CFIRE

Great Lakes Maritime Education Program for K-12 Teachers

CFIRE 04-02
February 2011

National Center for Freight & Infrastructure Research & Education
Department of Civil and Environmental Engineering
College of Engineering
University of Wisconsin–Madison

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16. Abstract Michigan Technological University has led an educational/outreach effort for the Great Lake Maritime Research Institute since 2006. Despite Michigan Tech's relative isolation and long distance from most locations in the Great Lakes Basin, every state in the Basin has been touched with some aspect of the outreach program. The overall goal of the project is to increase K-12 teachers' understanding of shipping on the Great Lakes, and increase their ability to teach their students about Great Lakes Maritime Transportation in the core subjects of science, math, language arts, and social studies.			
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Website: http://wupcenter.mtu.edu/education/great_lakes_maritime/programs.htm

Project Title: *Great Lakes Maritime Education Program for K-12 Teachers*

Michigan Technological University has led an educational/outreach effort for the Great Lake Maritime Research Institute since 2006. Despite Michigan Tech's relative isolation and long distance from most locations in the Great Lakes Basin, every state in the Basin has been touched with some aspect of the outreach program.

Two Summer Teacher Institutes

In 2010, the Great Lakes Maritime Transportation summer teacher institute was conducted at The Maritime Academy of Toledo. Eighteen educators participated---six from Ohio, one each from Ontario and Wisconsin, and ten from Michigan. Teachers toured the S.S. Boyer with Paul LaMarre, Manager of Maritime Affairs of the Toledo-Lucas County Port Authority and Executive Director of the S.S. Willis B. Boyer Museum Ship. LaMarre also led a tour of port facilities, highlighting the variety of cargo that moves through the City of Toledo. Summer institute participants toured the Maumee River and Harbor aboard the *Sandpiper* and explored maritime history and mapping shipwrecks with Carrie Sowden, underwater archaeologist, and executive director, Christopher Gillcrist , at the Inland Seas Maritime Museum in Vermillion. This summer's institute's location at The Maritime Academy of Toledo afforded several unique opportunities, including model boat building, operating a radar simulator, navigation training, and using an ROV in the academy's pool.

The 2010 teacher institute was well received by participants. In their post-institute evaluations, participants gave the field trips and hands-on activities high marks. When asked what they liked best about the institute, one participant stated, "well organized, variety of programs, awesome fellow students, field trips." Twenty-two lessons were submitted by participants of the 2010 Great Lakes Maritime Transportation Teacher Institute and are now posted on MTU's Great Lakes Maritime Transportation website: http://wupcenter.mtu.edu/education/great_lakes_maritime/institute2010.htm

A second summer teacher institute, "Mathematics & Navigation," taught by mathematics professor and boat captain, Dr. Stephen Roblee, was held at Michigan Technological University. Thirteen teachers attended from Michigan and Ohio. Teachers were able to earn two graduate credits by attending the institute and writing two lessons. The lessons are now posted on MTU's Great Lakes Maritime Transportation website: http://wupcenter.mtu.edu/education/great_lakes_maritime/institute2010.htm

Plans for conducting the 2011 summer institute in Door County, Wisconsin are already underway. Carolyn Rock, educator at Whitefish Point Sand Dunes State Park and a 2007 institute participant, and Wendy Lutzke, educator at Manitowoc Maritime Museum educator and recipient of a Great Lakes Maritime Shipping Chest, are helping to plan the institute.

School Year Teacher Workshops

School-year workshops (1-2 days in length) are also being conducted. A two-day Great Lakes maritime lesson-writing workshop was conducted in partnership with the Great Lakes Shipwreck Historical Society (GLSHS) on November 5-6, 2010 at the Great Lakes Shipwreck Museum and Whitefish Point Lighthouse. Ten educators from Wisconsin and Michigan attended. Renowned shipwreck and maritime historian and author, Fred Stonehouse, presented on Lake Superior shipwrecks and also on the Life-Saving Service on the Great Lakes, the precursor to the U.S. Coast Guard. Tom Farnquist, GLSHS founder, described various shipwreck investigations. Participants toured the lighthouse, lighthouse keepers' quarters, museum, and grounds. The Great Lakes Shipwreck Historical Society provided 2 nights lodging for participants, two presenters, an onsite assistant, and waived admission to the museum & lighthouse.

One of the workshop participants wrote two days after the workshop, "Thank you so much for informing me about this workshop. This was the best workshop I have ever attended! Everything was great--- the presenters, the participants, the location, and the food. I started teaching one of the lessons from the <workshop> to my students today and they are really enthusiastic. They loved the Lake Superior rocks!" 5th grade teacher participant from Detroit.

Another teacher workshop is planned for December 4th at Whitefish Dunes State Park in Door County, Wisconsin, that will focus on using the Great Lakes Maritime Teaching Chest.

