

Michigan Tech

and

K-12 Education

A Status Report

October, 2009

**Compiled by
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Division of Teacher Education**

In 2007, the National Academy of Sciences published

RISING ABOVE THE GATHERING STORM

*Energizing and
Employing America
for a Brighter
Economic Future*

<http://www.nap.edu/catalog/11463.html>

The first recommendation focused on actions in K-12 education (*10,000 Teachers, 10 Million Minds*): “Increase America’s talent pool by vastly improving K–12 science and mathematics education”. Specific goals and proposals include:

- to attract 10,000 of America’s brightest students to the teaching profession every year, each of whom can have an impact on 1,000 students over the course of their careers;

- to strengthen the skills of 250,000 teachers through training and education programs at summer institutes and in master’s programs;

- to foster high-quality teaching with world-class curricula, standards, and assessments of student learning;

- to create opportunities and incentives for middle school and high school students to pursue advanced work in science and mathematics.

During the July 2009 Board of Control retreat, the Academic Affairs Committee was asking me how Michigan Tech is involved in K-12 education, both with regard to improving K-12 but also as a means to recruit motivated high school students to Tech. I could give some examples, but I knew we did more. I was not aware of how much more we actually do. This is the report of Michigan Tech and K-12 education.

I would like to express my sincere thanks to Dr. Brad Baltensperger, chair of the Department of Cognitive and Learning Sciences which is home to our Division of Teacher Education. Brad prepared this status report. My thanks and compliments go to him and all the faculty and staff who have long been engaged in these efforts.

Max Seel
Provost and Vice President for Academic Affairs (interim)

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K-12 Connections at Michigan Tech

This report is a summary of recent and current collaborations between Michigan Tech and K-12 students and teachers. It includes activities funded by the National Science Foundation, the Michigan Department of Education, and other agencies and foundations; degree programs related to K-12 education; summer professional development courses for K-12 teachers; projects related to curriculum and curriculum reform; and projects involving K-12 students. Because of overlap among these categories, some programs appear in more than one location.

The scope and range of Michigan Tech's involvement in K-12 education is surprising, even to those faculty and staff who have long been engaged in these efforts. This report does not include the numerous activities of individual faculty, staff, students and student organizations that work with area teachers and classes to provide workshops, demonstrations, tutoring, coaching, and other forms of support.

1. Key Resources for Michigan Tech Involvement with K-12 Education

Division of Teacher Education

Housed in the Department of Cognitive and Learning Sciences, the Teacher Education program leads to secondary school certification (grades 6-12) in Michigan Schools. It also offers the M. S. degree in Applied Science Education. The Division works with all departments on campus to coordinate curricula that provide students with strong content knowledge and core instructional skills. The Teacher Education program meets regularly with area school administrators and its Teacher Education Advisory Council (teacher representatives of all local schools) to discuss the needs of secondary schools related to teacher preparation and professional development. It also partners with the Upper Peninsula Center for Education Development (UPCED) a region-wide consortium of universities and Intermediate School Districts.

Division Chair: Brad Baltensperger
<http://ed.mtu.edu/index.html>

Teacher Professional Development Center (TPDC)

The Center, within the Department of Cognitive and Learning Sciences, works with academic and administrative units across campus to initiate, coordinate, and support teacher professional development programs. Services include promotion and marketing, logistical coordination, financial management of funded projects, assistance with program assessment and reporting to funding agencies. The effect is to enhance Michigan Tech's visibility by building recognition for teacher PD programs and to strengthen the university's connections to K-12 schools, administrators and teachers in the Midwest.

Teacher Professional Development Coordinator: Lori Witting
<http://ed.mtu.edu/pd.html>

Center for Technology, Research and Assessment (CETRA)

CETRA is dedicated to educational improvement through linkages between cutting-edge scientific and engineering research to K-12 classroom teachers. CETRA provides program and project assessment and evaluation; designs instructional programs in mathematics, science, technology and social science based on educational research; develops technology-rich instruction; and provides support for professional development of STEM teachers.

Director: Kedmon Hungwe
<http://ed.mtu.edu/cetra/index.html>

Center for Science & Environmental Outreach

The Center, housed in the Department of Civil and Environmental Engineering, engages students, faculty and staff from many departments in offering educational programs for K-12 students, teachers, parents, and community members. These hands-on educational programs serve both local schools and communities, as well as statewide, regional and national K-12 educators. The Center is the Michigan Tech component of the Western Upper Peninsula Center for Science, Mathematics, and Environmental Education (WUPCSMEE).

Director: Neil Hutzler

Education Programs Coordinator: Joan Chadde

<http://cseo.mtu.edu/>

Western Upper Peninsula Center for Science, Mathematics and Environmental Education (WUPCSMEE)

This partnership of the Copper Country ISD, the Gogebic-Ontonagon ISD, and Michigan Tech serves 19 school districts in the five western UP counties. The Center is a member of the Michigan Mathematics and Science Centers Network. Its programs include after-school classes, field trips and evening programs for students and their parents, offers teacher professional development institutes and workshops, student competitions and science fairs, and a resource clearinghouse for teachers.

Director: Shawn Oppliger

K-12 Education & Outreach Program Coordinator: Joan Chadde

<http://wupcenter.mtu.edu/>

Youth Programs Outreach and Engagement

Michigan Tech Youth Programs operates a wide variety of programs for pre-college students, emphasizing career and adventure experiences to help prepare youth for the post-secondary endeavors. With a focus on engaging and exciting K-12 students in the fields of Science, Technology, Engineering, and Mathematics (STEM), YP's hallmark programs include Summer Youth Programs (SYP), Women in Engineering (WIE), and Explorations in Engineering (now Engineering Scholars Program). Academic year programming includes the new "STEM Road Shows," which bring discovery-based learning activities to schools and major STEM-related events.

Director: Stephen Patchin

<http://youthprograms.mtu.edu/>

2. Institutional Partnerships

Michigan Tech is directly involved in several ongoing collaborations that support K12 education.

Detroit Area Pre-College Engineering Program (DAPCEP)

DAPCEP's goal is to increase the number of historically under-represented minorities who are prepared to pursue careers in STEM-related fields. DAPCEP offers a number of in-school, Saturday, and Summer programs in the Detroit area, in collaboration with Michigan universities. Over 4200 students are served by DAPCEP's academic programs. Chris S. Anderson, Special Assistant to the President for Institutional Diversity, serves on DAPCEP's Board of Directors.

