Maritime and Marine Science Schools

Training America's next generation of mariners.

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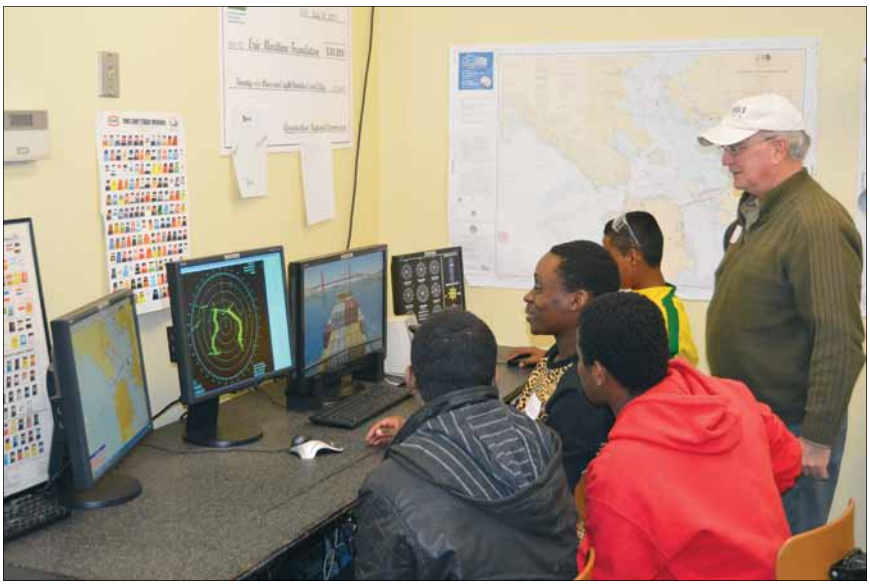
I have been pleased to see a recent re-emergence of primary and secondary maritime and marine science education in the nation. This is actually the third period in our country's history when public educators have embraced maritime education. The first time was in 1874, when the City of New York opened the New York Nautical School aboard the Navy sloop *St. Mary's* and 17 intrepid lads, aged 14 to 17, trooped aboard. This early school matured to become SUNY Maritime College.

The second resurgence of maritime education began in 1936 when the New York Board of Trade opened the Metropolitan Vocational High School for Boys to fill a growing need for unlicensed seaman. In 1946, this school moved aboard the former liberty ship *John W. Brown* and remained in operation until 1985, eventually graduating more than 5,500 students.[1]



Students use a marine simulator at the Bayfront Maritime Center in Erie, Pennsylvania. All photos courtesy of the author.

The third resurgence of maritime education began around the year 2000 and sprang up in several locations around the country. This resurgence, which continues today, has a much different focus than its predecessors, which were designed to produce seamen and officers to go to sea after graduation. Present-day high school maritime curricula and marine science and transportation/logistics programs are used to create student interest in staying in high school, developing their academics, and in considering post-graduation maritime marine science education, where they will actually receive the more advanced certified training for a maritime career.

Why Marine Science and Transportation?

The students of the 21st century are similar to those of past centuries, but differ from them in important ways. For example, today's students are visual learners and absorb material in short bursts, while previous generations were content to sit through a lecture to learn material. In the past, maritime education was hands-on—students learned to set a sail, operate a winch, or take a celestial navigation fix. These actions, while still necessary, have become much more advanced through the use of technology.

Further, the focus on maritime and marine science professions can address some of the major issues educators have identified that can plague public education, such as students not graduating high school and a lack of interest in science, technology, engineering, and mathematics (STEM) education and technical careers. Those in the maritime industry hope this focus can re-invigorate its ranks, too, as the industry

struggles with the shortage of a qualified technical workforce.

How These Programs Work

Our forefathers discussed establishing a national education system at the primary and secondary/post-secondary level that we see in much of the world. They discarded this idea in favor of the "little red schoolhouse" approach (local education), which is based on the premise that education tends to work best when the local taxpayers who fund the majority of school costs design and manage their programs. This remains true, so long as these programs conform to all national laws and state education requirements.

Similarly, things tend to work best in the neighborhood, too, with maritime and marine science programs. When local stakeholders support these programs, they can work in any section of the country. This allows a school district to design a program that best fits its own students, taxpayers, and local industry. The program can design its style to fit the needs of the community, region, or a specific company or industry. Individual programs can be designed to follow a career, technical, apprentice, or academic model that will allow students to select the program that best fits their needs.

Marine or Maritime?