Great Lakes Maritime Transportation Treasure Chests

The grant subsidizes the assembling and dissemination of eight Maritime Teaching Chests. The teaching chest contain children's literature, teacher activity guides, posters, maps, DVDs, sample cargo, a 12'x15' floor map of the Great Lakes basin, all related to maritime transportation---present and historic. Three have been purchased for $150 each (the grant provides a $350 subsidy) by:

- Community Education Services Agency (CESA 6) in Oshkosh, WI
- Wisconsin DNR Wild Rose Fish Hatchery in Wild Rose, WI
- Racine Unified School System, Racine, WI

Since 2007, 33 maritime teaching chests have been distributed to the following states: 15-MI, 2-PA,7-WI, 1-IN, 5-OH, 3-MN; who are located in the following Great Lakes watersheds: 6-Superior, 11-Michigan, 6-Huron, 9- Erie, 2-Ontario. The 33 recipients of these teaching chests were surveyed to find out how they are using the chest, and to gather suggestions for improvements, and suggestions for other potential recipients.

Thirty percent of the recipients responded to the survey. Respondents ranked the Great Lakes floor map, a 12'x15' canvas drop cloth with the five Great Lakes painted on it, along with labels for all states/countries, port cities, and rivers in the Great Lakes watershed, as the MOST useful item. Six more locations were suggested for potential dissemination of the chest. It was suggested that information on maritime careers be added, a timeline for Great Lakes development, and more on ship loading and unloading. The chest is used most often with teachers and youth, and is lent out to teachers a little less than once per month. One survey respondent wrote, "I think you have done a great job of including a wide variety of materials in the chest."

Shared Funding

This past year, 50% of the funding for the education/outreach program was provided by The National Center for Freight and Infrastructure Research and Education (CFIRE) at the University of Wisconsin Madison, and the Great Maritime Research Institute.

To find out more about the education/outreach program, please visit the website: http://wupcenter.mtu.edu/education/great_lakes_maritime/

###

5-day Summer Teacher Institute at The Maritime Academy of Toledo
(MTU Course ED5680)
2 Graduate Credits

For K-12 Teachers & Teacher Educators

Great Lakes Maritime Transportation Teacher Institute

Monday, June 21 - Friday, June 25 at The Maritime Academy of Toledo

COST: $240 registration (includes 5 lunches & 2 credits) or **$540** (includes 4 nights lodging & meals) at The Maritime Academy of Toledo (Ohio).

CLASS LIMIT: 20 participants

APPLICATION DEADLINE:
Friday, May 14

To Register:

Joan Chadde, Institute Coordinator
Center for Science & Env. Outreach
105 Dillman Hall—Michigan Tech
1400 Townsend Dr.
Houghton, MI 49931

Phone: 906-487-3341
FAX: 906-487-1620
E-mail: jchadde@mtu.edu

Explore the historical, economical and environmental aspects of Great Lakes shipping at the Port of Toledo, one of the busiest and most diverse transportation centers on the Great Lakes.

The institute includes visits to port facilities, instruction on navigation and radar simulators, tours of the historic SS Boyer & lighthouses, excursions on the Maumee River, investigation of invasive species, monitoring Great Lakes water quality, maritime careers, and other learning opportunities.

The institute will explore all facets of the shipping industry from the arrival of goods by rail and port safety, to the shipping of goods to other Great Lake ports and global destinations. The institute will provide teachers with a foundation in maritime transportation history, current operations, and future career opportunities.

Michigan Tech
Michigan Technological University

Great Lakes Maritime Research Institute
A University of Wisconsin - Superior and University of Minnesota Duluth Consortium

National Center for Freight & Infrastructure Research & Education
CFIRE
University of Wisconsin-Madison

Cost **Includes 2 graduate credits**

$240 per participant registration
$300 additional per participant for room & meals at The Maritime Academy of Toledo

Cost per participant is **$240** and includes 5 lunches, field trips, instructional materials, and 2 graduate credits from Michigan Tech University. Cost **is $540** with 4 nights lodging (M-Th) and all meals. (Actual cost of the Institute is $1500. A grant from the Great Lakes Maritime Research Institute and CFIRE at University of Wisconsin-Madison reduces the overall cost of MTU's 2009/10 official tuition rate of $822 for Applied Science Education Graduate Resident/Non-Residents.) Payment of the full registration fee is due Friday, June 4. Participants may pay by **check** payable to: *Michigan Tech University D93711* or **credit card** by calling the Michigan Tech cashier's office at (906) 487-2247.

Financial Aid

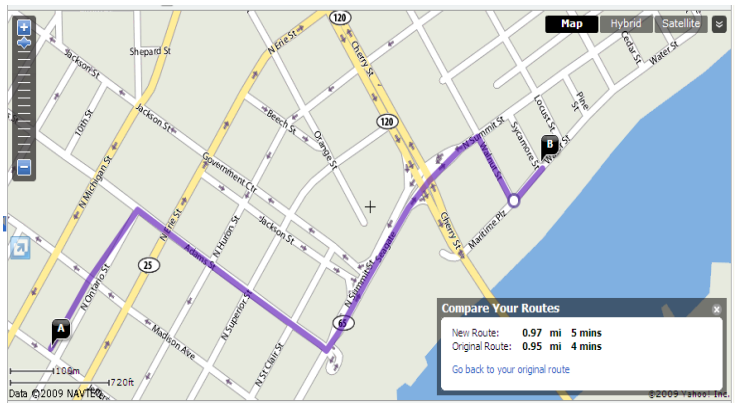
Applicants who teach grades 4-10 in the eight Great Lakes states may apply for a $500 Marine Immersion scholarship through the COSEE Great Lakes program http://coseegreatlakes.net/ Applications due April 16. For more information, contact: Jim Lubner jflubner@aqua.wisc.edu at Wisconsin Sea Grant.