<http://www.dapcep.org>

Grand Rapids Area Pre-College Engineering Program (GRAPCEP)

GRAPCEP is a regional pre-college program designed to meet the need for well-trained professionals in STEM fields. It forms partnerships with area schools, business, and universities to enhance the teaching and learning of mathematics and science in target schools. GRAPCEP offers advanced courses in the Grand Rapids Public Schools to approximately 250 students in grades 9-12. Chris S. Anderson, Special Assistant to the President for Institutional Diversity, serves on DAPCEP's Board of Directors.

<http://www.grapcep.com>

Upper Peninsula Center for Educational Development (UPCED)

UPCED is a consortium of the three universities and seven Intermediate School Districts of Michigan's Upper Peninsula. Its role is to provide leadership to school districts in the region, technical assistance, resource development and coordination, and professional development for teachers and staff. Brad Baltensperger, Chair of the Department of Cognitive and Learning Sciences, is Michigan Tech's representative on the UPCED Board.

<http://webb.nmu.edu/Centers/upced/index.shtml>

3. Major Externally-Funded Projects

A. Current Projects

During the 2009-10 academic year, Michigan Tech faculty and staff are working on over 20 K-12-related education projects that have been funded by outside agencies. The total amount of education-related funding exceeds \$12 million.

“Michigan Teacher Excellence Program (MiTEP): A Model for Improving Earth Science Education Nationwide”

PI: William Rose, Geological & Mining Engineering & Sciences

Co-PIs: Brad Baltensperger, Jacqueline Huntoon, Chris S. Anderson, Kedmon Hungwe

Other Partners: Grand Rapids Public Schools; Grand Rapids Area Pre-College Engineering Program; American Geological Institute; National Park Service
\$3.8 Million, Math-Science Partnerships, NSF

2008-2013

This partnership with GRPS provides professional development for science teachers to improve their content knowledge, educational leadership skills, and ability to engage K12 students in meaningful inquiry-based science learning. Approximately 100 science teachers from Grand Rapids and other districts will participate in summer courses, academic year workshops, and research projects. The result will be improved science teaching and learning in K12 schools.

<http://mitep.mspnet.org/>

“Michigan Tech Noyce Teacher Scholarship Program”

PI: Brad Baltensperger, Cognitive & Learning Sciences

Co-PIs: Chris S. Anderson, Sarah Green, John Jaszczak, Shari Stockero

Other Partners: Saginaw Public Schools, Grand Rapids Public Schools, Delta College, Grand Rapids Community College, Saginaw Valley State University, Grand Valley State University

\$900,000, Noyce Scholars Program, NSF

2009-2014

This program will support 36 STEM students and professionals to become certified to teach science or mathematics in secondary schools. Noyce Scholars will participate in a summer workshop and a set of seminars, and will complete an intensive field experience and complete their student teaching in a partner school. Once hired as K-12 teachers, they will also receive mentoring from Michigan Tech and partner university faculty to insure that they have a successful introduction to the teaching profession.

<http://noycescholars.mtu.edu>

“GlobalWatershed: Integrating Rural and Global Perspectives with Research and Technological Advances”

PI: Alex Mayer, Civil & Environmental Engineering

Co-PIs: Nancy Auer, Linda Nagel, Brad Baltensperger, Shawn Oppliger

Other Partners: Western Upper Peninsula Center for Science, Mathematics, and Environmental Education (WUPSCMEE); Colegio Munoz, Sonora, Mexico;

Western Michigan University

\$2.5 Million, GK-12, NSF

2009-2014

In project GlobalWatershed, graduate Fellows will conduct research in watershed science topics, while working with middle/high school teachers to create lesson plans that transfer this knowledge to their students. The goals are to (a) expand traditional STEM graduate student training to improve teaching and communication skills and to gain a greater appreciation of the scientific context of their research, and (b) to enrich STEM learning and instruction in local K12 schools and a Sonora, Mexico K12 school system, specifically by translating state-of-the-art watershed research to the K12 level.

“Educators’ Professional Development Institute Series (EPDIS) – Physical Sciences – Physics & Chemistry”

PI: John Irwin, School of Technology

Co-PIs: Kedmon Hungwe, Michael Meyer, Paul Charlesworth, Doug Oppliger

Other Partners: Public Schools of Calumet, Laurium & Keweenaw; Saginaw; Fenton; Hemlock

\$197,000, Improving Teacher Quality (ITQ) grant, Michigan Dept of Education

2009-2010

This project will expand teachers’ conceptual understanding and pedagogy in the physical sciences. The project will target grade 5-12 teachers, and will focus on the application of classroom inquiry and technology. Teachers will develop and practice lessons using technologies and pedagogical techniques, engage in “Lesson Study,” a method of improving instruction by examining the effectiveness of lessons in engaging students in meaningful learning, and enroll in an online course, “Science Inquiry, and Assessment.”

“Increasing Expertise in Earth Science Education”

PI: Brad Baltensperger, Cognitive & Learning Sciences

Co-PIs: Chris S. Anderson; Wayne Pennington

\$160,000, Geoscience, NSF

2006-2010

Pilot project to provide Earth science and science education courses to secondary school science teachers, leading to Earth Science teacher certification and the M.S. in Applied Science Education with a concentration in Earth System Science. The program supports the development of two new online geology courses and a new field course on Natural Hazards and Human Impacts.

<http://www.ed.mtu.edu/msase/essrequire.html>

“Family Engineering for Parents and Elementary-Aged Children”

PI: Neil Hutzler, Civil & Environmental Engineering

Co-PIs: Joan Chadde

Other Partners: Foundation for Family Science, Portland OR; American Society for Engineering Education, Washington DC, Christine Cunningham, Museum of Science, Boston MA

\$1.7 Million, Informal Science Education, NSF

2008- 2011

Family Engineering is a program to actively engage parents and their children in fun, hands-on engineering activities and events. Modeled after the popular Family Science and Family Math programs, Family Engineering will introduce parents and elementary-aged children to the exciting world of engineering through informal engineering experiences. A key product will be a Family Engineering Book to be used by families, schools, and organizations.

www.familyengineering.org

“Pursuing Underrepresented Girls’ Involvement in Research, Science and Energy Production (PURSE)”

PI: Chris S. Anderson, Institutional Diversity

Michigan Tech Co-PIs: Leonard Bohmann, Shalini Suryanarayana, Cody Kangas

Other Partners: Lawrence Tech, University of Michigan-Dearborn; Oakland

University; Dow Corning; DTE; Consumers Power; General Motors; Detroit Area Pre-College Engineering Program (DAPCEP)

\$474,000, Michigan Tech subaward, ITEST, NSF (full award is \$1.2 Million)

The goal of this collaborative project is to educate students about the opportunities available in the area of energy and power generation. Approximately 240 9th-grade female participants will investigate fuel cells and batteries; wind and solar energy; and petroleum nuclear and power systems.

