



# Great Lakes Maritime Research Institute

*A University of Wisconsin - Superior and  
University of Minnesota Duluth Consortium*

## *Great Lakes Maritime Education for K-12 Teachers & Community* Door County, WI and Navigation Workshops – June 2011

### **Final Report**

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# **Michigan Tech**

## **Michigan Technological University**

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## Executive Summary

The Center for Science & Environmental Outreach at Michigan Technological University (MTU) continued and expanded several of the successful education/outreach programs implemented from 2006 to 2010. The Center partnered with the National Center for Freight & Infrastructure Research and Education (CFIRE) at the University of Wisconsin-Madison (<http://cfire.wistrans.org>). The Center conducted two summer teacher institutes: *Great Lakes Maritime Transportation* in Door County, WI, June 20-24, 2011, and *Teaching Mathematics Through Navigation* held at Michigan Technological University, June 27-July 1, 2011. In addition, the Center conducted a one-day teacher workshop in November 2010 at the Great Lakes Shipwreck Historical Museum & Lighthouse at Whitefish Point (MI) attended by teachers from Michigan, Wisconsin, Ohio, and Maryland. Teachers earned two graduate credits for completing the coursework and developing two lessons for each of the summer institutes. Teachers earned one credit for completing the course requirements of the workshop and developing one lesson. A total of forty-eight new lessons have been created and are posted online. Teachers attending the two summer institutes estimate that they will teach 1400 students and 500 students, respectively, about Great Lakes maritime transportation and navigation this school year. Eight more Great Lakes maritime transportation education teaching chests were assembled and four have been distributed to education/outreach schools, museum, and institutions in the Great Lakes region (bringing the total of chests distributed in all five Great Lake watersheds to 40). Two \$100 presentation stipends were given to teachers who presented their maritime lessons at conferences in February and March 2012. The Great Lakes Maritime Transportation website [http://wupcenter.mtu.edu/education/great\\_lakes\\_maritime/index.htm](http://wupcenter.mtu.edu/education/great_lakes_maritime/index.htm) is regularly updated with lessons and new workshop offerings.

### Project Objectives were to:

1. Conduct a *Great Lakes Maritime Transportation Summer Teacher Institute* in Door County in summer 2011. COMPLETED
2. Conduct a *Teaching Mathematics & Navigation Summer Teacher Institute* at Michigan Technological University in summer 2011. COMPLETED
3. Conduct two 1-day lesson-writing teacher workshops in Great Lakes states: Michigan, Wisconsin, Minnesota, or Ohio. ONE WORKSHOP COMPLETED; workshops were scheduled for December 2010 at the Door County Maritime Museum in Sturgeon Bay, WI, and for June 2011 at the Dossin Great Lakes Museum in Detroit, MI. Both were cancelled due to low registrations.
4. Provide 2-4 \$100 stipends to past participants to present at state conferences. TWO stipends requested.
5. Regularly update *Great Lakes Maritime Transportation Education* website. COMPLETED
6. Assemble and disseminate EIGHT *Great Lakes Maritime Transportation Education* teaching chests to museums and education centers in the Great Lakes region. EIGHT chests assembled; FOUR distributed to date. (as of December 2012)

## **Introduction**

Few K-12 students or the public have a well developed understanding of maritime transportation on the Great Lakes. This lack of familiarity translates directly into a high demand for mariners. The Maritime Administration says about 10,000 replacements are needed in the graying officer corps, and a U.S. Coast Guard study predicts shipping trade will double or triple by 2020.

*(Shipping Industry Runs Short of Young Mariners... What to Do?*

<http://www.thinkmaritime.com/2009/02/24/shipping-industry-runs-short-of-young-mariners-what-to-do/> )

This project is designed to raise public awareness of the role that the maritime transportation plays in our lives, economy, harbor and community development, and the current challenges the maritime industry faces, including prevention of the spread of invasive species, dredging for harbor and channel maintenance, and/or impacts of climate change, in addition to the growing opportunity for maritime careers.

To meet this need for greater maritime knowledge and awareness, the investigator conducted summer teacher institutes, facilitated the creation of lessons accessible online by K-12 educators throughout the Great Lakes region and nationwide, and assembled and disseminated maritime education chests full of resources to support formal and informal education programs throughout the Great Lakes region.