More Information

Toledo Area:
http://www.toledo.com/

The Maritime Academy of Toledo
http://www.maritimeacademy.us/

Great Lakes Maritime Research Institute
www.glmri.org



To Apply & For More Information

Application forms and updated information available at: http://wupcenter.mtu.edu

Application deadline: Friday, May 14

Submit applications to:
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Center for Science & Environmental Outreach
105 Dillman Hall—Michigan Tech University
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Phone: 906-487-3341 FAX: 906-487-1620
Email: jchadde@mtu.edu

Accommodations

For an additional $300, participants can spend Mon.-Thurs. nights at The Maritime Academy of Toledo (TMAT) one block from the Maumee River. Enjoy "4-Star" meals from Monday lunch through Friday lunch. Lodging on Sunday or Friday for additional fee. Enjoy the walking paths at nearby International Park on the Maumee River. For more information visit: www.themaritimefoundation.us.

Sponsored by Great Lakes Maritime Research Institute (UW Superior & UM Duluth) and CFIRE at UW Madison
Coordinated by Michigan Technological University and conducted at The Maritime Academy of Toledo

Great Lakes Maritime Transportation Summer Institute

Monday-Friday, June 21-25, 2010

AGENDA

MONDAY, June 21

7:30 AM **Check-in**

8:00 AM **Breakfast & Welcome**
--Mike Bell, Mayor of Toledo
--Paul Toth, President and CEO, Toledo-Lucas County Port Authority

8:30 AM **Institute Overview & Course Requirements**
--Joan Chadde

10:00 AM Great Lakes Maritime Transportation & the middle/high school curriculum
--Patricia Eaton, TMAT Science Teacher
Benchmarks & Content Standards addressed
--Josh Sandwisch, TMAT Social Studies Teacher
Activity from Great Lakes Treasure Chest : Great Lakes Watershed
--Joan Chadde, Michigan Tech

11:00 AM Ship Crewing; How Great Lakes Shipping Fits into Global Transportation of Goods: Ship designs, shipping routes, cargoes & challenges of shipping on the Great Lakes
--Rick Brown & Jim Hartung
Activity from Great Lakes Treasure Chest: Plot the Path
--Joan Chadde, Michigan Tech

NOON Depart for S.S. Boyer

12:30 PM **Lunch** & Tour aboard S.S. Boyer: Travel to Sandpiper (pick up at Restaurant Docks)
--Paul LaMarre, Toledo Port Authority

2:30 PM Tour of Maumee River & Maumee Harbor aboard the *Sandpiper* with *Sandpiper* Captain Mary Dalby

4:30 – 5 PM Tour of The Maritime Academy of Toledo (TMAT)

6:30 PM **Dinner at TMAT**

TUESDAY, June 22

7:00 AM Group breakfast & discussion at TMAT

8:00 AM Navigation Introduction: Chart Reading & Basic Ship Handling
--Barb Pinter, TMAT maritime education
Navigation Simulation: Transiting through the Great Lakes & Soo Locks
--Rick Brown, TMAT maritime education

NOON Lunch at TMAT

1:00 PM Visit Port Facilities (meet at One Maritime Plaza)
--Paul LaMarre and Joe Cappel, Toledo Port Authority

3 - 4:30 PM U.S. Coast Guard: Port Security, water/vessel safety; responsibilities for Maritime Transportation

6:30 PM Dinner & Maumee Riverwalk

WEDNESDAY, June 23

7 AM Group breakfast & discussion TMAT

8:00 AM History of Maritime Vessels
--Tim Evans, Social Studies Teacher, Marysville Middle School & St. Clair Community College

9:00 AM Vessel Construction & Boat Building Lab
--Steve Toth & Dave Brown

NOON **Lunch** at TMAT
Presentation: "The White Hurricane"
--Dave Brown, Author

1 -4:00 PM Invasive Species & Water Quality Sampling
--Patricia Eaton, Science Teacher, The Maritime Academy of Toledo

4:30-5:30 PM Challenges to Great Lakes Maritime Transportation
--Dave Knight, Great Lakes Commission

6:00 PM Dinner at TMAT – cook out on patio overlooking Maumee River

7:00 PM The Last Log of the Titanic
--Dave Brown, author

8:00 PM Movie Titanic

THURSDAY, June 24

7:00 AM Group breakfast & discussion TMAT

8:00 AM Remotely Operated Vehicle
--Mark Gleason, Great Lakes Naval Memorial Museum, Muskegon, MI
Introduction from NOAA, Thunder Bay Maritime Museum
Taking It Back to the Classroom discussion
-- Joan Chadde, Michigan Tech

NOON Lunch at TMAT

1-2:30 PM Drive to Vermilion, OH

3-6 PM Exploring Maritime Museum, Maritime History Presentation; Mapping Shipwrecks
--Carrie Sowden, Inland Seas Maritime Museum in Vermillion

6:15 PM Special Dinner at Chez Francois (555 Main St., Vermillion, OH; Tel: 440-967-0630)

FRIDAY, June 25

7:00 AM Group breakfast & discussion TMAT

8:00 AM Planet in Action / Google Earth (computer lab) (Rick Brown & Barb Pinter)