Today's programs may be offered in primary schools and high schools. The major difference between the two is in the manner of presentation and the outcome objective. There are also differences between "marine" or "maritime" education. Marine-focused education typically refers to those subjects and professions related to the science of the sea—such as marine biology, oceanography, or ecology. The term "maritime" refers to the practical side of the industry, including sailing, ship repair, fishing terminal operations, or marine engineering.

The classroom structure of a primary school single classroom with a primary teacher and a fairly regulated curriculum lends itself to what I call the "Song of the Sea," where maritime subjects are infused into traditional subjects. As an example, when discussing fractions or degrees in a math class, a ship's compass may be used to illustrate a practical example of navigation. Likewise, the mathematics of a right triangle is the basis of a plane sailing solution.

Many schools have a maritime instructor on staff, just like a music or art teacher, and students attend these "special" classes once a week for enrichment. Given the fact that many of these are urban students with little exposure to the sea, these classes can build an interest in the science of the sea, profession of the sea, and STEM education.

The majority of these types of schools have marine/maritime programs at the high school level, since the structure of high school allows students the opportunity to select maritime/marine courses as electives to complement their required classes. However, several high schools are expanding their curriculum into the primary grades, which affords a greater opportunity to shape a student's academic outcome. Research shows that building interest in STEM needs to begin in primary school.

The programs vary greatly: from a school with a single course designed to provide awareness of career and educational opportunities, to schools with several career tracks with multiple courses, and finally, to apprentice programs with industry partners that offer U.S. Coast Guard certifications and employment upon graduation.

Roles for Government and Industry

The maritime and marine science schools have done their part over the last several years in developing curriculum, engaging students, advancing student academic proficiency, and creating an interest for post-secondary maritime education and careers. The government and industry can help advance these students to post-secondary education and employment by sponsoring conferences. For example, in 2001, the U.S. Maritime Administration helped to raise awareness of a mariner shortfall with a conference held at the U.S. Merchant Marine Academy entitled "Creating an Action Plan for Recruiting and Retaining American Mariners." One of the suggestions that came out of the conference was creating maritime high schools.[2]

The Ship Operations Cooperative Program (SOCP) sponsored the follow-on conference in 2008 that introduced the

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STEM

The good jobs of the future at sea and ashore are connected to science, technology, engineering, and mathematics—often referred to as "STEM." Maritime applications include:

- **studying ocean currents (science),**
- **automated engine rooms (technology),**
- **alternative fuel-powered propulsion plants (engineering), and**
- **navigation (mathematics).**

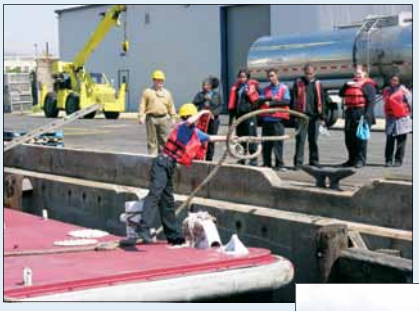
MARITIME/MARINE SCIENCE SCHOOLS OVERVIEW

The Veterans and the New Recruits

Veterans

- **The Maritime Academy Charter School (Grades K–12), Philadelphia, Pennsylvania**
- **The Urban Assembly New York Harbor School (Grades 9–12), Governor's Island, New York**
- **The Bayfront Maritime Center (Grades K–12), Erie, Pennsylvania**

The Maritime Academy Charter School, Philadelphia, Pennsylvania



Students learning line throwing to a barge.

One of the original high schools that heralded the maritime education movement in the 21st century, the Maritime Academy Charter opened its doors in 2003 with 128 fifth- and sixth-grade students in some rented college classrooms. The school is now entering its 13th year and has graduated five classes. In 2013, the school added a second campus and was approved to expand to a full K–12 school.

Students learn about boat handling at the Maritime Academy Charter school in Philadelphia, Pennsylvania.

Presently, there are more than 800 students enrolled. The middle school is rated in the top 20th percentile of Philadelphia middle schools; a large portion of its graduates are accepted to elite city high schools. It recently added career tracks in marine science and transportation logistics to the original maritime studies program.

The school also offers a traditional high school curriculum. Students may switch between tracks after they take the "Introduction to Maritime and Marine Science Studies, Education and Careers" course in ninth grade.

The school partners with several of the port's maritime organizations and the Independence Seaport Museum to offer summer maritime experiences, including sailing aboard the tall ship *Niagara* and attending maritime STEM and leadership camps. Additional information at www.maritimecharter.org.