## **Report**

This project is designed to address the lack of awareness and knowledge the general public has about the maritime industry, although there are many who enjoy “ship watching.” To reach out to a varied audience, we have identified a number of programs and products that would reach a wide range of ages most efficiently across the Great Lakes region, using a variety of learning styles. Programs were successful and well received.

The *Great Lakes Maritime Transportation Teacher Institute* was conducted in Door County, WI from June 20-24, 2011. The *Teaching Mathematics Through Navigation Teacher Institute* was conducted at Michigan Technological University from June 27-July 1, 2011. One 2-day lesson-writing workshop on Great Lakes Maritime Transportation was held Nov. 5-6, 2010 at the Great Lakes Shipwreck Historical Museum & Lighthouse at Whitefish Point, MI. Two one-day workshops planned for Sturgeon Bay on Dec. 4, 2010 and at the Dossin Great Lakes Museum on Belle Isle in Detroit, MI on June 20, 2011 were cancelled and need to be rescheduled. The Maritime & Navigation Teacher Institute agendas and Teacher Institute Evaluation summaries are in the Appendix.

Eight of the maritime chests were created; four chests were distributed this year to:

Belle Isle Nature Zoo in Detroit, MI

Dossin Maritime Museum in Detroit, MI

Armitage Academy in Kenosha, WI

Case Western Reserve University in Cleveland, OH.

Teachers completed evaluations regarding the Great Lakes Maritime Transportation Teacher Institute and the Navigation & Mathematics Teacher Institute (see Appendix A & B).

## Dissemination of Study Results

### (1) Publications

Chadde, Joan. *Teachers Explore Great Lakes Maritime Transportations*. Summer 2011. Seaway Compass. <http://www.seaway.dot.gov/eCompass/Summer2011.pdf>

### (2) Conference Presentations

Chadde, Joan. *Status Report on Great Lakes Maritime Transportation Education Program*. Great Lakes Maritime Research Institute Annual Meeting. Sept. 23, 2011. Duluth, MN.

Daenzer, Tammy. *Introduction to Great Lakes Maritime Transportation* at **Michigan Science Teachers Association Annual Conference**. Lansing, MI. March 7-8, 2012.

Lindstrom, Laurie. *Nautical Archeology – Mapping Using Trilateration & Triangulation* **Math in Action Conference: Strategies for Student Success** Grand Valley State University Department of Mathematics & Regional Math Science Center. February 25, 2012

### (3) Use of material in classrooms

Teachers attending the two summer teacher institutes were asked to quantify the number of students that they are likely to reach each year with their new lessons on *Teaching Mathematics Through Navigation* or *Great Lakes Maritime Transportation*.

#### **Great Lakes Maritime Transportation Teacher Institute = 19 teacher participants (2011)**

Number of Students	Response %	Response Count
15-25 students	17.6%	3 = 75
26-50 students	29.4%	7 = 350
51-75 students	17.6%	3 = 225
76-100 students	11.7%	2 = 200
101-125 students	11.7%	2 = 250
126-150 students	11.7%	2 = 300

**Total Number of Students Reached per Year: 1400 students**

#### **H Teaching Mathematics Through Navigation = 11 teacher participants (2011)**

Number of Students	Response %	Response Count
15-25 students	45.5%	5 = 125
26-50 students	45.5%	5 = 250
51-75 (3 classes)	0.0%	0
76-100 (4 classes)	0.0%	0
101-125 (5 classes)	9.1%	1 = 125.

**Total Number of Students Reached per Year: 500 students.**

**Lesson plans developed by teachers participating in the November 2010 Great Lakes Maritime Transportation Workshop** at the Great Lakes Shipwreck Historical Society Museum & Lighthouse at Whitefish Point and posted online.