9:30 AM Panel Discussion: Nautical/Maritime Integration Across the Curriculum: TMAT Staff Presentations & Question/Answer on "How to integrate nautical/maritime themes into K-12 teaching" (TMAT faculty: Rick Brown, Patty Eaton, Josh Sandwisch, Megan Kozakowski, Brian Marciniak, Jennifer Chitwood)

10:30 AM Taking it back to the classroom small group discussion & sharing

11:30 AM Course evaluations (survey monkey) in computer lab (Joan Chadde)

12:30 PM Course ends. Lunch

"Great Lakes Maritime" Lesson Plans

Developed by Great Lakes Maritime summer teacher institute participants
in fulfillment of course taught at Michigan Technological University June 21-25, 2010
with funding from the Great Lakes Maritime Research Institute and the University of Wisconsin-Madison CFIRE

ELEMENTARY

1. **"Heave, Ho the Cargo!"** by Judy Bowlus
   Kindergarten: math, science and social studies

Lesson Overview
Students will learn to identify, sort and graph samples of goods from the Great Lakes area using the criteria of living/non-living, natural/man-made, and above ground/below ground.

2. **"Aye Aye Captain"** by Judy Bowlus
   Kindergarten: math, reading and writing

Lesson Overview
Students will learn to identify and demonstrate directional and positional words (inside/outside, over/under, above/below, beside, between, in front of, in back of, right/left, etc.) using a cardboard boat, miscellaneous objects, and their bodies.

3. **"The Edmund Fitzgerald-Vanished in the Night"** by Sarah Stevens
   Kindergarten: science and social studies

Lesson Overview
These two lessons are intended to introduce kindergarten students to shipping on the Great Lakes by learning about the Edmund Fitzgerald. The reason I chose to focus on the Edmund Fitzgerald is because its sinking was the most famous disaster in the history of Great Lakes shipping. My goal is that children learn what the Great Lakes are and that they identify the lake closest to us---Lake Superior---which is also where the Edmund Fitzgerald sunk. My goal is to have students learn about the past and become familiar with how shipping affects our present everyday life.

4. **Exploring Beach Erosion in the Great Lakes** by Amy Martin-Crowel
   4th grade Science

Lesson Overview
This lesson is meant to expose students to an example of environmental change, beach erosion, in the Great Lakes. The lesson provides a brief overview of why the Great Lakes are important, then focuses on erosion as one of the challenges, explores beach erosion with a hands-on activity, and suggests ways of slowing beach erosion.

5. **Impact of Invasive Species on Food Webs and Ecosystems** by Amy Martin-Crowel
   5th grade Science

Lesson Overview
This lesson will expose students to an example of environmental change--beach erosion--in the Great Lakes. The lesson provides a brief overview of why the Great Lakes are important, then focuses on erosion as one of the challenges, explores beach erosion with a hands-on activity, and suggests ways of slowing beach erosion.

MIDDLE SCHOOL

1. **Comparing Great Lakes Maritime Transportation Systems: 1800 to 1898** by Tim Evans
   8th Grade American History

Lesson Overview
Great Lakes maritime transportation systems of the 19th century will be addressed in this lesson. The lesson will focus on ships, and shore side activities, and the economic and social impact they had on people and industries, locally and nationwide. Studying this topic will strengthen students' understanding of transportation in 19th century America, which in contemporary textbooks is dominated by land transportation, by looking at the important role of waterways in America. Students will also communicate their understanding of the topic in writing.

2. **Lighthouses and Lenses** by Jay Sinclair
   8th Grade Science

Lesson Overview
The lesson will cover the function and importance of lighthouses. The main focus (pun intended) will be on the use of Fresnel lenses to concentrate the beam of the light. The lesson will serve as an extension of the unit on optics and lenses, will connect to social studies topics, and will involve writing across the curriculum, a major school improvement goal in my district.

3. **The Great Lakes Storm of 1913** by Jay Sinclair
   Grades 7-9 Earth Science

Lesson Overview
The lesson will cover the causes and effects of the Great Lakes Storm of 1913. Topics covered will include the meteorological causes of the event, as well as the human impact. The lesson will serve as an extension of the unit on weather, will connect to social studies topics, and will involve writing across the curriculum, a major school improvement goal in my district.

4. **Great Lakes Watershed** by Jon Way
   8th Grade Earth Science

Lesson Overview
Students construct a plaster model of the Great Lakes watershed. Students will paint the major rivers that enter into the Great Lakes, the individual river and lake watersheds, and the area that would be considered the Great Lakes watershed. Students will compare the Great Lakes watershed with other major watersheds in the United States. My goal is for student to be able to identify the watershed in which they live in, as well as the interconnectedness of the Great Lakes waterway used for shipping goods to people across our country.

5. **Invasive Species** by Jon Way
   8th Grade Science

Lesson Overview
This lesson introduces the topic of invasive species to students and will be taught in environmental science. Great Lakes shipping is one way that invasive species have entered the Great Lakes. This lesson fits into environmental problems and solutions. My goal is for students to have an understanding of non-native species, their impact on the Great Lakes and water bodies in the Great

Lakes watershed, as well as, potential options for controlling or preventing their entry and movement in the watershed, including some of the new ship designs.