Students at the Maritime Academy Charter School in Philadelphia, Pennsylvania, pilot the launch *Delaware River.*

The Urban Assembly New York Harbor School, Governors Island, New York

One of the first maritime high schools, this is now in its 13th year as a career and technical education (CTE) high school. It falls under the New York City Department of Education. Originally located in the heart of Brooklyn, in 2010 the school moved to the site of the former U.S. Coast Guard base on Governors Island in the center of New York Harbor. The city oversaw a $34 million renovation of a former U.S. Coast Guard facility for the academic building, and the Harbor Foundation that supports the school recently completed a $5 million capital campaign for the school's new marine affairs science and technology center.

Additionally, the school recently received formal approval for its six CTE programs from the state Department of Education. Students now graduate with an industry-approved technical credential in fields such as:

- aquaculture,
- marine biology research,
- marine systems technology,
- ocean engineering,
- professional diving, and
- vessel operations.

Wood shop students at the New York Harbor School.

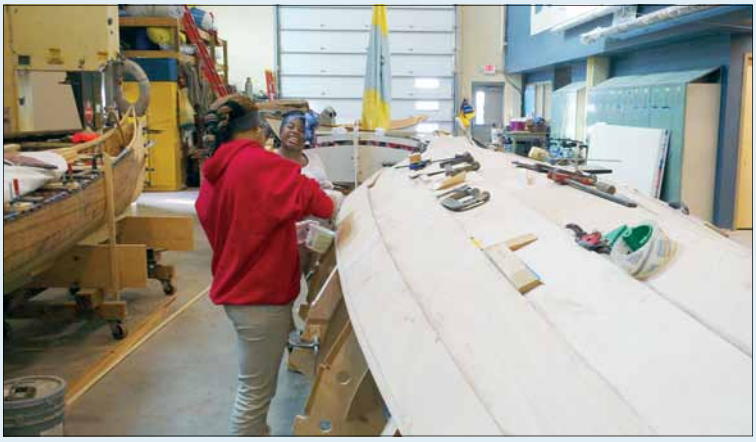
To support these CTE programs, the school and the Harbor Foundation developed partnerships with the local maritime community, including the South Street Seaport Museum, SUNY Maritime College, and local maritime operators such as McAllister Towing and New York Water Taxi. The school also offers a sail training program aboard the South Street Seaport Museum's schooner *Lettie G. Howard.*

In April 2014, the Harbor Foundation, in partnership with the Harbor School, launched the Billion Oyster Project, aimed at restoring one billion live oysters to New York Harbor by 2035, and, in the process, engaged thousands of students in their local marine ecosystem. Further, the city has plans in the works to open two maritime middle schools (to be located on the Staten Island and Brooklyn waterfronts) that will serve as feeder schools over the coming years. Additional information on the school is available at www.newyorkharborschool.org or www.bop.nyc.

The Bayfront Maritime Center, Erie, Pennsylvania

Entering its 18th year, this community-based, nonprofit center moved into a new waterfront facility in 2004. What better location to work with maritime community partners? In 2011, the Bayfront Maritime Center (BMC) developed a partnership with Erie's public schools to provide an alternative education program for students in grades 9 through 12 having difficulty succeeding in a traditional school setting.

In addition, the BMC runs a summer credit recovery program for students to complete courses needed to graduate. The center's after-school program, Project SAIL, helps students prepare for employment through boat building and sail training by building



Students build a boat at the Bayfront Maritime Center in Erie, Pennsylvania.

self-confidence and learning about teamwork. Additionally, the Bayfront Maritime Center recently acquired an unfinished hull that will be developed into a representation of the 1812 schooner *Porcupine* — one of the vessels in the Battle of Lake Erie. The schooner is being built to USCG standards and will allow the center to take more students on extended sail training opportunities. The center is also working with the Veterans Administration to develop maritime employment pathways. To learn more about this unique maritime community organization, visit www.bayfrontcenter.org.

The Tall Ship *Niagara* docked in front of the Toledo Maritime Academy before a summer cruise.

Bayfront Maritime Center students learn to sail on Lake Erie.

