

CMI/MDEQ Environmental Education Curriculum Development

PROJECT OVERVIEW

Grant Awards

The Department of Environmental Quality, through the Clean Michigan Initiative (CMI), has awarded a series of grants for the development of an environmental curriculum for middle schools. The DEQ will utilize \$1 million of the CMI funds to develop and disseminate sound science-based supplementary environmental curriculum materials for use by Michigan educators. The grant awards are as follows:

- Western Upper Peninsula Center for Science, Mathematics, and Environmental Education is awarded \$188,302 to develop three curriculum units – Energy and Resources (\$62,329); Ecosystems (\$60,811); and Water Quality (\$65,162).
- Western Michigan University is awarded \$49,991 to develop a curriculum unit on Individuals' Impact on the Land.
- Grand Valley State University – Water Resources Institute is awarded \$55,070 to develop a curriculum on Air Quality.
- Central Michigan University is awarded \$487,449 to coordinate the entire project, including project coordination (\$119,931); project and curriculum evaluation through subcontracting to Science and Mathematics Program Improvement, Western Michigan University (\$45,000); and providing statewide training of curriculum trainers and at least 3,000 teachers (\$322,518).

The DEQ has worked in cooperation with the Michigan Department of Education and an advisory committee to develop the project and assess the proposals. “The Department of Education is thrilled to partner with the Department of Environmental Quality as we move forward together to develop a groundbreaking curriculum that will enlighten students and teachers on the importance of maintaining and improving the quality of our environment,” said Tom Watkins, Michigan Superintendent of Public Instruction, for the Michigan Department of Education.

Organizations funded through this process will produce a series of science-based curriculum units to increase students' knowledge of science principles associated with the environment. They will also develop a network of trained facilitators to present workshops that will help educators learn how to use the materials and integrate them into their curricula and grade levels. The target grade level for this project is middle school science; however, it is anticipated that the material will contain enough variety that educators will be able to use it with other grade levels.

“We are very pleased to move forward with this important education project,” said Governor Jennifer M. Granholm. “The end product of this project will offer Michigan teachers useful tools and training to help them integrate environmental concepts into their teaching curriculum.”

For more information on the curriculum project, contact Tom Occhipinti at (517) 373-2379.

Curriculum Development Phase

The Western U.P. Center for Science, Mathematics, and Environmental Education (Joan Chadde and Shawn Oppliger (co-PIs jchadde@mtu.edu and sopplige@ccisd.k12.mi.us) has designed a curriculum development process that brings together scientists, classroom teachers, environmental educators, and resource professionals from across upper and lower Michigan to serve on curriculum teams to guide the development of the water, ecosystems and energy/resources curriculum units. Center's units will also include the development of field investigations for students, as well as, an informative website on each unit topic. The Center is collaborating with Michigan Tech University faculty and students to design interactive web activities for some of the lessons. Each unit writer will invite input from many organizations and entities throughout the state, as well as, suggest links to existing materials. The Center also plans to conduct presentations at state and national education conferences in 2005 to publicize the

curriculum units. The Center's lead curriculum writers for the three units are: **ecosystems** (Pam Schmidt plschmid@mtu.edu), **water** (Joan Schumaker-Chadde jchadde@mtu.edu) and **energy/resources** (Heather Luoto hluoto@skynet.net).

Dr. Janet Vail (vailj@gvsu.edu) at Grand Valley State University is writing the **air quality curriculum unit**. Dr. Joe Stoltman (joseph.stoltman@wmich.edu) and Dr. Lisa DeChano (geoquack@hotmail.com) at Western Michigan University are writing the **impacts on the land curriculum unit**.

The 5-8 core lessons will be developed for each unit topic that relates that topic to Michigan and should form the foundation for understanding the essential concepts related to the topic. The themes of civic responsibility, environmental sustainability, and cooperative problem-solving will be woven into each curriculum unit. Those interested in learning more about specific units may contact the lead writers listed above.