6. **Boat Design** by Rick Suckow
   7th Grade Math, Social Studies or Science

Lesson Overview
Students will design and build a clay boat that will carry the native ore from Marquette, Mi through the Sault Saint Marie Locks to the processing mill in Dearborn, Mi. The boat's cargo will be nickel sulfide (old copper pennies) and be restricted to the size of the locks 30 *cm* by 15 *cm*.

7. **Charting a Shipping Lane** by Rick Suckow
   7th Grade Social Studies or Science

Lesson Overview
A newly constructed steel mill located on the Rouge River will be using the ore obtained from a new mine located north of Marquette, Mi. Over the last five years the water level of the Great Lakes and its tributaries has dropped in depth. The shipping lane has to be measured and new buoys need to be placed. The Army Corps of Engineers may need to dredge the river that will allow the freighters to safely reach the mill.

HIGH SCHOOL

1. **Profiling the Enemy: Using the Internet to Identify Great Lake Invasive Species**
   by William Hodges
   10th Grade Biology

Lesson Overview
In this lesson, students will receive pre-made dossiers for 6 varied invasive species in the Great Lakes. They will then need to use the internet to discover useful information about each species, including hypothesized method of invasion, trophic level of the food chain that is immediately affected, ecological damage, and methods of control.

2. **Becoming a Great Lakes Invasive Species Czar** by William Hodges
   10th Grade Biology

Lesson Overview
In this lesson, students will play a game where they will be given a role in the Michigan Department of Natural Resources where they will control where money is spent on different invasive species projects. They will deal with a budget that constantly changes, and they will need to put their money where they think it will do the most good. If they are successful, they will receive political points (useful in keeping one's job). If they have too many failures, they will get fired. The purpose is to show how difficult it is to try to control invasive species in the Great Lakes, especially given the limited resources devoted to controlling them.

3. **Careers in the Maritime Field** by Jackie Johnson
   Grade 11-12 Transition Exploration w/ Special Needs

Lesson Overview
Students will explore the OCIS website to select three jobs of interest that relate to the Maritime employment. They will determine what type of further training they may need in order to obtain these jobs. They will then search out where they can go to obtain this training. They will create a PowerPoint or other type of presentation to share the information with the class.

4. **What Shipping Job Would I Be Good At?** by Jackie Johnson
   Grade 11-12 Transition Exploration w/Special Needs

Lesson Overview
The objective of the lesson is to take self inventories to determine what occupations are a good fit for our personality and learning styles. Students will play the SHIPS BINGO game to test their knowledge of maritime careers. We will then take the self inventories to find out what occupation fits them the best.

5. **Wind Through Your Socks** by Denise Little
   Algebra 1 and Geometry

Lesson Overview
The students have been studying graphing and direction. This lesson focuses on more abstract applications. That is, determine wind direction and speed and to decide what is their importance in real life applications.

6. **Where Are They?** by Denise Little
   High School Math

Lesson Overview
Students have been studying the coordinate system. They will use their knowledge to apply what they have learned to locate places throughout the world using longitude and latitude.

7. **What's so GREAT about these Lakes?** by Carrie Wenta
   High School Environmental Sciences

Lesson Overview
This lesson will be used to introduce students to the importance of the Great Lakes, contributing, both economically and environmentally, to the lives of people in the state of Michigan. Many students may have visited one of the lakes to camp, fish, or swim and have seen a large cargo ship moving far off in the distance. These students have not likely given thought to the connection between the goods and materials that these ships carry and their own lives.

8. **Clean Up This Mess: Addressing Ecological Impacts of Shipping** by Carrie Wenta
   High School Environmental Sciences

Lesson Overview
This lesson will be used to look at the environmental impact of Great Lakes shipping. Students will break into groups to focus on each problem. Students will explain the problem, cause, current policy, cost to clean up, who is responsible, and potential solutions. Students will discover that other modes of transportation can create far more environmental damage than shipping.

9. **Working on the Water** by Nancy Jayne
   High School Career Education

Lesson Overview
As the high school guidance counselor, I advise high school students on post-high school career options. I created a website and a brochure to present the various maritime careers available to students—job descriptions, pay, etc.

COLLEGE

1. **Historic Vessels of the Great Lakes: Evolution of Maritime Transportation** by Tim Evans

Lesson Overview
This lesson uses images and data to demonstrate the types of ships that carried goods on the Great Lakes from the birch bark canoe of the 17th century to the 1000-foot steel freighters of today. Presenting the images in chronological order shows the evolutionary changes that have occurred with Great Lakes ships and their cargos. This lesson connects the evolving modes of transportation in the past with historical maritime events during the same time periods, and helps students associate ships with time periods, understand uses of ships, and recognize patterns of change.

Anchors Aweigh!

Middle & High School Teachers

Michigan Tech Summer Teacher Institute
(MTU Course ED5661)
2 Graduate Credits

Teaching Mathematics through Navigation

Monday, June 28 - Friday, July 2 ▪ Michigan Technological University

COST: $250 off-campus, or $475 on-campus (includes 4 nights lodging & meals)

CLASS LIMIT: 12 participants

APPLICATION DEADLINE: Friday, May 14

Explore innovative ways to teach geometry, measurement, and algebra through the practice of marine navigation. Teachers will learn navigation techniques via daily hands-on experiences aboard Michigan Tech's Research Vessel, *Agassiz, and* become proficient in solving navigation problems using mathematics, charts, and electronic instruments.