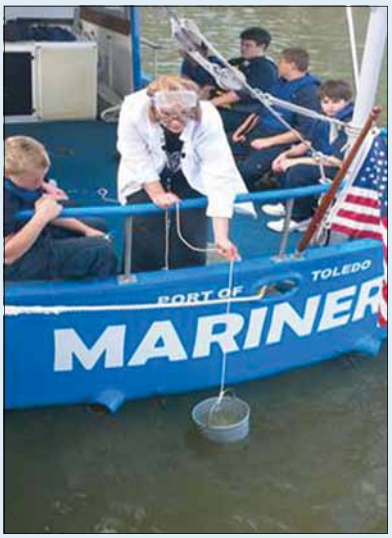
New Recruits

- **The Maritime Academy of Toledo (Grades 5–12), Toledo, Ohio**
- **Stephen F. Austin and Kirk Lewis Career & Technical High Schools (Grades 9–12), Port of Houston, Texas**
- **Blake and Jefferson High Schools (Grades 9–12), Tampa, Florida**

The Maritime Academy of Toledo, Toledo, Ohio

This school is located on the banks of the Maumee River in the Port of Toledo. From a small beginning in 2007 with 32 students in a rented apartment, it has grown to over 275 students. The founder recognized early on the importance of partnering with the maritime industry, port organizations, and maritime academia.

The school broke ground by being the first in the nation to have state-approved maritime career technical education (CTE) programs in maritime occupations and maritime culinary arts programs. The school has developed a long-term relationship with several Great Lakes steamship companies, including Interlake Steamship Company, which has hired entry-level graduates.



Students on the school boat *Mariner* collect marine samples from the Maumee River.

Additionally, several graduates have been admitted to the Great Lakes Maritime Academy in Traverse City, Michigan. In 2010, the school moved to its new location, the former American Maritime Officers Great Lakes Training Center. This state-of-the-art facility comes with a pool and a marine simulator that the academy uses to offer USCG-approved professional mariner training courses. The school is the first in the nation to have a student USCG Auxiliary detachment and to utilize modified college versions of USCG Auxiliary courses.

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MARITIME/MARINE SCIENCE SCHOOLS OVERVIEW

The Veterans and the New Recruits *(continued)*

Students from the Maritime Academy of Toledo cruise on the Tall Ship *Niagara*.

Students in the maritime program are job-ready upon graduation, complete with a transportation workers identification credential, merchant mariner credential, and passport. The school is adding a three-year marine environmental CTE program this fall, which will be the first such program in the Midwest. Additional information about the school and its programs may be found at www.maritime-academy.us.

Stephen F. Austin High School and Kirk Lewis Career and Technical High School, Port of Houston, Texas

Stephen F. Austin High School is the largest of the four high schools in the Houston area school district that offers a maritime-based curriculum. Austin boasts 700 students enrolled in four main maritime pathways:

- **piloting and deck operations,**
- **maritime logistics,**
- **naval engineering and design, and**
- **maritime systems engineering.**

Further, a program in ship building and repair will soon be added. Austin also offers maritime IT systems, maritime human relations, and business, all designed to interest students in exploring related careers in business, computers, telecommunications, transportation, and engineering.

The Stephen F. Austin High School and Kirk Lewis Career and Technical High School each have marine simulators to introduce students to the basics of ship handling, weather and bridge management, and team management. Additionally, the Kirk Lewis Career and Technical High School has state-of-the-art facilities to practice practical seamanship on its pond.

Both high schools have built a strong partnership with San Jacinto Community College, which recently opened a $26 million maritime campus on the Houston Ship Channel. This facility offers USCG-certified courses to high school students as well as a two-year associate degree in maritime transportation with mariner credentials.

Students in the Maritime Academy of Toledo's wood shop build a boat.

The high schools and community college also have a strong working relationship with the maritime community through the Port of Houston Authority and the Houston Pilots Association, funding internships and program guidance. The totally integrated maritime education program in the Port of Houston is unique in the country. Additional information on these schools can be found at www.houstonisd.org/austinhs, www.cthsweb.com, and www.sanjac.edu.

Blake and Jefferson High Schools, Tampa, Florida

This is a unique program, in that two high schools in the same city — Blake and Jefferson — partner on maritime/marine science programs. Approved programs are eligible for state funding, and, as a result, Florida has the largest number of maritime K–12 schools in the nation. The program in Tampa started in 2011 and currently has 200 students between the two schools.

The International Propeller Club of Tampa has been a long-time partner and has connected the school with industry partners such as International Ship Repair and the port authority, providing summer internships. Additional information on Blake High School is available at www.blake.mysdhc.org.

maritime industry to the concept of maritime K–12 education. More than 150 individuals from industry, academia, and the government attended to hear from representatives from the first six maritime and marine schools in the country.

