents in the environment. However, the skin is in direct contact with the environment. While the dense outer layer of skin cells is a good barrier to chemical absorption, it is not perfect, even when intact. When the skin is cut or abraded, it absorbs chemicals very rapidly.[4]

Students' Misconceptions About Chemicals

Students often harbor misconceptions about chemicals. When asked what a chemical is, rather than define the word, students tend to give examples of synthetic, toxic chemicals like pesticides. When asked to name some things made of chemicals, students list items such as shampoo, window cleaner, processed foods, and "fake sugar" (aspartame). Students believe that chemicals pollute rivers and air. Students often do not realize that natural substances in the world around them also are made of chemicals. When asked if it would be better if there were fewer chemicals in the world, one student replied that fewer human-made chemicals would mean less pollution. When pressed, students will agree that some synthetic chemicals, like a pain reliever, can be good; however, students also recognize that even "good" chemicals like pain relievers can be toxic if a person takes too much.[5]

Notes About Lesson 1

The purpose of this lesson is to help move students from the view that chemicals are toxic, synthetic substances that are bad for human health and the environment to the more inclusive view that all things in the environment, including their bodies, are made of chemicals. Some of both naturally occurring and synthetic chemicals can have a detrimental effect on human health and the environment, but many do not. Those that have a harmful effect on human health do so because they get into the body through inhalation, ingestion, and absorption.

In Advance

CD-ROM Activities	
Activity Number	**CD-ROM**
Activity 1	yes
Activity 2	yes
Activity 3	yes
Extension Activity	no

Photocopies		
Activity Number	**Master Number**	**Number of Copies**
Activity 1	Master 1.1, *Item Cards* Master 1.2, *Periodic Table of Elements* Master 1.3, *Elemental Composition of the Human Body*	1 set for the class 1 transparency (optional) 1 transparency
Activity 2	none	none
Activity 3	Master 1.4, *Questions for Case Studies* Master 1.5, *Case Studies of Routes of Exposure*	1 transparency 1 copy of Case Study #1 for each student; number of copies of Case Studies #2–5 varies; see *Preparation* for Activity 3
Extension Activity	none	none

Materials		
Activity 1	**Activity 2**	**Activity 3**
For the class: • CD-ROM • computers • overhead projector • transparency of Master 1.2, *Periodic Table of Elements* (optional) • transparency of Master 1.3, *Elemental Composition of the Human Body* • 12 samples of things made of chemicals[a] • 1 set of Item Cards, from Master 1.1, *Item Cards*[b] • 8 4-by-6-inch index cards **For each student:** • science notebook	**For the class:** • CD-ROM • computers • blue food coloring • 50-mL graduated cylinder • 50 mL of purified water • 50-mL or larger glass jar with a lid • 1 large shoe box with a lid[c] • variety of clothing in a large basket or box[d]	**For the class:** • CD-ROM • computers • overhead projector • transparency of Master 1.4, *Questions for Case Studies* **For each student:** • 1 copy of Case Study #1 for each student from Master 1.5, *Case Studies of Routes of Exposure*; copies of Case Studies #2–5; see *Preparation* for Activity 3 • science notebook

[a] Because everything in the environment is made of chemicals, any item will work, such as salt, sugar, lemon, soft drink, liquid soap, window cleaner, shampoo, apple, rock, leaf, chair, and water. Use the chemicals students test in Lesson 2 (see *Preparation* for Activity 3 on page 28), plus others that do and do not fit students' concept of chemical.

[b] Item cards depict objects that are too big for the materials table or are potentially dangerous substances that students should consider when they choose items made of chemicals.

[c] Make sure that the glass jar fits inside the shoe box.

[d] Collect clothing such as elbow pads, knee pads, shorts, T-shirt, long-sleeved shirt, pants, different kinds of hats, hip waders, boots, sandals, sneakers, socks, sunglasses, protective goggles, ear and nose plugs, paper mask, mittens, gloves, and latex gloves.

PREPARATION

Activity 1

Arrange for students to have access to computers.

Collect samples of things made of chemicals. Place them on a materials table.

Tip from the field test: To make gathering the materials easier, ask students to bring in one item they think is made of chemicals and one they think is not made of chemicals.

Duplicate and cut out the Item Cards from Master 1.1, *Item Cards*. Fold them in half to make tent cards. Place the Item Cards on the materials table with the things made of chemicals.

Fold the index cards in half to make tent cards and label them with one of the following titles:

- made of chemicals
- not made of chemicals
- synthetic
- naturally occurring
- toxic
- nontoxic
- good
- bad

Make a transparency of Master 1.2, *Periodic Table of Elements* (optional).

Make a transparency of Master 1.3, *Elemental Composition of the Human Body*.

Activity 2

Arrange for students to have access to computers.

Make 50 mL of a mystery chemical:

- Measure 5 mL of blue food coloring into a 50-mL graduated cylinder.
- Add purified water to the graduated cylinder until you have 50 mL of blue solution.

Pour the mystery chemical into a 50-mL or larger glass jar and screw on the lid tightly. Place it inside the shoe box. Place the shoe box behind your desk.

Ask students to bring in articles of clothing. Place them and any you have gathered in a basket or box behind your desk.

Activity 3

Arrange for students to have access to computers.

Make a transparency of Master 1.4, *Questions for Case Studies*.

Duplicate Case Study #1 from the Master 1.5, *Case Studies of Routes of Exposure*, 1 for each student. Decide whether each student or teams will complete Case Studies #2–5 and duplicate the appropriate number.

ACTIVITY 1: WHAT IS A CHEMICAL?

Procedure

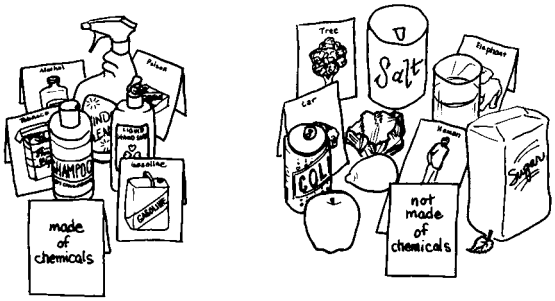
1. **Place the samples of things made of chemicals and the Item Cards on the materials table.**

2. **Ask the students to look at the materials table and select one thing that they think is made of chemicals and one thing they think is not made of chemicals. Direct students not to remove the items, but to record the name of the items in their science notebooks.**

   Tip from the field test: In large classes where it might be difficult for students to see the materials, prepare a list of the names of all the materials and make a copy for each student. Instruct students to circle those materials on the list that are made of chemicals.

   You might find that students want more information. They might want to know what you mean by "made of chemicals." They might want you to be more specific about whether they should consider only synthetic items or those that may be toxic. Acknowledge that you have given them limited information, but ask them to do their best to make their choices. Do not provide any assistance at this time.

3. **Once all the students have recorded the items in their notebooks (or circled the items on their list), ask each student to name one item that is made of chemicals and one that is not. As students tell you their choices, stand by the materials table and separate the items according to student choices into two categories: made of chemicals and not made of chemicals. Continue until all students have shared their ideas. Use two of the tent cards to label the two categories: "made of chemicals" and "not made of chemicals."**

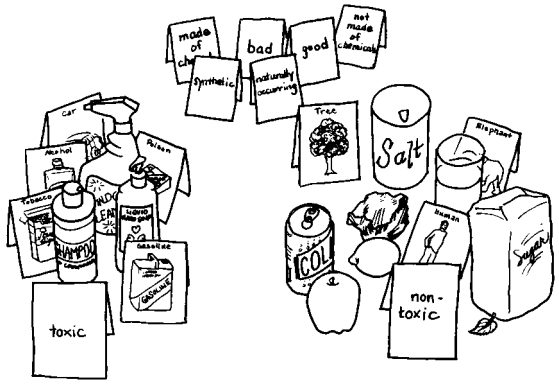


This activity provides you with a good assessment of students' prior knowledge of the concept of chemicals.

4. **Direct students to look at the groups of substances they think are and aren't made of chemicals. Conduct a discussion by asking questions similar to these:**

   - **Why do you think these are (or are not) chemicals?**
   - **Can you redivide these items into several different categories, such as synthetic (made by people) or naturally occurring? Good for humans or the environment or bad for humans or the environment? Toxic (harmful) or nontoxic (not harmful)?**
   - **Can a natural substance be made of chemicals?**
   - **Can a synthetic substance not be made of chemicals?**
   - **Is a natural substance always nontoxic, or a synthetic substance always toxic?**

   As you conduct this discussion, rearrange the items on the table several times and use new tent cards to label the new categories: "synthetic" or "naturally occurring"; "toxic" or "nontoxic"; and "bad" or "good."



Content Standard B: …There are more than 100 known elements that combine in a multitude of ways to produce compounds, which account for the living and nonliving substances we encounter.

5. **As you progress through the discussion in Step 4, students may realize that they do not know a useful definition for "chemical." Have this definition ready for them:**

   chemical: any substance that is made of specific elements combined into molecules

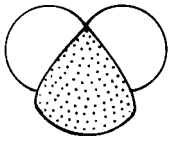
6. **As a class, view the segment from the CD-ROM titled *Everything Is Made of Chemicals*.**

To view the segment, load the CD (see Installation Instructions on page 13) and go to the main menu. Click on *Chemicals, Chemicals, Everywhere* and select the segment titled *Everything Is Made of Chemicals*.

Note: If you do not have access to a projection screen for the CD-ROM, set up a computer center where students can view the CD-ROM on their own or in small groups at a later time. At this time, display the transparency of Master 1.2, *Periodic Table of Elements,* and discuss the following:

- **Ask students to consider one substance, water, in light of the definition. Is water made of elements combined into molecules?**

Students are familiar with the molecular composition of water: H_2O. Point out the elements hydrogen and oxygen on the periodic table.



Water

- **Help students recognize that sugar and salt also are made of a combination of elements that form molecules.**

Table sugar is a crystalline carbohydrate, $C_{12}H_{22}O_{11}$. Salt is sodium chloride, NaCl.

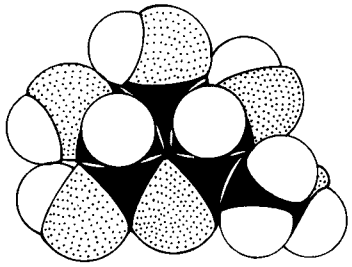


Table sugar

7. **After viewing the CD-ROM or discussing the periodic table, continue by helping students recognize that all of the substances on the materials table are made up of specific molecules, even if the students don't know exactly what they are. Once they recognize this, students will begin to realize that all things are made of chemicals. Ask students to tell you, based on their new understanding, some other things around them that are made of chemicals. Let students continue until you see that they understand that everything around them, or everything in their environment, is made of chemicals.**

8. **To make sure that the students understand that they, too, are made of chemicals, display a transparency of Master 1.3, *Elemental Composition of the Human Body*. Let your students know that these elements are combined in many different ways to form thousands of different chemicals that make up the human body.**

9. **Discuss with students how their original idea about what a chemical is, which led them to their choices in Step 2, is different from the scientific definition of a chemical. Why do they think this is so?**

Students will recognize that they hear most about the chemicals that are toxic to humans or the environment. Because of this, students often think of chemicals as only those synthetic substances that are introduced to the environment and cause harm. Help students recognize that they also know a lot about synthetic chemicals that are beneficial to humans, such as pain relievers and other medicines. They also know about naturally occurring chemicals that are toxic to humans, such as

hydrogen sulfide (sewer gas) and carbon monoxide, to name two. By the end of the discussion, help students recognize that chemicals can be synthetic or naturally occurring and make up every substance on Earth, even our bodies.

Bridge to Activity 2 by helping students understand that many chemicals, both synthetic and naturally occurring, can be beneficial to humans and the environment. Those chemicals that are not beneficial are the ones we want to know more about so that we can protect ourselves and the environment from harm.

ACTIVITY 2: PROTECT THE TOXICOLOGIST

1. **Bring out the shoe box from behind your desk. Tell the students that inside the shoe box is a mystery chemical. Discuss with the students some things they might want to know about the contents of the shoe box before they open it. Ask why it would be important to know these things.**

   Be sure that students recognize that they would want to know what the chemical is (for example, name; naturally occurring or synthetic; solid, liquid, or gas; how much of the chemical is in the container). Most importantly, they would want to know if it is toxic to the humans in the classroom because they would not want to accidentally expose themselves to a harmful substance.

Content Standard G: Students should develop an understanding of science as a human endeavor.

2. **Tell the students that they are asking a lot of the same questions that a toxicologist might ask. Write the word *toxicologist* on the board. Ask students to identify the root of the word, *toxic*. Underline it on the board. Tell students that toxicologists are scientists who are specially trained to examine the nature of the harmful effects of chemicals on living organisms. They try to understand which chemicals are toxic to living organisms and in what amounts those chemicals are toxic. While they want to know which chemicals might cause death, they also are interested in other toxic effects, such as disease, tissue damage, genetic alterations, and cancer.**

3. **Select a student (or ask for a volunteer) and tell the student that he or she is a toxicologist. Tell students that you want the student toxicologist to open the shoe box and look at the mystery chemical, but you do not know anything about the chemical. The student toxicologist needs to protect himself or herself in case the chemical is harmful to humans.**

   Present to the class the large basket or box of clothing. Ask the class to work together to think of items that the toxicologist should wear for protection from exposure to the chemical. Find items in the basket as students suggest them and give the items to the student toxicologist to put on until he or she is dressed in a protective manner that satisfies the class.

Tip from the field test: You may not have access to a wide variety of true protective gear. Use regular clothing, but ask students what problems there might be with certain items. For example, if students suggest that the toxicologist's hands need to be covered, you could pull out a pair of mittens. Direct the toxicologist to put on the mittens, but ask the class if the mittens are the best choice and why or why not.

This activity is engaging and fun for the students, but it also helps you assess students' knowledge of an important concept of toxicology: routes of exposure.

As students select an item, question why a toxicologist needs to wear it. Probe for understanding that a toxicologist is concerned about exposure to a chemical by eating or drinking it, by breathing it, and by absorbing it through the skin. Look to see whether the student toxicologist's skin, eyes, mouth, and nose are covered.

4. **Once the student toxicologist is dressed protectively, explain that real toxicologists know that chemicals can enter the body in three ways, called routes of exposure: through the mouth by ingestion, through the nose and mouth by inhalation, and through the skin by absorption. Write the list of the three routes of exposure on the board:**

Routes of Exposure

✓ ingestion

✓ inhalation

✓ absorption through the skin

Use the list as a checklist and ask students if they think the student toxicologist is adequately protected from all routes of exposure. If not, have them adjust the protective clothing or suggest useful clothing that is not in the basket.

Point out that the mystery chemical could be a solid, a liquid, or a gas. Discuss each form of a chemical and how the form can help determine which routes of exposure are most likely. For example, a gas might be easily inhaled as soon as the container is opened, while a solid might only be harmful if a person touches it or ingests it. In addition, chemicals can change form. For example, dry ice is solid carbon dioxide that quickly becomes a gas. Liquid mercury can evaporate into a gas, causing exposure by inhalation.

Thank the student toxicologist and ask him or her to return the protective clothing to the basket.

5. **Tell students that people who work around toxic chemicals protect themselves in ways similar to those the students suggested for the student toxicologist. Provide time for students to view the segment *Ride Along with HAZMAT* on the CD-ROM.**

To find the segment, load the CD and go to the main menu. Click on *Chemicals, Chemicals, Everywhere* and select *Ride Along with HAZMAT.*

Photo: Corel

6. **Tell the students that you will dress protectively and remove the mystery chemical from the container when they are not in the room (because they are not protected). Let them know that they will be able to examine the chemical during the next class if you decide it is safe to do so.**

ACTIVITY 3: CASE STUDIES OF ROUTES OF EXPOSURE

1. **Set up the class so that each team of students has access to a computer, such as in a computer lab. Instruct teams to do the activity titled *What's Wrong Here*? on the CD-ROM. Circulate around the room and listen as groups work through each situation.**

To view the activity, load the CD and go to the main menu. Click on *Chemicals, Chemicals, Everywhere* and select *What's Wrong Here?*

2. **Tell students that now they will consider some true chemical exposures. Display a transparency of Master 1.4, *Questions for Case Studies*. Then, distribute a copy of Case Study #1 from Master 1.5, *Case Studies of Routes of Exposure*, to each student.**

3. **Ask students to work in teams and to read Case Study #1. Instruct them to answer the questions on the transparency in their science notebooks.**

4. **Once teams have read and answered the questions about Case Study #1, conduct a class discussion about the case study by answering the questions on the transparency.**

Content Standard E: Students should develop understandings about science and technology.
Content Standard F: Students should develop understanding of natural hazards, and risks and benefits.
Content Standard G: Students should develop understanding of science as a human endeavor.

Sample Answers to Questions for Case Study #1 on Master 1.4

Question 1. What happened? Where did it happen? When did it happen?

A Dartmouth College scientist died of mercury poisoning in 1997 in New Hampshire after being exposed to the chemical in 1996.

Question 2. What chemical was involved?

The chemical was dimethylmercury (die-METH-ul-MER-kyoo-ree).

Question 3. What was the route of exposure?

The route of exposure was absorption through the skin.

Question 4. What were the symptoms of toxicity?

The symptoms of toxicity were permanent nervous system damage, numbness of fingers, unsteady walking, difficulty speaking, blurred vision, hearing problems, coma, and death.

Question 5. How could a person have prevented his or her exposure to the chemical?

Answers will vary. The researcher used precautions thought to be adequate at the time.

Question 6. Have any changes occurred since the incident? Describe them.

Researchers now know that dimethylmercury can seep through latex gloves. They now use neoprene gloves with long cuffs or wear two pairs of gloves, one of them laminated and one of them heavy duty.

5. There are four more case studies, two describing chemical exposure through inhalation and two describing chemical exposure through ingestion. Continue to have students read, discuss, and answer the questions about each case study.

This is a good time to assess your students' understanding of the three ways chemicals can enter the human body and cause harm: ingestion, inhalation, and absorption.

Tip from the field test: Give a different study to each team and ask the teams to read their study. Then, instruct teams to present their case study to the class. Teams can explain their case study and answer the questions from the transparency so that everyone in the class learns about the case and discusses the route of chemical exposure. The case studies vary in length, allowing you to individualize the reading assignment for students of varying reading abilities.

Sample Answers to Questions for Case Studies #2–5 on Master 1.4

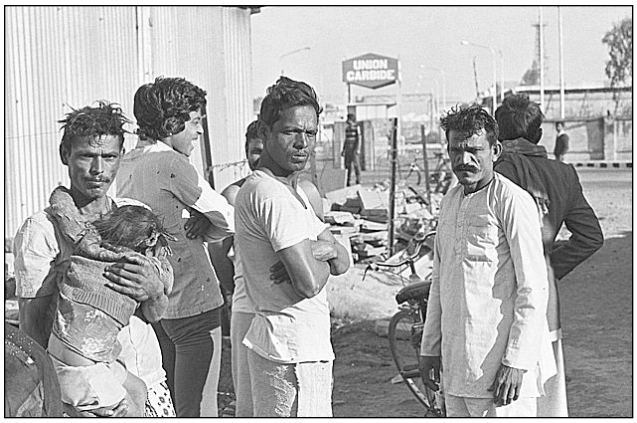
Case Study #2

Question 1. What happened? Where did it happen? When did it happen?

Gas leaked from a chemical plant in 1984 in India.

Question 2. What chemical was involved?

The chemical involved was methylisocyanate (METH-ul-EI-soh-SIE-uh-nate).



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Question 3. What was the route of exposure?

The routes of exposure were inhalation and absorption through the eyes and the nose.

Question 4. What were the symptoms of toxicity?

The symptoms of toxicity were eyes and lungs burning, vomiting, lung impairment, loss of motor control, neurological disorders, and damaged immune system.

Question 5. How could a person have prevented his or her exposure to the chemical?

Answers will vary. Students should recognize that people who lived in Bhopal had little choice over their exposure. People could have made the choice not to live near a chemical plant.

Question 6. Have any changes occurred since the incident? Describe them.

The chemical plant was sold to a company in Calcutta. Proceeds from the sale supported hospitals and clinics in Bhopal.

Case Study #3

Question 1. What happened? Where did it happen? When did it happen?

Jane had lead poisoning; it happened in her home during her first two years of life.

Question 2. What chemical was involved?

The chemical involved was lead.

Question 3. What was the route of exposure?

The route of exposure was ingestion.

Question 4. What were the symptoms of toxicity?

The symptoms of toxicity were abdominal pain, constipation, vomiting, and lethargy; in severe cases, learning disabilities, decreased growth, hyperactivity, impaired hearing, and even brain damage can occur.

Question 5. How could a person have prevented his or her exposure to the chemical?

Prevention for children includes annual blood tests to check lead levels; clean play areas, floors, windowsills, and hands; professional paint removal; and drinking of milk.

Question 6. Have any changes occurred since the incident? Describe them.

Students can assume that Jane's mother acted on the doctor's suggestions for minimizing the family's exposure to lead.

Case Study #4

Question 1. What happened? Where did it happen? When did it happen?

Jimmy Green died from sniffing gasoline in the spring of 1999.

Question 2. What chemical was involved?

The chemical was gasoline.

Question 3. What was the route of exposure?

The route of exposure was inhalation.

Question 4. What were the symptoms of toxicity?

The symptoms of toxicity were short-term memory loss, hearing loss, arm and leg spasms, permanent brain damage, liver and kidney damage, and death.

Question 5. How could this person have prevented his or her exposure to the chemical?

Jimmy Green voluntarily exposed himself to gasoline fumes. He could have prevented his exposure by choosing not to sniff gasoline.

Question 6. Have any changes occurred since the incident? Describe them.

Parents and students are now informed of the dangers of inhalants.

Case Study #5

Question 1. What happened? Where did it happen? When did it happen?

In 1971, more than 6,500 people were poisoned in Iraq.

Question 2. What chemical was involved?

The chemical was methylmercury (METH-ul-MER-kyoo-ree).

Question 3. What was the route of exposure?

The route of exposure was ingestion.

Question 4. What were the symptoms of toxicity?

The symptoms of toxicity were nervous system disorders.

Question 5. How could a person have prevented his or her exposure to the chemical?

If people had been better informed, they would have planted the seed instead of eating it.

Question 6. Have any changes occurred since the incident? Describe them.

No changes were mentioned in the case study, but students might discuss the need for better warning labels and instructions for grain shipped between countries.

Extension Activity

Ask students to find current event stories in newspapers, magazines, or television programs that talk about chemical exposure. Challenge students to find one event that involves a chemical exposure that harms humans or other living things and one that involves a chemical exposure that benefits humans or other living things.

You will be able to use a chemical exposure described in these articles in the extension activity in Lesson 5.

Tip from the field test: If students in your school are required to bring in current event articles for several other classes, coordinate with teachers making similar assignments so that students are not duplicating efforts. Alternatively, collect articles yourself and display them in the classroom.

At a Glance

Overview

Students apply their growing understanding of the concepts of toxicology (dose, response, individual susceptibility, potency, and threshold) to their discussion of the 1950s tragedy in Minamata, Japan. They learn how to assess the risk of people to specific chemical hazards and make decisions about how to manage that risk.

Major Concepts

People can make some choices about chemical exposure; however, some exposure is controlled at a level other than an individual one. Collective groups of people, such as communities and governments, seek to control chemical exposure on a community or global level.

Objectives

After completing this lesson, students will

- use their knowledge about dose, response, individual susceptibility, and route and frequency of exposure to understand a historical situation involving hazardous chemical exposure;
- assess the risk to people in Minamata of mercury poisoning using a risk assessment flow chart;
- compare their own risk of mercury poisoning with that of the people of Minamata; and
- understand the kinds of critical choices people make about chemical exposure and that some exposure is controlled at a level other than an individual one, such as the community or global level.

Background Information

The Minamata Case Study

When people living in Minamata, Japan, in the 1950s began slurring their speech occasionally or dropping their chopsticks at a meal, no one thought much of it. Some people cruelly laughed, claiming their clumsy friends were acting like the cats that were "dancing" strangely in the street and falling to their death in the sea. When it seemed like more and more people were suffering from the mysterious lack of coordination, the community began to realize that something was seriously wrong. But, people did not know that they were seeing the first signs of a debilitating nervous condition caused by ingesting mercury.[1]

We now know the tragic story of Minamata. The Minamata Bay was polluted with the industrial waste from the Chisso Corporation, which manufactured acetaldehyde used to make plastics. The mercury that the company used in the production process was discharged into the bay, incorporated into bacteria, and passed through the food chain to people living in the area. The people in the town were slowly being poisoned by their most important food source: fish.

The consequences of such blatant polluting seem obvious to people today. But at the time, science had not yet documented the hazards of mercury, and environmental awareness was not pervasive. In fact, the Minamata case has become a classic lesson in the tragedy of industrial pollution and the need to anticipate the unexpected consequences of introducing chemicals into the environment. Although the story is now half a century old (and "ancient history" for today's middle school students), it has a well-documented cause and effect, as well as a resolution. In this way, it provides a good model for teaching about risk assessment and management that students can apply to their analysis of current exposures to chemicals.

Photo: W. Eugene Smith and Aileen M. Smith

Risk Assessment

Today, when toxicologists study the extent and type of negative effects associated with a particular level of chemical exposure, they can use what they learn to assess the threat of that chemical to people's health. To do this, toxicologists measure a person's risk of exposure to the chemical. For example, even though dioxin is considered the most toxic synthetic chemical known, it does not pose the greatest risk to humans because the potential for significant dioxin exposure is quite small. In addition, while the lethal dose of a chemical is an important measurement to make, it is quite possible that a chemical will produce a very undesirable toxic effect at doses that cause no deaths at all. These lower doses may be the amount to which people are regularly exposed.

How a person is exposed to a chemical also determines the factor of risk. In the case of a single exposure, the amount of chemical and the way the body is known to respond to the chemical determine the severity of the toxic response. In the case of repeated exposures to a chemical, it is not only the amount of chemical that counts, but also the frequency of exposure. If the body is able to rid itself entirely of the chemical before the next exposure, it is possible that each exposure is akin to a single exposure to the chemical. If, however, the body still retains some of the chemical from the previous exposure, accumulation of the chemical can occur and eventually can reach toxic levels, even if each exposure is small.