“Michigan Tech Nanotechnology Enterprise”

PI: John A. Jaszczak, Physics

Co-PIs: Nasser Alaraje, Paul Bergstrom, Mary Raber, Michael Bennett (Adjunct), Frank Underdown (Adjunct)

Other Partners: Keweenaw Nanoscience Center

\$200,000, Nanotechnology Undergraduate Education in Engineering, NSF

2008-2010

Nanotech Innovations Enterprise (NIE) is a vehicle for undergraduate students to experience the development and operation of a commercial enterprise related to nanotechnology products and services, and to actively address industry's needs for creative engineers with strong technical, communication, interpersonal, leadership, entrepreneurship, and business skills. Outreach includes workshops and presentations for high school teachers; introductory presentations, demonstrations, and hands-on workshops to local high school students; and summer EIE and WIE programs.

<http://nano.mtu.edu/ni>

“High School Enterprise”

PI: Jean Kampe, Engineering Fundamentals

Co-PIs: Doug Oppliger, Robert Warrington; John Jaszczak; Mary Raber; Susan Amato-Henderson

Other Partners: Ford Motor Company Foundation; AT&T; IBM

\$1.5 Million, ITEST (Innovative Technology Experiences for Students & Teachers), NSF

2008-2012

This program supports the development of 8 high school enterprise teams. Current projects are underway at Arthur Hill HS (Saginaw); Hancock HS; Central HS (Traverse City); Utica HS; Tech HS (Atlanta, GA); and Manuela Toro HS (Caguas, Puerto Rico). Teams led by a teacher/coach partner with university students and industry mentors to help develop technical, business, interpersonal, entrepreneurial, and applied workforce skills.

<http://itestlrc.edc.org/high-school-enterprise>

<http://www.enterprise.mtu.edu/highschool/>

“High School Enterprise”

PI: Doug Oppliger, Engineering Fundamentals

Co-PIs: Robt. Warrington; Mary Raber

\$100,000, IEECI (Innovations in Engineering Education, Curriculum and Infrastructure), NSF

2009-2010

This funding helped initiate the High School Enterprise Program in 5 schools during the 2008-09 school year.

"Collaborative LTREB Proposal: Long-Term Ecosystem Response to Chronic Atmospheric Nitrate Deposition"

PI: Andrew Burton, School of Forest Resources and Environmental Science

\$152,000, NSF

2008-2013

This project funds ecosystem research and includes a 5-day Global Change Teacher Institute offered each summer at Michigan Tech (see Section 3, below). The teacher PD activities have been funded by previous grants to Drs. Burton, Pregitzer, Lilleskov, and Zak since 2003.

“Rethinking Elementary Mathematics Instruction (REMI): From Doing to Understanding”

PI: Shawn Oppliger, WUPCSMEE

Consultants: Shari Stockero, Cognitive and Learning Sciences, Ann Humes, Mathematical Sciences

Other Partners: 19 western UP school districts

\$380,000, Mathematics and Science Partnership (MSP), Michigan Dept of Education
2008-2011

This project helps grade K-7 teachers carefully listen to and make sense of students' mathematical thinking in order to build on it during instruction. To do so, the project focuses on deepening teachers' own understanding of elementary mathematics, pushing

teachers to consider what it means to understand elementary mathematics topics, and developing strategies that teachers can use in their own classroom to make mathematics meaningful for students.

“Geology of Utah’s National Parks”

PI: Jacqueline Huntoon, Graduate School and Geological & Mining Engineering & Sciences

Co-PIs: various, including Chris Wojick; Brad Baltensperger, William Everham
Funding from Michigan Space Grant Consortium through multiple grants, 2000-09.

This project supports in-service and pre-service teachers participating in a two-week summer course designed to benefit participants with little or no Earth science background. The course uses the spectacular geologic setting of southeastern Utah to teach basic geology within an Earth system science framework.

<http://www.ed.mtu.edu/pd/utahgeology.html>

“National Summer Transportation Institute”

PI: Steve Patchin, Youth Programs

Co-PI: Cody Kangas

\$57,000, Federal Highway Administration
2009

Michigan Tech is the sole host school of this program in Michigan. In partnership with Michigan Tech’s University Transportation Center for Materials in Sustainable Transportation, NSTI hosted 30 students from diverse backgrounds for two weeks. The purpose of the program is to use innovative learning methods to expose diverse students to careers involved in all modes of transportation.

<http://youthprograms.mtu.edu/docs/Transportation2009.pdf>

“Outdoor Science Investigations Field Trips”

PI: Joan Chadde, Center for Science & Environmental Outreach

\$125,000, Kinship Foundation

2007-2011

Engages more than 3,000 K-6 students each year from 24 schools in the Copper Country ISD and Gogebic-Ontonagon ISD in conducting hands-on investigations in forests, fields, streams and wetlands to stimulate and awaken their scientific interest and enjoyment of the natural world.

“Great Lakes Maritime Transportation Institute”

PI: Joan Chadde, Center for Science & Environmental Outreach

\$160,000, Great Lakes Maritime Transportation Institute

2006-2011

Principal activities include a Great Lakes Maritime Teacher Institute in Toledo (summer, 2010), teacher workshops at the Great Lakes Shipwreck Museum in Paradise, MI, and at the Michigan State Historical Museum in Lansing, and development of teaching materials for distribution to museums and schools.

http://wupcenter.mtu.edu/education/great_lakes_maritime/index.htm

“Renewable Energy from Forest Resources”

PI: Ann MacLean, School of Forest Resources & Environmental Science

Co-PIs: David Shonnard, Chris Webster, David Flaspohler, John Sutherland, Kathy Halvorsen

\$1.7 Million, MUSES – NSF; \$128,000 for education outreach

2006-2010

K-12 project activities include an annual 5-day summer teacher institute, day-long field trips for high school classes to learn about biofuels research from Michigan Tech scientists, interactive web modules, and conference presentations to expand citizen awareness of the consequences of unsustainable decisions and to generate public willingness to make sustainable decisions.

“Lake Superior Stewardship Initiative”

PI: Joan Chadde, Center for Science & Environmental Outreach

Co-PI: Lloyd Wescoat

\$136,000, Copper Country ISD through grant from Great Lakes Fishery Trust

2008-2011

This is a project to prepare K-12 students to become knowledgeable citizens engaged in activities that enhance their school, community, and the Lake Superior watershed through teacher professional development, fostering school-community partnerships, and engaging in projects that contribute to the health of the Great Lakes.