In 2015, the State University of New York Maritime College and North American Marine Environmental Protection Association sponsored the "Securing Maritime's 21st Century Workforce" conference to connect marine employers and post-secondary academic institutions with the now 56 maritime K–12 schools around the country and their cadre of graduating students.

Building on this model, the SOCP has developed the course "Introduction to Maritime & Marine Science Studies Education and Careers," which covers all aspects of the industry and educational requirements for various positions. Written

by maritime/marine high school teachers and industry professionals, the course is 170 hours long, divided into 19 individual modules, and is suitable for grades 8–12.[3]

Outcome

The proliferation of these schools—from six to more than 50 schools in programs around the country—demonstrates their success. Further, the physical facility investment and development at schools in New York, Toledo, Houston, and Philadelphia, to name a few, as well as increased enrollment at individual schools, clearly shows that parent and student interest in maritime and marine studies has increased.[4]

While all of these are positive, visible signs of program interest and growth, we still needed to evaluate student academic success. In 2012, a three-year case study, "Maritime Tactile Education for Urban Secondary Education Students," was completed at the University of Pennsylvania Graduate School of Education. This study of two urban maritime/marine high schools (located in Toledo and Philadelphia) in a six-way case comparison with similar public and charter schools in the cities examined a number of questions:

- Why do students enroll and stay enrolled in a maritime high school?
- How do the demographic characteristics of students who enroll compare with characteristics of those students attending local high schools?
- How does attending a maritime high school affect outcomes in terms of student attitude, attendance, academic achievement, benchmark scores, graduation, and marine/maritime post-secondary education and career awareness?
- How do these schools address developing student character/personality characteristics, and what challenges do these schools face in developing their programs?

Overall, the study findings suggested that attending these schools made a difference for students in terms of school attendance, academic engagement, grade and test score improvement, and graduation rates.[5] In recent years, more students have been attending maritime post-secondary academic and apprentice programs as well as directly entering the industry. These maritime/marine programs may provide one pathway for urban high schools to afford students the opportunity for academic achievement and a rewarding career.

The Future

As far as the marine/maritime schools are concerned, we have seen mixed results. Many of the inner city schools have graduation rates in the 90th percentile range, while other schools in their city languish at graduation rates below 60 percent.[6]

We've come a long way, but we don't want to fail our youth at this point. It is time for the government, industry, and institutions of higher academic learning to step up to the plate and bring these young people—our future workforce—to fulfilling careers. I encourage maritime industry leaders to find a K–12 maritime/marine/transportation school in your city or area and connect with them by offering financial support, internships, scholarships, mentoring, and employment.

About the author:

Dr. Arthur H. Sulzer, a graduate of SUNY Maritime College, is an actively sailing mariner and a professional surveyor and consultant in the Port of Philadelphia. He holds a USCG master's unlimited ocean license and third assistant engineer's unlimited horsepower license. He completed 30 years of active and reserve service with the U.S. Navy and retired at the rank of captain. He holds several advanced degrees, an M.S. in transportation from SUNY Maritime College, an MBA in finance from Hofstra University, and an Ed.D. in higher education from the University of Pennsylvania. In 2012, he was appointed by former President Obama to the Saint Lawrence Seaway Development Corporation Advisory Board.

Endnotes:

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2. Maritime Administration, Creating an Action Plan for Recruiting and Retaining American Mariners, U.S. Merchant Marine Academy, 2001, Kings Point , NY.
3. Ship Operations Cooperative Program, Introduction to Maritime & Marine Science Studies, Education and Careers, 2016, www.socp.us.
4. A. Sulzer, Maritime Tactile Education for Urban Secondary Education Students, 2012, ProQuest LLC, Ann Arbor, Michigan.
5. A. Sulzer, Maritime Tactile Education for Urban Secondary Education Students, 2012, ProQuest LLC, Ann Arbor, Michigan.
6. J. Jordan, G. Kostandini, and E. Mykerezi, Rural and Urban High School Dropout Rates: Are They Different?, *Journal of Research in Rural Education*, 2012.27(12).

For more information:

The Maritime for Primary and Secondary Education Coalition is made up of individuals, schools, industry members, and academics with an interest in promoting maritime K–12 education. The coalition sponsors conferences, shares best practices, and connects organizations and individuals. Visit the website at www.mpsecoalition.org.

The Ship Operations Cooperative Program is a nonprofit organization of maritime industry professionals who promote beneficial innovations in ship and other maritime operations. Get more information at the website: www.socp.us.