Instructor: R. Stephen Roblee, Professor Emeritus and Captain R/V *Agassiz*

To Register:

Joan Chadde, Institute Coordinator
Center for Science & Env. Outreach
105 Dillman Hall—Michigan Tech
1400 Townsend Dr.
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Great Lakes Maritime Research Institute
A University of Wisconsin - Superior and University of Minnesota Duluth Consortium

National Center for Freight & Infrastructure Research & Education
CFIRE
University of Wisconsin-Madison

Michigan Tech
Michigan Technological University

Cost Includes 2 graduate credits

$250 per participant OFF CAMPUS
$475 per participant ON CAMPUS

Cost per participant staying **off campus is $250** and includes half-day trips daily on the *Agassiz*, instructional materials, and 2 graduate credits from Michigan Tech University. Cost per participant staying **on-campus is $475** and includes 4 nights lodging, breakfast & dinner. (The actual cost of the Institute is $1375. A grant from the Great Lakes Maritime Research Institute at University of Wisconsin Superior and University of Minnesota Duluth, along with CFIRE at University of Wisconsin Madison, covers the 2009/10 official MTU tuition for Applied Science Education Graduate Resident/Non-Resident of $822.) Payment of the full registration fee is due June 4, via **check** payable to: *Michigan Tech University D93713* or **credit card** by calling the Michigan Tech Cashier's office at (906) 487-2247.

Financial Aid

Applicants who are teachers in the eight Great Lakes states may apply for a Marine Immersion scholarship through the COSEE Great Lakes program http://coseegreatlakes.net/. Applications are due April 16, 2010. For information, contact: Jim Lubner at Wisconsin Sea Grant: jflubner@aqua.wisc.edu

About Michigan Tech & Local Area

Michigan Technological University is located east of downtown Houghton, MI (pop. 7,000). Houghton is served daily by United Airlines (800) 864-8331 or united.com from Chicago to the Houghton County Airport. Taxi service is available from the airport to Michigan Tech's campus for about $20 per person. Call Neil's Taxi Service at (906) 482-5515.

Houghton, Michigan is a quaint town with roots in the historic copper mining days of the mid-19th century. Hiking and mountain biking is awesome at the nearby Michigan Tech Recreational Trail System, or stroll along Lake Superior at McLain State Park, or visit a nearby nature sanctuary. Learn more about MTU: http://www.mtu.edu or Keweenaw Tourism information: www.keweenaw.info/index.aspx

Michigan Tech
Houghton, Michigan

To Apply & More Information

Application forms and updated information available at: http://wupcenter.mtu.edu

Application deadline: Friday, May 14

Submit applications to:
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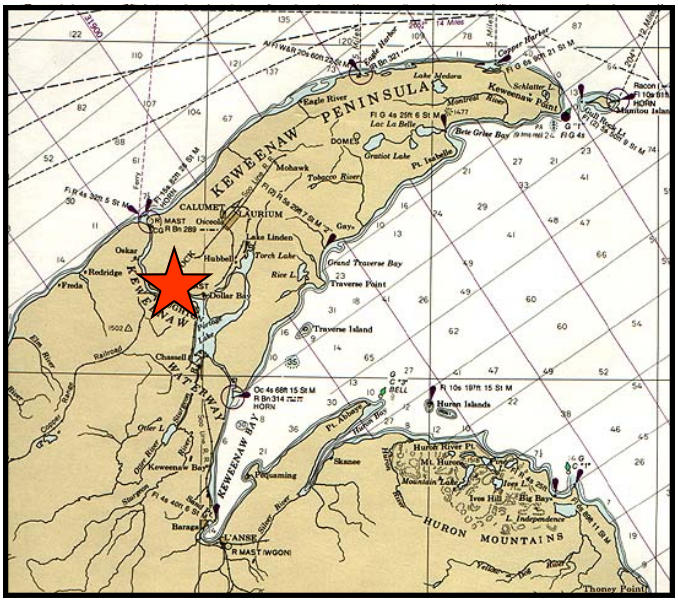
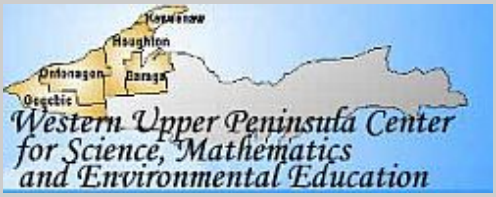


Accommodations

Participants will receive four nights lodging in MTU's newly remodeled Wadsworth Hall in a single room with private bath and breakfast & dinner from Monday dinner through Friday breakfast. Michigan Tech Trails and downtown Houghton are within easy walking distance.



MichiganTech
Great Lakes Maritime Education

Great Lakes Maritime Research Institute
A University of Wisconsin - Superior and University of Minnesota Duluth Consortium

Summer Institute Brochure & PDF
Course Agenda
Photo Slide Show 1 - 2010
Photo Slide Show 2 - 2010
Lesson Plans (by teacher participants)

Mathematics & Navigation

ED5661 Mathematics and Navigation Teacher Institute Schedule

Monday, June 28 – Friday, July 2, 2010

Agenda PDF Version

Meeting Locations

Morning sessions – in 312 Dillman Hall (building 14) on Michigan Tech's main campus. (Directions: http://www.mtu.edu/maps/). Participants may park in the Rozsa Parking Lot 9)

Afternoon and evening sessions - aboard the R/V Agassiz departing from H&Y Marina (weather permitting). To reach the H&Y Marina from Michigan Tech, drive across the Houghton-Hancock bridge, turn right onto M-26, drive one mile and turn right into the Marina.