<http://lakesuperiorstewardship.org/>

“Bringing Environmental Education to Urban Schools in Detroit and Pontiac”

PI: Joan Chadde, Center for Science & Environmental Outreach

\$10,000, Michigan Space Grant Consortium

2009-2010

This project will bring hands-on environmental education to urban school districts by introducing 24 teachers in Detroit and Pontiac to earth systems science. It provides mentors and professional development workshops, as well as attendance for teachers at the Michigan Alliance for Environmental & Outdoor Education conference.

“Bimetallic Overlayer Catalysts for Sustainable Fuel Production from Lactose”

PI: Joseph Holles, Chemical Engineering

Other Partners: Joan Chadde, Center for Science & Environmental Outreach

\$351,000 (education component = \$32,000), NSF

2009-2011

The education component of this project will develop a science curriculum module and will support classroom visits to middle schools by graduate students to discuss sustainability and promote interest in engineering. The theme of the Outreach Program will be “Environmental Protection and Sustainable Energy from Agricultural Waste.

“Forest Ecology Summer Teacher Institute”

PI: Chris Hohnholt, School of Forest Resources & Environmental Science

CoPI: Joan Chadde

\$5,000, Michigan Forest Foundation

2009

This five-day Institute prepares grades 4-12 teachers to engage their middle and high school students in a real-world study of the effects of global change on ecosystems

http://wupcenter.mtu.edu/education/Forest_Institute/

B. Recent Projects

“Educators’ Professional Development Institute Series (EPDIS) – Developing Algebraic Thinking”

PI: Shari Stockero, Cognitive & Learning Sciences

Co-PIs: Brad Baltensperger, Chris S. Anderson

\$184,000, Improving Teacher Quality (ITQ) grant, Michigan Dept of Education

2006-2008

This project focused on helping middle school mathematics teachers develop algebraic habits of mind that could then be built on in their high school courses. Teachers deepened their own mathematical knowledge and reflected on their teaching practices.

“Educators’ Professional Development Institute Series (EPDIS) – Statistics and Probability”

PI: Chris S. Anderson, Institutional Diversity

Co-PIs: Brad Baltensperger, Shari Stockero

\$184,000, Improving Teacher Quality (ITQ) grant, Michigan Dept of Education

2006-2008

This project combined online courses and on-campus summer institutes to help high school mathematics teachers deepen their own knowledge of statistics and probability concepts and to consider how they might teach these ideas in a meaningful way to high school students.

“Teachers Inquiring into Practice (TIIP) – Teaching Algebra to All”

PI: Shari Stockero, Cognitive & Learning Sciences

Co-PIs: Brad Baltensperger, Chris S. Anderson

\$206,000, Improving Teacher Quality (ITQ) grant, Michigan Dept of Education

2007-2009

This project engaged high school mathematics teachers in inquiry into their own practice in order to develop student-centered instructional approaches. Participants completed a small-scale research project in their classrooms and presented the results at a state mathematics conference.

“Geoscience PrEP: Seeding Diverse Interest in Geoscience Using Apprentice Enterprises for Watershed Protection”

PI: John Gierke, Geological & Mining Engineering & Sciences

Co-PIs: John Lehman, Pete Larsen, Karla Korpela, Mary Raber

\$98,000, NSF (plus Michigan Space Grant Consortium)

2005-2009

The project goal was to develop pre-college enterprises at urban, minority-serving institutions. High school students participated in a one-week summer program at Michigan Tech and then were mentored by undergraduate members of the Aqua Terra Tech Enterprise in regular visits (once per semester) to their schools during the academic year.

"A Nanosatellite Technology Demonstrator for Earth Remote Sensing"

PI: Lyon B. King, ME-EM

Other Partners: Calumet High School, NASA-Goddard Spaceflight Center

\$100,000, U.S. Air Force Office of Scientific Research

2003 - 2005

MTU partnered with a local high school to design and build a small 50-kg, 50-cm spacecraft. MTU students, acting as mentors, advised the high-school pre-engineering classes. The high-school students designed actual spacecraft components using computer-aided design tools, then fabricated the components in the school industrial arts facility.

"A Nanosatellite for Space Situational Awareness"

PI: Lyon B. King, ME-EM

Other Partners: Calumet High School, Houghton Elementary School, Raytheon

Missile Systems, SAIC, ABSL Power

\$110,000, U.S. Air Force Office of Scientific Research

2007 - 2009

Summary of Outreach: MTU students conducted educational outreach activities on the topic of space. Elementary school students built and launched model rockets. High school students participated in a three-day workshop where they designed and built water rockets, launched the rockets, and analyzed the post-flight data.

Michigan Environmental Education Curriculum Support

PI: Joan Chadde

CoPI: Pam Schmidt

\$61,000 Copper Country ISD grant from Michigan Dept. of Environmental Quality

2003-2006

The development of two units (9-10 lessons each) on Ecosystems & Biodiversity for grades 4-6 and Water Quality for grades 6-8, plus 18 interactive Tech Alive web modules on Michigan ecosystems, water resources, and energy resources:

http://techalive.mtu.edu/meec_index.htm

http://wupcenter.mtu.edu/education/ecosystem_curriculum_units/index.html

"World History and Geography: Educators' Professional Development Institute Series"

PI: Brad Baltensperger, Cognitive & Learning Sciences

Co-PIs: Terry Reynolds; Heather Simpson

Other Partners: Copper Country ISD

\$215,000, Michigan Department of Education, Improving Teacher Quality Grant

2007-2009

Project helped prepare high school teachers from across the UP to teach the new required World History and Geography course and to improve student knowledge in social studies.

Teaching American History: Building Bridges”

PI: Brad Baltensperger, Cognitive & Learning Sciences

\$8300, Copper Country ISD

2005-2006

Project supported an intensive summer course for teachers on how national, state, and local political issues affected life and history in the Upper Peninsula and the State of Michigan during the 19th and 20th centuries.

“Limnological Research in Lake Superior for Middle/High School Students & Teachers and Communities”

PI: Joan Chadde, Center for Science & Environmental Outreach

Other Partners: Department of Biological Sciences, Department of Chemistry, Michigan Tech Remote Sensing Institute, Wege Foundation

\$10,000, Michigan Space Grant Consortium

2006-08

Supports scientific excursions aboard Michigan Tech’s research vessel (R/V) Agassiz on Lake Superior and connecting waters for community members and middle/high school students and teachers in the Upper Peninsula. Excursions demonstrate how Great Lakes research is conducted, the equipment used, and what research tells us about the health of the Great Lakes.