Expert Content Review, Field Review and Teacher Field-Testing of Each Unit

Expert content review, field review, and pilot-testing of each unit will be supported by the coordination grant at Central Michigan University (P.I. Michael Libbee), *except* as indicated in specific unit proposals/contracts. Each lead writer, as well as Michael Libbee and Tom Occhipinti (MDEQ grant administrator) will assemble a list of **content experts** that will be invited to review the **2nd draft** of the unit in summer 2004. The five lead writers, Libbee, and Occhipinti will also generate a list of potential **field reviewers** (interested individuals and organizations from throughout the state) to review the **3rd draft** of the unit following the pilot-testing in Fall 2004.

Each curriculum unit will be field-tested in middle school classrooms during Fall 2004. Three 2-day training workshops for teacher field-testers will take place in summer 2004:

- Upper Peninsula (rural) - July 27-28
- Kalamazoo area (suburban) - August 2-3
- Detroit (urban) - August 4-5

Those interested in reviewing one or more of the curriculum units, or participating in the classroom teacher field-testing, are encouraged to contact the , Mike Libbee Michael.Libbee@cmich.edu or , Thomas Occhipinti OCCHIPIT@michigan.gov

The curriculum units are scheduled for completion March 1, 2005. Publication of the units will take place during Spring 2005.

Teacher Professional Development & Statewide Dissemination

Central Michigan University (P.I. Michael Libbee) received the teacher-training and dissemination grant. Approximately 3,000 teachers will be trained statewide through a '*train the trainer*' format. Math/Science Center staff and others will be trained in the use of the five curriculum units at a 5-day summer training session planned for summer 2005. These staff will then train teachers in their local areas. Approximately 1600 copies of *each* unit will be printed and distributed throughout the state of Michigan.

Michigan Environmental Education Curriculum Unit Topics for Middle School Students

(Information below taken from MDEQ Grant Application Package document November 2002 that was drafted by the “Michigan Dept. of Education and an Advisory Committee comprised of individuals with technical and practical expertise in developing and using a science-based environmental curriculum.”)

Unit Topic	Environmental Focus	Suggested Scientific or Ecological Concepts	Grade & Subject
1. Ecosystem	Changes in Ecological Systems	<ul style="list-style-type: none"> ➤ Population & Community ➤ Habitat ➤ Biodiversity ➤ Exotic species ➤ Food chain/web ➤ Nutrient cycle ➤ Biological amplification 	Gr. 4-6 (formerly Gr. 5-8) Science Social Studies/Geography
2. Individuals Impacts on the Land	Impacts	<ul style="list-style-type: none"> ➤ Point & non-point source pollution ➤ Watersheds ➤ Brownfield redevelopmt. ➤ Succession 	Gr. 4-6 (formerly Gr. 4-5) Science Social Studies
3. Water Quality	Surface and Groundwater	<ul style="list-style-type: none"> ➤ Water cycle ➤ Water quality monitoring ➤ Groundwater processes ➤ Degradability ➤ Toxicity ➤ Chemical pollutants ➤ Watersheds 	Gr. 6-8 Science Will add Social Studies
4. Air Quality	Trans-boundary Air Pollution and Great Lakes Climate Change	<ul style="list-style-type: none"> ➤ Airshed ➤ Criteria pollutants ➤ Chemical reactions ➤ Ozone ➤ Air quality monitoring ➤ Acid precipitation 	Gr. 6-9 (formerly Gr. 6-8) Science
5. Energy & Resources*	Pollution Prevention And Energy Conservation	<ul style="list-style-type: none"> ➤ Matter & energy ➤ Renewable & non-renewable energy ➤ Carbon-oxygen cycle ➤ Hazardous & non-hazardous wastes 	Gr. 6-9 (formerly Gr. 6-8) Science Will add Social Studies

Each curriculum unit must provide opportunities for students to:

- Understand and accurately apply appropriate science concepts, principles, laws and theories.
- Use and interpret data.
- Examine Michigan issues in regional, national, or global context.
- Write an essay or make a presentation.
- Discuss how individual decisions have an impact on the environment.
- Engage in hands-on activities.
- Participate in web-based inquiry and activities.