While on the vessel, wear closed toe shoes with rubber grip; bring a backpack with a water bottle, snack, rain/wind gear, warm jacket, hat, gloves and sunscreen. The temperature on Lake Superior is often ten to twenty degrees Fahrenheit less than on land. A calculator, notebook and pencils will be useful. Your provided navigation instruments will be needed.

Lunch- Lunch with the exception of Friday will be on your own. A list of nearby restaurants will be provided after you arrive on campus. On Friday a box lunch will be provided at no cost to you and we will have lunch on board while underway to Pequaming.

Schedule

Monday June 28
8:00 am to 12:00 pm Finding Position, DED reckoning
1:00 pm to 5:00 pm Practical Exercises on Portage Lake (aboard R/V Agassiz weather permitting)

Tuesday June 29
8:00 am to 12:00 pm Charts and Charting using navigation instruments
1:00 pm to 5:00 pm Practical Exercises on Portage Lake (aboard R/V Agassiz weather permitting)

Wednesday June 30
8:00 am to Noon Compass, Speed, Time and Distance
1:00 pm to 5:00 pm Practical Exercises on Portage Lake (aboard R/V Agassiz weather permitting)

Thursday July 1
8:00 - 10:00 amVisual Aids and Electronic Instruments

10:30 am – Noon Navigation experiences on the Great Lakes, marine careers, and navigation issues

-- Bill Hanrahan, Captain, Isle Royale Ranger, National Park Service

10:00 pm to 2:00 amNighttime Navigation Keweenaw Waterway (aboard R/V Agassiz weather permitting)

Friday July 2
10:00 am to 3:00 pm Navigation on Keweenaw Bay to Pequamming (aboard R/V Agassiz weather permitting)
Course Wrap-Up & Evaluation
*We will have a box lunch (5th & Elm) on board underway.

Contact the WUP Center

Last Update: 10/22/2010

If you have any problems or comments, contact the page designer and webmaster.
E-mail E.H.Groth, Webmaster

Great Lakes Maritime Education

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Mathematics & Navigation

"Mathematics & Navigation" Lesson Plans

Developed by Mathematics and Navigation summer teacher institute participants in fulfillment of course taught at Michigan Technological University June 28-July 2, 2010 with funding from the Great Lakes Maritime Research Institute and the University of Wisconsin-Madison CFIRE.

MIDDLE SCHOOL

- Real Life Application of Rates: Using Nautical Charts to Plan a Trip from Leland to North Manitou Island Loading Dock by Sarah Slade

6th grade

Lesson Overview

Rates have many real life applications, such as miles per hour, miles per gallon, cost per Lesson of weight, and calories per serving. Students in sixth grade are expected to solve applied problems involving rates such as those listed above. In this activity, students plan a boat trip from Leland to North Manitou Island. Their goal is to compute the travel time. They utilize charts to measure the distance in miles, they are given miles per hour.

- Kayaking around North Manitou Island: An Exercise in Rates and Physical Endurance! by Sarah Slade

6th grade

Lesson Overview

With sandy beaches, waterfowl and raptors aplenty, and sand cliffs, kayaking is a natural way to explore North Manitou Island. In this lesson, students have arrived on North Manitou Island (see lesson #1). They are embarking on a trip around the Island via kayak. To get them ready for the adventure, I'll bring in my sea kayak loaded as if we're traveling for several days (food, clothing, safety equipment, camping gear). Students will have the opportunity to see what's involved in the planning process. (My husband and I have circumnavigated the island this way, so I'll also share my photos of the trip.) Students will calculate distance around the island, determine the speed they will travel (they can use the internet to figure out about how fast they can expect to travel in knots), and finally determine the amount of time it will take to complete their journey. They ought to consider time of year, prevailing winds, camping regulations, and weather for August when charting their circumnavigation (which way will they travel?).

- Are We There Yet? by Tom Trusock

Pre-Algebra, 7th and 8th grade

Lesson Overview

Students will determine the amount of time it will take to traverse a given course by using given speeds and distances determined through use of maps.

- Learning About and Using the Compass Rose by Bonita Yocus

6th grade

Lesson Overview

This lesson will be used after completing lesson 3-6 (Pre-Transition Mathematics) on Angle Measure and Addition in order to show a real life use of a 360 protractor/compass rose. Students will learn about and practice using a 360-degree protractor. This is important in that a good understanding of these angles makes navigation much easier. Finally students will apply their skills using the compass rose on a navigation chart to draw a line showing the intended course from one location to another.

- Speed, Time, Distance Plotting a Course by Bonita Yocus

6th grade

Lesson Overview

This lesson will be used following lesson 7-1 “The Rate Model for Division” (Pre-Transition Mathematics) in order to show real life application of concept involving distance/rate/time. In this lesson, students will use the formula “distance = rate x time” in a variety of activities. The lesson will culminate with the students using the navigation chart (from the previous lesson plan) to determine how long it will take to navigate a boat from point A to point B.