“Bringing Engineering to Rural, Low Income & Native American Elementary Students & Families in the UP”

PI: Joan Chadde, Center for Science & Environmental Outreach

\$9600, Michigan Space Grant Consortium

2008-09

This grant supported three Family Engineering night programs for elementary students and families in Hannahville, Sault Ste Marie, and L’Anse, where there are significant numbers of Native American students.

C. Major Projects Under Review

“ENERGY in Discovery: Enhancing Energy Research and Guiding Youth in Discovery”

PI: Jeff Naber, ME-EM

Co-PIs: Bruce Mork, Brad Baltensperger, Chris S. Anderson, Jason Lee (DAPCEP)

\$2.9 Million, GK-12, NSF

“Youth in Engineering and Science (YES!) Expo Road Show”

PI: Leonard Bohmann, College of Engineering

Co-PIs: Steve Patchin, Michele Miller, John Jaszczak, Brad Baltensperger

\$3 Million, Informal Science Education, NSF

“Research Experiences for Teachers –Wood to Wheels (to be submitted in November)”

PI: Dave Shonnard

Co-PIs: Brad Baltensperger, Jeff Naber, Shekhar Joshi, and Chris S. Anderson

\$500,000, Research Experiences for Teachers, NSF

4. Academic Degree Programs

Secondary Teacher Certification

Michigan Tech's Division of Teacher Education, in collaboration with departments across campus, offers teacher certification in eleven fields. Since 1971, over 900 students have received certification and currently teach in at least 28 states. The university does not offer bachelor's degrees in education; all teacher education students earn a degree in an academic field, along with certification to teach grades 6-12. Certification is currently available in:

Biology	Economics	Physics
Chemistry	English	Social Studies
Computer Science	Integrated Science	Technology & Design
Earth Science	Mathematics	

Michigan Tech's teacher education program (within the Department of Cognitive & Learning Sciences) was recently rated "Exemplary" by the State Department of Education, based on graduates' knowledge of subject matter, evaluations by students and supervisors, focus on producing science and mathematics teachers, and program completion rate.

<http://ed.mtu.edu/stu.html>

The recently initiated Michigan Tech Noyce Scholars Program provides competitive scholarships to science, mathematics, and engineering students (\$10,000 per year for 2 years) and to STEM (science, technology, engineering, and mathematics) professionals (\$18,000 for one year), leading to teacher certification in science and/or mathematics (see further information in section 3A of this report).

M.S. Degree in Applied Science Education

Since 2001, Michigan Tech has offered the MS-ASE degree to practicing K-12 teachers. Initiated by a multi-year grant from NSF (CETP, PI: Sheryl Sorby), the program is designed to provide teachers with deep content knowledge, an understanding of science and engineering applications, and a commitment to inquiry-based, research-driven science teaching and learning. The core of the program includes:

- 12 credits of summer intensive applied science courses
- 6 credits of online science education courses during the academic year
- applied science electives
- an internship, either in industry or in research
- a research report

The program is housed in the Department of Cognitive & Learning Sciences. At this point, 22 teachers have received the M. S. degree; 45 teachers are currently enrolled in the program. They include individuals from California, Hawaii, Ontario, Florida, and Massachusetts, as well as Minnesota, Wisconsin, and Michigan.

<http://ed.mtu.edu/msase/gradintro.html>

Earth System Science

The Geosciences grant from NSF (“Increasing Expertise in Earth Science Education”) enabled the department to develop an Earth System Science track within the MS-ASE. A pilot cohort of 6 teachers, selected in a nationwide competition, enrolled in two new online Earth System Science courses, a new field course, and additional core courses that lead them to a master’s degree, as well as certification to teach Earth and Space Science. The program components include:

- 4 credits of summer intensive applied science courses
- 8 credits of online Earth System Science courses
- 6 credits of online science education courses during the academic year
- 7 credits of field courses in Earth System Science
- applied science electives
- a research report

Like the original MS-ASE degree, this program was developed around Michigan Curriculum Frameworks and Benchmarks, as well as national science standards. It emphasizes inquiry-based learning and using research to inform teaching practice.

<http://ed.mtu.edu/msase/essrequire.html>

Peace Corps-Master’s International Program in Science Education

Michigan Tech offers the only PC-MI in science education in the nation. Participants in the program are individuals holding B.S. degrees in engineering, science, or mathematics who want to serve in the Peace Corps and become certified to teach science or math in grades 6-12. During their first year in the program students enroll in courses on teaching materials and methods, psychological foundations of education, science education research, engineering applications in the sciences, and rural community development planning and analysis.

After spending approximately 2 years abroad in a Peace Corps placement, they return to campus to complete their research report and, in some cases, student teaching. The first students in the program will be placed in Peace Corps locations during the 2009-2010 academic year.

<http://www.ed.mtu.edu/peacecorps/index.html>

5. Teacher Professional Development

A number of teacher professional development programs are multi-year projects funded by the National Science Foundation or the Michigan Department of Education. Many of the courses developed within these larger projects serve as electives or required courses within the M.S. in Applied Science Education program. Full descriptions of most of these projects are found in section 3.

“Michigan Teacher Excellence Program (MiTEP): A Model for Improving Earth Science Education Nationwide”

A partnership with Grand Rapids Public Schools to strengthen Earth Science education nationwide.

“GlobalWatershed: Integrating Rural and Global Perspectives with Research and Technological Advances”

Graduate Students will work with middle and high school teachers and students, enriching science learning in schools in Mexico and the Upper Peninsula.

“Increasing Expertise in Earth Science Education”

A program leading to Earth Science teacher certification and the M.S. in Applied Science Education with a concentration in Earth System Science.

“Educators’ Professional Development Institute Series (EPDIS) – Physical Sciences – Physics & Chemistry”

A project to build teachers’ conceptual understanding and pedagogy in physics and chemistry. Targets grade 5-12 teachers and the application of classroom inquiry and technology.

Bioathlon Teacher Program

Teachers attending Bioathlon (see section 7 of this report) participate in teacher workshops held on the competition day. These workshops, led by faculty and staff, are designed to give HS teachers new information and techniques to use in their biology laboratory classes.