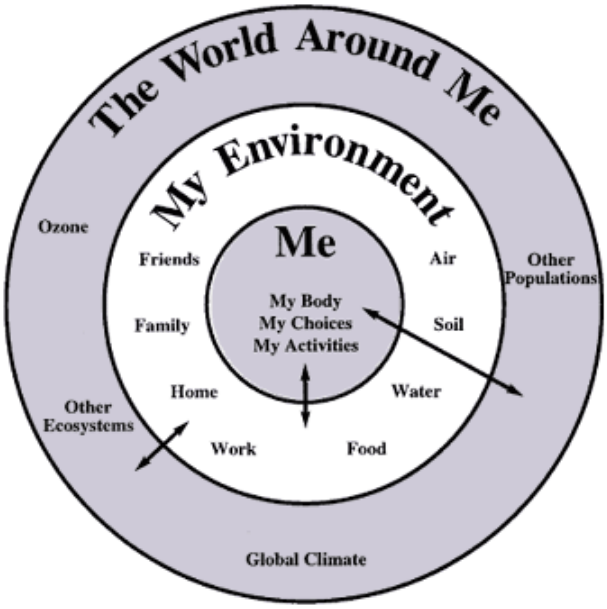
Many of the measurements that guide toxicologists in their assessment of human risk are based on studies of animals other than humans. This fact, coupled with the individual susceptibility of different members of the human population, makes it difficult to know with absolute certainty the level of risk to which each individual is exposed. With adequate information, however, toxicologists can predict the health risks associated with specific chemical exposures and help the human population make informed decisions about how to limit those exposures.

Managing Risk

The built-in uncertainty of risk assessment makes it essential for people to possess enough knowledge to make decisions about their own exposures to chemicals. With adequate knowledge, individuals can make decisions concerning their exposure to tobacco smoke, pollutants in water, and chemicals in food. By modifying their individual behavior, people can have some control over the chemicals they absorb into their body.

Not all decisions about chemical exposure and control can be made at an individual level, however. Local, national, and global communities of people are exposed to chemicals over which they have very little individual control. People are exposed to air pollution from factories and cars or chemicals used by farmers on crops without any individual consent. To manage a community's risk from chemicals in the environment, organizations and agencies set standards to protect human health.

There are choices about chemical exposure over which individuals have control (represented by the inner circle in the adjacent diagram). Individuals are also affected by their immediate environment (their friends and family, as well as the air, soil, and water around their homes and workplaces); the middle circle of the diagram describes influences on an individual over which he or she has less control. Finally, the outer circle describes the world that surrounds individuals over which they have little control but that can have an impact on individuals. The arrows between each concentric circle indicate that individuals, their environment, and the world at large all affect each other.



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One step in community risk management is to determine how much risk is acceptable to people. If the chance that exposure to a particular chemical causes cancer is only 1 in 1 million, people often are less concerned than if the chance is 1 in 10. The picture becomes more complicated when societal issues weigh in. Is the exposure voluntary (as in smoking cigarettes) or involuntary (as in pollution from a factory)? Does it occur in the workplace or at home? Are there acceptable alternatives to the use of the toxic chemical? How would use of a safer chemical change the economic picture?[2]

To establish some individual control over community management of chemical exposure, people can choose to be involved with organizations and agencies that are concerned with the prevention of toxic chemical exposure on a community level.

Notes about Lesson 5

In this lesson, students have the opportunity to apply many of the concepts of toxicology to a scenario that involved toxic chemicals in Minamata, Japan. By looking at a situation from the 1950s, students can recognize how far scientists and the general public have come in their understanding of chemical hazards and their knowledge of how to minimize risk from these hazards. Students can begin to identify situations in their own lives in which they make conscious decisions to limit their chemical exposure and those over which they have little control.

In Advance

Web-Based Activities

Activity Number	Web Version
Activity 1	Yes
Activity 2	No
Extension Activity	No

Photocopies

Activity Number	Master Number	Number of Copies
Activity 1	Master 5.1, *Risk Assessment and Management* Master 5.2, *Minamata Disease*	1 transparency 1 for each student
Activity 2	Master 5.1, *Risk Assessment and Management* Master 5.2, *Minamata Disease*	1 transparency 1 for each student
Extension Activity	None	None

Materials

Activity 1	Activity 2	Activity 3
For the class: • Web site address • computer with Internet access • overhead projector • transparency of Master 5.1, *Risk Assessment and Management* • plain paper **For each student:** • 1 copy of Master 5.2, *Minamata Disease*	**For the class:** • overhead projector • transparency of Master 5.1, *Risk Assessment and Management* • plain paper **For each student:** • 1 copy of Master 5.2, *Minamata Disease*	**For the class:** • current event stories students began collecting in Lesson 1, Extension Activity

Activity 1	Activity 2	Activity 3

PREPARATION

Activity 1
Arrange for students to have access to computers.

Make a transparency of Master 5.1, *Risk Assessment and Management*.

Duplicate Master 5.2, *Minamata Disease*, one for each student. To allow students to read only small amounts of the information at a time, fold along the dashed lines.

Activity 2
Gather the same materials used in Activity 1.

Extension Activity
Remind students to bring in the current event stories they began collecting in Lesson 1.

Be sure to have a transparency of Master 5.1, *Risk Assessment and Management*.

Procedure

ACTIVITY 1: PEOPLE AT RISK

1. Remind students that there are chemicals in the environment that cause health problems for humans. Tell students that toxicologists study the extent and type of health problems associated with a particular level of chemical exposure and use what they learn to assess the threat of that chemical to the health of people in particular situations. This kind of analysis is called a *risk assessment*. Display the top half of a transparency of Master 5.2, *Risk Assessment and Management*.

2. Distribute the folded sheets made from Master 5.2, *Minamata Disease*. Tell students that they are going to practice the steps to making a risk assessment by using a well-known case from Japan in the 1950s. Instruct students to read Part I of Master 5.2. Then, discuss the answers to the questions in Step 1 on the *Risk Assessment and Management* transparency.

Content Standard F: Students should develop understanding of personal health, natural hazards, and risks and benefits.

- **Is a new health problem present?**

  Yes. Fish, cats, and birds were sick and dying. Also, people were acting strangely.

- **What are the symptoms?**

  People were stumbling, unable to write, fumbling with their buttons, having difficulty balancing, falling from boats, suffering from convulsions, and dying.

- **What do the affected individuals have in common?**

  Many work as fishermen or were in the families of fishermen.

Once students have answered the questions on the transparency, ask them to offer ideas about what they think was contaminating the fish.

3. Instruct students to unfold the first fold, revealing Part II. Ask them to read the paragraphs and then answer the questions in Step 2 of the Risk Assessment on the transparency.

- **What is causing the problem?**

  Pollution was contaminating the fish with mercury, and people were getting sick when they ate the fish.

- **What is the source of the problem?**


Photo: W. Eugene Smith and Aileen M. Smith

The Chisso Corporation was dumping the mercury, so the company was the source of the problem. It might be interesting to discuss the role the community had in allowing the pollution of the bay to continue by accepting compensation for poor fishing conditions. Could the townspeople have demanded cleaner water instead of being satisfied with a monetary solution to the problem of fewer fish for harvest?

Once students have answered the questions on the transparency, ask them to suggest answers to the question at the end of Part II: What made this contamination of the fish so dangerous to humans?

Content Standard E: Students should develop understandings about science and technology. Perfectly designed solutions do not exist. All technological solutions have tradeoffs, such as safety, cost, efficiency, and appearance. . . . Technological solutions have intended benefits and unintended consequences. Some consequences can be predicted, others cannot.

4. Instruct students to unfold the next fold, revealing Part III. Ask students to read the paragraph and then answer the questions in Step 3 of the risk assessment.

- **What are the sources of exposure to the chemical?**

  People were exposed to mercury by eating contaminated fish. The contamination of the fish was serious because it was a primary food source for the community.

- **How much exposure are people in the area receiving?**

  People in Minamata, especially fishermen and their families, ate fish often. They were getting a small amount of mercury often over a period of time. Any amount of contaminated fish over 30 pounds per year is likely to provide a harmful exposure to mercury.

- **Is the exposure acute or chronic? (Is it likely to happen only once, or often over the course of time?)**

  The exposure to mercury happened in Minamata over a long period of time: It was a chronic chemical exposure.

5. Ask students *not* to unfold the last fold until directed to do so during the next activity. Discuss the information from the reading and answer the concluding question on the risk assessment: How great is the risk to people?

Because of their dependence on fish as a primary source of food, the potential risk of mercury poisoning from contaminated fish for people living in Minamata was very high.


Photo: Corel

6. Play the video segment on the Web site that describes the Minamata story.

Open the Web site in your browser (see instructions for using the Web site). From the main page, click on *Web Portion of Student Activities*, then select *Lesson 5—What Is the Risk?* Play the video documentary for the students.

Because the time period and geographic location of the Minamata tragedy are so far removed from students' experiences, the visual representation of the story on the Web site helps it come alive for students.

ACTIVITY 2: WHAT IS *YOUR* RISK?

1. Remind students that mercury is used today in thermometers and batteries. (Although newer thermometers now use red alcohol, many old ones contain mercury.) Tell students that although they do not live in Minamata in the 1950s, inappropriate disposal of items containing mercury poses a threat to their environment, even today. Since garbage either is incinerated or covered up in landfills, mercury can make its way into the environment through emission of burning gases into the air or groundwater contamination. Fish contaminated with mercury can make their way into the food supply.


Photo: Corel

2. Ask students how they think they can avoid mercury poisoning from contaminated fish.

Most students will say that they could stop eating fish, thereby eliminating their risk just by avoiding exposure to the mercury-contaminated fish. Some students may indicate that the risk of mercury poisoning provides a great excuse to

avoid a less-than-favorite food: fish.

Ask students if it is always possible to avoid a chemical in order to eliminate possible exposure. What about a chemical in the air? Could students choose not to breathe in order to avoid exposure to an air pollutant?

This question brings up the issue of control. If your food supply is varied enough, you can choose not to eat fish and still remain healthy. (This might not be an option for an island population that depends on fish for protein.) You cannot, however, choose not to breathe as a way to avoid exposure to an air pollutant. You would need to find other ways to limit your exposure to the air pollutant, like staying inside, not exercising outside, or wearing a mask that filters the air.

3. Tell students that one of the reasons for understanding the role of toxicology in human health is to empower the students to make choices that decrease their risk of becoming ill due to exposure to harmful chemicals. Once they know the risk from a chemical exposure, they can manage their risk by deciding how to deal with the risk. Walk the students through the steps of Risk Management on the bottom half of the transparency of Master 5.1, *Risk Assessment and Management*. Contrast the situation in Minamata, Japan, in the 1950s with the life of today's typical U.S. middle school student.

First, ask the students to think about risk assessment:

- **What is a person's risk of mercury poisoning?**

  Because of their dependence on fish as a primary source of food, the potential risk for a person living in Minamata in the 1950s was high. For today's middle school students, the risk is relatively low. The average middle school student does not consume enough fish to pose a problem, and most of the fish is commercially caught in regulated waters. Only a middle school student who lived near contaminated water and regularly ate the fish from the contaminated water would be at a higher risk.

  Then, continue answering the questions in the Risk Management section of the transparency:

- **How do the people involved perceive the risk? Are their perceptions accurate?**

  Possible answers: At first, Minamata residents did not know of the risk or worry about it. Once they began to see the effects of mercury poisoning, they perceived the risk as very serious. Their perceptions were accurate: Their primary food source was contaminated by industrial pollution, and that pollution was having a direct effect on the health of the community.

  Middle school students should perceive their risk as minimal. If a student perceives his or her risk as high, that perception would not be accurate according to the risk assessment above.

- **Who is responsible for the harmful substance and its presence in the environment? What role does the responsible party have in any cleanup?**

  Allow time for students to discuss who they think was responsible for the situation in Minamata and what they think the responsible party should have done. Then, instruct them to unfold the last fold on Master 5.2 and read Part IV.

  The Chisso Corporation was responsible for discharging polluted effluent into the bay. The corporation ultimately was held liable for its negligence in the 1970s. More complicated, however, are the social and economic pressures that influenced the placement of the plant in Minamata: People in the fishing village were interested in progress and enjoyed the prosperity that the industry brought to the town.

  Middle school students could be indirectly responsible for some of the mercury contamination in their local area because of the way they dispose of batteries. Students and family members can take responsibility for disposing of potentially harmful materials in a safe way and using safer alternatives, such as rechargeable batteries.

- **What are the benefits and tradeoffs that a person must weigh when making a decision about the risk?**

  Fish provide many health benefits to the cardiovascular system and to brain development. The dietary proteins that fish provided to the residents of Minamata were very important to good health. However, we now know that mercury poisoning from eating contaminated fish results in serious brain damage. The U.S. Environmental Protection Agency has advised that there are health benefits to eating fish and that consumption of fish should continue, but at a rate not to exceed 30 pounds per year. Because middle school students rarely reach an annual level of consumption of 30 pounds of fish, they can enjoy all the healthy benefits of eating fish without being concerned about any negative tradeoffs.

- **What action should people take to minimize their risk? Can the risk be managed by individuals, the community, and/or governments?**

In Minamata, industrial manufacture of acetaldehyde needed to stop. The corporation still operates in Minamata but produces liquid crystals, preservatives, fertilizers, and other chemicals. Over several years, 1.5 million cubic meters of contaminated sludge was dredged from the bay. Over the main dumping site, there now are museums, memorial sites, parks, and a study center. In 1997, the water in the bay was declared safe again for fishing and swimming. People have chosen to move away from Minamata to make their living elsewhere: The town has only 70 percent of the number of people it once had.

Middle school students can eat fish sensibly, dispose of mercury-containing products safely, and support organizations that provide hazardous waste cleanup in their communities. Regulatory agencies can measure mercury contamination in fish and regulate fishing or sales of fish from contaminated waters.

Before discussing the current event with the class, ask students to do a risk assessment individually. Collect students' written summaries and evaluate them for an understanding of the process of assessing risk. Then discuss the students' ideas for managing the risk.

Extension Activity

1. Review a local or current situation in which people are being exposed to a hazardous chemical. Use the *Risk Assessment and Management* transparency to discuss students' ideas about the level of risk for the community and ways to manage that risk.

Tip from the field test: This is a good time to go back to the current event articles the students have been collecting since Lesson 1. Choose one or two of the most interesting situations and assess risk for the population and decide how to manage the risk.

Because a current situation most likely will be unresolved, you will need to lead an open-ended discussion and help students recognize that there might not be answers for some of their questions at this time. This process of asking questions and not knowing the "right" answers is representative of the nature of science and scientific inquiry.

Content Standard G: Students should develop an understanding of the nature of science and the history of science.

◂ Return to Lesson Plans

Harmful chemicals may leach from septic systems

Reuters Health

By Megan Rauscher

NEW YORK (Reuters Health) - Septic systems may not remove natural hormone-disrupting chemicals -- like estrogen excreted in women's urine -- from wastewater before it gets into groundwater, which feeds many drinking water supplies, according to tests conducted in Cape Cod, Massachusetts.

In Cape Cod, more than 85 percent of residential and commercial properties use septic systems.

In a telephone interview, Dr. Chris Swartz said: "We did find both natural estrogen and alkyl phenols from detergents entering groundwater at concentrations very similar to concentrations that have been documented in the literature to show adverse reproductive effects in fish swimming in rivers downstream of wastewater treatment discharges."

Other chemicals detected in groundwater near the tested septic system include caffeine and detergent brightening compounds.

Swartz, senior scientist at the Silent Spring Institute in Newton, Massachusetts, said there is still "hot debate" in the Environmental Protection Agency and among scientists in general as to whether the concentrations of these and other chemicals that are being found in the environment have human health implications.

"The biggest concern is for prenatal exposures, because fetuses are exquisitely sensitive to any type of hormonal imbalances during their development," he explained.

Swartz hopes publication of his team's findings in the August 15 issue of Environmental Science and Technology will fuel dialogue among land use planners and policy makers about what septic systems are and are not removing.

"It's important to understand this if we are going to rely on septic systems," said Swartz.

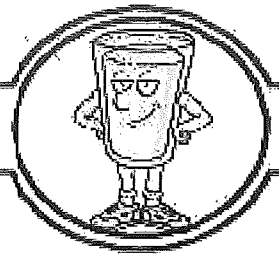
Currently about 25 percent of US households and probably a larger amount globally, Swartz noted, use on-site septic systems for household waste treatment as opposed to public sewage treatment plants.

"And there is a US and global trend toward decentralized wastewater treatment," Swartz said.

Prior research on septic systems have dealt only with nutrients such as nitrogen and phosphorus that may leach from septic tanks, get into groundwater, and eventually make it to surface body waters that the groundwater feeds.

The current tests, Swartz said, clearly show that other chemicals, like natural estrogens, known to interfere with human hormonal regulation, are also getting away from septic system treatment. Future studies, he concludes, are needed to determine the extent and potential effects of drinking water contamination with hormone-disrupting chemicals and other potentially harmful chemicals.

SOURCE: *Environmental and Science Technology,* August 15, 2006.



Resource Management
Protecting your Drinking Water

INTRODUCTION:

In almost any town, a large variety of chemicals and wastes are used or disposed of in day-to-day life. We are now learning that if things like gasoline, road salt, pesticides or sewage are not used or discarded wisely, they can contaminate a town's water supply.

We are also learning that some sources of water are easier to contaminate than other sources. Whether or not your town's supply is ***vulnerable*** to contamination depends on many different factors. These factors may add together to protect the supply, or to leave it very vulnerable to contamination.

To estimate the vulnerability of the ground water flowing under an area of land, a *hydrogeologist* measures several factors which affect how quickly rain water moves through the ground in that area. Pollutants will usually move in the same way as rain water.

Once you know something about each of these factors, you will be able to decide what must be done to be sure your drinking water will always be safe.

OBJECTIVE:

In this activity, you will use a simple mathematical model of *ground water vulnerability* to estimate the vulnerability of a small town's water supply.

Table 1
Estimated Value of Five Factors Affecting Groundwater Vulnerability

FACTOR	VALUE	
1. Yearly Rainfall (Total amount of rain that falls in one year)	3 2 1	...if more than 40 in. ...if from 15 to 40 in. ...if less than 15 in.
2. Depth to Water (Vertical depth from surface to aquifer)	3 2 1	...if less than 10 ft. ...if from 10 to 75 ft. ...if greater than 75 ft.
3. Aquifer Type (Type of soil/rock aquifer passes through)	3 2 1	...if sand or gravel ...if limestone ...if bedrock
4. Soil Type (Main type of soil and rock above aquifer)	4 3 2 1	...if sand or gravel ...if limestone ...if loam or silt ...if clay or shale
5. Lay of the Land (The general slope of surface of the land)	3 2 1	...if flat ...if gently rolling hills ...if steep hills/mountains

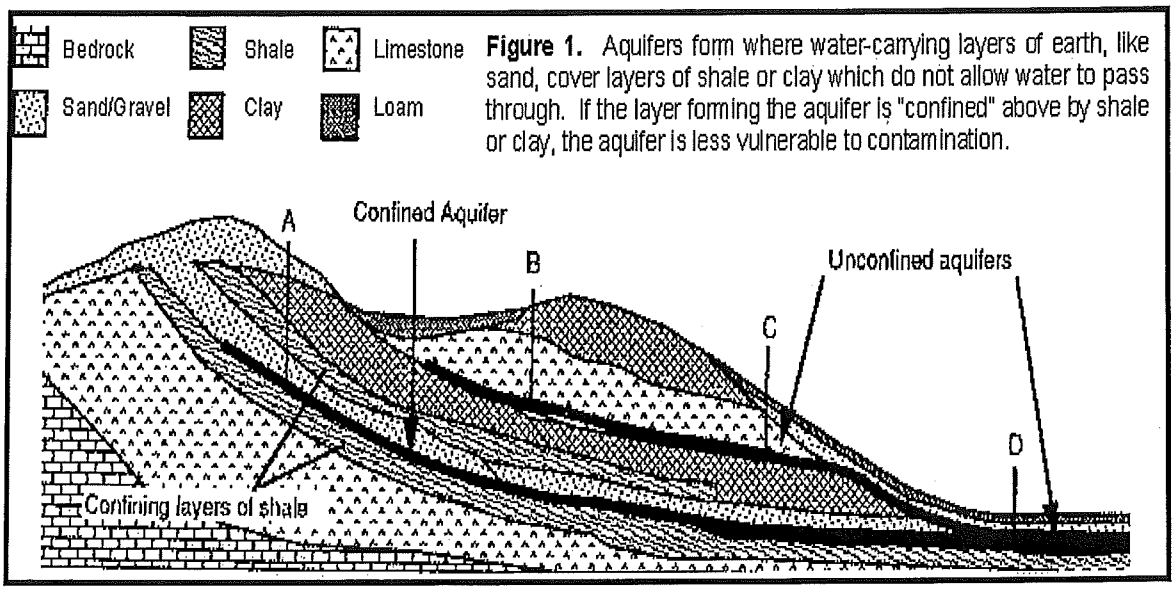


Figure 1. Aquifers form where water-carrying layers of earth, like sand, cover layers of shale or clay which do not allow water to pass through. If the layer forming the aquifer is "confined" above by shale or clay, the aquifer is less vulnerable to contamination.

MODEL OF GROUND WATER VULNERABILITY:

There are many factors affecting the vulnerability of a water supply, but we will only look at the five factors described in **Table 1**. A value of 1 means it is harder for rain water (and pollutants) to reach the supply, while a value of 3 means it is easier. It may be easy to see that the greater the depth to water, the longer it will take rain water to reach the supply. But how does a steep slope make the area less vulnerable? Figure 1 shows how some of these factors affect the vulnerability of various aquifers.

DIRECTIONS:

Use **Table 1** to find out how many points should be given for each of the five factors.

For example, **Table 1** tells you that if the depth to water is less than 15 ft, you should give 3 points for this factor in Quadrant 1. Values from **Table 1** may be averaged.

Fill in the rest of the blanks for each factor, then add them up to find the vulnerability of each quadrant.

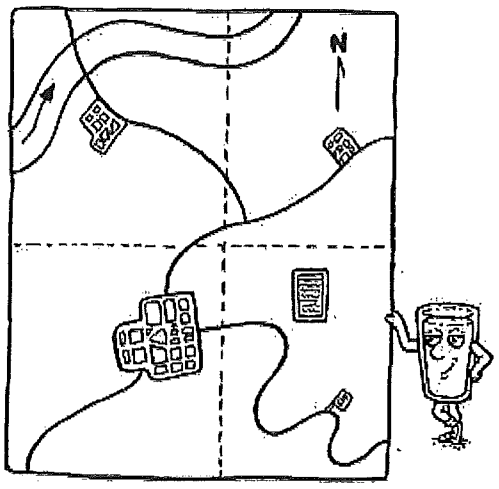
Table 2

Quadrant 1		
Depth to Water	12ft	3
Yearly Rainfall	45"	
Aquifer Type	Sand/Gravel	
Soil Type	Loam/Sand	
Lay of the Land	Flat	
VULNERABILITY SCORE		
Quadrant 2		
Depth to Water	40ft	
Yearly Rainfall	45"	
Aquifer Type	Limestone	
Soil Type	Limestone/Loam	
Lay of the Land	Gentle Slope	
VULNERABILITY SCORE		
Quadrant 3		
Depth to Water	60ft	
Yearly Rainfall	38"	
Aquifer Type	Limestone	
Soil Type	Limestone/Clay	
Lay of the Land	Rolling Hills	
VULNERABILITY SCORE		
Quadrant 4		
Depth to Water	100ft	
Yearly Rainfall	34"	
Aquifer Type	Sand/Gravel	
Soil Type	Shale/Clay	
Lay of the Land	Steep Hills	
VULNERABILITY SCORE		

HOW TO USE THE MODEL:

You can get a rough idea of the vulnerability of the underlying aquifer in each of Priceford's four quadrants. By using these five factors to give each quadrant a "score" on how easy it would be for a pollutant to pass through the ground to contaminate the aquifer.

Follow the instructions for filling out **Table 2**, then use your results along with the map of the Priceford area to answer the questions at the bottom of the page. **Give your reasons for each answer!**



QUESTIONS:

1. Discuss how factors 2-5 described in **Table 1** affect the vulnerability of water supplies at Points B, C and D in Figure 1. If three towns get their water supplies at Points B, C and D, which supply would be the most vulnerable? The least vulnerable?

2. Use **Table 3** below to interpret the vulnerability scores you calculated in **Table 2**. Which town's water supply would be most likely to be contaminated if a larger tanker truck full of a toxic chemical spilled its contents during a traffic accident on the nearest road?

3. Compare the vulnerability values you calculated in the four towns in the above map to Points A, B, C and D in Figure 1. Which of these towns is most likely to be located at which of these Points?

4. How would one town's pollutants affect the other town's supplies? If a wood preserving chemical is found in Smalltown's water, but not in Riverville's, where is the most likely area where the source of contamination might be found?

Table 3.
Vulnerability Score

5	7.5	10	12.5	15
very low		moderate		very high

Relative Vulnerability

THE REAL DEAL

You have selected an issue and learned a lot about it. You have collected a bunch of facts and figures, plus opinions, but how do you use them? How will your research guide your plan for action? Experts have devised a strategy called community mapping to help bring information together to guide action. So what is "the real deal" with the issue you have chosen?

SPECIAL OPS MISSION POSSIBLE ACTIVITY

Select an area in the community where you will work. You might choose a block, subdivision, school district or the entire county.

Create a map of the area you select. Use the map to show the location of the needs and resources you have discovered. Create symbols to represent the resources and needs. Draw them in a legend and give each a brief description.

You may find it helpful to interview a city or county planner, council member, commissioner, principal or other community professional.

When you have the information you need, place the symbols on the map to identify where the resources and needs actually exist.

When finished with the map, you will have a better understanding of where and how to begin the action for your service learning experience.

My Map

My Legend

Written by
Carol Weatherford

Project Skill: Community mapping. **Life Skill:** Planning and organizing. **National Education Standard:** NL.ENG.K-12.3 Evaluation strategies.
Success Indicator: Creates a community map showing community assets and challenges.

[Debrief]

Reporting Out

What did you find out is needed? What resources did you find in your community? What feelings did you experience as you learned about "the real deal?" What triggered these feelings?

Investigate

Where were the needs greatest in your community? Where do gaps exist between resources and needs? What actions can narrow the gap?

Trace the Links

How do the gaps between resources and needs affect your neighbors? How would your life be different if the gaps disappeared?

Follow the Lead

How do other communities, states or countries provide resources to address these kinds of needs? If you were county commissioner, how would you prioritize limited resources to meet needs?

SERVICE LEARNING
MISSION ONLINE
n4hccs.org/servicelearning

Community mapping.
Planning for change.

