**Discovering SMART Careers**

**An Educational Module for Middle School (Grades 6-8)
STEM Classes**



**Additional modules can be found at:**

**www.maritime-technology.org**



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**Purpose**

Expose middle school students (grades 6-8) in the Hampton Roads region of Virginia to careers within the maritime and transportation industry and educational pathways for those careers. While this lesson is intended for students, it could also be to educate parents and teachers.

**Duration**

One class period

**Materials**

* Discovering SMART Careers PowerPoint Presentation (separate document – both in Word for handouts and PPT for viewing)
* SMART Careers Matching Game Cards (included in this packet)
* Chart Paper labeled with each of the four sectors of SMART careers:
	1. Shipbuilding and Ship Repair
	2. Ports and Port-Based Logistics
	3. Seagoing
	4. Pleasure Craft and Marinas
* Markers

**Introduction**

Start by telling students that after today’s lesson they will be SMARTer! Discuss what SMART means and engage in a discussion about the definition of maritime. Then show the second slide of the presentation which contains pictures of popular items used by Americans. Ask students what the items on the screen have in common. Students will give many responses, so steer them towards a discussion about where the products are made and how we obtain them. Discuss that the transport of goods relates directly to careers in maritime and transportation, probably most of which they never considered before now.

**Process**

1. Show the presentation and explain concepts on each slide to students. Presenter notes are included in the presentation.

Key points in the first half of the presentation:

* + Reasons careers in maritime and transportation are important for students to consider.
	+ Facts about the Port of Virginia – multiple career options in their own backyard.
	+ The four maritime and transportation sectors.
1. Play SMART Careers Matching Game (using following career cards)

Required set up:

* Laminate each sheet of SMART careers and cut apart the career titles and career descriptions.
* Sort the 30 career titles and corresponding descriptions evenly into envelopes for easier distribution to small groups. Try to make sure each group has careers from across the four different sectors.
* Within the classroom post four pieces of chart paper (one in each corner) which bears the name of one of the four maritime and transportation sectors.
* Place a marker near each piece of chart paper.

To play the game:

1. Divide students into small groups.
2. Distribute an envelope containing SMART career matching pieces to each group.
3. Group members may work together to match the career titles and descriptions and to decide under which of the four maritime and transportation sectors the careers may fall.
4. Each individual student should stand up and read at least one career and description to the class and explain their rationale for the sector of its classification.
5. Then the student should move to the respective corner of the room, marked by hanging chart paper, for that sector.
6. Once all students have presented and moved to a corner of the room, the students in each sector group should review their career descriptions and note similarities and differences on chart paper provided. Groups should also brainstorm other careers that may fall within that sector. Each group should present their findings.
7. Have students return to their seats and continue showing the presentation.

Key points in the second half of the presentation:

* Education and training options for careers in maritime and transportation
* Opportunities for career advancement
* Apprenticeship programs – explore apprentice program link with the presentation
* Maritime Academies
1. Quiz the students on information learned. This can be done as a whole group, as an exit slip before leaving class, a Senteo quiz, etc. Prizes (SMART or nautical themed) could also be awarded to students who answer correctly.

**Evaluation**

Quiz the students on information learned (see slide 22 of the presentation for questions). This can be done as a whole group, as an exit slip before leaving class, a Senteo quiz, etc. Prizes (SMART or nautical themed) could also be awarded to students who answer correctly.

**Extension Opportunities**

Have students continue to further explore SMART careers by conducting independent research using the websites listed within the presentation or on the references and resources slide of the presentation.

**Additional Resources**

* SMART Website: [www.maritime-technology.org](http://www.maritime-technology.org)
* “Make the SMART Choice” Career Awareness Video Series:

<http://www.maritime-technology.org/students-videos/>

**Tags**

Discovering SMART Careers, SMART Careers, Shipbuilding and Ship Repair, Ports and Port-Based Logistics, Seagoing, Pleasure Craft and Marinas, SMART Careers Matching Game, Hawsepiper, Apprenticeship, Maritime Academies

***SMART Careers Matching Game Cards***

***(Career information below was obtained from the*** [***http://www.MyFuture.com***](http://www.MyFuture.com) ***website)***

***(cut here)***

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**Pilot, Ships**

Description

Command ships to steer them into and out of harbors, estuaries, straits, or sounds, or on rivers, lakes, or bays. Must be licensed by U.S. Coast Guard with limitations indicating class and tonnage of vessels for which license is valid and route and waters that may be piloted.