#### **ELEMENTARY**

1. ***BIF\*'s Journey to Dearborn***, by Candace Kawatsu  
Grade 3 Social Studies (\*Banded Iron Formation)
2. ***Oh Christmas Tree Ship, Oh Christmas Tree Ship*** by Gary Lindstrom  
Grade 4: English Language Arts

#### **MIDDLE SCHOOL**

1. **Learn About the Great Lakes for Goodness Sakes** by Pamela J. Skokan,  
Grades 4 – 8, Social Studies and/or English Language Arts
2. ***A Historical Look At Lifesaving As A Career*** by Jody Lehman  
Grade 8, Careers Curriculum
3. ***Shipwreck Sleuths: Becoming Marine Archaeologists*** by Valerie Martin  
Grades 5-7: Science and Social Science
4. ***What's So Great About The Great Lakes?*** by Kathy Keeney  
Grades 6 – 8, Earth Science, Math, Geography, Language Art

#### **HIGH SCHOOL**

1. ***Nautical Archeology – Mapping Using Trilateration & Triangulation*** by Laurie Lindstrom,  
Geometry
2. ***Surface Area of Lake Superior and Impact of Water Level on Shipping Income***  
By Donald E Hill, Algebra, Geometry, Advanced Algebra

**Lesson plans developed by teachers participating in the 2011 Great Lakes Maritime Transportation Summer Teacher Institute and posted online.**

#### **ELEMENTARY**

1. **Pen Pals with a Great Lakes Ship**, by Lynn Maki  
1<sup>st</sup> Grade, Social Studies and Language Arts
2. **Aquatic Invasive Species and Their Control**, by Patti Thunell  
2nd Grade, Language Arts, Social Studies and Science
3. **Let There Be Light**, by Beth Messman  
3<sup>rd</sup> & 4<sup>th</sup> Grade, Social Studies, Art & Language Arts
4. **Vanish Into Thin Air**, by Beth Messman  
3<sup>rd</sup> & 4<sup>th</sup> Grade, Social Studies and Language Arts
5. **The Rouse Simmons: The Christmas Tree Ship**, by Patti Thunell  
3<sup>rd</sup> Grade, Language Arts and Social Studies
6. **Michigan Shipping and Products**, by Sandra Carey  
3<sup>rd</sup>-4<sup>th</sup> Grade, Integrated Classroom
7. **Most Wanted!**, by Angela Adams  
5<sup>th</sup> Grade, Science and Writing

8. **The Mighty Workhorse**, by Angela Adams  
5<sup>th</sup> Grade, Writing and Social Studies

### **MIDDLE SCHOOL**

1. **How Low Can They Go?**, by Amy Gustafson  
7<sup>th</sup> Grade, Science and Math
2. **Predicting Future Trends in Great Lakes Shipping Using Multiple Representations of Data** by Laura Scribner,  
7<sup>th</sup>/8<sup>th</sup> Grade, Math
3. **How Fast, How Far?**, by Dennis Simi  
8<sup>th</sup> Grade, Math
4. **Where Are We Now?**, by Dennis Simi  
8<sup>th</sup> Grade, Math
5. **Introduction to Great Lakes Maritime Transportation** by Tammy Daenzer  
8<sup>th</sup> Grade, Science
6. **Threats to the Great Lakes** by Tammy Daenzer  
8<sup>th</sup> Grade, Science

### **HIGH SCHOOL**

1. **The Great Lakes St. Lawrence Seaway System** by David Rowe  
8-12 Grade, Science and Social Studies
2. **Friend or Foe?**, by Amy Gustafson  
10<sup>th</sup> Grade, Biology
3. **Quagga Quandary** by Deb Del Zoppo  
10<sup>th</sup> Grade, Biology
4. **Hydrilla/Godzilla** by Deb Del Zoppo  
10<sup>th</sup> Grade, Biology
5. **Invasive Species** by Troy Averill  
9-12 Grade, Math
6. **Calculating Ballast** by Troy Averill  
9-12 Grade, Math

**Lesson plans developed by teachers participating in 2011 Teaching Mathematics Through Navigation Summer Teacher Institute and posted online.**

### **ELEMENTARY**

1. **Marine Navigation Using a Compass Rose**, by Julie E. Junttila  
4<sup>th</sup> Grade, Social Studies and Math
2. **The Route of the Edmund Fitzgerald**, by Julie E. Junttila  
4<sup>th</sup> Grade, Social Studies and Math
3. **Learning Directions and Degrees of Movement** by Jeff Adamick  
5<sup>th</sup> Grade, Special Education Math