[Bonus Assignments]

1. Draw a map of your community as you want it to be. Compare with your "the real deal" map. Discuss with your helper or group.
2. Compare "the real deal" in your community with "the real deal" in your state. Contact the research department at one of the state agencies that deals with your issue. Ask if community mapping is used.
3. Put on an art show titled, "Visions for a New Community," with your friends to display your maps. Next to each map, post action step ideas. Have attendees vote or write opinions next to each idea.

INTELLIGENCE

Map Making

The World Book defines **cartography** as the study of map making. A **cartographer** or mapmaker chooses graphic or visual symbols that represent characteristics of an area such as rivers, state parks, cities, towns and highways. **Community mapping** can help you describe community resources and needs. These needs and resources are usually identified or determined by community members. When you create a community map, you may or may not represent both the geographic area and the needs on an actual map.

Actually mapping a community's needs and resources on a geographic map can be very helpful, especially when a map focuses on one need and includes all of the resources available to help. By seeing the resources and needs visually, you can establish and deepen your understanding of the gaps that exist between needs and existing resources. Community maps communicate where resources are needed. They can even help decision-makers figure out how to make effective resource allocations in the future.

SPEAK OUT

Getting the input and ideas of many people in the community can help you plan your service learning project. Giving people a way to voice their opinions is also a way to build support and sort out difficulties. In this activity you will organize a **community panel** to share ideas for addressing the need.

SPECIAL OPS MISSION POSSIBLE ACTIVITY

Organize and describe your community forum. For each speaker and the moderator, list their name, title and organization and perspective. Prepare questions that **facilitate** a discussion about the need.

Moderator

Speaker 1

Speaker 2

Speaker 3

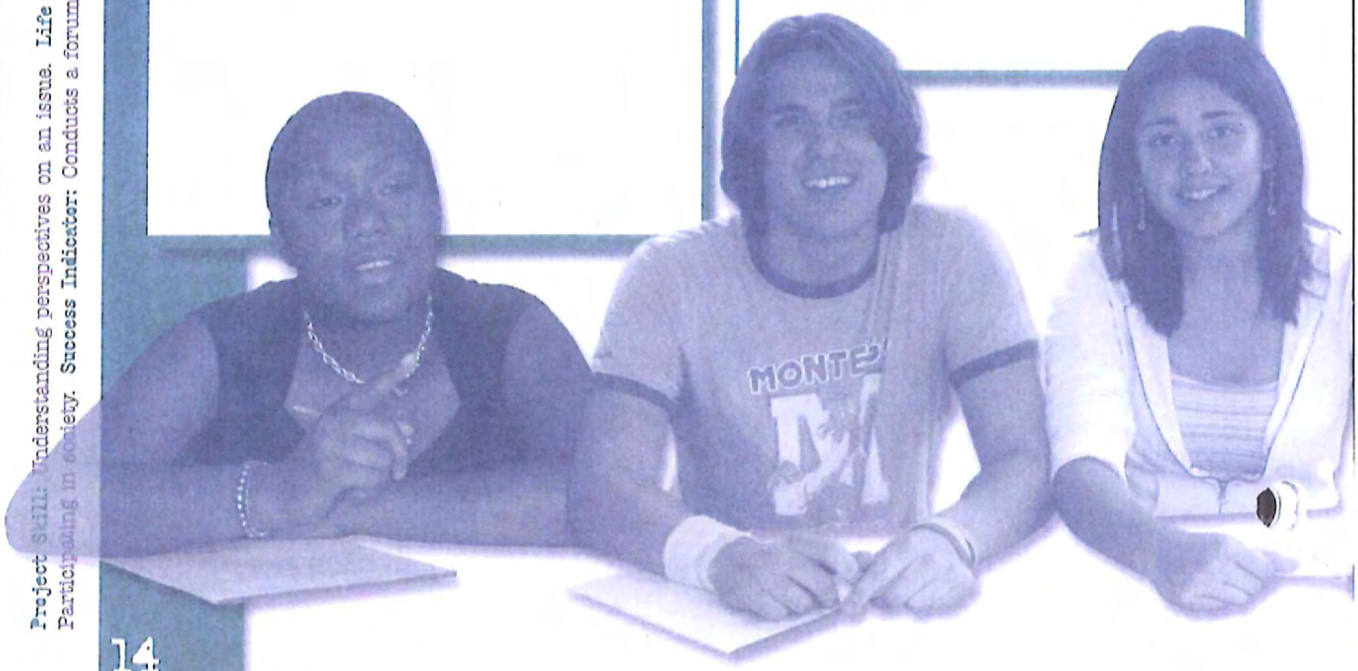
Topic:

Date & Time:

Location:

Publicity:

Agenda:



Project Skill: Understanding perspectives on an issue. **Life Skill:** Planning and organizing. **National Education Standard:** NL.ENG.K-12.11 Participating in society. **Success Indicator:** Conducts a forum for the community.

[Debrief]

Reporting Out

What went well during your community panel? Describe how the panelists reacted to the questions.

Investigate

What key points were made by the panelists? Describe the body language and hand motions used by the panelists and audience.

Trace the Links

How does what the panelists had to share change or alter your plans? What kinds of arguments are most effective at persuading you to change your mind?

Follow the Lead

How can you use the planning and organizing skills you developed through this activity in other parts of your life? What about your community panel would you do differently?

SERVICE LEARNING
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n4hccs.org/servicelearning

Community forums.
Organizing a panel.

[Bonus Assignments]

1. Design a short survey about the event and ask the people attending to fill it out. Share what they have to say with your helper.
2. Write a report about your community panel and summarize the key points made by each panelist. Share your report with your helper.
3. Prepare a photo collage about your community panel. Try to capture the vibrancy and interaction of the event. Share with your helper or group.

Written by Ami Neiberger-Miller

INTELLIGENCE

Organizing a Community Forum

Organizing a successful community forum requires you to focus on the details. Use these tips to plan a great event.

Speakers. Invite experts who speak clearly and know about the topic. Good speakers might be community activists, a university professor, a nonprofit executive or a government official. Invite speakers with a variety of opinions and perspectives.

Date & Location. How many people will want to attend your forum? A large crowd will require a bigger space. Consider public interest, transportation and seating when selecting a location. If your event conflicts with other major community activities, it may be difficult for people to attend. Consult calendars for your community and use commonsense when selecting a date. Don't forget that you will need time to promote the event.

Publicity. Put up fliers and posters in your community. Issue a news release about the event. Ask a radio station to announce the forum on the air. Invite interested organizations.

Agenda. Outline the program for the forum. Determine how much time each speaker will have to make a general statement about the topic. Write a list of questions to ask all of the panel members. Plan time for the audience to ask questions themselves, and leave a few moments to thank your panelists at the end.

Logistics. On the day of the event, arrive early. Check the temperature in the room and make sure the chairs are set up. If you are using a sound system, test it ahead of time.

Watershed Patch Project 2004

Projects and Activities

Home and Lawn Care Checklist: "Personal Pollution"

When rain falls or snow melts, the seemingly small amounts of chemicals and other pollutants in your driveway, on your lawn, and on your street are washed into storm drains. In many older cities, the storm water runoff is not treated and runoff flows directly into rivers, streams, bays, and lakes. Pollutants in this runoff can poison fish and other aquatic animals and make water unsafe for drinking and swimming.

What can you do to help protect surface waters and groundwaters? Start at home. Take a close look at practices around your house that might contribute to polluted runoff. The following is a checklist to help you and your family become part of the solution instead of part of the problem!

Do-It-Yourself Home Cleaning Products

General, multipurpose cleaner (for ceramic tiles, linoleum, porcelain, etc.): Measure 1/4 cup baking soda, 1/2 cup white vinegar, and 1 cup ammonia into a container. Add to a gallon of warm water and stir until baking soda dissolves.

Window Cleaner: 3 tablespoons of ammonia, 1 tablespoon of white vinegar and 3/4 cup of water. Put into a spray bottle.

Visit http://www.epa.gov/grtlakes/seahome/housewaste/src/recipes.htm for more ideas on nontoxic alternatives!

Household Products

1. **Do you properly dispose of household hazardous waste such as leftover oil-based paint, excess pesticides, nail polish remover, and varnish by taking them to your city's or county's hazardous waste disposal site or by putting them out on hazardous waste collection days?** Labels such as **WARNING, CAUTION, and DANGER** indicate the item contains ingredients that are hazardous if improperly used or disposed of.

   ☐ Yes ☐ No

2. **Do you use less toxic alternatives or nontoxic substitutes?** Baking soda, distilled white vinegar, and ammonia are safe alternatives to caustic chemicals. And they save you money.

   ☐ Yes ☐ No

3. **Do you limit the amount of chemicals, fertilizers, and pesticides you use and apply them only as directed on the label?**

   ☐ Yes ☐ No

4. **Do you recycle used oil, antifreeze, and car batteries by taking them to service stations and other recycling centers?**

   ☐ Yes ☐ No

Landscaping and Gardening

5. **Do you select plants with low requirements for water, fertilizers, and pesticides? (e.g., native plants)**

   ☐ Yes ☐ No

6. **Do you preserve existing trees and plant trees and shrubs to help prevent erosion and promote infiltration of water into the soil?**

☐ Yes ☐ No

7. **Do you leave lawn clippings on your lawn so that the nutrients in the clippings are recycled, less fertilizer is needed, and less yard waste goes to landfills?** If your community does not compost lawn trimmings, they usually go to landfills.

☐ Yes ☐ No

8. **Do you prevent trash, lawn clippings, leaves, and automobile fluids from entering storm drains?** Most storm drains are directly connected to our streams, lakes, and bays.

☐ Yes ☐ No

9. **If your family uses a professional lawn care service, do you select a company that employs trained technicians and minimizes the use of fertilizers and pesticides?**

☐ Yes ☐ No

10. **Do you have a compost bin or pile? Do you use compost and mulch (such as grass clippings or leaves) to reduce your need for fertilizers and pesticides?** Compost is a valuable soil conditioner that gradually releases nutrients to your lawn and garden. In addition, compost retains moisture in the soil and thus helps conserve water and prevent erosion and runoff. Information about composting is available from your county extension agent (see the blue pages in your phone book).

☐ Yes ☐ No

11. **Do you test your soil before fertilizing your lawn or garden?** Overfertilization is a common problem, and the excess can leach into groundwater and contaminate rivers or lakes.

☐ Yes ☐ No

12. **Do you avoid applying pesticides or fertilizers before or during rain?** If they run off into the water, they will kill fish and other aquatic organisms.

☐ Yes ☐ No

Did You Know?

One quart of oil can contaminate up to 2 million gallons of drinking water!

Water Conservation

Homeowners can significantly reduce the volume of wastewater discharged to home septic systems and sewage treatment plants by conserving water. If you have a septic system, you can help prevent your system from overloading and polluting ground and surface waters by ensuring that it is functioning properly and decreasing your water usage. For other ideas on what you can do to conserve water, check out a new Web site, http://www.h2ouse, developed in partnership with the California Urban Water Conservation Council.

13. **Do you use low-flow faucets and shower heads, and reduced-flow toilet flushing equipment?**

☐ Yes ☐ No

14. **When washing your family's car, do you use a bucket instead of a hose to save water?**

☐ Yes ☐ No

15. **Do you use dishwashers and clothes washers only when fully loaded?**

☐ Yes ☐ No

16. **Do you take short showers instead**

Give Water A Hand

What is your city, town, or school doing to prevent polluted runoff? GIVE WATER A HAND ACTION GUIDE contains checklists for schools, communities, and farms. This guide can help you and your school identify potential problems in your community and take action.

You can download a free copy of *Give Water A Hand Action Guide and Leader Guidebook* at http://www.uwex.edu/erc/gwah. Or to order printed copies call:

University of Wisconsin-Extension
608-262-3346
Items 4-H450 & 4-H855
Leader Guidebook ($4.92)
Action Guide ($6.96)
Price includes shipping.

of baths and avoid letting faucets run unnecessarily (e.g., when brushing teeth)?

☐ Yes ☐ No

17. **Do you promptly repair leaking faucets, toilets, and pumps to conserve water?**

☐ Yes ☐ No

18. **Do you conserve the amount of water you use on your lawn and water only in the morning and evening to reduce evaporation?** Overwatering may increase leaching of fertilizers to groundwater.

☐ Yes ☐ No

19. **Do you use slow watering techniques such as trickle irrigation or soaker hoses?** These devices reduce runoff and are 20 percent more efficient than sprinklers.

☐ Yes ☐ No

In Your Community

20. **Do you always pick up after your pet (e.g., Rover's poop)? Be sure to put it in the trash, flush it down the toilet, or bury it at least 5 inches deep.** Pet waste contains viruses and bacteria that can contaminate surface and groundwater.

☐ Yes ☐ No

21. **Have you helped stencil stormdrains to alert people that they drain directly to your local waterbody?** If not, get involved with a local conservation group or organize your own stenciling project.

☐ Yes ☐ No

22. **Do you ride or drive only when necessary?** Try to walk instead. Cars and trucks emit tremendous amounts of airborne pollutants, which increase acid rain. They also deposit toxic metals and petroleum by-products.

☐ Yes ☐ No

23. **Do you participate in local planning and zoning decisions in your community?** If not, get involved! These decisions shape the course of development and the future quality of your watershed.

Deadly Links
(a bioaccumulation simulation)

*Good follow-up for Pollution Town and Water Watchers/Fred the Fish
**Needs a large open space

Purpose: . Students will explain the positive and negative impacts of human activity on food webs of the earth. They will further expand their knowledge of how pollution can affect *everyone.*

Materials: poker chips, small paper bags or other small containers

Instructions:

Set up: Briefly explain the concept of the food chain. Divide the students into three groups: the grasshoppers, shrews, and hawks. (Work with approximately three times as many shrews as hawks, and three times as many grasshoppers as shrews. In a group of 26 students, there would be two 'hawks,' six 'shrews,' and 18 'grasshoppers.') Hand each 'grasshopper' a paper bag or other small container. The container represents the stomach of whatever animal is holding it. With the students' eyes close, or otherwise not watching where you place the food, distribute the poker chips around the open space. Give the students their instructions.

Play: The grasshoppers are the first to go looking for food. The hawks and shrews are to sit quietly on the sidelines watching the grasshoppers; after all, the hawks and shrews are predators and stalking their prey! At a given signal, the grasshoppers are allowed to enter the area to collect food and place the food in their 'stomachs' (the bags). At the end of 30 seconds, the grasshoppers are to stop collecting food.

The shrews are now allowed to hunt the grasshoppers. The hawks are still on the sidelines quietly watching the activity. The amount of time available to the shrews to hunt the grasshoppers should take into account the size you are working in. In a classroom, 15 seconds may be enough time; on a large playing field, 60 seconds may be better. Each shrew should have time to catch one or more grasshoppers. Any grasshopper caught be a shrew – that is, tagged by the shrew, must give its bag of 'food' to the shrew then sit on the sidelines.

The next time period (from 15-60 seconds, or whatever time you set) is time for the hawks to hunt for food. The same rules follow. Any shrews alive may hunt for grasshoppers, grasshoppers hunting for food chips that represent corn or other plants, and the hawks are hunting for the shrews. If a hawk catches a shrew, the hawk gets the food bag and the shrew goes to the sidelines. At the end of the designated period, ask all students to come together in a circle, bringing whatever food bags they have with them.

Wrap-up: Ask the students who having been consumed, to identify what animal they are and what animal ate them. Next ask to hawks to empty their food bags out onto the floor or on a piece of paper where they can count the number of food chips they have. They should count the total number of white food chips and the total number of multi-colored food pieces they have in their 'stomachs.' List any grasshoppers and the total number of white and multi-colored food pieces each has, list the number of shrews left and the number of white and multi-colored food pieces each has, and finally list the two hawks and the number of white and multi-colored food pieces each has.

Inform the students that there is something called a 'pesticide' in the environment. (Take a moment to define pesticide, make sure students understand that pesticides have both good and bad effects.) This pesticide was sprayed onto the crop the grasshoppers were eating, in order to prevent a lot of damage by the grasshoppers. If there was a lot of crop damage by grasshoppers, the farmers would have less of their crop to sell, and some people and some livestock might have less of that kind of food to eat. Also, it might cost more to buy because a smaller quantity was available. This particular pesticide is one that is poisonous, accumulates in food chains and stays in the environment for a long time.

In this activity, all of the multi-colored food chips represent the food contaminated with pesticides. All of the grasshoppers that were not eaten by shrews may now be considered dead, if they have *any* multi-colored food chips in their food supply. Any shrews for which half or more of their food supply was multi-colored chips would also be considered dead. The hawk with the highest number of multi-colored food chips will not die at this time; however, it has accumulated so much of the pesticide in its body that the egg shells produces by it and its mate during the next nesting season will be so thin that the eggs will not hatch successfully. The other hawk is not visibly affected at this time.

Conclusions: Talk with the students about what they experienced in the activity. Ask them for their observations about how the food chain seems to work, and how toxic substances can enter the food chain, with a variety of results. The students may be able to give examples beyond those of the grasshopper-shrew-hawk affected by the pesticide in this activity. Discuss DDT. In the 1970s, a pesticide known as DDT was commonly used. It was banned eventually because it was discovered that it contaminated supplies of fish, who were not visibly affected, that were eaten by Bald Eagles. The eagle population diminished due to thin eggshells, caused by the ingestion of the pesticide. The Bald Eagle has now been upgraded from once being on the endangered species list to the threatened species list. (*Saturday (May 15, 2004), a top Bush administration official said the American Bald Eagle will be removed from the threatened species list this year. The birds will still be safeguarded under the federal Bald Eagle Protection Act of 1940.*

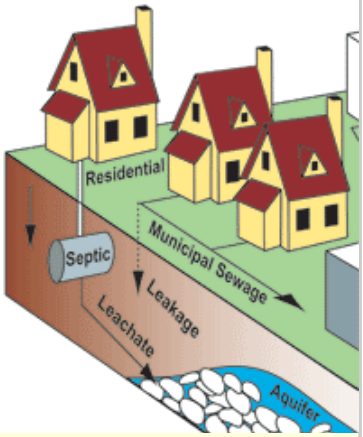
In 1963 the bald eagle population in the continental United States was reduced to just 417 known breeding pairs. Today, there are more than 7,678 pairs of bald eagles in the contiguous United States. *** As of May 9, 2005 the Bald Eagle remains on the threatened species list.)

Adapted by Deanna Garner, Recycling & Waste Reduction District of Porter County. Adapted from Project WILD, "Deadly Links," p.270, 1992, Western Regional Environmental Education Council

Background Information for Student Research

Basic Information

Pharmaceuticals and personal care products were first called "PPCPs" only a few years ago, but these bioactive chemicals (substances that have an effect on living tissue) have been around for decades. Their effect on the environment is now recognized as an important area of research.



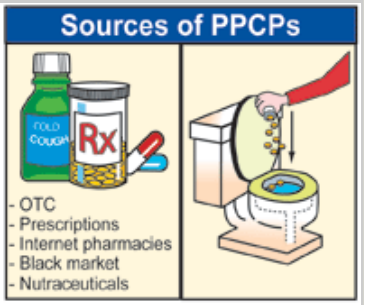
This drawing shows the pathway between homes and septic or municipal sewage facilities.

PPCPs include:

- Prescription and over-the counter therapeutic drugs
- Veterinary drugs
- Fragrances
- Cosmetics
- Sun-screen products
- Diagnostic agents
- Nutraceuticals (e.g., vitamins)

Sources of PPCPs:

- Human activity
- Residues from pharmaceutical manufacturing (well defined and controlled)
- Residues from hospitals
- Illicit drugs
- Veterinary drug use, especially antibiotics and steroids
- Agribusiness



Discarding unused drugs and personal care products down the toilet is a common but poor disposal method.

The importance of individuals directly contributing to the combined load of chemicals in the environment has been largely unrecognized. PPCPs in the environment illustrate the immediate connection of the actions/activities of individuals with their environment.

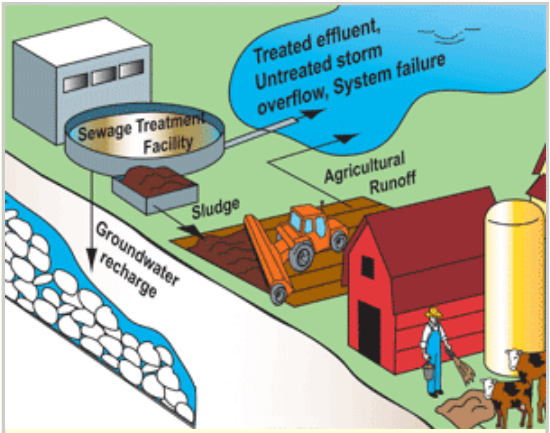
Individuals add PPCPs to the environment through excretion (the elimination of waste material from the body) and bathing, and disposal of unwanted medications to sewers and trash. In February 2007, the White House Office of National Drug Control Policy issued the first consumer guidance for the Proper Disposal of Prescription Drugs (pdf, 1pp, 95 KB) EXIT Disclaimer. Proper disposal of drugs is a straightforward way for individuals to prevent pollution.

Some PPCPs are easily broken down and processed by the human body or degrade quickly in the environment, but others are not easily broken down and processed, so they enter domestic sewers. Excretion of biologically unused and unprocessed drugs depends on:

- individual drug composition (certain excipients -- i.e., inert ingredients -- can minimize absorption and therefore maximize excretion)
- ability of individual bodies to break down drugs (this ability depends on age, sex, health, and individual idiosyncrasies)

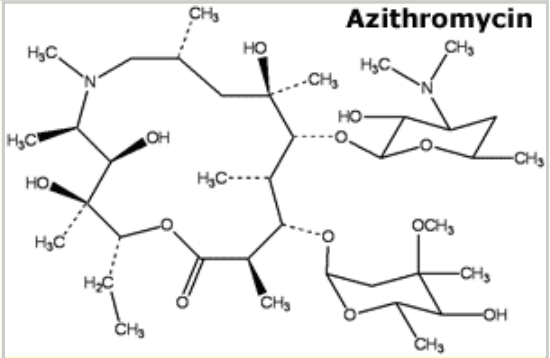
Because they dissolve easily and don't evaporate at normal temperatures or pressure, PPCPs make their way into the soil and into aquatic environments via sewage, treated sewage sludge (biosolids), and irrigation with reclaimed water.

Please read the PPCP Frequent Questions for more details and background information. The poster Origins and Fate of PPCPs in the Environment (PDF) (poster, 284KB, About PDF) illustrates the origins/sources of PPCPs.



This drawing shows some of the contributions of sewage, biosolids and farms to PPCPs in the environment.

Frequent Questions



Azithromycin is a synthetic version of a naturally produced macrolide antibiotic - - erythromycin. It is among the top 10 of the most widely prescribed pharmaceuticals and can be frequently found in environmental samples.

You will need Adobe Reader to view some of the files on this page. See EPA's PDF page to learn more.

Consumer Focus

Scientific Focus

Consumer Focus

What are "PPCPs"?

Pharmaceuticals and Personal Care Products as Pollutants (PPCPs) refers, in general, to any product used by individuals for personal health or cosmetic reasons or used by agribusiness to enhance growth or health of livestock. PPCPs comprise a diverse collection of thousands of chemical substances, including prescription and over-the-counter therapeutic drugs, veterinary drugs, fragrances, lotions, and cosmetics.

What are the major sources of PPCPs in the environment?

Sources of PPCPs:

- Human activity (e.g., bathing, shaving, swimming)
- Illicit drugs
- Veterinary drug use, especially antibiotics and steroids
- Agribusiness
- Residues from pharmaceutical manufacturing (well defined and controlled)
- Residues from hospitals

The importance of individuals adding chemicals to the environment has been largely overlooked. The discovery of PPCPs in water and soil shows even simple activities like shaving, using lotion,

or taking medication affect the environment in which you live.

People contribute PPCPs to the environment when:

- medication residues pass out of the body and into sewer lines,
- externally-applied drugs and personal care products they use wash down the shower drain, and
- unused or expired medications are placed in the trash.

Personal use and manufacturing of illicit drugs are a less visible source of PPCPs entering the environment.

Many of the issues pertaining to the introduction of drugs to the environment from human usage also pertain to veterinary use, especially for antibiotics and steroids.

The discharge of pharmaceuticals and synthesis materials and by-products from manufacturing are already well defined and controlled. For more information regarding manufacturing discharges, see: Development Document for Final Effluent Limitations Guidelines and Standards for the Pharmaceutical Manufacturing Point Source Category, Office of Water, EPA-921-R-98-005, September 1998.

This poster shows a generalized synopsis of the sources of PPCPs in the environment (PDF). (1pp, poster, 307KB)

What is the overall scientific concern?

Studies have shown that pharmaceuticals are present in our nation's waterbodies. Further research suggests that certain drugs may cause ecological harm. More research is needed to determine the extent of ecological harm and any role it may have in potential human health effects. To date, scientists have found no evidence of adverse human health effects from PPCPs in the environment.

Reasons for concern:

- Large quantities of PPCPs can enter the environment after use by individuals or domestic animals.
- Sewage systems are not equipped for PPCP removal. Currently, there are no municipal sewage treatment plants that are engineered specifically for PPCP removal or for other unregulated contaminants. Effective removal of PPCPs from treatment plants varies based on the type of chemical and on the individual sewage treatment facilities.
- The risks are uncertain. The risks posed to aquatic organisms, and to humans are unknown, largely because the concentrations are so low. While the major concerns have been the resistance to antibiotics and disruption of aquatic endocrine systems (the system of glands that produce hormones that help control the body's metabolic activity) by natural and synthetic sex steroids, many other PPCPs have unknown consequences. There are no known human health effects from such low-level exposures in drinking water, but special scenarios (one example being fetal exposure to low levels of medications that a mother would ordinarily be avoiding) require more investigation.
- The number of PPCPs are growing. In addition to antibiotics and steroids, over 100 individual PPCPs have been identified (as of 2007) in environmental samples and drinking water.

Should we be worried about ecological and/or human health?

Studies have shown that pharmaceuticals are present in some of our nation's waterbodies. Further research suggests that there may be some ecological harm when certain drugs are present. To date, no evidence has been found of human health effects from PPCPs in the environment.

Where are PPCPs found in the environment?

PPCPs are found where people or animals are treated with drugs and people use personal care products. PPCPs are found in any water body influenced by raw or treated sewage, including rivers, streams, ground water, coastal marine environments, and many drinking water sources. PPCPs have been identified in most places sampled.

The U.S. Geological Survey (USGS) implemented a national reconnaissance to provide baseline information on the environmental occurrence of PPCPs in water resources. You can find more information about this project from the USGS's What's in Our Wastewaters and Where Does it Go? site.