Education

* Officers and engineers usually must have a bachelor's degree.
* Water transportation jobs require the Transportation Worker Identification Credential (TWIC) from the U.S. Department of Homeland Security and a Merchant Marine Credential (MMC).

General Qualifications

* Customer-service skills
* Hand-eye coordination
* Hearing ability
* Manual dexterity
* Mechanical skills
* Physical strength
* Visual ability

Average Salary - $69,920

***(cut here)***

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**Heavy and Tractor-Trailer Truck Drivers**

Description

Drive a tractor-trailer combination or a truck with a capacity of at least 26,000 pounds Gross Vehicle Weight (GVW). May be required to unload truck.

Education

* High school diploma or equivalent and a commercial drivers’ license.

General Qualifications

* Hand-eye coordination
* Hearing ability
* Physical health
* Visual ability

Average Salary - $38,700

***(cut here)***

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**Storage and Distribution Manager**

Description

Plan, direct, or coordinate the storage or distribution operations within an organization or the activities of organizations that are engaged in storing or distributing materials or products.

Education

* Bachelor’s degree

General Qualifications

* Administration and Management
* Transportation
* Personnel and Human Resources
* Mathematics
* Customer and Personal Service

Average Salary - $83,890

***(cut here)***

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**Industrial Engineer**

Description

Design, develop, test, and evaluate integrated systems for managing industrial production processes, including human work factors, quality control, inventory control, logistics and material flow, cost analysis, and production coordination.

Education

* Bachelor's degree
* Students interested in this career path should take high school courses in mathematics, such as algebra, trigonometry, and calculus; computer science; and sciences such as chemistry and physics.

General Qualifications

* Creativity
* Critical-thinking skills
* Listening skills
* Math skills
* Problem-solving skills
* Speaking skills
* Writing skills

Average Salary - $80,300

***(cut here)***

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**Logistics Engineer**

Description

Design or analyze operational solutions for projects such as transportation optimization, network modeling, process and methods analysis, cost containment, capacity enhancement, routing and shipment optimization, or information management.

Education

May qualify for positions with an associate's degree; however, as the career becomes increasingly complex, more companies prefer to hire workers who have at least a bachelor's degree. Many in this career field have a bachelor's degree in business, industrial engineering, process engineering, or supply chain management.

General Qualifications

* Communication skills
* Critical-thinking skills
* Organizational skills
* Problem-solving skills

Average Salary - $73, 400

***(cut here)***

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**Crane and Tower Operator**

Description

Operate mechanical boom and cable or tower and cable equipment to lift and move materials, machines, or products in many directions.

Education

Vary by the type of job. Usually have several years of experience in related occupations.

A number of states and several cities require licensure, which involves a skills test and written exam on knowledge of safety rules and procedures.

General Qualifications

* Alertness
* Dexterity
* Mechanical skills
* Visual ability

Average Salary - $48,630

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**Railroad Conductors and Yardmasters**

Description

Coordinate activities of switch-engine crew within railroad yard, industrial plant, or similar location. Conductors coordinate activities of train crew on passenger or freight trains. Yardmasters review train schedules and switching orders and coordinate activities of workers engaged in railroad traffic operations, such as the makeup or breakup of trains and yard switching.

Education

* High school diploma and certification by the Federal Railroad Administration which involves a written knowledge test, a skills test, and a supervisor determining that the engineer understands all physical aspects of the particular route on which he or she will be operating.

General Qualifications

* Communication skills
* Speaking skills
* Decision-making skills
* Hand-eye coordination
* Hearing ability
* Visual ability
* Leadership skills
* Mechanical skills
* Physical strength
* Customer-service skills

Average Salary - $56,060

***(cut here)***

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**Marine Engineer and Naval Architect**

Description

Design, develop, and evaluate the operation of marine vessels, ship machinery, and related equipment, such as power supply and propulsion systems.

Education

Entry-level jobs require a bachelor's degree. Programs typically include courses in calculus, physics, and computer-aided design plus fluid mechanics, ship hull strength, and mechanics of materials.

An exam for a mariner's license from the U.S. Coast Guard is also usually taken. The first stage of the license is known as the 3rd Assistant License. With experience and further testing, a marine engineer may get a 2nd and then a 1st Assistant License. The highest level is known as Chief Assistant.