Key personnel: Biological Sciences department faculty and staff

A. 2009 Summer Courses for Teachers:

<http://www.ed.mtu.edu/pd.html>

The university offers a number of courses to K12 teachers each summer. Some of these are funded by external grants. Some are individual faculty initiatives. Many are in support of the graduate program in Applied Science Education. Course offerings are coordinated and marketed by the Teacher Professional Development Center within the Department of Cognitive and Learning Sciences. Courses are taught by faculty in engineering, geology, forestry, social sciences, mathematics, and education. Annual enrollment averages approximately 200 teachers)

Engineering Applications in the Physical Sciences, July 13-24

How engineers use principles from physical sciences to solve problems and design systems. Concepts linked to national and state science standards. 4cr. ENG5200

Engineering Applications in the Earth Sciences, July 27-Aug7

Problem-solving in the earth sciences, emphasizing applications in mathematics and science teaching. 4 cr. ENG5300

Ecology of Isle Royale, June 14-20

Explore the ecology and history of Isle Royale through wilderness, backpacking, conversations with researchers, and examination of research data. 3cr. ED5560

Advanced Ecology of Isle Royale by Sea Kayak, June 21-27

Introduction to sea kayaking, ecology, and research of Lake Superior on Isle Royale's coastlines. 3cr. ED5630

Great Lakes Watershed Investigations, June 15-19

Investigate the physical, chemical and biological components of the Great Lakes ecosystem, using the Lake Superior watershed as the classroom. 3cr. ED5640

Earth Systems Institute I, June 15-19

K-12 teachers will use the scientific method in earth system science to make observations, develop hypotheses, collect data, test hypotheses, and communicate results. A field-based course conducted on the Keweenaw Peninsula. 2 cr. GE5230

Lake Superior Ecology Aboard a Tallship, June 21-26 and June 28-July 3

Tallship Dennis Sullivan is your classroom for study of lake ecosystems. Participants serve as crew to sail around the Keweenaw Peninsula. 2 cr. ED5640

Forest Ecology & Management, June 21-26

Participants will investigate forests through lecture, data collection, field trips, and technology applications. 3 cr. ED5630

Future Fuels from Forests, July 6-10

Investigate the technological, ecological, social, economic, and political issues associated

with ethanol production from woody biomass and switch grass through lectures, hands-on data collection and analysis, field trips, lab experiences, and discussions with research scientists. 3 cr. ED5630

Global Change, July 13-17

Investigate effects of global change on ecosystems, including impacts of changing climate, elevated carbon dioxide, ozone levels, acid rain, and invasive species. Addresses social studies and science standards. 3cr. ED5641

Regional Content for World History and Geography, June 22-26

Examine key concepts for teaching world geography and connections between geography and history. Focus on Africa, Eastern Europe, India, and China. 3 cr. ED5686

Action Research

Mathematics teachers learn how to examine instructional practice through research based on their own classrooms. 2 cr. ED5700

B. Additional Summer Courses for Teachers, 2006-2008

Teaching World History and Geography	4 cr.
Natural Hazards and Human Impacts	3 cr.
Teaching American History: Understanding Politics	2 cr.
Teaching American History: Windows to the Past	2 cr.
Using Environment to teach Science and Social Studies	1 cr.
Developing Mathematical Tasks	3 cr.
Exploring Mathematics through Engineering Applications	2 cr.
Mathematics and Navigation for Teachers	2 cr.
Geology of Utah's National Parks	4 cr.
Great Lakes Maritime Transportation	2 cr.
The Engineering Process	4 cr.
Engineering for Educators	2 cr.
Engineering in Earth Science	2 cr.
Michigan's Environmental Science Curriculum Teacher Training	1-2 cr.
Forest Resources and Environmental Science	3 cr.
Great Lakes Ecology aboard the <i>Lake Guardian</i>	3 cr.
ASM Materials Science Camp for Teachers	2 cr.
Teaching with Technology	2 cr.

6. Curriculum-Related Projects

Michigan Teacher Excellence Program (MiTEP) 2008-13

This program is a research partnership between Michigan Tech and the Grand Rapids Public Schools, which seeks to re-invigorate Earth Science teaching and learning. This involves intensive teacher professional development, an emphasis on the development of teacher leaders, and Earth Science curricular reform over a five-year period. The goal is to develop a model for science education reform, nationwide. See additional information in Section 3A of this report.

Michigan Environmental Education Curriculum Support (MEECS) 2003-06

Michigan Tech developed 2 of the 5 units of a statewide curriculum sponsored by Michigan Dept. of Environmental Quality. Each of the units (on Ecosystems & Biodiversity for grades 4-6 and Water Quality for grades 6-8) included 9-10 lessons plus interactive Tech Alive web modules on Michigan ecosystems, water resources, and energy resources. The curriculum is still widely used and Professional Development related to it are offered regularly across the state. See additional information in Section 3B of this report.

7. Projects Involving K12 Students

Online Calculus for HS Students

From 2006 through 2008, Michigan Tech offered an online section of MA1160, Calculus I, for high school students across the UP. The course was delivered through Marratech software for real-time videoconferencing. The instructor holds a Ph.D. in mathematics education and has had extensive experience teaching at both the high school and university levels.

Key personnel: faculty in Mathematical Sciences and Cognitive & Learning Sciences

Dual Enrollment

Students in area high schools are eligible to enroll in Michigan Tech courses if they have completed all courses in the field offered at their high school. Between 2005 and 2009, 134 individual high school students have enrolled in 286 classes offered in 11 departments. Most popular courses were Calculus, Modern Languages, and Chemistry.

“Family Engineering for Parents and Elementary-Aged Children”

A project to develop engineering activities and events for elementary school children and to test the program and materials nationwide. See further information in Section 3A of this report.

“Explorations in Engineering” (“Engineering Scholars Program” [ESP] as of 2010) (94 participants in 2009)

This competitive scholarship program targets high school students from populations traditionally under-represented in engineering and science. Students investigate options for college and future careers in engineering. Practicing minority engineers, educators, and University faculty lead sessions on innovative research, utilizing hands-on activities and team engineering projects.

Key personnel: Youth Programs Outreach and Engagement
<http://youthprograms.mtu.edu/eie/index.html>

“Women in Engineering” (140 participants in 2009)

This highly competitive scholarship program provides high school students, academically talented in math and/or science (average GPA of 3.93 in 2009) with opportunities to investigate careers in engineering. Practicing female engineers, educators, and University faculty lead sessions on innovative research, utilizing hands-on activities and team engineering projects.

Key personnel: Youth Programs Outreach and Engagement
<http://youthprograms.mtu.edu/wie/index.html>

“Get WISE!” (Get Women In Science and Engineering)

This program hosts over 200 young women from the Western Upper Peninsula to a day of exciting and engaging STEM-based hands-on activities, held on the Michigan Tech campus. Lunch is included, as are YES! Expo backpacks full of gifts from many departments on campus, along with stylish Get WISE! T-shirts.

Key personnel: Youth Programs Outreach and Engagement; Western U. P. Center for Science, Mathematics & Environmental Education

Summer for-credit courses for high school juniors and seniors

Two 3-credit courses will be offered in summer, 2010:

Cryptography (MA1990)

Key personnel: Youth Programs; Mark Gockenback; Dept. of Mathematical Sciences

Course will give students an understanding of modern encryption schemes.