PPCPs in the environment are frequently found in aquatic environments because PPCPs dissolve easily and don't evaporate at normal temperature and pressures. Practices such as the use of sewage sludge ("biosolids") and reclaimed water for irrigation brings PPCPs into contact with the soil.

- For more information about biosolids see the National Research Council (NRC) report: Biosolids Applied to Land: Advancing Standards and Practices (2002) EXIT Disclaimer)
- USGS: Pharmaceuticals Found in Soil Irrigated with Reclaimed Water

How is the disposal of unused pharmaceuticals regulated by the US EPA?

The Resource Conservation and Recovery Act (RCRA) is a federal law controlling the management and disposal of solid and hazardous wastes produced by a wide variety of industries and sources. The RCRA program regulates the management and disposal of hazardous pharmaceutical wastes produced by pharmaceutical manufacturers and the health care industry. Under RCRA, a waste is a hazardous waste if it is specifically listed by the EPA or if it exhibits one or more of the following four characteristics: ignitability, corrosivity, reactivity and toxicity.

How do I properly dispose of unwanted pharmaceuticals?

In February 2007, the White House Office of National Drug Control Policy issued the first consumer guidance for the Proper Disposal of Prescription Drugs (pdf, 1pp, 95 KB) EXIT Disclaimer. Proper disposal of drugs is a straightforward way for individuals to prevent pollution.

RCRA does not regulate any household waste, which includes medications/pharmaceutical waste generated in a household. While discarded pharmaceuticals under the control of consumers are not regulated by RCRA, EPA encourages the public:

- to take advantage of pharmaceutical take-back programs or household hazardous waste collection programs that accept pharmaceuticals
- If there are no take-back programs near you,
  - contact your state and local waste management authorities (the disposal of household waste is primarily regulated on the state and local levels) with questions about discarding unused pharmaceuticals, whether or not these materials meet the definition of hazardous waste
  - follow any specific disposal instructions that may be printed on the label or accompanying patient information

Who can I contact for more information?

You can contact an EPA regional representative or a program office representative.

Scientific Focus

Where Did the Acronym PPCPs Originate?

The acronym "PPCPs" was coined in the 1999 critical review published in *Environmental Health Perspectives (PDF)* (41pp, 789 KB) to refer to Pharmaceuticals and Personal Care Products. PPCPs comprise a very broad, diverse collection of thousands of chemical substances, including prescription, veterinary, and over-the-counter (OTC) therapeutic drugs, fragrances, cosmetics,

sun-screen agents, diagnostic agents, nutraceuticals, biopharmaceuticals, growth enhancing chemicals used in livestock operations, and many others. This broad collection of substances refers, in general, to any product used by individuals for personal health or cosmetic reasons. Since its introduction in 1999, the acronym PPCPs has become the most frequently adopted term in both the technical and popular literature and therefore is a useful keyword for performing literature searches.

What was EPA's historical role in this area?

EPA established a leadership role beginning in 1999 with publication of a critical review (PDF) (41pp, 789 KB) article that attempted to bring together the many different aspects of this complex issue.

From the beginning, a major objective has been to stimulate a proactive versus a reactive approach to this environmental issue. The work was driven by goals from the U.S. EPA's Strategic Plan. The relevant goals included:

- Clean and Safe Water
- Preventing Pollution and Reducing Risk in Communities, Homes, Workplaces, and Ecosystems
- Better Waste Management, Restoration of Contaminated Waste Sites, and Emergency Response
- and Sound Science - Improved Understanding of Environmental Risk and Greater Innovation to Address Environmental Problems

In addition, a primary goal of the U.S. EPA's Office of Research and Development is to identify and foster investigation of potential environmental issues/concerns before they become critical ecological or human health problems. Pollution prevention (e.g., source elimination or minimization) is preferable to remediation or restoration to minimize both public cost and human/ecological exposure.

Current Work:

- Comprehensive list of EPA research about PPCPs

In what quantities are PPCPs used or introduced to the environment?

As a whole, PPCPs are produced and used in large quantities. Personal care products tend to be made in extremely large quantities - thousands of tons per year. But quantities of production or consumption do not correspond with the quantities of PPCPs introduced to the environment. PPCPs manufactured in large quantities may not be found in the environment if they are easily broken down and processed by the human body or degrade quickly. PPCPs made in small quantities could be over represented in the environment, if they are not easily broken down and processed by the human body and make their way into domestic sewers.

What are some major issues with respect to effects?

- The effects of PPCPs are different from conventional pollutants. Drugs are purposefully designed to interact with cellular receptors at low concentrations and to elicit specific biological effects. Unintended adverse effects can also occur from interaction with non-target receptors.
- Environmental toxicology focuses on acute effects of exposure rather than chronic effects.
- Effects on aquatic life are a major concern. Exposure risks for aquatic organisms are much larger than those for humans. Aquatic organisms have:
    - continual exposures
    - multi-generational exposures
    - exposure to higher concentrations of PPCPs in untreated water
    - possible low dose effects
- Effects may be subtle because PPCPs in the environment occur at low concentrations. There's a need to develop tests that detect more subtle end-points. Neurobehavioral

effects and inhibition of efflux pumps are two examples. Subtle effects that accumulate may be significant.

- There are little aquatic/terrestrial toxicology data for PPCPs. There is substantially more data available for pesticides. For example, brief exposure of salmon to 1 ppb of the insecticide diazinon is known to affect signaling pathways (via olfactory disruption), leading to alteration in homing behavior (with obvious implications for predation, feeding, and mating). There's concern that low doses of PPCPs may also have effects.
- There are many drug classes of concern:
    - antibiotics which are actively being researched
    - antimicrobials
    - estrogenic steroids
    - antidepressants. Profound effects on spawning and other behaviors in shellfish can occur with antidepressant selective serotonin reuptake inhibitors (SSRIs).
    - calcium-channel blockers. Dramatic inhibition of sperm activity in certain aquatic organisms can be effected by calcium-channel blockers.
    - antiepileptic drugs (e.g., phenytoin, valproate, carbamazepine) have potential as human neuroteratogens, triggering extensive apoptosis in the developing brain, leading to neurodegeneration.
    - multi-drug transporters (efflux pumps). Possible significance of efflux pump inhibitors (EPIs) in compromising aquatic health.
    - musk fragrances are bioaccumulative and persistent
    - genotoxic drugs (primarily used at hospitals)

How can I contact scientists working on this topic?

Contact information for research scientists with active research about PPCPs in the environment and government scientists with interest in regulatory aspects, is available. Listing of research scientists and their contact information. (PDF) (2pp, 16KB)

Proper Disposal of Prescription Drugs

Office of National Drug Control Policy October 2009

Federal Guidelines:

- Do not flush prescription drugs down the toilet or drain unless the label or accompanying patient information specifically instructs you to do so. For information on drugs that should be flushed visit the FDA's website.

- To dispose of prescription drugs not labeled to be flushed, you may be able to take advantage of community drug take-back programs or other programs, such as household hazardous waste collection events, that collect drugs at a central location for proper disposal. Call your city or county government's household trash and recycling service and ask if a drug take-back program is available in your community.

- If a drug take-back or collection program is not available:

    1. Take your prescription drugs out of their original containers.

    2. Mix drugs with an undesirable substance, such as cat litter or used coffee grounds.

    3. Put the mixture into a disposable container with a lid, such as an empty margarine tub, or into a sealable bag.

    4. Conceal or remove any personal information, including Rx number, on the empty containers by covering it with black permanent marker or duct tape, or by scratching it off.

    5. Place the sealed container with the mixture, and the empty drug containers, in the trash.

Office of National Drug Control Policy
750 17th St. N.W., Washington, D.C. 20503
p (202) 395- 6618 f (202) 395-6730

Useful Links

- Nearly 7 million Americans are abusing prescription drugs*—more than the number abusing cocaine, heroin, hallucinogens, Ecstasy, and inhalants, combined. That 7 m just 3.8 million in 2000, an 80 percent increase in just 6 years.
- Prescription pain relievers are new drug users' drug of choice, vs. marijuana or coc
- Opioid painkillers now cause more drug overdose deaths than cocaine and heroin c
- Nearly 1 in 10 high school seniors admits to abusing powerful prescription painkiller shocking 40 percent of teens and an almost equal number of their parents think abu prescription painkillers is safer than abusing "street" drugs.
- Misuse of painkillers represents three-fourths of the overall problem of prescription abuse; hydrocodone is the most commonly diverted and abused controlled pharma the U.S.
- Twenty-five percent of drug-related emergency department visits are associated w prescription drugs.
- Methods of acquiring prescription drugs for abuse include "doctor-shopping," traditi drug-dealing, theft from pharmacies or homes, illicitly acquiring prescription drugs v Internet, and from friends or relatives.
- DEA works closely with the medical community to help them recognize drug abuse diversion and relies on their input and due diligence to combat diversion. Doctor invo illegal drug activity is rare—less than one tenth of one percent of more than 750,00 are the subject of DEA investigations each year—but egregious drug violations by p unfortunately do sometimes occur. DEA pursues criminal action against such practit
- DEA Internet drug trafficking initiatives over the past 3 years have identified and dis organizations based both in the U.S. and overseas, and arrested dozens of conspir result of major investigations such as Operations Web Tryp, PharmNet, Cyber Rx, Chase, and Click 4 Drugs, Bay Watch, and Lightning Strike, tens of millions of dosa prescription drugs and tens of millions of dollars in assets have been seized.

* Prescription drugs refers to abuseable pharmaceuticals controlled under federal law enforced by the DEA.

Useful Links:

- DEA Testimony on Prescription Drug Abuse
- ONDCP's Prescription Drug Abuse Fact Sheets

Headlines

What's in Our Wastewaters and Where Does it Go?

The U.S. Geological Survey (USGS) has implemented a national reconnaissance to provide baseline information on the environmental occurrence of "emerging contaminants" such as human and veterinary pharmaceuticals (e.g., fluoxetine and lincomycin), industrial and household wastewater products (e.g., p-nonyphenol and triclosan), and reproductive and steroidal hormones (e.g., equilenin and progesterone) in water resources. During 1999 and 2000, 142 streams, 55 wells, and 7 effluent samples were collected across 36 states as part of this national reconnaissance effort. A majority of the sites sampled were those suspected to be susceptible to emerging contaminants from animal or human wastewaters. This national reconnaissance of emerging contaminants is the first of its kind in the United States.

Publications

Buxton, H.T., and Kolpin, D.W., 2002, Pharmaceuticals, hormones, and other organic wastewater contaminants in U.S. streams: U.S. Geological Survey Fact Sheet FS-027-02, 2 p.

Kolpin, D.W., Furlong, E.T., Meyer, M.T., Thurman, E.M., Zaugg, S.D., Barber, L.B., and Buxton, H.T., 2002, Pharmaceuticals, hormones, and other organic wastewater contaminants in U.S. streams, 1999-2000--A national reconnaissance: Environmental Science and Technology, v. 36, no. 6, p. 1202-1211.

Barnes, K.K., Kolpin, D.W., Meyer, M.T., Thurman, E.M., Furlong, E.T., Zaugg, S.D., and Barber, L.B., 2002, Water-quality data for pharmaceuticals, hormones, and other organic wastewater contaminants in U.S. streams, 1999-2000: U.S. Geological Survey Open-File Report 02-94.

More Information

- Emerging Contaminants in the Environment Investigation
- Research on the Environmental Occurrence of Emerging Contaminants

Related Headlines

- Measuring Antidepressants, Fungicides, and Insecticides in the Environment
- Detergents in Streams May Just Disappear
- Emerging Contaminants Targeted in a Reconnaissance of Ground Water and Untreated Drinking-Water Sources
- Household Chemicals and Drugs Found in Biosolids from Wastewater Treatment Plants
- Endocrine Disruption Found in Fish Exposed to Municipal

Wastewater

- Pharmaceuticals Found in Soil Irrigated with Reclaimed Water
- Are Pharmaceuticals in Your Watershed? Understanding the Fate of Pharmaceuticals and Other Contaminants in Watersheds
- Book Chapter on Exposure Modeling and Monitoring of Human Pharmaceuticals in the Environment
- Tracing Wastewater - Using Unique Compounds to Identify Sources of Contamination
- USGS Scientists Contribute to New Book on Pharmaceuticals in the Environment
- USGS Scientists Develop New Method to Measure Pharmaceuticals in Water
- Developing Methods to Measure New Contaminants in Aquatic Environments
- Veterinary Medicines in the Environment
- Glyphosate Herbicide Found in Many Midwestern Streams, Antibiotics Not Common
- National Reconnaissance of Pharmaceuticals, Hormones and Other Organic Wastewater Contaminants in U.S. Streams is Making an Impact
- "National Reconnaissance of Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in Streams" Named as One of the Top 100 Science Stories of the Year

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USGS Water Water Quality Biology Geology Geography

U.S. Department of the Interior | U.S. Geological Survey
URL: http://toxics.usgs.gov/highlights/whatsin.html
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Dispose Medicines Wisely

www.teleosis.org/greenpharmacy

Green Pharmacy: Preventing Pollution

A Cross Sector Approach

BY JOEL KREISBERG, DC, MA

The recent increase in awareness of environmental issues is creating an opportunity for all constituencies involved with PPCPs to take action and reduce potential harm. A "cross-sector" approach offers a systems perspective that includes all individuals and organizations involved with the production, distribution, consumption, and disposal of pharmaceutical medicine. For pharmaceutical pollution, the solution calls upon all sectors involved in health care—pharmaceutical developers and manufacturers, hospitals, individual physicians and all those involved in the health care system, law enforcement agencies, pharmacies, waste management agencies, consumers, environmental protection organizations, and governmental agencies—to participate in preventing pharmaceutical pollution. This powerful approach provides a comprehensive solution to an issue that has the potential to affect much of life on Earth.

The Manufacturing Sector

The manufacturing of medicine is ripe for leadership. In the past decade "green chemistry," which minimizes the use of toxic chemicals in design and production, has emerged (see side bar on pg 37) as a technological advancement in the research and development of new pharmaceutical treatments. As manufacturers become more responsive to concerns about environmental hazards and sustainability, production techniques that lower the overall impact on the environment are becoming increasingly important. From a product standpoint, this sector is developing a new model of "product stewardship"—a "cradle-to-cradle" strategy for developing a new product. While all those involved in the production, distribution, sale, and use of any drug should be involved with product stewardship, the manufacturing sector is in the best position to reduce the environmental impact of medicines, because a product begins with development and manufacturing. If the process begins with cradle-to-cradle stewardship, it is more cost-effective and environmentally sensitive.

One way manufacturers can exercise healthy product stewardship is to design drugs that are more ecologically sensitive and medicines that biodegrade more

quickly and yield end products that are less harmful. Innovative drug design can improve delivery systems to require lower doses for efficacy; shifting from the current system of averaging, the practice of refining a medication's expiration date can bring shelf life into closer alignment with real time; recyclable materials can be used for packaging, or package size can be reduced to minimize the unused portion of prescriptions; and more complete and direct information about proper disposal techniques can be added to packaging.

The pharmaceutical industry is in an excellent position to provide more information directly to physicians. The European pharmaceutical industry is currently implementing a system in which medicines are graded for persistence, bioaccumulation, and toxicity (PBT). This information will be available to prescribing physicians, who will be in a position to make healthier environmental choices (see our Spotlight article on the Stockholm County Council on page 45). As is already happening in Canada, Australia, and New Zealand, our pharmaceutical industry could provide funding for the proper disposal of unused or expired medicines. Such initiatives might promote advanced recycling strategies, which would require changes in the current laws for drug handling in America. The pharmaceutical industry could also devote a portion of its huge advertising campaign to educate both physicians and consumers about the environmental and health issues associated with PPCPs.

Health Care Systems

Hospitals

Model solutions already exist for the medical industry. Those involved in hospital medicine are already developing methods for proper disposal. Hospitals for a Healthy Environment (H2E) *(http://www.h2e-online.org/)* is collaborating with many major hospitals in the United States, initiating proper disposal of hospital wastes. In May 2007, H2E's Environmental Excellence Summit focused on pharmaceutical waste management. Since much of medicinal waste is generated by hospital medicine itself, there is no reason why hospitals cannot be regional centers for "take-back" programs, where patients and consumers can easily return unwanted and expired medicines. With a high concentration of physicians and nurses, hospitals also offer an opportunity to expand the educational content required of the medical profession.

Physicians, Veterinarians, and Dentists

Individual physicians must also participate in the solution. Any medical office can offer a take-back program. Physicians, as the first line in any health care strategy, can inform patients about healthy product stewardship. The time when a doctor is prescribing a medication is an ideal moment to educate patients about proper disposal habits. Imagine receiving a phone call from your medical office reminding you not only about your next appointment but also to bring your expired and unused medicines with you. Veterinarians and dentists can take these steps as well. Domestic animals are the object of increasing amounts of PPCPs in medicine. These offices, too, can participate in proper disposal programs.

Pharmaceutical developers and manufacturers, hospitals, individual physicians, law enforcement agencies, pharmacies, waste management agencies, consumers, environmental protection organizations, and governmental agencies—all can help prevent pharmaceutical pollution.

www.teleosis.org/greenpharmacy

At least $1 billion worth of unused drugs are flushed down the toilet each year.

Pharmacies and Law Enforcement Agencies

To date, many of the proposed solutions for proper disposal of PPCPs are focused on two sectors, pharmacies and law enforcement. Pharmacies seem a natural fit for proper disposal of medication, and in fact some pharmacies serve as take-back sites for proper pharmaceutical disposal. In British Columbia, 95% of all pharmacies have recycle bins, which allow consumers to bring their unused/expired medicines back whenever they shop. Because certain medications find their way into an illicit drug market, law enforcement agencies sometimes participate in take-back programs to ensure that these substances are handled only by a pharmacist, physician, or police officer. Take-back events and selected programs at police stations are helpful, but are less accessible.

Hospice

One sector of the health care system that relies most heavily on medication is hospice. Researchers estimated in 2003 that at least $1 billion worth of unused drugs are flushed down the toilet each year.[1] Senior centers and home hospice care should consider several types of disposal systems. Current hospice protocol is to have families dispose of medicine; unfortunately, it is often disposed of improperly. These medicines are typically good quality medicines that could easily be reused for others in need. While regulations prevent hospice workers from reverse handling of medicine, families could return unused medicines to proper disposal facilities, or investigate if long term care facilities in your area accept unused dispensed medications. Senior centers, too, can offer educational outreach and take-back services.

Waste Management Agencies and Environmental Organizations

Waste management agencies have an interest in seeing that PPCPs are disposed of properly. Municipal water agencies in particular are developing policies that maintain proper water quality. Some agencies are proposing regulations that would prevent hospitals from disposing medicines directly into the municipal water system. Solid waste organizations too, have a similar interest, though unused medicines make up a relatively small percentage of solid waste. Most solid waste systems in the U.S. request that unwanted medicines be returned to hazardous waste facilities. However, only a very small percentage of household medicines are hazardous wastes (see page 39), and pound for pound, hazardous waste is much more expensive to handle. Since many medications are not hazardous, significant money can be saved by separating most drugs out of the hazardous waste stream.

Other approaches to drug recycling do exist. For manufacturers, "reverse-distribution," which allows pharmacists to return unsold drugs back to the manufacturer, could be enlarged to include unused medication and expired medication.

While human health is very important, water quality needs to be preserved for nonhuman life as well. Many environmental organizations that support wildlife and aquatic ecosystems are supporting take-back programs. In Oakland, California, for example, Save the Bay is actively involved in preventing PPCP pollution.

Consumers

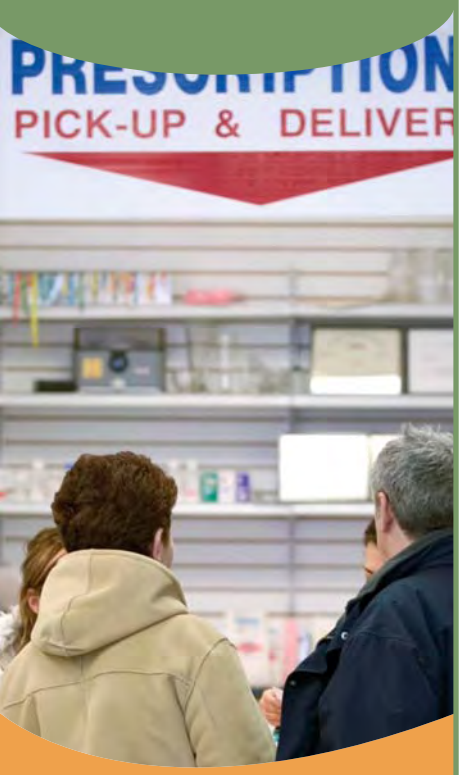
Finally, consumers need to participate in keeping our environment clean. Each of us has a responsibility for healthy product stewardship of all consumer goods. Rather than throwing medicine down the toilet or in the garbage, bring non-controlled drugs to a take-back site or hazardous waste facility. Buy smaller containers of medicines. Buy products with recyclable packaging. Ask your doctor about environmental impacts of your medication and whether a more sustainable alternative exists. Always choose the smallest prescription amount or refill option unless the medication is for a chronic condition. Encourage your physician or primary care provider to take back unused/expired, non-controlled medicines. Most importantly, commit to health promotion strategies that reduce your need for medication in the first place. When given a choice, always choose sustainable medical treatments first, reserving more problematic choices for more difficult situations.

Unused medications may be donated to nonprofit organizations that redistribute medicines to charitable organizations in non-industrial countries that need basic medications. Green funeral practices are emerging as an alternative to traditional practices that release significant chemicals into the environment.

What you can do

- Dispose of unused or unwanted medications at take-back sites or events only
- Do NOT dispose of any medication down the toilet or in the trash
- Purchase drugs in small amounts, limiting expired medications
- Ask for medications with low environmental impact
- Encourage your provider to take-back non-controlled unused/expired drugs.
- Commit to health prevention strategies to reduce your reliance on medications

www.teleosis.org/greenpharmacy



Commit to health promotion strategies that reduce your need for medication in the first place—if there is a choice, always choose sustainable medical treatments first, reserving more problematic choices for more difficult situations.

Who Pays?

Perhaps the most contentious aspect of proper disposal of PPCPs is cost: Who should pay? No one wants to pay the additional cost for proper product disposal. In many sectors of durable goods or consumer goods, particularly electronics, the cost of disposal is beginning to be included in the cost of the product. For consumers, this is the preferred method, although a fee added at time of purchase, called an "advanced recycling fee" (such as the system for beverage bottles and cans), allows users to pay as they go. When this is mandatory, however, it feels like a tax. Many of us remember the struggle to get "bottle bills"—an added fee on bottles—passed in state legislatures. Perhaps medications can be handled that way, although experience shows that the public is not easily persuaded to mandate such fees.

The product stewardship model suggests that the cost be spread throughout the life cycle of the product and that the proportion of cost be distributed by the ability of the party to have a significant impact.[2] Applying this model, pharmaceutical companies would provide the largest proportion of investment. To date, this is how Europe and other industrialized countries are building capacity.

But healthy product stewardship requires everyone's participation. In addition to manufacturer involvement, we need to shift our focus to actions and processes that reduce the need for disposal, thereby reducing household accumulation of unwanted drugs. Currently our focus is on prudent disposal options, but we need to address this problem at the source rather than further downstream at the consumer/patient level. We need to aim for a healthcare-consumer system that results in fewer medications needing disposal. Each one of us can contribute to a healthier home for all of us on planet Earth—just by making the better choice.

Everyone Participates

Green Pharmacy offers an opportunity for social action that will greatly benefit our environment at all levels of our society. With relatively simple yet firm commitments to change our habits, becoming stewards of medicine rather then consumers of medicine we effectively become part of the solution. Ideally, there would be no drugs to return. Until that time, all prescribed medicines would be brought back in subsequent visits to a physician, veterinarian and dentist. Manufacturers and pharmaceutical distributors would facilitate medical, dental and veterinarian offices in disposing of these medicines wisely. Consumers willingly participate by returning unused medication. Green Pharmacy is a commitment we undertake today. Our vision is zero waste. Our simple actions have a positive effect of the health and vitality of our world. It requires a commitment to restore that each of us carries in our hearts a vision of a sustainable healthy future.

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There is Medicine in These Waters

BY JOEL KREISBERG, DC, MA

Joel Kreisberg, DC, MA

Dr. Kreisberg holds a Doctor of Chiropractic from New York Chiropractic College and a Masters of Arts in Integral Ecology from Prescott College. He currently is adjunct faculty in JFK University's Masters Degree in Holistic Health Education. Author of several books on Homeopathy, Dr. Kreisberg has been teaching for twenty years and maintains a private practice in Berkeley, CA.

We drank of every variety of water excepting pure water—sometimes iron, sometimes sulphur; and, indeed, every kind of chalybeate, for every rill was impregnated in some way or another. At last, it occurred to me that there were such things as chemical affinities, and that there was no saying what changes might take place by the admixture of such a variety of metals and gasses, so I drank no more. I did not like, however, to interfere with the happiness of others, so I did not communicate my ideas to my fellow-passengers, who continued drinking during the whole day; and as I afterwards found out, did not sleep very well that night; they were, moreover, very sparing in the use of them the next day.

— Captain Frederick Marryat. (1839)[1] *A Diary in America, with Remarks on Its Institutions.*

The medicinal effects of mineral water have been touted for millennia. Famed healing springs include Baden-Baden in Germany, Vichy in France, Piestany in Slovakia, and Saratoga in upstate New York—all places where the sick sought relief from chronic illness and pain. Today we can stay at home; there is medicine in the water. Persistent concentrations of hormones, antidepressants, and antibiotics end up in our waterways and our drinking water according to the U.S. Geological Survey.[2,3] Perhaps this is a cheap public health measure for keeping everyone healthy! Unfortunately, a recent study[4] found that a mixture of 13 common medications found in drinking water inhibits cell growth and causes negative changes to human embryonic cells. Simply put, by-products of industrial society are not the only endocrine disruptors; medications for humans and livestock have negative consequences on our health as well. Casual disposal of medicinal hormones creates water-borne pollution. Proper disposal of pharmaceutical medications is a must.