General Qualifications

* Communication skills
* Ingenuity
* Interpersonal skills
* Math skills
* Problem-solving skills

Average Salary - $89,550

***(cut here)***

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**Welders, Cutters, Solderers, and Brazers**

Description

Use hand-welding, flame-cutting, hand soldering, or brazing equipment to weld or join metal components or to fill holes, indentations, or seams of fabricated metal products.

Education

Certification which comes from formal training is available in high school career and technical education courses and in postsecondary institutions, such as community colleges, technical institutes, and private schools.

General Qualifications

* Detail oriented
* Manual dexterity
* Physical stamina
* Physical strength
* Spatial-orientation skills – ability to read, understand, and interpret two- and three-dimensional diagrams in order to fit metal products correctly

Average Salary - $36,720

***(cut here)***

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**Sheet Metal Workers**

Description

Fabricate, assemble, install, and repair sheet metal products and equipment. Work may involve setting up and operating fabricating machines to cut, bend, and straighten sheet metal; shaping metal over anvils, blocks, or forms using hammer; operating soldering and welding equipment to join sheet metal parts; or inspecting, assembling, and smoothing seams and joints of burred surfaces.

Education

* Students should take high school classes in English, algebra, geometry, physics, mechanical drawing and blueprint reading, and general shop.
* Community colleges and technical schools can provide academic credit and non-credit training that can result in industry (American Welding Society) certifications.

General Qualifications

* Manual dexterity
* Mechanical skills
* Physical strength
* Spatial relationships
* Computer skills
* Customer-service skills

Average Salary - $43,890

***(cut here)***

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**Plumbers, Pipefitters, and Steamfitters**

Description

Assemble, install, alter, and repair pipelines or pipe systems that carry water, steam, air, or other liquids or gases. May install heating and cooling equipment and mechanical control systems. Includes sprinkler fitters.

Education

A high school diploma or equivalent is required. Technical schools offer courses on pipe system design, safety, and tool use. They also offer welding courses that are considered necessary by some pipefitter and steamfitter apprenticeship training programs. Some states require licensure.

General Qualifications

* Business skills
* Customer-service skills
* Mechanical skills
* Physical strength
* Troubleshooting skills

Average Salary - $50,180

***(cut here)***

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**Machinists**

Description

Set up and operate a variety of machine tools to produce precision parts and instruments. Includes precision instrument makers who fabricate, modify, or repair mechanical instruments. May also fabricate and modify parts to make or repair machine tools or maintain industrial machines, applying knowledge of mechanics, mathematics, metal properties, layout, and machining procedures.

Education

High school diploma or equivalent and a postsecondary certificate earned at a community college or technical school. In high school, students should take math courses, especially trigonometry and geometry. They also should take courses in blueprint reading, metalworking, and drafting, if available.

General Qualifications

* Analytical skills
* Manual dexterity
* Math and computer skills
* Mechanical skills
* Physical stamina
* Technical skills

Average Salary - $39,570

***(cut here)***

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**Electrician**

Description

Install, maintain, and repair electrical wiring, equipment, and fixtures. Ensure that work is in accordance with relevant codes. May install or service street lights, intercom systems, or electrical control systems.

Education

* A high school diploma or equivalent is required and a post-secondary certificate.
* Many technical schools offer programs related to circuitry, safety practices, and basic electrical information. Graduates usually receive credit toward their apprenticeship. After completing their initial training, continuing education courses may be required. These courses are usually related to safety practices, changes to the electrical code, and training from manufacturers in specific products.

General Qualifications

* Color vision
* Critical-thinking skills
* Troubleshooting skills
* Customer-service skills
* Business skills

Average Salary - $50,510

***(cut here)***

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**Cost Estimator**

Description

Prepare cost estimates for product manufacturing, construction projects, or services to aid management in bidding on or determining price of product or service. May specialize according to particular service performed or type of product manufactured.

Education

* Bachelor's degree in an industry-related field, such as construction management, building science, or engineering.
* Course work in engineering, physical sciences, mathematics, or statistics. Some employers accept candidates with backgrounds in business-related disciplines, such as accounting, finance, and business.

General Qualifications

* Analytical skills
* Detail oriented
* Technical skills
* Time-management skills
* Writing skills

Average Salary - $59,460

***(cut here)***

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# Bus and Truck Mechanics and Diesel Engine Specialists

Description

Diagnose, adjust, repair, or overhaul buses and trucks, or maintain and repair any type of diesel engines. Includes mechanics working primarily with automobile or marine diesel engines.