Engineering Problem Solving (ENG1001) and Intro to Spatial Visualization (ENG1002). Students will apply the engineering design process to a team-based design-construct project that requires engineering analysis.

“Summer Youth Programs”

(Over 650 participants in 2009)

Students can choose to participate in over 70 career explorations, each of which provides an intensive weeklong experience in a particular field of interest. Explorations are offered in engineering, science and technology, computer science, business and economics, outdoor and environmental studies, and arts and social sciences. Participants investigate their areas of interest through innovative classroom activities, hands-on laboratory exercises, and discovery-based field trips.

Key personnel: Youth Programs Outreach and Engagement

“GEAR UP” (Gaining Early Awareness and Readiness for Undergraduate Programs)

This program, funded by the King-Chavez-Parks initiative and the U. S. Department of Education, introduces high school students from participating UP schools to the excitement of college life, while investigating college options and careers. University faculty and graduate students lead informational sessions for this cohort of nearly 600 students on careers available to students with a college education through hands-on activities, interactions with role models and dynamic academic field trips.

Key personnel: Youth Programs Outreach and Engagement

<http://youthprograms.mtu.edu/syp/index.html>

“TiViTz” Mathematics Program

7 schools, 248 students

TiViTz is a challenging math and strategy game used to build students' mathematics and problem solving skills. Each year, a workshop guides teachers in how to incorporate TiViTz games into the math curriculum. In May, teachers and students participate in a TiViTz tournament held at Michigan Tech. Dr. Kathryn Clark, former Chief Scientist of Human Space Flight for NASA, serves as the Master of Ceremonies.

Key personnel: Youth Programs Outreach and Engagement; WUPCSMEE

<http://wupcenter.mtu.edu/education/tivitz/index.htm>

Pavlis Summer Leadership Institute

This one-week program provides high school students opportunities to expand their abilities to lead. Students are given tips and tools to make a difference in their school and local communities. Students are mentored by undergraduate members of the Pavlis Institute, who have been trained by Michigan Tech faculty through an intensive 25-credit curriculum.

Key personnel: Robert Warrington and Mary Raber, Institute for Interdisciplinary Studies; Steve Patchin and Cody Kangis, Youth Programs

http://youthprograms.mtu.edu/docs/Pavlis_bro.pdf

Youth Program Road Show

Youth Programs builds student excitement about STEM fields through fun science activities and demonstrations. This is delivered in such settings as the 2009 Young Einstein Science Fair in Green Bay, Wisconsin (2500 students). During the next year the program will work with 6000 students at the Score with Science program in Grand Rapids and the National Boy Scout Jamboree in Virginia (43,000 scouts and scoutmasters).

Key personnel: Youth Programs Outreach and Engagement

Lake Superior Stewardship Initiative (LSSI)

14 schools; 43 teachers, 1,377 K-12 students; 40 community partners

This project facilitates partnerships between schools and community organizations to plan and implement activities that engage students in enhancing their school, community, and the Lake Superior watershed. Funding from the Great Lakes Stewardship Initiative (Great Lakes Fishery Trust and Wege Foundation). Mini-grants to school teams support the design and implementation of community projects.

Key personnel: Western Upper Peninsula Center for Science, Mathematics and Environmental Education (WUPCSMEE), a partnership of Copper Country ISD, Gogebic-Ontonagon ISD and the Michigan Technological University, through the Center for Environmental Outreach

<http://lakesuperiorstewardship.org/index.html>

Family Math, Science & Forest Nights

17 family nights; 1,731 students & parents

K-6 students and parents/caregivers attend family science and forest nights at elementary schools throughout Houghton, Baraga, Gogebic, and Ontonagon counties. Michigan Tech students conduct most activities and are trained in lesson plan development and teaching methods through a course taught by Center staff.

Key personnel: Western Upper Peninsula Center (WUPCSMEE); Center for Science and Environmental Outreach

<http://wupcenter.mtu.edu/education/familysciencenight/index.htm>

Hands-on Outdoor Science Field Trips

15 schools, 360 students

These environmental educator-led field trips to forest, field, streams, and wetlands engage K-8 students in hands-on learning. Field trips are 60-120 minutes. Different activities are offered for each grade during each season: fall, winter, and spring. Teachers may select from a wide variety of field trip sites in the western U.P.

Key personnel: Western Upper Peninsula (WUPCSMEE); Center for Science and Environmental Outreach

Outdoor Science Investigations Field Trips

24 schools, 3000 K-6 students

A project to engage students in scientific investigations. See further information in Section 3 of this report.

<http://wupcenter.mtu.edu/education/fieldtrips/index.htm>

Western Upper Peninsula Science Fair

15 schools, 360 students

Since 1997, the Western UP Center has sponsored an annual regional science fair for students in grades 4-8. Students receive a project planning guide, and their classroom teachers assist them through the process of scientific inquiry and communication of results.

Key personnel: Western Upper Peninsula Center (WUPCSMEE); Center for Science and Environmental Outreach

<http://wupcenter.mtu.edu/education/sciencefair/index.html>

Investigations aboard MTU's Research Vessel Agassiz

3 schools & 5 community excursions, 200-300 participants annually

Scientific investigations for middle/high school students, teachers, and community members aboard MTU's research vessel *Agassiz*. See further information in Section 3B of this report.

http://wupcenter.mtu.edu/education/great_lakes_ecology/Agassiz-Water-Quality_Field_Trips/index.htm

Future Fuels High School Field Trip Program

7 schools, 95 students

Upper Peninsula high school students and teachers investigate the viability of forests as a source of biofuels. Students meet with Michigan Tech scientists and tour labs engaged in transforming woody fiber to liquid fuels. See further information in Section 3A of this report.

“Michigan Tech Nanotechnology Enterprise”

An active learning experience that provides introductory presentations, demonstrations, and hands-on workshops to high school students. It will be initiating an Enterprise with Chassell High School. See further information in Section 3A of this report.

“Bioathlon”

60-72 students served annually; 1760 students have participated over 20 years

Each high school may send one team of 4 students to compete in the Bioathlon. There are four sets of Biological competitions which test student team understanding and knowledge of biology problem solving skills. Students who have completed only the first high school biology course compete for honors.

Key personnel: Jeff Lewin, Dept. of Biological Sciences

Partially supported by Bioathlon-Outreach endowment at MTF and by Dept. of Biological Sciences

Biology High School Visitation Program

approx. 120 students per year; duration: 19 years

Every year students in 34 Western U.P. high schools are invited to spend a day with the Department of Biological Sciences. The program includes discussion about careers in biology, attending a university Biology class, and a laboratory experience designed for H.S. students using equipment not typically available in high schools. The objective of the program is to motivate high school students to attend college, think about their future, experience MTU, and learn something about MTU’s program offerings in Biology.