Today, in the U.S. and Europe, municipal drinking water typically has 100 or so pharmaceutical medicines and personal care products in significant concentrations.[5] Various hormones, antidepressants, and antibiotics end up in our waterways, the most common being aspirin, statins, hypertension medications, and hormones of women.[6] In fact, 80% of the waterways sampled included such common medicines as acetaminophen (24%), the hormone estradiol (16%), Ditiazem, a blood pressure medication (13%), Codeine (11%), and antibiotics (10%). The risks of this chemical pollution go relatively unrecognized and certainly unanticipated. Nevertheless, the Strategy Plan 2000 for the U.S. EPA Office of Research and Development makes identifying the risks of pharmaceutical and personal care products (PPCPs) one of top five goals for protecting human and ecological health.[7]

Ecosystem changes through human activities occur primarily via three routes: habitat fragmentation, alteration of community structure, and chemical pollution. Since the work of Rachel Carson, scientist and author of *Silent Spring*, the impact of chemical pollution has centered on the conventional "priority" pollutants due to their

Today, in the U.S. and Europe, municipal drinking water typically has 100 or so pharmaceutical medicines and personal care products in significant concentrations.

long-term persistence in the environment. Little attention has been given to the active ingredients of pharmaceuticals and personal care products (PPCPs) because they break down more quickly in the environment compared to more traditional chemicals, such as PCBs and dioxin. However, since the exponential growth of pharmaceutical use by consumers, the quantities of PPCPs being disposed of are on par with agricultural chemicals. The ecological consequences of most of (PPCPs) are poorly understood. Since most of these substances are disposed of continually via the sewage system, PPCPs are essentially persistent in the environment. The transformation/removal rates for these substances are compensated by their replacement through continuous consumer use—they are present, at significant concentrations, all the time.

Due to various routes of discharge, PPCPs occur as complex mixtures in the environment. These discharge routes include treated domestic and industrial wastewater, commercial animal feeding operations, and surface applications of manure. However, the two largest sources of PPCPs discharge into the sewer system are residential and hospital waste streams. Depending on the medicine, a significant percentage of the bioactive ingredients may pass through the body unchanged while others are partially metabolized into other bioactive metabolites. This results in the direct excretion of metabolites into the sewer system, where they go largely untreated. Without proper education, patients dispose of pharmaceutical drugs, further contaminating the water system.

Attempting to understand the effects of pharmacological agents on aquatic life isn't particularly easy. Research on pharmaceuticals primarily focuses on the individual effect of each medicine. However, drugs are typically found in complex combinations in the environment. The recently published study on 'Effects of a Complex

Reducing Pharmaceutical Pollution

WHAT PHYSICIANS CAN DO:

- Always take cost-effectiveness and environmental impact into account when comparing medications that are equally safe and suitable for the purpose.
- Prescribe starter packs.
- Prescribe refill packs if available.
- Encourage patients to return unused medications to the pharmacy.
- Inform patients of the importance of even returning used estrogen patches to the pharmacy and avoid flushing them down the toilet, since most of the estrogen remains in the patch after use.
- Do not prescribe more medications than can be used; if in doubt, repeating the prescription is preferable.
- Review and regularly reassess the patient's total consumption of medication in order to reduce waste.
- Learn more about which drugs have large environmental impacts by using this website (see below) and by asking for information from the pharmaceutical companies' representatives.

From Janus: Environment and pharmaceuticals http://www.janusinfo.se/imcms/servlet/GetDoc?meta_id=7240

The two largest sources of these products entering the sewer system are residential and hospital waste.

Mixture of Therapeutic Drugs at Environmental Levels on Human Embryonic Cells' in *Environmental Science Technology*[8] investigated the effects of 13 drugs at low concentrations. The purpose of this study was to mimic the association and concentration of various drugs found in the natural environment. In the study, the drug cocktail showed a 30% decrease in cell proliferation compared to controls, as well as cellular activated stress response and morphological changes. The studies concluded that "water-borne pharmaceuticals can be potential effectors on aquatic life."[9]

Public agencies are beginning to consider the problem seriously. In fact, the Stockholm County Council in Sweden has identified the presence of medicinal products in the ground water and air as one of the five most important environmental issues.[10] Several solutions are underway, including prioritizing medications that are less harmful to the environment. To do this the Swedish Association of the Pharmaceuticals Industry has begun an environmental risk assessment of all medications marketed in Sweden. The primary evaluation occurs on a scale of insignificant (0), low (1), moderate (2) and high (3) for three of the areas under consideration: *persistence*—the ability to resist degradation in the aquatic environment, *bioaccumulation* (accumulation in adipose tissue of aquatic organisms), and *toxicity*—the potential to poison aquatic organisms.[11] The published report also considers the volume of daily doses delivered. Estradiol, a female hormone, scored a high risk for persistence, bioaccumulation and toxicity, giving it a total score of 9 on a scale from 0-9. In Sweden, there were 25 million doses of Estradiol delivered daily, making it the fourth most common medicine on the list after aspirin, Simvastatin (cholesterol-lowering) and Furosemide (an antihypertensive).

The Stockholm County Council created recommendations for physicians to participate in the safe disposal of medications (see page 5). One of the most important is: "Inform patients of the importance of even returning used estrogen patches to the pharmacy and avoid flushing them down the toilet, since most of the estrogen remains in the patch after use."[12] The environmental impact of pharmaceutical medicines designed to treat human female reproductive issues include endocrine disruption on an ecological level—the life cycle of aquatic life. Though there is not well designed evidence to date, this may also affect human endocrine activity as well. Consequences may include the steady decline in the age of puberty onset over time.[13] Simply put, human pharmacological hormones can act as endocrine disruptors in the environment!

The first principle of the Stockholm County Council states "Always take cost-effectiveness and environmental impact into account when comparing medications that are equally safe and suitable for purpose."[14] This is reminiscent of the 'Principles of Ecological Healing: "All healing has ecological consequences."[15] In California, the Emerging Contaminants Workgroup of the Santa Clara Basin Watershed Management Initiative published a white paper discussing the environmental impact of pharmaceutical disposal.[16] In it they summarize the potential actions we can take to reduce this serious problem. For example, unused residential and expired pharmaceuticals should not be disposed of in toilets and sinks. To inculcate this practice, we should encourage proper disposal through organized "take-back" events at local senior centers, pharmacies, and police and fire departments. Ultimately, legislation and funding is required to most effectively promote these programs.

From a professional perspective, it is our responsibility to understand the ecological consequences of the practices we use every day in our work. With rising

Environmental Risk Assessment for medications includes:

- **persistence**
- **bioaccumulation**
- **toxicity**

populations of modern cities and states, pharmacological agents will continue to emerge as unsuspected chemical pollutants. It is our job as health professionals to create 'clean medicine,' a part of Green Health Care. Green Health Care requires not only a workplace that is healthy for its occupants; it involves medical practices that do no harm to ourselves or the environment. While current medicinal practices generate significant pollution, we do have health care options that generate little if any waste. We can and must choose these more enlightened practices.

Our health depends on the health of the environment in which we live. As well, it depends on the medicines we use for illness, meant for returning us to wellness. Precaution is essential for human health as well as the health of the environment. Due to people living longer and an increasing population, ecosystems are continuously contaminated by medicines and personal care products. Low concentrations of modern medicines can and do act as endocrine disruptors in our ecosystems and may potentially damage human health. Our medical system has the technology and the know how to make significant changes that will be good for people and the environment. The time to act is now!

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Education
Videos
Articles
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National Programs
International
Recycling Meds

Green Pharmacy Resources

Education Materials

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  Green Pharmacy Program Preliminary Data Report
- Symbiosis Journal Vol 4.2
  Green Pharmacy: Pharmaceutical Pollution Prevention
- Environmental Health Brochure
  Drugs In Our Water

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  Products Pharmaceuticals
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  Unwanted Medications Collections
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  Pharmaceuticals Resources & Publications
- Recycling Medicine

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- U.S. Fish and Wildlife Service & American Pharmacists Association
  SMARxT Disposal Public Awareness Campaign

GETTING RID OF STUFF

Disposal of Unwanted Medicines: A Resource for Action in Your Community

You can tell we are a society that takes a lot of drugs (legal ones that is) by watching commercials. You see ads for anti-depressants, antacids, and a host of other remedies for ailments we just as soon not think about. But, what happens to all the prescription or over-the-counter drugs that are brought home, but for one reason or another, end up unused?

When people's prescriptions change, their drugs expire or are no longer needed, these medicines are typically flushed or thrown away. Pharmaceuticals thrown in the trash can leach into the environment; flushed drugs can kill bacteria that break down waste in sewage plants, damage septic systems, and contaminate nearby waterways and harm aquatic wildlife.

A 2008 Associated Press investigation found pharmaceuticals in the drinking water supplies of at least 41 million Americans. In the course of a five-month inquiry, the AP discovered that drugs have been detected in the drinking water supplies of 24 major metropolitan areas.

IISG has developed a series of toolkits and initiatives to help communities, schools and individuals develop and promote programs for safe disposal of unwanted medicine.

Contacts

Susan Boehme
Coastal Sediments Specialist
312-353-4383
boehme.susan@epa.gov

Elizabeth Hinchey-Malloy
Great Lakes Ecosystem Extension Specia
312-886-3451
hinchey.elizabeth@epa.gov

Safewater Home

For Kids & Students
- Grades K - 3
- Grades 4 - 8
- Grades 9 - 12

For Teachers
- Grades K - 3
- Grades 4 - 8
- Grades 9 - 12

Games & Activities

Other Kids' Stuff

Kids' Health

For Teachers (Grades 9-12)

Classroom Lessons (ALL ABOUT PDF FILES)

Tracking Pollution - A Hazardous Whodunit PDF (2pp, 237K) - An activity for the class trying to figure out who is responsible for the water pollution and who has to pay for the cleanup in the town of Riverville.
- Teachers Guide PDF (2pp, 252K)

Building a Model Aquifer PDF (2pp, 256K) - Step by step instruction on building your own aquifer.

Resource Management: Protecting your Drinking Water PDF (2pp, 176K) - This activity will help you estimate your ground water vunerability.

Decision Making - A Mock Town Meeting on a Proposed Tank Farm PDF (2pp, 208K) - Your class will represent all of the citizens of Priceford. A major corporation wants permission to build a tank farm just outside of the town and both sides must be heard at a town meeting in your class.

Water Filtration PDF (2pp, 186K) - A class activity to demonstrate the procedures that municipal water plants may use to purify water for drinking.

Interactive Water Filtration Instructions * - A step-by-step instruction on how to complete this in class activity complete with narration and visual support. You can jump from section to section and repeat as necessary. (Some of the links in this game are to external sources not hosted on EPA's web site EXIT Disclaimer)

Protecting America's Public Health - Safe Drinking Water Act - This web site contains an informative poster and CD-ROM that illustrates how everything we do can effect our drinking water.

The Water Source Books - The Water Sourcebooks contain 324 activities for grades K-12 divided into four sections: K-2, 3-5, 5-8, and 9-12. Each section is divided into five chapters

Games & Activities (ALL ABOUT PDF FILES)

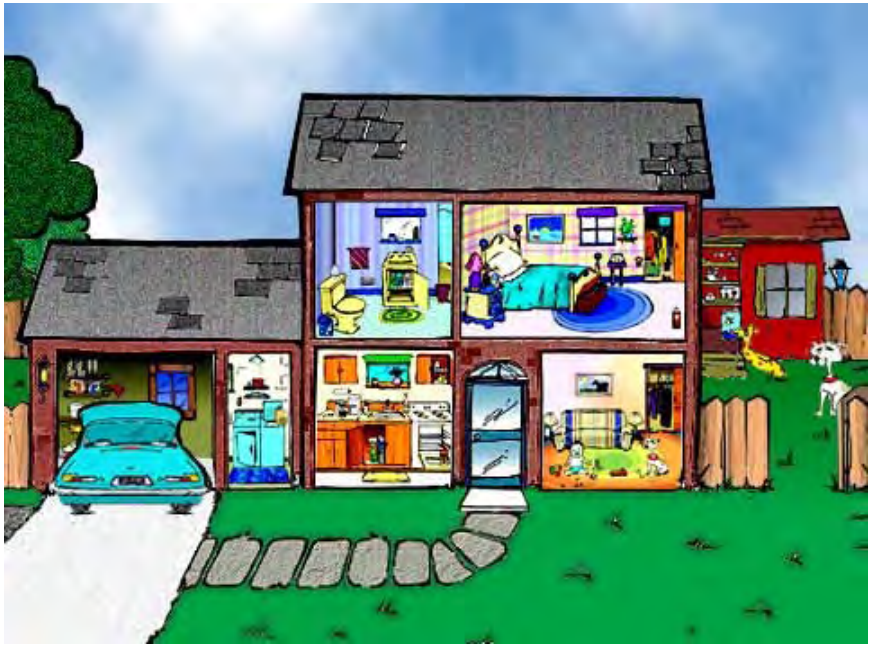
Question & Answer Game PDF (2pp, 128K) - A card game that you can print and cut apart the individual cards. The game is played by one team reading the Answer from the card and the other team has to guess the correct Question that relates to the Answer.

Interactive Question & Answer Game * - A flash animated game that gives the Answer and you have to choose the correct Question from three possible answers. The game lets you know instantly if you have the right answer.

Build Your Own Watershed - A class activity to illustrate the basic properties of a watershed.

Learn About Chemicals Around Your House

Select a room or go into the backyard and explore.
How many products can you find?



BACK 2 neighborhood

Test Your Knowledge: Questions

Instructions: Select the *best* answer from the choices for each question.

1. On the label of a product, what does a skull and cross bones mean? (Justin, Age 14, Kentucky)

A. The product has been pirated and is an imitation of the real product.
B. The product is poisonous.
C. Not sure or don't know.

(answer)

2. A 20-month-old Detroit girl is being treated for poisoning after ingesting a hair oil that does not contain a warning to parents about its danger. The girl, who is in good condition and under observation at Children's Hospital of Michigan in Detroit, took a sip of Luster's Pink Hair Oil, doctors said. (Excerpted from the Detroit Free Press, May 10, 2002).

What can you do in your home to prevent an accident like this from happening?

A. Tell your sisters and brothers not to get into stuff that doesn't belong to them.
B. Keep household products, even personal care products like shampoos or perfumes, and medicines out of reach of children.
C. Don't buy that kind of hair oil any more.
D. Not sure or don't know.

(answer)

3. You can get more information about pesticides from:

A. National Pesticide Information Center (NPIC).
B. National Pesticide Information Office (NPIO).
C. Master-of-Pests, USA.
D. not sure or don't know.

(answer)

4. Your big sister has to finish cleaning the bathroom before she can go out with her friends. She is using a toilet bowl cleaner your mom gave her. She thinks the job will go much faster if she adds some bleach too. What should you tell her?

A. Go ahead, using two chemical products will clean the toilet twice as fast.
B. Go ahead, but hold your breath because using both products will cause a really strong smell.
C. Never mix a chlorine bleach with any other household or cleaning products. I'm getting Mom.
D. Not sure or don't know.

(answer)

5. If you need a toxic product for school, should you ask your mom first? (Kate, Age 5, New York)

True or False

(answer)

6. Can insects be beneficial or useful?

A. Yes, some insects can be beneficial.
B. No, insects cause damage to plants, spread disease and can bite humans.
C. Not sure or don't know.

(answer)

7. Your Dad has just finished changing the oil in his car. What should he do with the used oil?

A. Pour it back into an empty motor oil container and put it in the trash.
B. Pour it back into an empty motor oil container and recycle it. C Pour it on the ground.
D. Empty it into an outside drain.
E. Not sure or don't know.

(answer)

8. A mobile home "exploded" yesterday after insecticide from three aerosol bug bombs came in contact with the pilot light of a gas stove. Ethel Marie Gue, of the Bryans Road Mobile Home Park, put the six-ounce aerosol bug bombs in a kitchen cabinet shortly after 10 a.m. She was sitting in the living room when the cans exploded minutes later. The trailer's walls were bowed and most of the windows were blown out, but there was no fire. (Excerpted from the Washington Post, February 21, 2000)

What mistakes did Ethel Marie make?

A. She used an aerosol can near the pilot light of her gas stove. (A pilot light is a small flame that ignites the gas from the stove burners.)
B. She stayed in the trailer while the insecticide was being released from the bug bombs.
C. She used them in a mobile home.
D. A and b.
E. Not sure, don't know.

(answer)

9. A mobile home "exploded" yesterday after insecticide from three aerosol bug bombs came in contact with the pilot light of a gas stove. Ethel Marie Gue, of the Bryans Road Mobile Home Park, put the six-ounce aerosol bug bombs in a kitchen cabinet shortly after 10 a.m. She was sitting in the living room when the cans exploded minutes later. The trailer's walls were bowed and most of the windows were blown out, but there was no fire. (Excerpted from the Washington Post, February 21, 2000)

What mistakes did Ethel Marie make?

A. She should not have used bug bombs at all.
B. She should not have set them off near an open flame.
C. She should have read the label on the cans of bug bomb.
D. She should have only used one and not three cans.
E. Not sure, don't know.

(answer)

10. Name a type of pesticide used in swimming pools.

A. Algicide
B. Herbicide
C. Scumicide
D. Not sure, don't know

(answer)

Get Rid of Stuff Sensibly

Medicines

The Problem
Medicine that is flushed down the toilet can end up in lakes and rivers, potentially affecting fish and drinking water.

The Solution
DON'T FLUSH! Try bringing medicine to a pharmacy; or find a collection center or collection event.

Electronics

The Problem
Electronic waste contains metals and chemicals that can end up polluting soil and waterways.

The Solution
Find your old electronics a new home, recycle them through the manufacturer or find a collection event.

Aquarium Fish and Plants

The Problem
Fish or aquatic plants that end up in lakes and rivers can push out native species and impact fishing and boating.

The Solution
Find a new home for your pets and plants; or contact a vet or retailer for humane and safe disposal options.

Motor Oil

The Problem
Motor oil can pollute drinking water if it ends up on the ground or in lakes or rivers.

The Solution
Pour used motor oil into a container with a screw-top lid. Then recycle it at a gas station or quick-lube business.

Household Trash

The Problem
Burning trash releases many harmful pollutants that can impact people as well as nearby rivers and lakes.

The Solution
Recycle metal, glass and paper. Compost yard and food waste. Donate useful things. Have the rest picked up by a waste hauler or take it to a landfill.

Dog Poop

The Problem
Germs from dog poop can wash down into streams. These germs can be harmful to water quality and human health.

The Solution
Pick up after your dog! Bag the poop and throw it in the trash.

www.iiseagrant.org Sea Grant ILLINOIS - INDIANA

Websites for more information—

Medicine

Illinois-Indian Sea Grant
www.iiseagrant.org/unwantedmeds/index.html

Illinois Environmental Protection Agency
www.epa.state.il.us/medication-disposal

U.S. Fish and Wildlife Service
American Pharmacists Association
Pharmaceutical Research and Manufacturers of America
www.smarxtdisposal.net

E-Waste

Illinois-Indiana Sea Grant
www.ecyclingtools.com

Earth 911
earth911.com/electronics

National Center for Electronic Recycling
www.electronicsrecycling.org/public

Dog Poop

Green Living Tips
www.greenlivingtips.com/articles/43/1/Dealing-with-dog-poop.html

Dummies.com
www.dummies.com/how-to/content/what-to-do-with-doggy-doo.html

wikiHow
www.wikihow.com/Pick-Up-Dog-Poop

Motor Oil

American Petroleum Institute
www.recycleoil.org

Earth 911
earth911.com/automotive/motor-oil

Illinois Poison Center
www.mchc.org/ipc/FirstAidSafetyTips/RecyclingHP.pdf

Household Trash

Illinois-Indiana Sea Grant
www.iiseagrant.org/learnnot2burn/index.html

Keep America Beautiful, Inc.
www.cleansweepusa.org

The U.S. EPA Student Center—Waste and Recycling
www.epa.gov/region5/students/waste.htm

Fish & Aquatic Plant

Illinois-Indiana Sea Grant
www.iiseagrant.org/habitattitude/index.html

The Pet Industry Joint Advisory Council of Canada
www.habitattitude.ca/en

Center for Aquatic and Invasive Plants, University of Florida
aquat1.ifas.ufl.edu/node/90

Resources

Thanks to the cyber world, a tremendous amount of information is only a mouse click away (check out the list of Web sites on the inside back cover). Also, you can use the government pages of your telephone book to locate local agencies in your community or state. The following list includes some of the organizations that may be helpful to you:

- Cooperative Extension Service
- Department of Agriculture
- Department of Health
- Department of Natural Resources
- Environmental Quality Department
- Soil and Water Conservation District
- Wastewater Department

Educational Programs

Adopt-A-Watershed uses a local watershed as a living laboratory in which students engage in hands-on activities, making science applicable and relevant to their lives. To get more information on activities you can do in your state/community go to http://www.adopt-a-watershed.org/contacts.htm and click on your state. You can also call 530- 628-5334 for a list of contacts for your state.

Coastal Cleanups. Visit http://www.cmc-ocean.org/ or call the Ocean Conservancy at 1-800-CMC-Beach for information about beach cleanups or how to participate in the annual International Coastal Cleanup.

Earth Force (G.R.E.E.N.). Earth Force is youth-driven. Through Earth Force, kids discover and implement lasting solutions to environmental issues in their community. In the process they develop life-long habits of active citizenship and environmental stewardship. For more information, call 703-299-9400 or visit the Web site at http://www.earthforce.org.

EPA Safe Drinking Water Act Hotline (1-800-426-4791). You can call this number to report problems or to get information on safe drinking water practices.

EPA Water Resource Center (202-260-7786). You can obtain free fact sheets, coloring books, and other useful materials on wetlands.

Global Learning and Observations to Benefit the Environment (GLOBE) is a worldwide network of students, teachers, and scientists working together to study and understand the global environment. GLOBE students make environmental observations at or near their schools and report their data through the Internet. For more information on getting involved, call 1-800-858-9947 or visit GLOBE's Web site at http://www.globe.gov.

Izaak Walton League of America's Save Our Streams program provides educational material on stream and wetland monitoring. Visit http://www.iwla.org/sos or call 1-800-BUG-IWLA.

National Wildlife Federation's Schoolyard Habitat program shows you how to help save a place for wildlife at your own school. Visit http://www.nwf.org/habitats.

Project WET is a nonprofit water education program for educators and young people, grades K–12, located on the Montana State University campus in Bozeman, Montana. The goal of Project WET is to facilitate and promote awareness, appreciation, knowledge, and stewardship. At project WET's homepage (http://ww.montana.edu/wwwwet) you can get more information from the contact in your state (see the State Project WET Program Coordinator list) or call 406-994-5392.

River of Words Poetry and Art Contest is a national poetry and art contest for grades K–12 that invites children to explore their own watershed through the arts. Visit http://www. riverofwords.org, e-mail info@riverofwords.org, or call 510-548-POEM.

River Network maintains a directory of river and watershed conservation groups. Visit http://www.rivernetwork.org/library/libnetdir.cfm.

The Groundwater Foundation is a nonprofit organization dedicated to teaching the public about the conservation and management of groundwater. Visit http://www.groundwater.org or call 1-800-858-4844.

The Water Environment Federation (WEF) is an international technical and educational services

organization for water quality professionals. Visit http://www.wef.org for hands-on water environment activities from the Water Sourcebook. To receive a free kit on organizing a watershed festival and/or a schematic guide of the wastewater treatment process, e-mail public_education@wef.org.

Publications, CDs & Other Materials

50 Simple Things Kids Can Do to Save the Earth by Earthworks Group provides practical tips to kids on how they can conserve energy, recycle waste, and take on important environmental projects. Available in bookstores.

The *Backyard Conservation* booklet can show you things you can do to the land around your home and school to help protect the environment. Tip sheets and 28-page booklet are available for free by calling 1-888-LANDCARE (single copies only). On the Web at http://www.nrcs.usda.gov.

Getting Started in Volunteer Monitoring providesan introduction to volunteer monitoring. Visit the EPA Web site at http://www.epa.gov/volunteer.

Girl Scout Water Drop Patch Project encourages girls to make a difference in their communities. Call the National Service Center for Environmental Publications (NSCEP) at 1-800-490-9198 or visit http://www.epa.gov/adopt/patch. Ask for EPA document # EPA 840-B-99-004.

Give Water a Hand Activity Guide (http://www.uwex.edu/erc) provides information for youth about watersheds and ways to protect them.

What's Up with Our Nation's Waters presents key findings of EPA's National Water Quality Report in an easy-to-read fashion and includes projects for school or fun.. Available on the Web at http://www.epa.gov/owow/monitoring/nationswaters/waters.pdf or by calling NSCEP at 1-800-490-9198. Publication EPA-841-F-00-005. *The National Water Quality Inventory: Report to Congress* is available at http://www.epa.gov/305b or by calling 1-800-490-9198.

Splash (CD-ROM). This interactive tool provides information on nonpoint source pollution. Contact the Conservation Technology Information Center at 765-494-9555.

Turning the Tide on Trash: A Learning Guide on Marine Debris. Call NSCEP at 1-800-490-9198 or visit the Web site at http://www.epa.gov/OWOW/info/PubList/publist2.html. EPA document number 842-B-92-003.

Make Your Own Watershed kit. Available from the Terrene Institute. Phone: 703-548-5473. Internet http://www.terrene.org; $29.95 plus $5.50 shipping and handling.

Waters to the Sea: Rivers of the Upper Mississippi (CD-ROM). This interactive tool presents fundamental concepts of ecology, the water cycle, and watershed hydrology. ($39.95 plus shipping and handling). For more information, contact the Center for Global Environmental Education at 651-523-2480.

Mention of any commercial products, materials, or publications in this booklet does not constitute endorsement or recommendation for use by EPA. Visit the Adopt Your Watershed (http://www.epa.gov/adopt) or Office of Water Web page (http://www.epa.gov/ow) for a more complete list of other available resources.

Source: Watershed Patch Project, U.S. EPA

Outreach Areas
+Community-based Environmental Education
+Conservation Training
+Invasive Species
✓Human Dimensions of Sustainable Agriculture
+Pollution Prevention
+Water Resources
+Youth Water Education
State Projects
+Discovery Farms
+ENVIRONMENT Catalog
+Wisconsin Hazardous Waste Collection Programs
+Water Action Volunteers
+Wisconsin's Water Basin Initiative
National Projects
+Farm & Home Environmental Management Programs
+Great Lakes Regional Water Coordination
USDA CSREES National Facilitation Projects
✓Changing Public Behavior
✓Pollution Assessment and Prevention
✓Volunteer Water Quality Monitoring
✓Water Outreach Education-Best Education Practices

Youth Water Education Resources

Youth have an important role in source water protection. Individually, as members of a family and community, and as future citizens, the youth of today have the power to act as catalysts to initiate change and guide development of future activities to ensure the health of the nation's drinking water sources. The Environmental Resources Center, in collaboration with a variety of partners in the public and private sector, offers the following programs for promoting youth water resource education:

Links

Agua Pura - a manual for planning a workshop for leaders in Latino communities that want to promote involvement of Latino youth in water stewardship projects.