## MIDDLE SCHOOL

- 8. Learning Directions and Degrees of Movement** by Jeff Adamick  
6<sup>th</sup> Grade, Special Education Math

## HIGH SCHOOL

- 1. Using Vectors to Navigate (Day One)**, by Randall L. Elenbaas  
9-12 Grade, Geometry or Algebra 2
- 2. Using Vectors to Navigate (Day Two)**, by Randall L. Elenbaas  
9-12 Grade, Geometry or Algebra 2
- 3. Plotting a Course through the School**, by Randall L. Elenbaas  
11<sup>th</sup> grade Trigonometry
- 4. Finding Locations on a Chart with Polar Coordinate**, by Randall L. Elenbaas  
11<sup>th</sup> grade Trigonometry
- 5. Getting Your Fix: How to Determine One's Location Using Lines of Position**, by Serena Gay, 9-12 Grade, Geometry
- 6. Plotting and Adjusting Your Course: Using Vectors and Trigonometry in Navigation**, by Serena Gay, 9-12 Grade, Precalculus
- 7. Oblique Triangles**, by Nathaniel Heralde  
9-12 Grade, Geometry
- 8. Right Triangles**, by Nathaniel Heralde  
9-12 Grade, Geometry
- 9. Lines of Latitude and Longitude**, by Keith Johnson  
9-12 Grade, Math
- 10. Plotting Points in Baltimore Harbor**, by Fiel Angela Hose  
9-12 Grade, Math
- 11. Convert Decimal Degrees into Degrees, Minutes, Seconds**, by Fiel Angela Hose  
9-12 Grade, Math
- 12. Vector Resolution**, by Robert Madigan  
11-12 Grade, Physics
- 13. Dimensional Analysis**, by Robert Madigan  
11-12 Grade, Physics
- 14. Correcting for Magnetic Variation**, by Kevin Murphy  
11-12 Grade, Physics
- 15. Average Velocity and Speed on a Boat Trip**, by Kevin Murphy  
11-12 Grade, Physics
- 16. Calculating Time When Travelling by Water**, by Tiffany Scullion  
9-12 Grade, Introduction to Algebra
- 17. Wave Speed and Wind Height on Lake Superior**, by Tiffany Scullion  
9-12 Grade, Introduction to Algebra



## **APPENDIX A**

A-1

**AGENDA**

**Great Lakes Maritime Transportation Institute  
~ June 20-24, 2011 in Door County, WI**

**Monday, June 20 – Green Bay, WI**

- 9:00 am Course Overview & Introductions  
9:30 Overview of Great Lakes Intermodal Transportation by Carol Wolosz, Exec. Director, Great Lakes Maritime Research Institute (GLMRI)  
10:30 Overview of Port of Green Bay by Chuck Larscheid, Director, Brown Co. Port & Sewerage Authority  
12:15 pm Benefit/Cost Analysis of Transportation Choices by Dr. Teresa Adams, CFIRE  
2:00 Tour NOAA Green Bay Weather Station (Teri Egger, meteorologist).  
3:15 Neville Public Museum tour: *On The Edge of the Inland Sea* exhibits  
4:00 Hands-On Mapping Old Green Bay Activity with Matt Welter, Neville Museum

**Tuesday, June 21 – Manitowoc, WI**

- 9:30 am Wisconsin shipbuilding history, tour exhibits; boat-building activity  
10:30 K-12 Lessons – Wendy Lutzke, educator, Wisconsin Maritime Museum  
Noon Tour of *SS Badger* (car ferry from Ludington, MI)  
1:30 pm Aquatic Invasive Species & Ballast Water Management by Susan Sylvester, WI DNR  
2:30-4:30 Invasive Species Curriculum – Wendy Lutzke  
5:00-6:00 Working Aboard Ship by Rick Brown, Mariner, Maritime Academy of Toledo

**Wednesday, June 22 – Sturgeon Bay, WI**

- 8:30 am Sturgeon Bay Coast Guard Station tour with Wayne J. Spritka, Station Master  
11:00 Shipping: Then & Now - Rick Brown, Maritime Academy of Toledo  
12:30 Navigation Through the Ages - Rick Brown, Toledo Maritime Academy.  
1:30-4:00 pm Bay Ship-building Company tour - dry dock & 1000-footer repairs  
7:00-9:00 Harbor Lady cruise on Sturgeon Bay canal (<http://www.harborlady.com/>).