Key personnel: Jeff Lewin, Dept. of Biological Sciences

Cass Tech Advanced Placement

Faculty and staff presented a 3-day workshop to Cass Technical High School biology teachers to discuss the objectives, difficulties, and laboratory requirements for an A.P. Biology course.

Key personnel: Jason Carter, Chair-Exercise Science; John Adler, Chair-Biological Sciences; Chris S. Anderson, Special Assistant to the President for Institutional Diversity

High School Enterprise Program

The High School Enterprise program is designed to motivate high school students to pursue post-secondary STEM education and careers. In addition to the 8 high schools listed in Section 3 of this report, 4 other schools are supported by financial resources from industry and the Engineering Fundamentals Dept. at Michigan Tech-- Chassell HS, Melvindale HS; BRIDGE Alternative HS (Copper Country Intermediate Schools), and Horizons Alternative HS (Calumet Public Schools). The two alternative high schools are being funded by a grant from the Ford Motor Company “College Community Challenge.” See further information in Section 3A of this report.

Community, After-School, Assembly & Library Programs

860 students and community members

Presenters from throughout the Midwest are invited to conduct assembly programs in area schools. Programs on the Great Lakes, Michigan forests, energy use, and engineering are conducted at local libraries and other venues by Michigan Tech students, staff and faculty.

Key personnel: Center for Science and Environmental Outreach

“National Summer Transportation Institute”

A program to introduce high school students to the wide range of careers in the field of transportation. See further information in Section 3A of this report.

Michigan Green School Website

Michigan Tech is hosting and maintaining the **Michigan Green School Website** to inform teachers, integrate into school curricula, and expand “green” practices in Michigan schools.

Key personnel: Center for Science and Environmental Outreach

<http://www.michigangreenschools.org/>

Biennial Lake Superior Youth Symposium

The **Lake Superior Youth Symposium** engages teachers and students in grades 8-12 in learning about the science, history and stewardship of Lake Superior and its watershed. Michigan Tech plays a prominent role in planning and bringing 45 western UP students and teachers to each biennial event.

Key personnel: Center for Science and Environmental Outreach and Western U.P.
Center for Science, Mathematics & Environmental Education.

http://wupcenter.mtu.edu/education/lake_superior_symposium/index.html

Capillarity Module

PI; Jeffrey Allen, ME-EM

Under this CAREER Award, a capillarity model is being developed to inspire a lifelong curiosity about natural phenomena in pre-university students. The module will be utilized in Women in Engineering, Explorations in Engineering, and Summer Youth Programs. Graduate students will mentor undergraduates, who will conduct the modules with secondary school students during the summer.

Undergraduate Expo

Each year, more than 800 students from Michigan Tech’s Enterprise, Senior Design, and Undergraduate Research teams showcase their project work and compete for awards at the Undergraduate Expo. High School Enterprise teams come to this Expo to display their work alongside college teams and make presentations to University students, faculty, and industry representatives. HSE teams engage in other activities to familiarize themselves with the college experience.

“Engineering Olympics”

This annual event, led by the Engineering Fundamentals Department, consists of a series of competitions for high school students from the Upper Midwest. The purpose of the program is to excite and inform high school students about the engineering profession and provide them with an opportunity to apply scientific and mathematical principles to the “real world”. This event gives students ‘hands on’ challenges where they can apply knowledge gained through their high school courses. Engineering Olympics, in operation for 10 years, is typically attended by between 100 and 300 students.

YES! Expo

For five years, Michigan Tech hosted the Youth Engineering & Science (YES!) Expo at Ford Field in Detroit. YES! Expo is a unique collaboration (state agencies, corporations, universities, youth organizations, professional societies, and business development organizations from throughout Michigan) designed to inspire middle and high school students to pursue education and careers in science and engineering. Exhibitors demonstrate the excitement of studying science and engineering. A high-energy live/multimedia highlights exciting technologies and fascinates students about the world of science, engineering, and technology. Annual student attendance at this one-day event is 15,000 students and approximately 1,400 teachers representing 250 schools. Over 50% of the students attending represented minority groups.

Summary

Michigan Tech is well known for its contributions to advancing the frontiers of knowledge in science and technology. At a time when state and national leaders are expressing concern about the adequacy of K-12 students' understanding of science and mathematics, Michigan Tech faculty and staff are also making important contributions to improving STEM learning among pre-college students. Michigan Tech provides key resources and institutional partnerships that enable faculty to engage with K-12 education. Through bachelor's and master's degree programs, teacher professional development, curriculum improvement projects, and activities for K-12 students, Michigan Tech is playing an important role in supporting and reforming STEM education.

This report is designed to highlight Michigan Tech's contributions to a national STEM education reform effort. In the compilation of this report, some programs may have been inadvertently omitted. For any errors and omissions, we sincerely apologize.

SOME COMPETITIVENESS INDICATORS (Source: *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*, National Academy of Sciences)

- About **one-fifth** of the **4th graders** and **one-third** of the **8th graders** lacked the competence to perform even **basic mathematical computations**.
- In 1999, **69% of US 5-8th-grade students** received instruction from a **mathematics** teacher who did **not hold a degree or certification in mathematics**.
- In 2000, **93% of students in grades 5–8** were taught **physical science** by a teacher **lacking a major or certification in the physical sciences** (chemistry, geology, general science, or physics).
- US **15-year-olds** ranked **27th** out of **39 countries** that participated in a 2003 administration of the Program for International Student Assessment (PISA) examination, which assessed students' ability to apply mathematical concepts to real-world problems.
- American youth spend **more time watching television** (1460h) **than in school** (990-1040h in 2000).

WHAT IS MICHIGAN TECH DOING

- Michigan Tech's Division of Teacher Education, in collaboration with departments across campus, offers **teacher certification in eleven fields**. All teacher education students earn a B.S. degree in an academic field, along with certification to teach grades 6-12. Since 1971, **over 900 students** have received certification and currently **teach in 28 states**.
- Since 2001, Michigan Tech offers a **M.S. Degree in Applied Science Education** degree to practicing K-12 teachers.
- Michigan Tech offers the **only Peace Corps-Master's International Program in Science Education in the nation**.
- The university offers about a **dozen professional development courses** to K12 teachers each summer. **Annual enrollment** averages **200 teachers**.
- During the **2009-10 academic year**, Michigan Tech faculty and staff are working on over **20 K-12-related education projects** that have been **funded by outside agencies** with **\$12.7 million**.