Cooperative Extension Supports Youth Environmental Stewardship (CESYES) - a national project that seeks to strengthen the abilities of Extension educators, 4-H county and state faculty, and professionals from other natural resources agencies to serve communities, youth leaders and youth.

Educating Young People About Water - provides the guidelines and materials to develop a community-based, youth water education program that targets youth and links key community members in partnerships--all working toward common water education goals.

- Assessing National Water Quality Education Needs for the Nonformal Youth Audience (1992) - served as the spring board for many of the youth education resources listed on this Web page. It began as a 1991 request to identify youth water education needs across the country. ERC embarked on an exhaustive effort to identify youth water education resources, along with state, federal and NGO assessments of water education needs. As part of the study, we developed national criteria for reviewing youth water education curricula and a system for making the findings about specific curriculum available via the Internet. In the process we reviewed approximately 1000 water education resources, which helped us to identify specific gaps in youth water education. The study resulted in 19 findings, and a suggested list of 18 short and long term needs. These are still relevant in 2009 and many have not yet been addressed. 1992 Study Bibliography

Evaluating US Geological Survey (USGS) Water Education Resources - helps educators evaluate uses of USGS materials and determine future needs for educators. Summarizes the focus group strategies developed to provide an assessment of the USGS water posters, other USGS earth science education materials, and future education resource needs for educators.

Give Water A Hand - helps youth solve real water problems in their own communities with the aid of two guides-the youth Action Guide (also available in Spanish) and an accompanying Leader Guide.

Holding onto the GREEN Zone - A Youth Action Guide for the Study and Stewardship of Community Riparian Areas - http://www.uwex.edu/erc/youth

/riparian.html

The new Earth science curriculum, *Holding onto the GREEN Zone*, is a product of the Initiative that will encourage collaboration between land managers and youth educators/leaders to promote conservation of fragile riparian resources. Through the processes of science inquiry and experiential learning, learners will enhance their science knowledge and come to understand the importance of preserving and restoring riparian ecosystems.

The Youth Riparian Education Initiative is a collaboration of federal agencies and land grant universities to provide resources to engage youth in stewardship activities that support the Bureau of Land Management (BLM) and the U.S. Forest Service (USFS) riparian restoration goals. Project resources were primarily designed to help land managers communicate with the public about management techniques and decisions.

National Extension Water Outreach Education - facilitates access to resources and best education practices.

Project WET Wisconsin - facilitates and promotes youth knowledge and stewardship of water resources through the development and dissemination of teaching materials-the Project WET Curriculum and Activity Guide for Grades K-12.

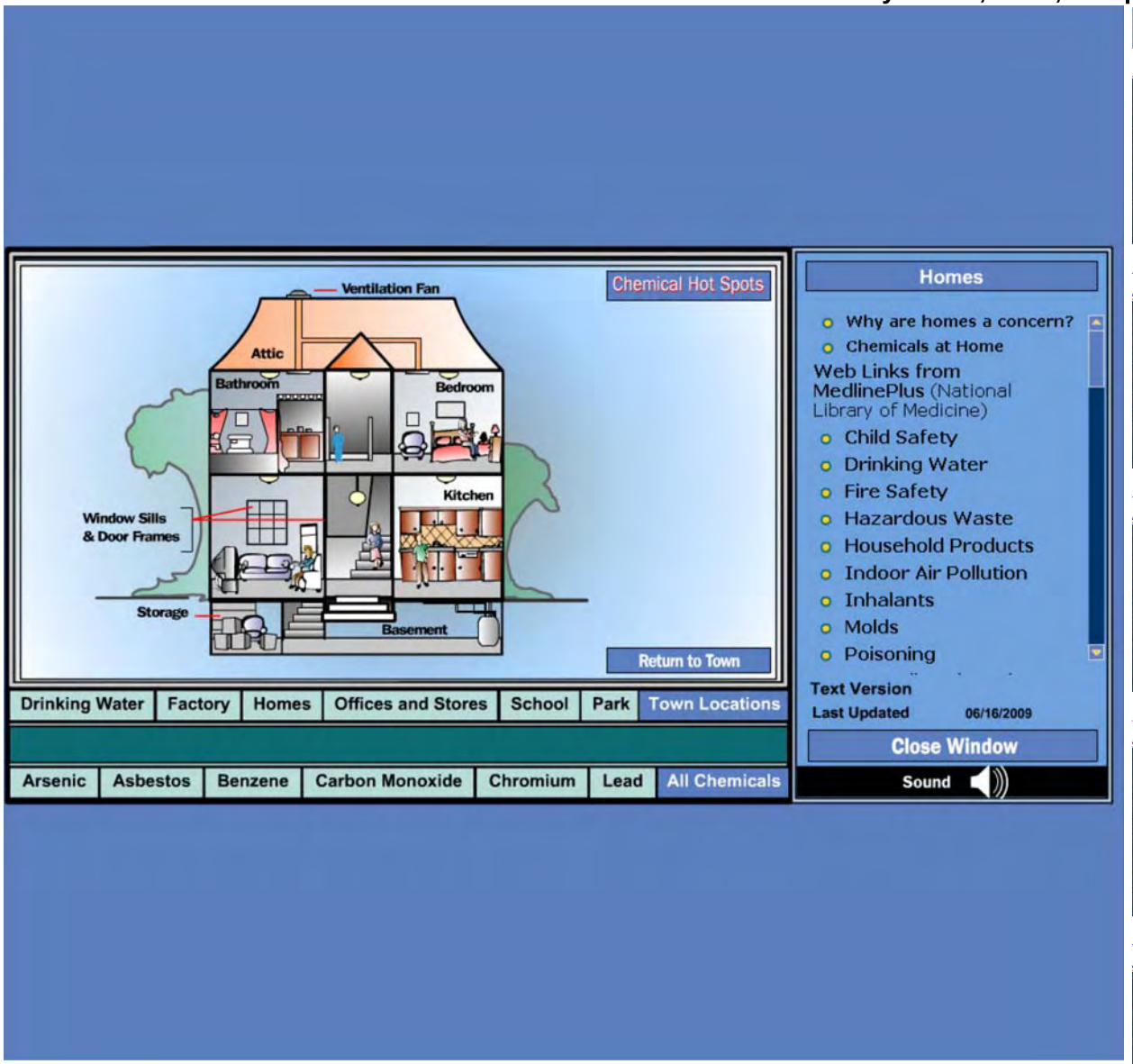
Source Water Education - an evaluation of K-12 water education materials for topic areas related to drinking water sources. The report identifies youth curricula that meet source water education needs. It also outlines gaps that could be filled through expansion of existing materials, or creation of new source water education materials. Educators will find appendices useful in clarifying needs for developing curricula or in developing new curricula. Appendices include a bibliography of source water education materials and recommendations for what to include in a source water curriculum. A worksheet is provided to simplify the review of curricula according to priority criteria.

Water Action Volunteers (WAV) - a program for both kids and adults who want to learn about and improve the quality of Wisconsin's waterways through projects and hands-on activities. WAV volunteers across Wisconsin are learning about the environment while taking action to keep their local community waterways clean.

Youth as Partners, A Cooperative Extension Service investment in community-based environmental education, 1991–1998 - The report describes impacts on youth water education nationally, as an outcome of development and dissemination of the Educating Young People About Water and Give Water A Hand resources. Impacts are summarized according to three priority themes: involving youth in communities; supporting educators and leaders; and building and fostering partnerships.

Tox Town - Environmental health concerns and toxic chemicals where you live, work, and play

Tox Town - Environmental health concerns and toxic chemicals where you live, work, and play



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(flash_sp.php)

(http://toxtown.nlm.nih.gov/flash/city/flash.php)

(http://toxtown.nlm.nih.gov/flash/farm/flash.php)

(http://toxtown.nlm.nih.gov/flash/town/flash.php)

(http://toxtown.nlm.nih.gov/flash/border/flash.php)

(http://toxtown.nlm.nih.gov

Ideas for Creating Successful Community Stewardship Projects

Reflection Activities

Reflection activities play an important role in helping students to analyze, understand, and gain meaning from the service they are participating in. Most teachers/facilitators think reflection activities have to be writing intensive, but there are a variety of ways that students can reflect. The following list of reflection activities is divided into activities to be used pre-service, during service, post-service, and general activities that could be used throughout the process.

Pre-Service Activities

Pre-service activities should assist students in looking at their assumptions and biases, as well as expectations of what they hope to accomplish.

1. Have students write a letter to themselves describing their feelings, their expectations, and what they hope to gain from this process. The teacher/facilitator should keep the letters and return them at the end of the program during the final reflection stage.

2. Working individually or in groups, have students design and create a utopia envisioning what their community would be like if they could fix all the problems that they have discovered during the community inventory. They could present their utopia in a variety of ways - in a written format, as a poster, or as a play.

3. As a group, create a list of expectations and hoped for outcomes from the program. Write the list on chart paper and refer back to it at the end of the program during the final reflection phase.

During Service Activities

Reflection activities carried out during service should allow students to process their feelings and revisit their expectations in light of what they have done so far. Reflection is also useful at this point to help students look at the direction they are going, identify next steps, and make adjustments if needed.

1. Hold a mock debate where students defend various sides relating to the issue they are pursuing.

2. Have students write a letter to their family or friends explaining the project they are working on and what their goals are.

Suggestion: The teacher/facilitator may be more successful using writing based activities as this point, particularly if students are very involved with the issue they are working on.

Post Reflection Activities

Post-service reflection activities should assist students in evaluating and drawing conclusions from their experiences. They should also provide meaning and help students to understand what they found out about themselves during the service experience.

1. Have the students take photographs throughout the process. At the end, tell each student to select a group of photographs that most accurately portrays the experience they had. Have them create a poster using these photographs with captions explaining why they chose particular pictures.

2. Have the group save items throughout the process then use these to make a group scrapbook at the end. Items that could be included - letters, meeting agendas, surveys, phone transcripts, photographs, etc.

3. Ask students to choose one word that best describes their service experience. Have them make a poster based around this word. (This poster could be combined with the photo poster. Students could choose their word, then select photographs that represent it.)

4. Individually or in groups, have students create an artistic representation of their experience. It could be a collage, a drawing, a painting, or a mural.

5. To facilitate a final reflection discussion, create reflection stations by writing questions on chart paper, posting them around the room, and having students write answers to the questions on each chart. Questions could include 1. What was your most memorable experience? 2. What do you feel best about? 3. What disturbs or puzzles you about your experience? and 4. How has this experience changed the way you think? The teacher/facilitator could then use the responses to lead a class discussion.

6. Have students videotape the process throughout then create a documentary at the end. If discussion was the primary mode of reflection, students could record discussions on an audiotape then edit sections to create an audio documentary.

7. Have students create a resume listing the skills they developed or improved through their experience with the program.

Reflection Activities to be Used Throughout

1. As an alternative to a written journal, students could keep an **artistic journal** where they draw what they are feeling about their experiences. They could also cut out pictures or use computer graphics.

2. **Discussion**-based activities:
   - As a lead-in to reflective discussion, pose a question and have students do five minutes of silent reflection before the discussion begins.
   - Write a quote on the board and have students respond.
   - Use metaphors, (i.e. doing this project is like …)
   - Create a continuum representing various views of an issue. Have students stand at a point on the continuum and explain why they chose to stand there.
   - Pose a question then think, pair, share (have students pair off, discuss the question, then report back to the group).
   - Skittle game – pass out a skittle to each student. Have a list of reflection questions prepared and link each question to a color. Go around the room and have each student answer a question based on the color of the skittle they received.

3. **Writing** based activities:
   - Have students keep a journal throughout.
   - Have students write stories or poems to express their feelings or describe experiences.
   - Round Robin Poetry – Pose a reflection question or a theme and have each student write two lines of poetry relating to that question or theme. As the poem goes around the room, fold the paper so that each student can only see the lines written by the previous student. At the end, read the full poem to the group. Rewrite the poem onto a poster board.
   - Each day as students are preparing to leave, pose a question (i.e. what did you find out today that you did not know before?) and write the question on a piece of chart paper. Before each student leaves, have him/her write a one-sentence response to the question. The teacher/facilitator could also write the sentence for the student.
   - Instead of keeping individual journals, the group could create a group journal where students could jot down ideas and feelings throughout the program.

3. Other kinds of activities that could be used for reflection:
   - Writing plays / Writing songs / Creating dances / Doing role plays

4. **Critical Incident Activity**. Anytime students have a pivotal experience during the Earth Force program, the teacher/facilitator could use the critical incident activity to help students assess the impact of the experience. This activity could be done as a discussion or as a written activity. The activity has three steps: 1. Describe your role in the incident. 2. Analyze the incident- what is you understanding of it? How did you react? 3. What impact did the incident have on you?

Reflection Opportunities

Segment One

Your Earth Force group has just completed a walking tour in order to develop a community inventory. When you return to the classroom, the group develops a list of community strengths and weaknesses. The students are able to come up with a long list of weaknesses and a relatively short list of strengths. What reflection questions would be beneficial to pose at this point? What kinds of activities could you use to address these questions?

For facilitator - Possible reflection questions might include:

1. How do you view your community?
2. How does the list of weaknesses you developed make you feel about your community?
3. Were you surprised at the strengths you found in your community?
4. What did you learn about your community that you did not know?
5. What do you want your community to be like?
6. When looking at the list of weaknesses, which weakness concerns you the most?

Segment Two

Your group has finally selected the problem they wish to focus on. After cutting the list down to four problems, the group used their criteria to select their problem. The issue they plan to focus on is the pollution in their neighborhood lake. What reflection questions would be beneficial to pose at this point? What kinds of activities could you use to address these questions?

For facilitator - Possible reflection questions might include:

1. What do you hope to accomplish in relation to this problem?
2. When you determined your criteria, which of the criteria were most important to you and why?
3. What strengths in your community might help you solve this problem?
4. Did you feel your voice was heard in the process of selecting the problem?

Segment Three

Your group has chosen to focus on the issue of school waste and the lack of recycling. In order for your students to determine how the waste is being created and the opportunities provided for recycling, you set up a sleuthing activity. In this activity you divided the group into smaller groups and each one was given a sheet describing a possible waste contributor (i.e. a student, a janitor, the school secretary, a teacher, the principal). Each group of students sought out their potential contributor and asked a list of questions included with the description to help determine what waste the individual was creating and whether they were doing any recycling. After returning to the classroom, the groups debated who was the biggest contributor in creating waste and not recycling. What reflection questions would be beneficial to pose at this point? What kinds of activities could you use to address these questions?

For facilitator - Possible reflection questions might include:

1. What new knowledge have you gained about this issue?
2. How do you contribute to the problem?
3. Who contributes most to the problem?
4. Do you feel like your group will be able to have an influence on this problem?

Segment Four

Your group has chosen to pursue the issue of waste and recycling in their school. When choosing their action, group members have decided to try to get the school cafeteria to change from Styrofoam to paper or other kinds of trays, to provide a location for teachers, students, and the office to recycle paper, to provide recycling for aluminum cans, and to get all members of the school community to recycling printing cartridges. In order to prepare the students in your group for potential opposition, you set up an activity for them. In this activity you have two sets of students swinging two jump ropes a few feet from each other. On the other side of the jump rope you have three students staggered in a zigzag line. You tell the students in the group that in order to be successful they have to make it through the two ropes and past the three students. One rope represents the school principal, and the other is the cafeteria manager. The three students represent the students of the school, the teachers, and the school office workers. The students try making it through the obstacle course, but only few are successful. What reflection questions would be beneficial to pose at this point? What kinds of activities could you use to address these questions?

For facilitator - Possible reflection questions might include:

1. What are the obstacles that you will have to surmount in order to achieve your goal?
2. If your project is successful, what difference will it make for the people in your community?
3. How do you feel about the action you have chosen to take? Does your goal seem achievable?

Segment Five

Your group has just met with the cafeteria manager to request that the cafeteria start using something other than Styrofoam trays. The cafeteria manager tells your group that the other options are not cost effective and she cannot make the change at this time. What reflection questions would be beneficial to pose at this point? What kinds of activities could you use to address these questions?

For facilitator - Possible reflection questions might include:

1. Is your group heading in the right direction to achieve its goal?
2. Should the group revisit its expectations in light of what has happened so far?
3. What are the next steps that the group should take? What kind of adjustments should the group make?

Segment Six

Your group chose the issue of pollution in a neighborhood lake. The action they chose to take was to stencil warnings on surrounding storm drains asking community members not to use storm drains to dump waste since it will end up in the lake. The day after the group completed the stenciling, they sit down to reflect on the completion of the project. What reflection questions would be beneficial to pose at this point? What kinds of activities could you use to address these questions?

For facilitator - Possible reflection questions might include:

1. How well did your plan for action work?
2. What problems did you encounter in carrying out your plan?
3. How did you respond to these problems?
4. What were you not able to achieve?
5. What did you accomplish?
6. How do you feel about what you accomplished?
7. Do you feel like you made a difference in your community?
8. Was making a difference difficult or easy?
9. How has this experience changed you?

Creating an Action Plan

Team Names

Action Plan Title

Final Goal

List a goal for each week spent on this project. (How will you *plan your work and work your plan*?)

List 5 or more actions steps that you plan to take to help accomplish your goals.

What are some possible problems that you think could make it difficult for you to accomplish your project goals?

What actions will help you overcome these obstacles?

List the community partner/s that will work with your team.

What role will each team member be responsible for? List the person's name and job title.

Answer the following questions with your team. Be prepared to share your responses with the larger group.

What went well and what needs improvement?

How did the experience affect you?

What impact will it have on your future actions?

This Action Plan Template was developed by Terri Hallesy, Illinois-Indiana Sea Grant Program.

Community Partnerships – Meeting Community Needs

Service-Learning Guidelines

- The most important service you and your students can provide to the community is to **meet a community need**. *Make sure your community wants jellybeans before you show up with a hundred jellybean baskets!*

- The best way to discover a community need is to **ask questions** of community members.

- Some **ways to ask effective questions** to determine community need include:

    - Invite a representative from that community or organization to speak to your students about their needs. *Example:* Invite a social worker from a local homeless shelter to visit your class and identify volunteer projects to benefit the shelter.

    - Create a survey for community members that will help identify needs. *Example:* Students create a survey for their parents to discover literacy needs in the home. Students create "book bags" that parents can check out and read to their children.

    - Take a field trip into the community you wish to serve such as, your school, neighborhood, or entire town. What issues do you observe as a class that you could address through service? *Example:* While touring the school, students notice that a wall is crumbling and dirty. You decide as a group to paint a mural on that wall.

    - Read local newspapers and identify social issues in your community. *Example:* While following local news stories, your class records a high amount of fires in the area. They put together a fire safety program to present at other area schools.

    - Educate yourself about a community need by interacting with members of that community. *Example:* While visiting the local hospital, your students discover that many patients wish they had magazines to read. Your students run a magazine drive to donate to the hospital.

- Remember to **think locally and globally** – a community can be your classroom, your school, your neighborhood, your town or city, the United States, or the global community!

BUILDING EFFECTIVE PARTNERSHIPS FOR SERVICE LEARNING

Effective partnerships between agencies, schools, colleges or universities, businesses, government, and residents for the benefit of the community are a vital part of youth service in America. Service learning collaborations provide students with an increased confidence in their ability and show the community that young people can make valuable contributions. (PA Service-Learning Resource and Evaluation Network) By working together, we can reach a larger population, avoid duplication of efforts, make better use of resources and deal more effectively and thoroughly with the myriad of problems faced by our young people. Whether it is schools partnering with Volunteer Centers, community based organizations partnering with business, or youth corps partnering with nursing homes, the potential for and productivity of effective partnerships are limitless. However, there are a number of issues related to creating effective partnerships and this Resource Packet provides some resources that will get you thinking about how to develop and sustain them.

Like a piece of art, true collaboration is a long-term process, often going through many revisions as our environment and relationships change. However, there are a few techniques that will ensure the final masterpiece is ready for the gallery. Here are a few simple guidelines, or techniques, to guide you as you form collaborations for service learning:

- Make sure everyone shares a commitment to a common vision, since some problems will surely arise.
- Put agendas and needs (personal and organizational) out in the open, agendas or needs do not need to be identical, but should be compatible.
- Be sensitive to the needs, styles, and limitations of other collaborators.
- Involve more people at all levels; by involving more people at your organization and those with whom you collaborate you will improve the sustainability of the collaboration.
- Maintain frequent and open communication.
- Be sure everyone understands expectations especially concerning tasks and accountability.

"Full collaboration, includes not only the exchange of information, altering activities and sharing resources, but also enhancing the capacity of other partners for mutual benefit and to achieve a common purpose." (*Working Together for Youth*) It is important to realize that DiVinchi did not paint the Mona Lisa the first time he picked up a paintbrush. Since full collaboration is the most complex form of partnership, it may not be the best way to start partnerships among organizations that are unfamiliar with each other. For example, a school that has never worked with a community based organization may want to start a partnership by networking or coordination, which are simpler forms of partnership. Networking is simply sharing information for the benefit of both parties, while coordination includes a willingness to alter activities to achieve a common purpose. So our school may choose to work with a community organization by sharing relevant information about its curriculum; that is networking. If the school (or teachers at the school) decided to teach a unit at a different time during the school year because it fits in with a service opportunity, that would be coordination. A

Benefits of Service-Learning Partnership

- Accomplish work together that would be difficult or impossible to accomplish alone.
- Build a shared sense of commitment and responsibility throughout the community.
- Ensure that everyone who is touched by the service is represented in the leadership, planning and implementation.
- Avoid unnecessary duplication of efforts among agencies.
- Offer opportunities for people to learn from each other and share resources.
- Contribute to rebuilding healthy, caring communities.

slightly more ambitious form of partnership is cooperation. It builds on coordination by involving shared resources. In our example, the community organization might provide brochures and background information for students and teachers. Establishing these partnerships and personal relationships can prepare people and organizations to enter into strong true collaborations for service learning. Remember success is the best way to encourage continued partnership, so be sure to set goals that are concrete and obtainable, especially at the early stages of a partnership.

The remainder of this resource packet will include on-line resources, information on organizations and more tips. Supplementary materials have been created to help agencies work with colleges, universities and schools, as well as for colleges, universities and schools work with community organizations. If you did not receive the appropriate supplement to this packet please contact Youth Outreach at the Points of Light Foundation.

Sorting Out Agency/School Partnerships

Type	DESCRIPTION	ELEMENTS	EXAMPLE
Networking	Sharing information	• Open • Low commitment, low risk • Separate	Volunteer Center puts a teacher on a mailing of youth volunteer opportunities
Coordination	Sharing information and altering activities for mutual benefit	• Open • Low commitment, low risk • May be joint may be separate	Two agencies planning schedule for service projects so they build off of one another and are not competing for volunteers. May schedule joint activities
Cooperation	Sharing resources, as well as information and altering activities for mutual benefit	• Open • Higher commitment • Work together	No one school can hire a Service Learning Coordinator, so two schools hire a service learning coordinator to find service opportunities for students at both schools
Collaboration	Sharing resources, information and altering activities to enhance the capacity of other partners for mutual benefit	• Open • Very high commitment • Work hand-in-hand • Seek joint funding	School and multiple agencies form a collaboration to engage young people as leaders. The new collaboration gets a grant to fund youth led projects with sponsoring agencies

Discussion Starter Questions

The following questions can help you start conversations about partnering with schools, agencies or campus. Remember it will also be important that you provide answers to these questions to potential partners.

- What experiences have you had in community service or volunteering? What impact has that had on you?
- What experiences has your agency had working with students?
- What experiences have you had working with students?
- Why are you interested in this partnership?
- What do you think is the most important reason for involving students in service-learning?
- What is one thing you hope students would learn about the community or society?
- What are the major challenges to providing services to community?
- One dream you have for those served through your agency.
- What do you hope service-learning will accomplish at your organization?

ESTABLISHING EFFECTIVE RELATIONSHIPS

1. Know your objectives. Before contact, build a solid base.
2. Be able to articulate your goals, your service objectives and your learning expectations.
3. Know your volunteers. What types, their range of interests, their limitations, their talents.
4. Know your resources. Can you provide PR, transportation, duplication? Remember, simple details loom large to agencies.
5. Know agencies and their programs. Understand their structure, their mission, and their activities at least well enough to ask informed questions.
6. Make a strong effort to involve others in approaching agencies and to use them in an on-going way for program implementation.

A CHECKLIST FOR SUCCESSFUL PARTNERSHIP IS:

IDENTIFY POTENTIAL PARTNERS
- Schools
- Youth Service Organizations
- Nonprofit Organizations
- Businesses
- Recipients of Services
- Individuals

IDENTIFY NEEDS WHICH ARE OF MUTUAL CONCERN
- Do a needs assessment of the community with students and agency representatives.

DETERMINE INDIVIDUALS WHO WILL SERVE AS PRIMARY LIAISONS IN THE PLANNING AND IMPLEMENTATION PROCESS
- Assign student coordinators.
- Visit agencies ahead of time.

SET UP A LOCAL ADVISORY BOARD

NEGOTIATE AND AGREE UPON DESIRED OUTCOMES FOR:
- Recipient of Volunteer Services
- Student/Youth Volunteer
- Nonprofit Organization
- Educational Institution
- Others

NEGOTIATE AND AGREE UPON EXPECTATIONS FOR THE:
- Recipient of Volunteer Services
- Student/Youth Volunteer
- Nonprofit Organizations
- Educational Institution
- Others

DETERMINE BEST METHOD FOR ON-GOING COMMUNITY AND EVALUATION

PERIODICALLY, REDESIGN RELATIONSHIPS BASED ON CHANGING NEEDS AND CIRCUMSTANCES

Select Bibliography & On-Line Resources

Building Bridges: Across Schools and Communities; Across Streams of Funding
Cross-City Campaign for Urban School Reform (1998)
This report summarizes a 1997 conference that brought community activists, school reformers and community funders together to talk about how to organize for reform using local resources and strategies, and combining school and community efforts.

The New Community Collaboration Manual
National Collaboration for Youth (1997)
Provides philosophical background of the seven keys to successful collaboration (shared vision, skilled-leadership, process orientation, cultural diversity, member driven agenda, multiple sectors and accountability).

The Coordinator's Handbook of The Thomas Jefferson Forum: A Comprehensive Guide for Developing High School-Based Community Service Programs.
Thomas Jefferson Forum, Inc. Boston, MA: 1991.
This manual has an excellent section on forming partnership and gaining support from the community and schools.