**Thursday, June 23 - Door County, WI**

- 9:00 am Eagle Bluff Lighthouse Tour at Peninsula State Park  
11:00 am Coast Guard Marine Safety presentation by Chris Tantillo, U.S.C.G.  
1:00 pm *Maritime Archeology* - Keith Meverden & Tamara Thomsen, maritime archaeologists, WI St. Historical Society.  
3:30 pm *Basic Navigational Concepts* - Rick Brown, Maritime Academy of Toledo

**Friday, June 24 – Sturgeon Bay, WI**

- 8:00 am *Great Lakes Bulk Carriers* by Joseph Fischer, President, Bay Engineering  
10:00 am Door County Maritime Museum & *John Purvis* tugboat tour  
1:00 pm *Lake Levels & Great Lake Compact* by Jim Lubner, Wisconsin Sea Grant  
2:00 pm Participants share lesson ideas  
4:00 pm Course evaluation

**2011 Great Lakes Maritime Teacher Institute ~ Teachers' Overall Evaluation Comments**

1. A wonderful class. I look forward to more classes that bring depth to our understanding of the Great Lakes.
2. We loved it and hope you do a Michigan class next year. Thanks for making this happen.
3. I very much enjoyed the Institute. I was just in Port Huron with my father to celebrate my birthday. I'm sure he was getting sick of me saying, "Hey, look at that ship! At the class I just took, I learned that..." "Oh, there's the Coast Guard. Did you know that they..." I'm just as excited about getting to share some of what I learned with my students.
4. I would consider attending additional sessions as this was very informative.
5. Thank you for such a great opportunity. I can't wait to bring much of this information back to my school. I truly appreciate all of the time that each of the presenters took to help make this class be successful. A special thank you to Joan for all of her efforts as well. Thank You!
6. I want to thank all the people who were presentors, planners behind the scenes, organizers, and motel accomations, and restrauts and other food preparers.
7. Wow, what a week. My mind was spinning from all that I learned. I would like a group reflection time each day - a communal sharing time of the most important thing learned, etc.
9. Wonderful event, looking forward to more!
10. Overall, a great week. I feel this experience has build up my background knowledge of the Great Lakes and has provided me with activity ideas for my classroom. Well worth the time spent! Thanks for making it a wonderful week and lining up so many experts!
11. The sharing portion at the end of the week was extremely helpful. I appreciated the attention to details each day. This institute was planned very well!
12. The venue for the class was so good that I would recommend that you have it in Door County every year. I can't imagine that you would find a better place.

## **APPENDIX B**

## B-1

### **Mathematics and Navigation Teacher Institute June 27-July 1, 2011 at Michigan Technological University**

#### **Meeting Locations**

**Morning sessions** – Room 312 Dillman Hall (building 14) on Michigan Tech’s main campus.

**Afternoon and evening sessions** - aboard *R/V Agassiz* departing from Houghton County Marina

#### **AGENDA**

##### **Monday June 27**

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 28**

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 29**

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 June 30**

8:00 - 10:00 am Visual Aids and Electronic Instruments (312 Dillman)

10:30 am – Noon Navigation experiences on the Great Lakes, marine careers, and navigation issues -- Bill Hanrahan, Captain, Isle Royale National Park

10:00 pm to 2:00 am Nighttime Navigation Keweenaw Waterway (aboard *R/V Agassiz*)

##### **Friday July 1**

10:00 am to 3:00 pm **Navigation on Keweenaw Bay to Pequamming** (aboard *R/V Agassiz*)  
Course Wrap-Up & Evaluation

**2011 Navigation & Math Summer Teacher Insitute ~ Teachers' Overall Evaluation  
Comments**

1. It was a great course. I enjoyed every moment. Professor Roblee was very thorough.
2. Good Course
3. Fun experience
4. I had fun, it was great to be out on the boat and apply our class work to the real world.
5. Dr. Roblee was an excellent teacher.
6. I loved everything about it!
7. Great fun and an experience of a lifetime. I looked forward to every day of this 5-day institute. My claasmates as well as my professor were phenomenal. Overall the institute was a well designed curricular program.