Each curriculum unit must include the following deliverables:

- 5-8 lesson plans per unit.
- Unit objectives---what the student will learn (skills and knowledge).
- Correlate to Michigan curriculum frameworks.
- Poster on each major topic.
- Student resources, including black-line readings, graphics, and data (reproducible).
- Classroom set of resources---full-color maps, diagrams, readings.
- Teacher resources including overhead transparencies, masters, etc.
- List of additional resources, materials, activities related to each topic or theme.
- MEAP-like pre-test and post-test assessment instruments.

- Glossary
 - Feedback and evaluation form for the purpose of updating future editions.
- Western Upper Peninsula Center for Science, Mathematics and Environmental Education

Environmental Education Curriculum Development Teams (2/16/04)

A) Ecosystems (Gr. 4-6)

1. Dr. Nancy Auer (Dept. of Biological Sciences, MTU)
2. Dale Elshoff (Project Wild state coordinator)
3. Susan Erhardt (Greening of Detroit)
4. Dr. David Flaspohler (School of Forest Resources and Environmental Sciences, Michigan Tech)
5. Dave Kronk (Pictured Rocks National Lakeshore)
6. Kristan Small (Gr. 4 teacher, Gunnison Public Schools, Lansing)
7. Helen Stenvig (Gr. 6 science teacher, L'Anse Middle School)
8. Kathy Winnett-Murray (Biological Sciences, Hope College)

Lead Writer: Pam Schmidt - K-8 Michigan teacher certification, B.A. Biology; M.A. Education; 5 years environmental education experience (Detroit, Ecuador, Mexico, Michigan)

B) Water Quality (Gr. 6-8)

1. Dr. Marty Auer (Civil and Environmental Engineering, MTU)
2. Heather Bradway (Gr. 7-8 science teacher, Hancock Middle School)
3. Wil Cwikel (Director, Tipp of the Mitt Watershed Council, Petoskey)
4. Dr. Shari Dann (Dept. of Fisheries and Wildlife, Michigan State University)
5. Margaret Ehiemere (Gr. 8 science teacher, Ferndale Middle School & Past President, Metropolitan Detroit Science Teachers Association)
6. Amy Keranen (Michigan Dept. of Environmental Quality)
7. Dr. Alex Mayer (Geological Engineering and Sciences, MTU)
8. Dr. Janet Vail (Michigan Project WET coordinator, Grand Valley State University)

Advisors:

Sharon Baker (Michigan Department of Surface Water Quality, Lansing)
 Heather Van Dem Berg (Education Director, Clinton River Watershed Council)
 Shawn Keenan (Water Resources Coordinator, City of Auburn Hills, MI)

Lead Writer: Joan Chadde - secondary science certification: General Science, Biology; B.S. Natural Resources; M.S. Water Resources; 8 yrs Montana Dept of Natural Resources, 15 yrs environmental education experience (northern Michigan, Wyoming, Montana, Yosemite NP, Michigan)

C) Energy and Resources (Gr. 6-9)

1. Tom Abramson (Northwoods Math Science and Technology Center, Escanaba)
2. Kristine Bradof (GEM Center for Science and Environmental Outreach, MTU)
3. Dr. Hugh Gorman (Social Sciences, MTU) - *sabbatical*
4. Aileen Gow (Director, Great Lakes Renewable Energy Association)
5. Tom Martin (Director, Office of Policy and Legislative Affairs)
6. Linda Rulison (Gr. 7-8 social studies teacher, Hancock Middle School)
7. Karen Schmitt (Gr. 9 physical science teacher, Marquette High School)
8. Dr. Debra Rowe (Oakland Community College)

Advisors:

Dr. Jim Mihelcic (Civil and Environmental Engineering, MTU) – *sabbatical*
 Pat Hudson (Residential Energy Programs – State Energy Office, Lansing)
 Keith Etheridge (Energy Consultant)

Lead Writer: Heather Luoto - B.S. Biological Sciences; M.S. Applied Science Education; Gr. 7-12 secondary teacher

certification: Biology, General /Physical Science