A Pocket Guide to Building Partnerships for Service Learning
National Education Association (1996)
This guide offers insight into starting partnerships between schools and agencies for strong Service Learning Programs.

Service Learning Educator
PA Service-Learning Resource and Evaluation Network Describes practices that promote collaboration and demonstrates the value of collaboration between schools and community.

Seven Tips to Building an Effective Partnerships
U.S. Department of Education (1998)
Here are some tips for building partnerships with schools, parents, community organizations, businesses and faith groups. This article was created by the Partnership for Family Involvement in Education to help strengthen communities and improve educational standards.

Thinking Collaboratively: Ten Questions and Answers to Help Policy Makers Improve Children's Services
Charles Bruner (Education and Human Services Consortium) (1991) http://www.cyfernet.org/research/thinkco.html
Provides some questions to ask in the planning stages of partnerships and addresses some of the limitations of collaborative partnerships.

Working Together for Youth
RespecTeen (Lutheran Brotherhood) (1993)
Pages 54-55 and 58-60 explain the different levels of collaboration and the six factors that contribute to effective partnerships.

Working Together: From School-Based Collaborative Teams to School-Community-Higher Education Connections
Center for Mental Health in Schools (1997) http://smhp.psych.ucla.edu/worktogh/intro.htm This is a packet of materials on forming effective partnerships, including information on working together effectively and examples of model school-community collaborations.

Younger Voices, Stronger Choices: Promise Project's Guide to Forming Youth/Adult Partnerships
by Mi chael McLarney, Loring Leifer (July 1, 1997)
It's also important to partner with young people! This book shows how to create true partnerships between adults and youth for real community change.

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Name: Service Learning 2: Raise Your Voice
Item: 08183
Price: $3.95
Volume Price

Email To A Friend

Order Options:
Qty: 1
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Description: A no-nonsense guide for older youth introduces service learning as an empowering learning vehicle for young leaders. Voices of real young people engaged in service inspire and enable youth to identify with others.

Service Learning 2: Raise Your Voice

May we also suggest:

Name: Service Learning - Set of 3
Item: 08185

Description: Service Learning Set of 3

Price: $11.50

Name: Service Learning 1: Agents of Change
Item: 08182

Description: Appropriate for Middle School aged audience. Youth become "Special OPPortunities Agents," as they follow a series of exciting activities that engage youth in their community & allow them to reflect on their experiences.

Price: $3.95

Name: Service Learning: Helper's Guide
Item: 08184

Description: Guide for leaders offers group service learning activities like community mapping, identifying group roles and teaching journaling. Offers advice tailored to help mentors seeking to lead youth through enriching learning experiences.

Price: $3.95

National 4-H Supply Service	Important Links	Specials
National 4-H Council 7100 Connecticut Ave. Chevy Chase, MD 20815-4999 Phone: (301) 961-2934 Fax: (301) 961-2937 4HStuff@fourhcouncil.edu	Get Your Free Source Book Print Order Form 2011 4-H Photography Contest 4-H.org 4-H Youth Conference Center National 4-H Headquarters	Camp Stuff Fair Stuff Volunteer Stuff

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National 4-H Cooperative Curriculum System, Inc.
4-HCCS BU-08183

VOICES
SERVICE LEARNING
SPECIAL OPPS

"RAISE YOUR VOICE"

Level 2

Service Learning Activities for High School Youth

Reviewed and Recommended
National Collection

Name _____ Group _____

The Following 4 pages are from: "Raise Your Voice" Level 2, National 4-H Cooperative Curriculum System, inc.

NOTE TO HELPER

You have a key role in helping youth learn about service learning and themselves. Youth can't do it without you! You can help young people get the most out of this project through your enthusiasm and ability to ask thought-provoking questions. You can help youth determine goals, identify resources, create presentations, think about their choices and evaluate their own progress.

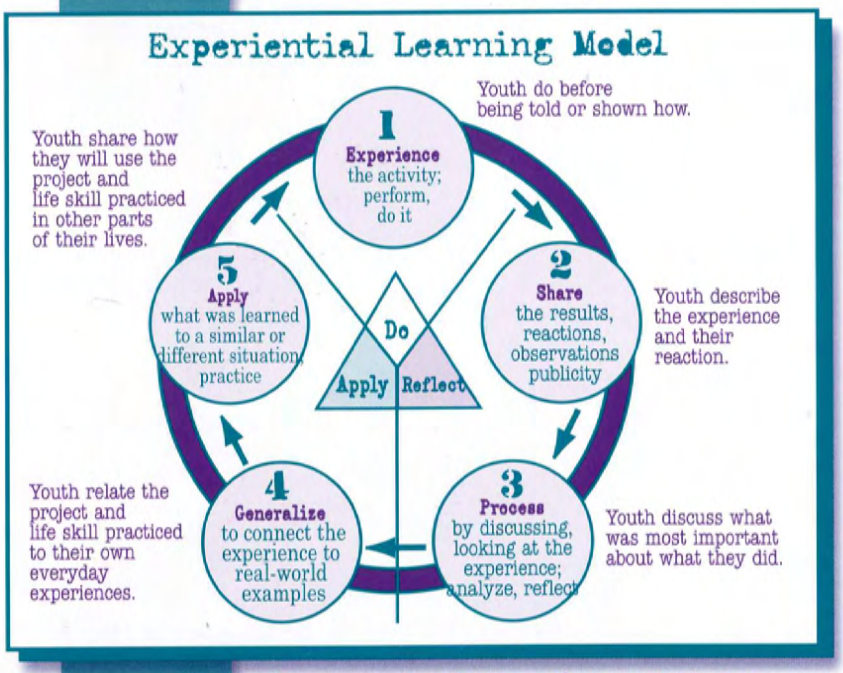
Service Learning Project Activity Guides

This is the second in a series of two service learning project activity guides for youth. The Level 1 guide takes middle school aged youth through the process of researching, planning and carrying out a service learning project. Level 2 is designed for high school aged youth. Each guide has an achievement program to encourage youth to learn and develop life skills. Your assistance in completing the achievement programs is very important.

In each activity, you'll find a description of the project and the life skill to be emphasized, questions to follow each activity, suggestions for additional activities and helpful information. The activities are designed for youth to learn by doing. With your help, youth reflect on what they did and what it means to them.

Your challenge is to allow youth to explore the activity and learn from the experience, even if it doesn't work the way he or she expects. In the "Debrief" sections for each activity, the best way for you to help a young person learn is to listen as they consider each question and draws their conclusions. You may also need to help youth find additional resources.

The **Service Learning Project Helper's Guide** provides additional learning by doing activities that can be adapted to the family, 4-H project groups, clubs, classrooms or other groups. You'll also find hints about life skill development, characteristics of youth at different ages and tips for activities in the youth guides.



The experiential learning model helps distinguish 4-H youth development education from many other education methods.

Acknowledgments

Design Team: Ami Neiberger-Miller (Design Team Coordinator and Writer), Barbara Brown (SC), Harriet Edwards (NC), Rhea Galati (GA), Stanley Guy (UT), Cedric Humes (SC), Katharine Leigh (CO), Sue Lerner (WA), Mark Manno (DE), Cyndi Mark (MI), Bill Million (IL), Patrick Nestor (WV), Joanne Roueche (UT), Carol Weatherford (SC), David Weatherford (SC) and Linda Williams (WA).

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Models: Aundrea Burton, Victoria Kurasz, Drake Miller, Vikkie Miller, Kyle Zilberfarb.

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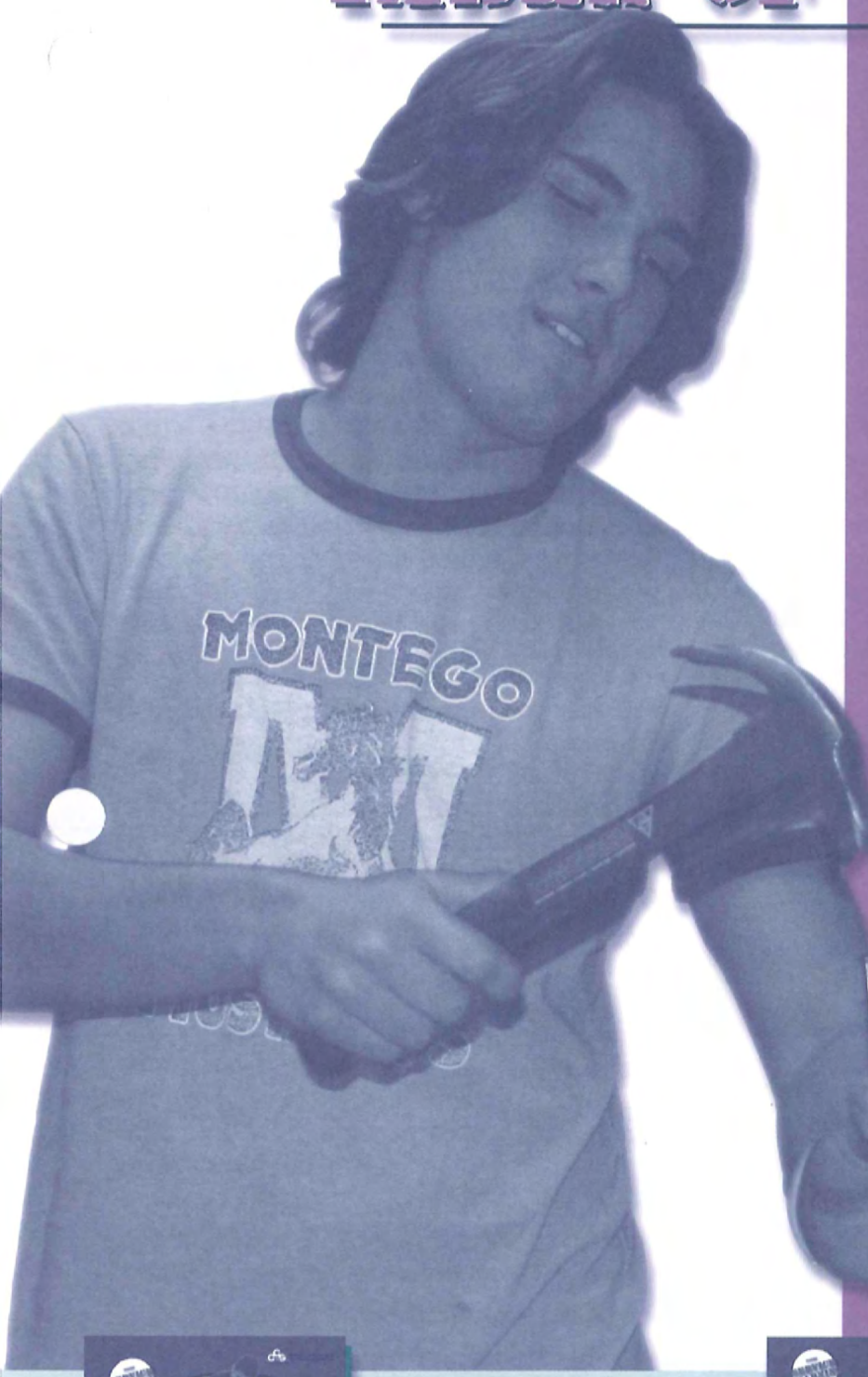

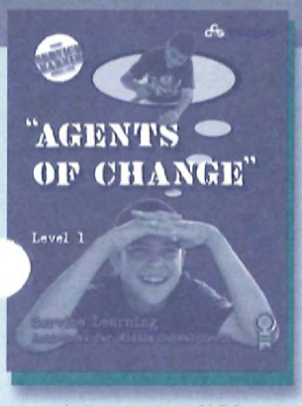

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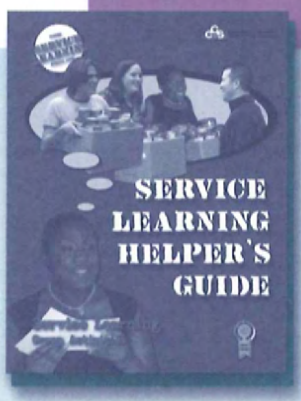
Level 1 helps youth plan their own service learning project. Activities include: public speaking, newsletter design, journaling and recognition.



4-HCCS BU-08184

The **Helper's Guide** supports youth working through Levels 1 or 2. Interactive group activities teaching communication skills, group process and journaling.

HAVING FUN WITH SERVICE LEARNING

Are you ready to make a difference in the world around you? Then you're ready for the service learning project!

You will find interesting and exciting activities in this guide. You'll learn how to research a topic, create an action plan, carry out your plan and celebrate your success. Don't be afraid to jump right in and don't give up if the activity doesn't work the first time.

Journaling after each activity is an important part of this project. Check out the Sevice Learning CD or Project Online website for tools to help you reflect after each activity. It is especially important that you journal while conducting your service learning project on-site and take time to think about your experiences.

Achievement Program

While you are having fun doing the activities, you'll also be completing Level 2 of the Service Learning Achievement Program shown on page 5. There are two levels in this program – one in each of the service learning project activity guides. This program will help you set goals, record your successes and be recognized for your work.

Your Project Helper

Your project helper is on your team, supporting you and making learning fun. This person may be a parent, project leader or advisor. The choice is yours. As you do the activities, you'll discuss what you did and the questions in the "Debrief" section with your helper. Sometimes your helper will work with you to find people, groups, events, books, web sites and magazines to help complete an activity. After completing each activity, your helper will initial and date your achievement program chart on page 5.

Do your best to complete each activity and answer the questions. You may need additional resources for some activities. The internet, magazines, books, videos, DVDs and information from associations can help you. The public library, other service learning enthusiasts and your extension center will have more information.

You'll learn a lot about service learning through this project, but you'll also learn about yourself too. Many of the things you'll learn are skills you can use in other areas of your life, like:

- Decision-making
- Planning and organizing
- Goal setting
- Critical thinking
- Communications

As you complete the activities, answer the questions and record your project highlights. Writing things down will help you realize how much you have learned.

Have fun!

My Project Helper: _____ Phone Number: _____ Email: _____

Your Mission

In the first part of this guide, you will research a problem. After selecting a problem to focus on, you will design an action plan to address it. After accepting your mission assignment, you will go into the field as a special agent to do your service learning project. At the end of the project, you will celebrate contributions and your success.

About Service Learning

Service learning helps you apply your skills and knowledge to a real community problem. It means checking out a problem and preparing, rolling up your sleeves and doing, and figuring out what it all means. Progress often comes in small steps. Journaling can help you chart progress toward your goal. It can also remind you how your actions today impact a larger community problem or issue.

Your Journal

Journaling is very important in service learning. It helps you learn from what you did. More than just recording your activities for the day, journaling helps you think about what it all means. A journal should help you answer the question – "**So What?**"

When you want to make big improvements in the world around you, progress often comes in small steps. Journaling can help you chart progress toward your goal. It can also remind you how your actions today impact a larger community issue.

Write one journal page after completing each activity in this guide or after a session at your service learning project site.

If you want to write your journal by hand, make copies of page 36* and keep them in a folder. If you want to keep your journal electronically on a computer, use the Service Learning CD to open the journal page on your computer. Some people like to journal through pictures and sketches. You may want to add pages to your written or electronic journal to hold photos.

Service Learning 2 Project Guidelines

- Do a minimum of seven Level 2 activities each year.
- Complete Level 2 within three years.
- Keep the Planning Guide current by setting project goals and recording the project highlights you experience. Use extra paper if needed.
- Complete the online evaluation at www.n4hccs.org/servicelearning.

Types of Service Projects

- Direct Service - works directly with community members or those being served.
- Indirect Service - uses a "behind the scenes" approach to work on an issue or resolve a problem.
- Advocacy - advocates for a solution to a problem.

Journaling Tips

- Sit in a quiet place where you can concentrate.
- Think through your day and service learning activities.
- Use all of your senses as you recall how things looked, tasted, smelled, sounded and felt.
- Be honest. Write down your real feelings – not just the best-sounding answers.

Watershed or Groundwater Festival

By sponsoring a watershed or groundwater festival at your school or in your community, you can help raise awareness about the importance of clean water and the need for watershed protection. A watershed or groundwater festival celebrates the unique aspects of a given watershed through educational activities, exhibits, and entertainment. The water festival concept is an enormously successful way to educate both children and adults. Make your event something that will inspire and motivate people to protect their watershed!

Schools may want to partner with their local or state water quality agency or a local watershed organization for help in planning the festival. Activities should be as hands-on as possible. Some ideas might include the *Enviroscape Model*, a 3-dimensional representation of a watershed (see box). You may want to check with the education office in your state water quality agency or with the local Cooperative Extension Service office—they might have a model to loan out. *Aquifer in a Cup* is a simple hands-on demonstration of how pollution moves through an aquifer (See EPA's Web site at http://www.epa.gov/safewater/kids). A *Household Hazardous Ring Toss* where rings listing household products are tossed onto stands representating disposal options is another idea. Be creative!

Enviroscape Models

EnviroScape interactive units dramatically demonstrate water pollution—and its prevention. Models cover Nonpoint Sources, Wetlands, Coastal, Hazardous Materials and Landfills, Riparian Areas, and Groundwater. Setup videos and curriculum are also available.

Schools may want to check first with the education office in their state water quality agency or with a Cooperative Extension Service—they often have models to loan out (look in the blue pages of your phone book). Or, schools can contact Enviroscape directly and ask for assistance in locating a model for loan. Call Erin Foster at 703-631-8810, ext. 12.

For more information, visit the Enviroscape Web site at http://www.enviroscapes.com

E-mail: info@enviroscapes.com

Steps for Organizing a Festival

The first steps are to define the watershed and then set up a committee to begin organizing the event. You should begin this process well in advance of your planned festival. The committee should:

1. Decide the size of the event
2. Select the location and date
3. Identify and recruit activity presenters
4. Organize volunteers
5. Contact potential financial and in-kind donators
6. Provide information to the media about the event
7. Evaluate event afterwards

NATIONAL SERVICE-LEARNING PARTNERSHIP

TALK IT UP
ADVOCATING FOR SERVICE-LEARNING

EDITION ELEVEN: MARCH 2005

Through the Talk It Up series, Partnership members share tips with one another about advocating effectively for service-learning. To read earlier issues, go to http://www.service-learningpartnership.org/publications.

JOIN FORCES TO IMPROVE AMERICAN PUBLIC EDUCATION

By Vince Meldrum, President of Earth Force

Advocates for environmental education, service-learning, and civics have much in common. Environmental classes frequently include hands-on projects to help students understand the subject matter. Service-learning projects often focus on environmental issues, such as recycling, schoolyard habitats, and energy conservation. And, both approaches to education aim to strengthen students' civic participation skills.

Advocates for environmental education, service-learning, and civics have much in common.

Yet, if we are candid, we must acknowledge that while environmental, service-learning, or civics teachers are all well-meaning, too often their curricula lacks the depth we would like to see. When programs are shortened to a single day, when educators aren't able to relate the project to academic content, or when students aren't asked to look for the root causes of problems, the quality of the programs suffers. As a result, students do not develop a lasting sense of environmental stewardship or the civic skills to address complex problems.

This situation is unlikely to improve unless advocates for environmental education, service-learning, and civics in American public schools join forces. We seek similar reforms in the education system—changes in the structure of the instructional day, in teacher preparation and ongoing professional development, and in support for out-of-classroom learning. We won't secure these changes unless we work together.

Fortunately, the building blocks for collaboration are in place. All of these disciplines focus on helping students become good citizens. Education for citizenship is central to each discipline's vision of school reform. We all promote similar strategies for improved teaching. And we all face the same types of challenges, including the current accountability system for American public schools, which does not embrace the civic purposes of schooling and thus neglects students' civic competencies.

With a common agenda, we will be more effective in our education reform efforts. The centerpiece of our effort must be support for *student involvement in community problem-solving*. Teaching that encompasses community problem-solving focuses on real-world needs in the context of a curriculum aligned with the relevant standards, uses a service-learning framework, and expands students' habits of civic participation.

The National Service-Learning Partnership is funded by the W.K. Kellogg Foundation and the State Farm Companies Foundation and sponsored by the Academy for Educational Development.

100 Fifth Avenue ● New York, NY 10011 ● Tel: 212-243-1110 ● Fax: 212-627-0407 ● www.service-learningpartnership.org

To advance our common agenda, advocates must use the building blocks for collaboration, as follows.

1 **Focus on our shared goal.** We all aim to provide students with crucial civic skills and dispositions. Dr. William Stapp, from the University of Michigan, helped shape environmental education, noting that it is "aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve those problems, and motivated to work toward their solution." The National and Community Service Trust Act of 1993 cites civic responsibility in its definition of service learning. Former Senator John Glenn, chair of the National Commission on Service-Learning, calls service-learning "the single best way to educate young people for active citizenship in a democracy." Finally, civic service-learning is one of the six model approaches to civic education recommended by the Carnegie Corporation's *Civic Mission of Schools* report.

2 **Acknowledge our similar challenges.** We all seek to maintain quality while we expand practice. But in fact practice is uneven. For example, according to the National Environmental Education and Training Foundation, more environmental content is reaching students, but the lasting impact on them is minimal. This research shows that while students may know more about the environment, they are no more likely to change their habits or take other action as a result. The Foundation envisions improving environmental education through students' ownership of projects focused on local problems. Service-learning and civics face similar challenges.

3 **Promote teaching strategies that focus on problem-solving and projects.** We all promote the value of interdisciplinary projects that engage students in community problem-solving to master core academic standards. The reaction to current education policy and budgets threaten our work. Let's advocate at every level for teaching that involves community problem-solving, environmental projects, service-learning, and civics. Let's ask state education departments to sponsor meetings of Learn and Serve staff with specialists in K-12 content areas, such as civics and environmental education, in order to identify or create rigorous, integrated units around local environmental issues. Let's make education for citizenship as important as any other subject when it comes to classroom time, teacher training, materials, testing, and field trip support. Let's advance a common research agenda. Let's support others' work that shares our purposes. Let's work together to advance the initiatives already in place like the Civic Mission of Schools Campaign (www.civicmissionofschools.org), the Alliance for Representative Democracy's state civic education campaigns http://www.representativedemocracy.org/CivicEd_StateSummaries.htm), and Service Learning United (www.servicelearningunited.org).

Vince Meldrum, President, Earth Force, Inc.

Vince Meldrum is the President of Earth Force, Inc., the national organization associated with Frontrange Earth Force. Vince is a member of the steering committees for the Campaign for the Civic Mission of Schools, Service-Learning United, the General Motors Educational Advisory Council and the Ethos International Advisory Board, and the Michigan Task Force on Social Studies Assessment.

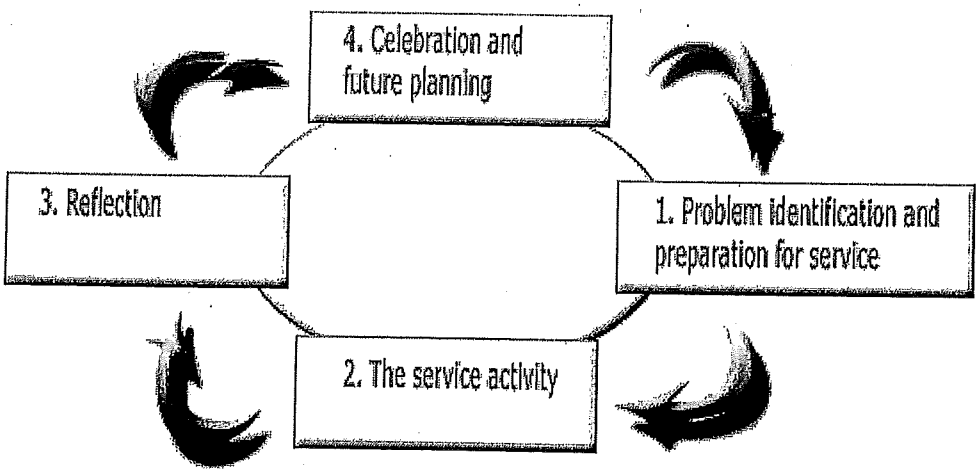
For more information about Earth Force e-mail earthforce@earthforce.org or visit http://www.earthforce.org.

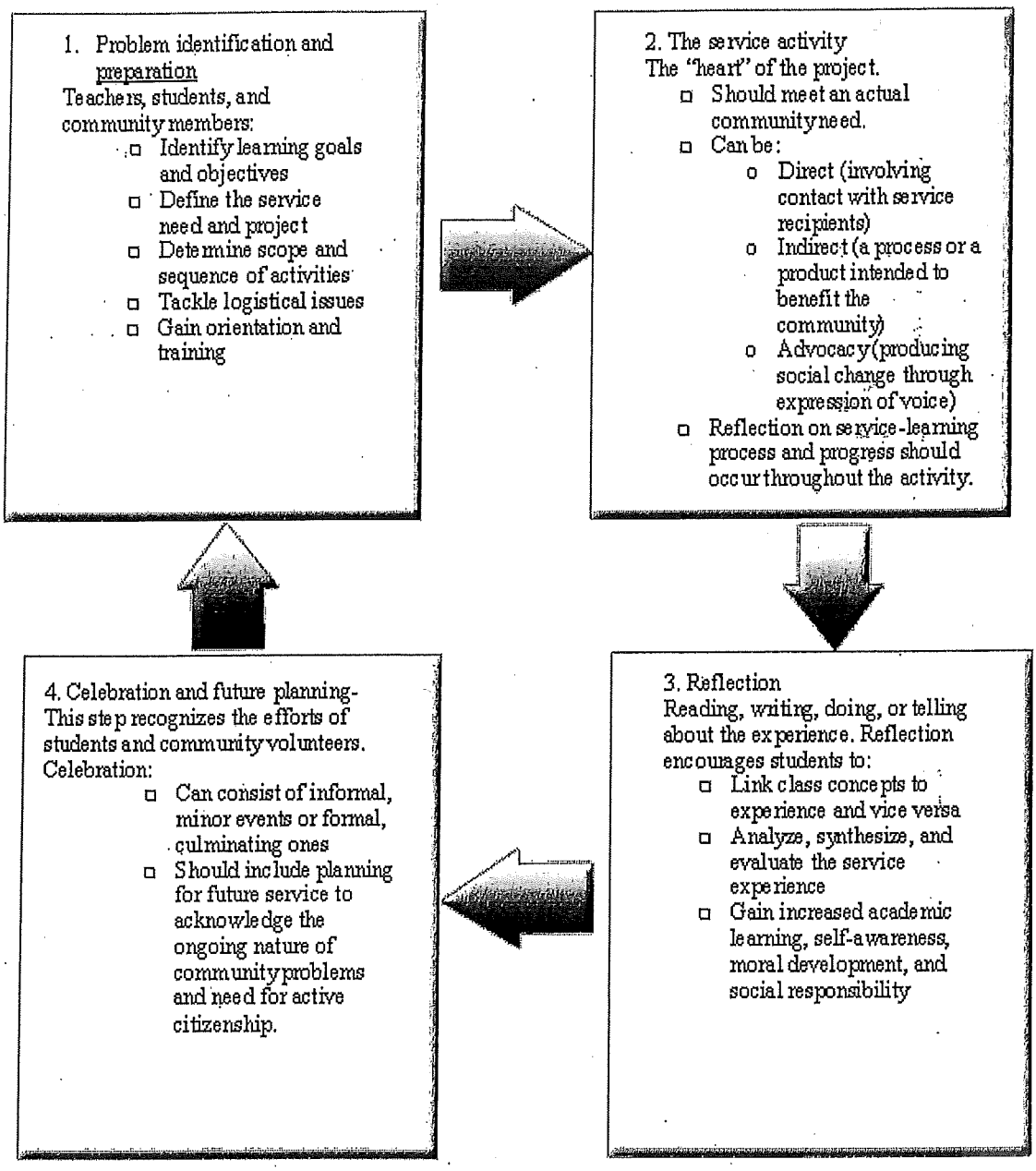
Curriculum Development for K-12 Service-Learning
Source: RMC Research Corporation, Denver, CO, September 2005

High quality service-learning can contribute to student academic achievement and civic and social development. However, for these outcomes to occur, service-learning projects must be organized to maximize the meaningfulness of both service and learning.