HIGH SCHOOL

- Mathematics and Navigation Lesson #1 by John Failor

Geometry

Lesson Overview

The goal of this lesson is to teach students how to use landmarks to find the visual fix of a location. This lesson connects to many concepts in the current Geometry curriculum, including measurement, parallel and perpendicular lines, Pythagorean Theorem and unit conversion.

- Mathematics and Navigation Lesson #2 by John Failor

Geometry

Lesson Overview

The goal of this lesson is to teach students how to plot a course. This lesson connects to many concepts in the current Geometry curriculum, including measurement, the distance formula and

unit conversion.

- Relating boat position, bearing, and heading to polar coordinates by Melanie Harmala

Precalculus

Lesson Overview
Students will use their knowledge of a variety of topics to perform several activities related to marine navigation. They will measure distances and angles, determine latitude and longitude of given points, use trigonometry and the Pythagorean Theorem to calculate angles and distances, and relate a marine navigation course to polar coordinates. (I would include this lesson soon after students are comfortable working with polar coordinates.)

- Relating boat position, bearing, and heading to polar vectors by Melanie Harmala

Precalculus

Lesson Overview
Students will use their knowledge of a variety of topics to perform several activities related to marine navigation. They will measure distances and angles, determine latitude and longitude of given points, use trigonometry and the Pythagorean Theorem to calculate angles and distances, and relate a marine navigation course to vectors. (I would include this lesson soon after students are comfortable working with vectors.)

- How Far Will We Go and When Will We Get There? by Cathy Hill

Geometry

Lesson Overview
The overall goal of this lesson is to calculate the distance and travel time between two points in a navigational setting while incorporating mapping skills, chart reading, construction skills and conversions.
The Keweenaw Waterway runs for almost 25 miles from its southern end at the mouth of the Portage River to its northern end at the Upper Entry in Michigan's Upper Peninsula. This navigation channel is rich in history from the copper boom of the late 1800's. Many large ships have traveled through this narrow canal. Navigation through this canal is hazardous due to its many turns and narrowness. Students will begin the first steps of learning how to measure distance in degrees, minutes, seconds on a nautical chart. Then they will convert these distances into nautical miles and then find the time it would take to travel this distance given a constant rate.

- Traveling from the Portage Lake Lift Bridge to the Lower Entry Light by Cathy Hill

Geometry

Lesson Overview
This lesson has been designed to calculate the distance from the Portage Lake Lift Bridge to the Lower Entry Light at White City. This lesson will be used to determine the time it takes to travel between these two points using three different methods.

- Navigation Lesson Plans Using GPS by Don Hill

Advanced Algebra

Lesson Overview

This lesson is being used primarily as an introduction to GPS and some of its uses and as a graphing exercise. I will conduct this lesson within the first two weeks of the year as a refresher/review exercise in graphing, and as an introduction to a new technology. Since some of the exercise will be conducted out of the classroom, early in the school year works best for weather conditions also.

- Mapping Exercises to Reinforce Basics of Geometry by Laurie Lindstrom

Geometry

Lesson Overview
All students are expected to take Geometry as part of the new Michigan Merit Curriculum. Many concepts required to master basic ideas in geometry are very abstract. Ideas such as lines continue forever, and angles are measured as the number of degrees between two rays are difficult for low ability students to assimilate or make sense of. Maps by definition take relative locations of objects and orient them on a two dimensional plane. The lessons in this Lesson build concepts based on practce with very concrete examples that move to from hands-on to an outdoor activity to a mapping activity using nautical charts.

- Using Laws of Sine and Cosine to Solve Navigation Problems by Susan Romska

Geometry

Lesson Overview
Review the Laws of Sine and the Laws of Cosine from section 8.5 in Holt Geometry, use these to solve navigation problems. Students will use their knowledge to solve problems in small groups and also have to make presentations to class.

- Using Vectors in Navigation by Susan Romska

Geometry

Lesson Overview
Students will use previous lessons and knowledge on vectors to solve navigation problems related to finding magnitude (speed traveled) and direction (bearing).

- As the Crow Flies by Tom Trusock

Lesson Overview
Students will determine distances (in nautical miles) between two points listed in latitude and longitude in both cardinal directions (N/S, E/W) and straight line (“as the crow flies”) distances. The overall purpose of this lesson is to provide students with an opportunity to apply the Pythagorean theorem in a real world situation as well as introduce students to various types of units in use around the world.

- Mathematics and Navigation Lesson #1 by Todd Waurio

Geometry

Lesson Overview
This is day one of a 2 day lesson for a Freshman Geometry class. In this lesson, students will be

introduced to latitude and longitude in D m s and D mm.mm and learn to convert between the two forms. They will be introduced to the definition of a nautical mile and how it relates to latitude. The students will take 2 points located on a photocopy of a local map of a nearby location, estimate their position in latitude and longitude in D m s and D mm.mm using a rolling ruler and divider then find out how far the 2 points are from each other using the changes in latitude and longitude.

- Mathematics and Navigation Lesson #2 by Todd Waurio

Geometry

Lesson Overview
This will be a continuation of the lesson for a Freshman Geometry class from the previous day that focused on introducing latitude, longitude and finding location on a map provided. The activity today will reinforce the skills from day 1, but will add 2 different tools. The students will use the website www.USGS.gov and a handheld GPS to reinforce the topics and introduce error estimations.

Contact the WUP Center

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E-mail E.H.Groth, Webmaster

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