Service-learning is considered a constructivist approach to teaching and learning. Constructivists (e.g., Brooks & Brooks, 1999) advocate allowing students to actively create knowledge by grappling with essential academic ideas in a personally and socially relevant context. Many constructivists also recommend that instruction be organized around a problem, and that students acquire knowledge and skills within the problem-solving experience. Service-learning shares this emphasis on active learning and problem solving. However, it is unique in that the problems that students encounter are real community needs, and the knowledge and skills gained, those needed for informed, engaged citizenship.

Although there are several useful models for organizing service-learning projects, in a constructivist framework, service-learning is viewed as a cyclical process with four interlocking phases: problem identification and preparation for service, the service activity itself, reflection, and celebration and future planning. The following figures explain these steps in more detail.





Regardless of the type of project, service-learning should incorporate standards for best practice. According to ASLER (the Alliance for Service Learning in Education Reform, 1995), effective service-learning:

- Strengthens both service and academic learning.
- Provides concrete opportunities for youth to learn new skills, to think critically, and to test new roles in an environment that encourages risk taking and rewards competence.
- Includes preparation and reflection
- Recognizes young people's efforts
- Involves youth in the planning, and
- Makes a meaningful contribution to the community.

References

Alliance for Service-Learning in Education Reform. (1995). *Standards of quality for school-based and community-based service-learning.* Alexandria , VA: Author.

Brooks, J.G., & Brooks, M. (1999). *In search of understanding: The case for constructivist classrooms.* Alexandria, VA: Association for Supervision and Curriculum Development.

Give Water A Hand

for young people taking action in their community

- Tell me more about Give Water A Hand!
- FREE!! Download the *Action Guide* and *Leader Guide*
- Descargue la Guía de Acción en español
- Where to order printed copies
- Our partners and how they can help you!
- Contact Give Water A Hand
- Other helpful water related web sites

The Environmental Resources Center website has moved to http://www.uwex.edu/erc.

MAKE A SPLASH! -- Do you know of a youth group or class that wants to *take action* to improve local water quality? With Give Water A Hand, young people team up with educators, natural resource experts and committed community members to study water issues and take *ACTION*!

To learn more about Give Water a Hand and how you can launch this successful program in your community, school or home, click here. Find out how YOU can Give Water A Hand!

What do you know about water quality in your community?

- Do the wild animals, birds, and fish have clean, healthy places to live?
- Do you care about the streams, lakes or wetlands in your neighborhood?
- Do you know where your drinking water comes from? Is it being polluted by storm runoff, industrial wastes, or other local sources of pollution?

Most important, what do *young people* know about these issues?

- Do the wild animals, birds, and fish have clean, healthy places to live?
- Do they have skills needed to protect local water resources?
- How can young people become active environmental stewards?

If these questions make you curious about local water quality and what you can do to help, click here to find out more about Give Water A Hand!

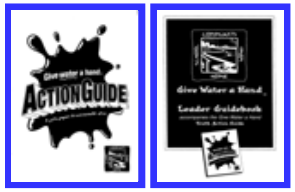
Give Water A Hand

for young people taking action in their community

What is Give Water A Hand?

Give Water A Hand is national watershed education program designed to involve young people in local environmental service projects. Following steps in the Give Water A Hand Action Guide (download it for FREE!), your youth group or class plans and completes a community service project to protect and improve water resources.

Here's how it works....Give Water A Hand program activities are presented in two publications -- the youth *Action Guide* and the *Leader Guidebook* (for youth leaders and teachers). These easy-to-follow, illustrated guides show how to organize and carry out effective action-oriented projects. To see the basic steps you'll follow to protect and improve your watershed resources, click here.



You can obtain the guides for FREE, by downloading them from this web site.

The *Action Guide* is also available in Spanish!

CLICK HERE to download the *Guía de Acción* FOR FREE!

PULSE AQUÍ para bajar una copia gratis de *la Guía de Acción*!

For a printed version of the Guía de Acción, please contact our office.

Give Water A Hand
445 Henry Mall, Room 202
Madison, WI 53706
Phone: 800-WATER20 (800-928-3720)
Fax: 608-262-2031
E-mail: erc@uwex.edu

Give Water A Hand is a program of the University of Wisconsin - Environmental Resources Center. Support for *Give Water a Hand* is provided by National Fish and Wildlife Foundation; the US Department of Agriculture, CSREES and NRCS; Church & Dwight, Co., Inc., and the University of Wisconsin.

Sample Student Stewardship Projects to Initiate Action

Jordyn Schara, an incoming Reedsburg Area High School freshman, is directing a program she has dubbed Wisconsin Prescription Pill and Drug Disposal (P^2D^2). The purpose of P^2D^2 is to dispose properly of excess medications. Schara started the program for two reasons: the first is that improper disposal of medications, both prescription and over-the-counter (OTC), leads to contaminated water in rivers, lakes and streams. The second reason is because she has seen people at parties using medications to get high. "Young people ages 12 to 17 abuse prescription drugs more than cocaine, heroin and methamphetamine combined," Schara said, citing a 2006 national survey on drug use and health. Schara said P^2D^2 will allow people to dispose of medications they don't need anymore for free.

For more information visit:
www.p2d2program.org/wisconsinp2d2.htm
www.girlzone.com/DrugsInWater/

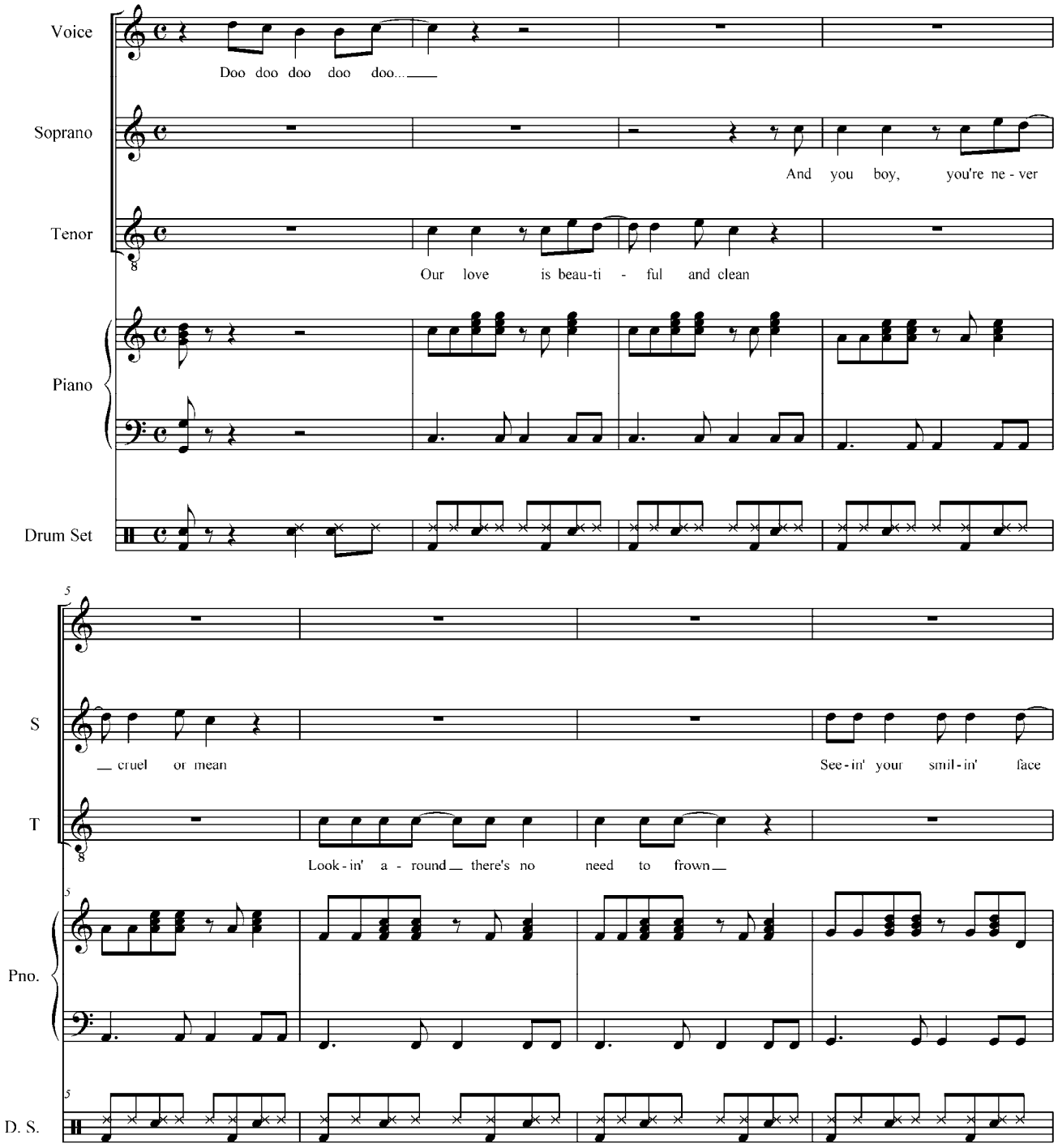
This billboard was designed through a partnership between Charleston High School and Pontiac Township High School. It was designed by Chris Ashmus, a Pontiac Township High School student whose class participated in the P^2D^2 program. It is posted near a roadway in Charleston, Illinois.

[Refer to P^2D^2Lessons, p. 10 for donation information related to producing a billboard]

This billboard was designed by Pontiac Township High School student Samantha Washko, participant in the P^2D^2 program. It is posted near Bloomington, Illinois.

We Love P2D2

Lyrics by Natashia Coan
Music by Zachary Kohlmeier
Vocals by Zach, Natashia, and Nathaniel Bardwell



A P²D² mail drop box at the Illinois State Police District Six Headquarters. The graphics were designed by Pontiac Township High School art students.

Students get the word out by creating awareness of the P^2D^2 Program through a rain barrel art project.

Students paint a collection drop box to inform citizens about medicine dropoff locations.

Pharmaceutical Reclamation Program

By: Darrius Washington
&
Kyle Resin

Sample Student PowerPoint Presentation

What is the Pharmaceutical Reclamation Program ?

- Pharmaceutical – Pertaining to pharmacy or pharmacists
- Reclamation – the process or industry of deriving usable materials from waste, by-products, etc.
- Program - a plan of action to accomplish a specified end

Pharmaceuticals in our Sewage

- Pharmaceuticals in sewage creates a potential problem in a sewage plant's ways of treating sewage. There are 6 main "trouble making" toxic pharmaceuticals, which are carbamazepine, sulfamethoxazole, propranolol hydrochloride, diclofenac sodium, ofloxacin and clofibric acid, which all affect the anaerobic digestion process.

Carbamazepine

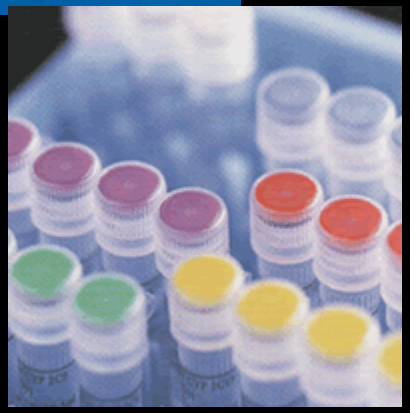
- Carbamazepine: This is a group of drugs called anticonvulsants, which will lower nerve impulses that causes seizures & pain. Carbamazepine is used for more than just seizures. It is also used for nerve pain such as trigeminal neuralgia and diabetic neuropathy. This isn't just used for nerve pain, but can also treat bipolar disorder.

Sulfamethoxazole

- TRIMETHOPRIM-SULFAMETHOXAZOLE - TMP-SMX is a commonly used drug, which treats PCP pneumonia, urinary tract infection, enteric infection (shigella, salmonella) and certain STD’s; also serves as a prophylactic agent against toxoplasmosis.

Other Drugs in our Water

diclofenac sodium



clofibric acid

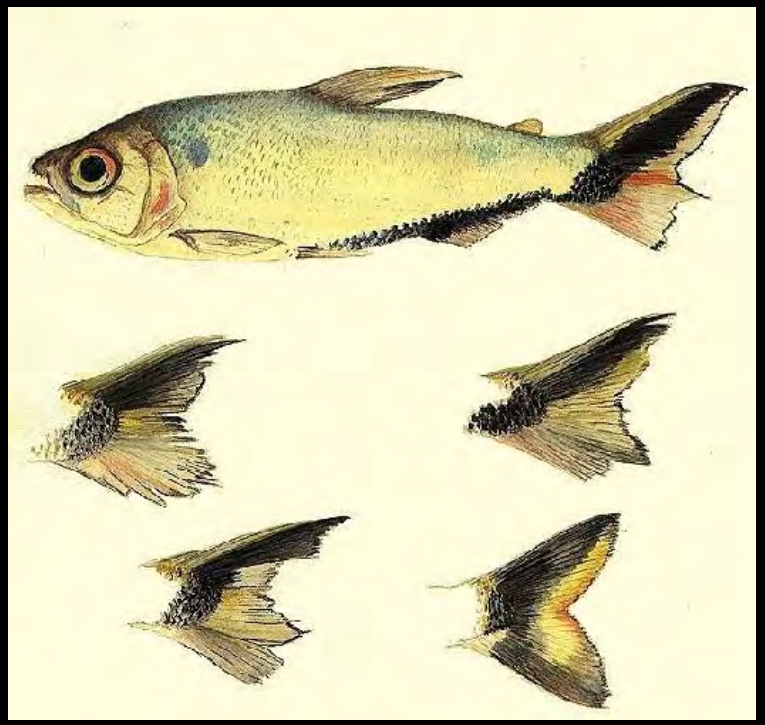
Prevalence in the Environment

- Pharmaceuticals have been in our water ever since they were first taken by people. It's just that now there is so much of it, that it can be detected and removed.

Exposure Concerns

- The amount of pharmaceuticals in water is well below the recommended dosage, but it will affect aquatic ecosystems. Some fish have been known to have high levels of estrogen and also are not able to repair their own damaged fins.

What Damaged Fins Look Like



Something Funny

Web Sites Used

- http://www.iwaponline.com/wst/05005/wst050050335.htm
- http://www.healthline.com/multumcontent/carbamazepine#H2
- http://www.hivdent.org/drugs/TRIMETHOPRIM.htm
- http://www.google.com

Pharmaceuticals In Our Water!

By: Karisly Ambrose
Brittany Kolesar
Amanda McBride

Sample Student PowerPoint Presentation

Facts

- In Phoenix Arizona they have found pharmaceuticals in their drinking water !!
- Which is a huge problem for them!
- And us….

.....

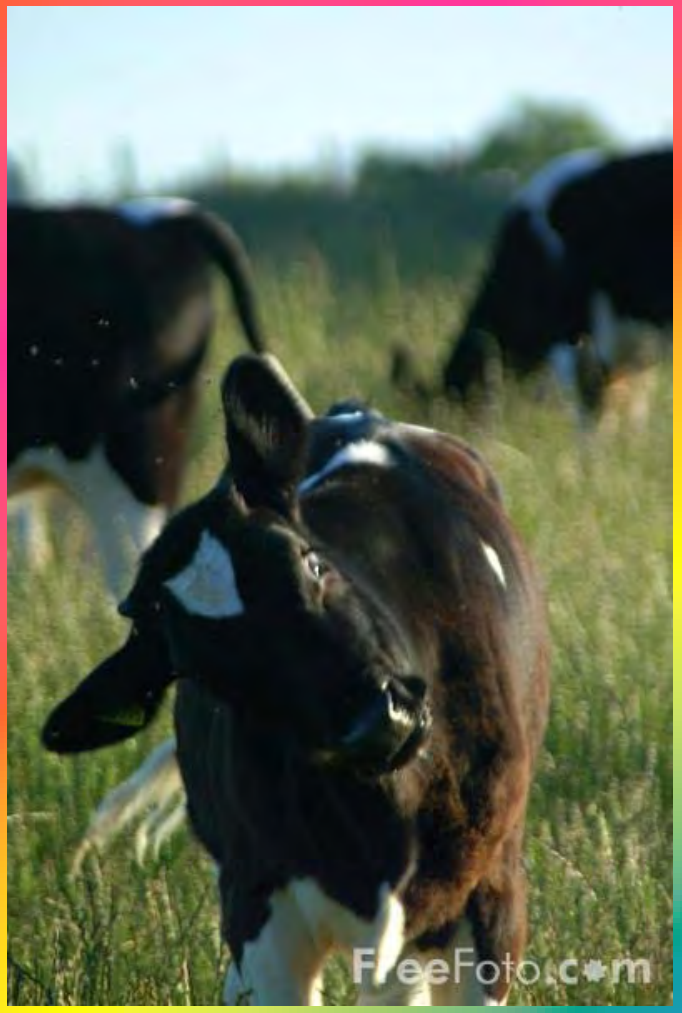
- This issue in the U.S. might have been taken care of about 20 years ago if the officials would have fixed the problem.

- NOW they have realized that the pharmaceuticals are being put into our drinking water!

Along with pharmaceuticals, personal care products also are showing up in the water as well.

OH SNAP!

- Farm animals also are a source of pharmaceuticals
  - ingestion of hormones
  - antibiotics
  - veterinary medicines
- Manure containing pharmaceuticals is spread on land and can then wash off into surface water and even percolate into groundwater.



WHY ARE THERE DRUGS IN OUR WATER?

Drugs enter the environment in two ways:

- Prescription medicines and supplements that are unwanted are difficult to remove through wastewater treatment.
- Unwanted drugs are improperly disposed of in the trash or toilet.

NOOOOOOO!!!!!

- **Over 80% of waterways tested in the U.S. show traces of common medications such as acetaminophen, hormones, blood pressure medicine, codeine, and antibiotics.**

- We need your help….
- It is not just everyone else who this is affecting.
  - YOU are drinking.
  - YOUR children are drinking.
  - We can prevent this……right here right now!
- Help us start The Pharmaceutical Reclamation Program.

http://ag.arizona.edu/AZWATER/awr/july00/feature1.htm

http://www.teleosis.org/pdf/GreenPharmacyBrochure.pdf

www.google.com

THANK YOU FOR YOUR TIME!!!

Glossary

Glossary

Accidental poisoning: When any substance interferes with normal body functions after it is inadvertently swallowed, inhaled, or absorbed.

Bacteria: Microscopic organisms that can aid in pollution control by metabolizing organic matter in sewage, oil spills or other pollutants. However, bacteria in soil, water or air can also cause human, animal and plant health problems.

Bioaccumulation: The increase in concentration of a substance in an organism over time; i.e.; a general term for the accumulation of substances, such as pesticides, methylmercury, or other organic chemicals in an organism or part of an organism. Bioaccumulative substances tend to be fat soluble and not to be broken down by the organism.

Biodegradation: Decomposition or breakdown of a substance through the action of microorganisms (such as bacteria or fungi) or other natural physical processes (such as sunlight).

Biota: Plants and animals in an environment. Some of these plants and animals might be sources of food, clothing, or medicines for people.

Chemical compound: A distinct and pure substance formed by the union or two or more elements in definite proportion by weight.

Chemical load: The amount of harmful chemicals present in a person's body.

Chronic exposure: Repeated, continuous exposure to a hazardous substance over an extended period.

Collection programs: Process for people to turn in unwanted medications for proper disposal to improve public safety and ecosystem health.

Community stewardship: An ethic that embodies the responsibility of cooperative planning and management of resources; for organizations and communities to actively engage in the development and maintenance of its people, property, and financial assets. Relates to the care and/or management of resources for which one has no ownership.

Concentration: The amount of a substance present in a certain amount of soil, water, air, food, blood, hair, urine, breath, or any other media.

Contaminant: A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.

Contamination: Introduction of chemicals, toxic substances, wastes, or wastewater into water, air, and soil in a concentration that makes the medium unfit for its next intended use.

Controlled substance: A drug or chemical whose manufacture, possession, and use are regulated by a government.

Direct disposal of unwanted medicine: The disposal of pharmaceuticals directly to a sewage system or landfill by flushing, pouring down a sink, or discarding in the trash.

Discharge: The amount of water flowing through a river or aquifer.

Ecological harm: This occurs when an action results in habitat alteration and degradation or directly harms native animals, such as altering the endocrine system of species.

Ecosystem: The interacting system of a biological community (plants, animals) and its non-living environment.

Effluent: Wastewater--treated or untreated--that flows out of a treatment plant, sewer, or industrial outfall. Generally refers to wastes discharged into surface waters.

Environmental education: Organized efforts to teach how natural environments function and, particularly, how humans can interact sustainably with their environments.

Environmental hazard: Any situations or events that poses a threat to the surrounding environment.

Environmental health: Aggregate of conditions, forces, and substances in an environment that affect the physical and mental well being of the people living in it.

Environmental impact: Possible adverse effects caused by the release of substances in the environment, which may be due to industry as well as building or infrastructure projects.

Environmental persistence: The ability of a chemical substance to remain in an unchanged form. The longer a chemical persists, the higher the potential for human or environmental exposure.

Excretion: The elimination of waste material from the body.

Exposure pathway: The route a substance takes from its source to its end point. This includes how people or wildlife come into contact with or get exposed to the substance.

Feminization of fish: This occurs when compounds released into water systems affect how male fish develop, causing them to produce eggs.

Groundwater: The supply of freshwater under the earth’s surface in an aquifer or soil.

Habitat: Specific environment in which an organism lives, which provides food and shelter to sustain the organism.

Hazardous waste disposal: The act of safely discarding any solid, liquid, or gaseous waste materials that, if improperly managed or disposed of, may pose substantial hazards to human health and the environment.

Health risks: Any factor that increases the chance of disease or injury.

Identity theft: Obtaining a person's personal and financial information through criminal means.

Inert ingredient: Pesticide components such as solvents, carriers, dispersants, and surfactants, which are not active against target pests. Not all inert ingredients are innocuous.

Medicine take-back programs: A way for consumers to return unused or unwanted medications to a pharmacy or other collection location for proper disposal.

Monitor: To measure a characteristic, such as the population of aquatic life, using uniform methods to assess change over time.

Municipal sewage: Wastes (mostly liquid) originating from a community; may be composed of domestic wastewaters and/or industrial discharges.

Nonpoint source pollution: "Diffuse" toxic waste, generated from large areas with no particular point of contaminant origin, but rather from many places.

Pharmaceutical: Drug or medicine that is prepared or dispensed in pharmacies and used in medical treatment.

Point source pollution: A discharge of water contaminant to a stream or other body of water via an identifiable pipe, vent, or culvert.

Prescription drug: A drug that can be obtained only by means of a physician's prescription.

Resource Conservation and Recovery Act: A federal law controlling the management and disposal of solid and hazardous wastes that are produced by a wide variety of industries and sources. The law regulates hazardous pharmaceutical wastes produced by manufacturers and the health care industry.

Reverse distribution: Collecting damaged, outdated, or unsold goods and bringing them back to the supplier or manufacturer.

Sampling: The process of taking a portion of water for analysis or other testing.

Septic system: An onsite system designed to treat and dispose of domestic sewage. A typical septic system consists of a tank that receives waste from a residence or business and a system of tile lines or a pit for disposal of liquid effluent (sludge), which remains after decomposition of the solids by bacteria. The tank and must be pumped out periodically.

Service learning: A method of teaching, learning and reflecting that combines academic classroom curriculum with meaningful service throughout the community.

Toxic: Able to poison or harm an organism. Toxic substances can cause adverse health effects.

Unwanted medicine: Unused or out-of-date prescriptions or over-the-counter medications that are expired or no longer needed.

Wastewater treatment: Process that modifies wastewater characteristics such as biological oxygen demand (BOD), chemical oxygen demand (COD), pH, etc., to meet effluent standards.

Educator Feedback Form

Feedback Form

[Note: If you are one of the first 20 educators completing this form, you'll have the opportunity to receive a free classroom resource.]

What activities from this collection did you use in your classroom or after-school program or club?

Besides the lesson plans, what other sections were helpful to you, and why?

What additional information would you recommend that we include on our Illinois-Indiana Sea Grant Program Education Webpage addressing sensible disposal of unwanted medicine? (www.iiseagrant.org/education/gros_educ.html)

Do you plan to work with your students to create community stewardship projects?
____Yes ____No

If *yes*, what is/are the nature of the project(s)?

(Note that we will be pleased to post quality student projects on our Website www.iisgcp.org/education/safe_disposal_curriculum.html)

If *no*, what is the barrier limiting you from incorporating community stewardship as part of your instruction?

Can we add you to our educator contact list to receive further information on this and other education initiatives and professional development opportunities? If yes, please complete the information below.

Name:_____

School or Education Facility:_____

Grade Level:_____ Subject(s) taught:_____

Street/City/State:_____

Email address:_____

THANK YOU VERY MUCH FOR YOUR INPUT!

Mail to: Robin Goettel, Illinois-Indiana Sea Grant, University of Illinois,
390 NSRC, MC-635, 1101 W. Peabody Drive, Urbana, IL 61801, or Fax to: 217-333-8046