Education

* High school diploma or equivalent and/or postsecondary training in diesel engine repair.
* High school or postsecondary courses in automotive repair, electronics, and mathematics provide a strong educational background for a career as a diesel mechanic.
* Many community colleges and trade/vocational schools offer programs in diesel engine repair that may lead to a certificate of completion or an associate's degree.

General Qualifications

* Customer-service skills
* Dexterity
* Mechanical skills
* Troubleshooting skills

Average Salary - $42,730

***(cut here)***

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**Carpenter**

Description

Construct, erect, install, or repair structures and fixtures made of wood, such as concrete forms; building frameworks, including partitions, joists, studding, and rafters; and wood stairways, window and door frames, and hardwood floors. May also install cabinets, siding, drywall and insulation.

Education

* A high school diploma or equivalent is required.
* High school courses in English, mathematics, mechanical drawing, and shop are considered useful.

General Qualifications

* Detail oriented
* Manual dexterity
* Math skills
* Physical stamina
* Physical strength
* Problem-solving skills
* Business skills

Average Salary - $40,500

***(cut here)***

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**Motorboat Mechanic and Service Technicians**

Description

Repair and adjust electrical and mechanical equipment of inboard or inboard-outboard boat engines.

Education

* Begin with a high school diploma and learn on the job.
* Employers prefer candidates who have completed courses in small engine repair, automobile mechanics, and science. Some employers may hire applicants with less education if they have adequate reading, writing, and math skills. Some marine equipment mechanics complete postsecondary education programs in small engine repair. Employers may prefer to hire these workers because they usually require significantly less on-the-job training.

General Qualifications

* Detail oriented
* Dexterity
* Mechanical skills
* Troubleshooting skills
* Customer-service skills

Average Salary - $36,090

***(cut here)***

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**Surveyors**

Description

Make exact measurements and determine property boundaries. Provide data relevant to the shape, contour, gravitation, location, elevation, or dimension of land or land features on or near the earth's surface for engineering, mapmaking, mining, land evaluation, construction, and other purposes.

Education

* Typically need a bachelor's degree due to greater use of sophisticated technology and mathematics.
* Candidates with a bachelor's degree must usually work for about 2 years under the direction of a licensed surveyor in order to qualify for licensure.

General Qualifications

* Communication skills
* Detail oriented
* Physical stamina
* Problem-solving skills
* Technical skills
* Time-management skills
* Visualization skills

Average Salary - $56,590

***(cut here)***

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**Fiberglass Laminators and Fabricators**

Description

Laminate layers of fiberglass on molds to form boat decks and hulls.

Education

* High school diploma or the equivalent.

General Qualifications

* Color vision
* Dexterity
* Math skills
* Mechanical skills
* Physical stamina
* Physical strength
* Technical skills

Average Salary - $28,450

***(cut here)***

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**Electrical and Electronics Installers and Repairers, Transportation Equipment**

Description

Install, adjust, or maintain mobile electronics communication equipment, including sound, sonar, security, navigation, and surveillance systems on trains, watercraft, or other mobile equipment.

Education

* Understanding of electrical equipment and electronics.
* Employers often prefer applicants who have taken courses in electronics at a community college or technical school.

General Qualifications

* Color vision
* Communication skills
* Technical skills
* Troubleshooting skills

Average Salary - $52,830

***(cut here)***

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**Retail Salespersons**

Description

Sell maritime-related equipment such as boats, navigation systems, safety items, etc. to consumers.

Education

* No formal education requirements.
* Some employers prefer applicants who have a high school diploma or equivalent.

General Qualifications

* Customer-service skills
* Interpersonal skills
* Persistence
* Selling skills

Average Salary - $21,140

***(cut here)***

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# Description

# Supervise or coordinate activities of crew aboard ships, boats, barges, or dredges.

# Education

# Varies by the type of job. Officers and engineers usually must have a bachelor's degree.

# All mariners working on ships with U.S. flags must have a Transportation Worker Identification Credential (TWIC card) from the U.S. Department of Homeland Security and a Merchant Marine Credential (MMC).

General Qualifications

* Customer-service skills
* Hand-eye coordination
* Hearing ability
* Manual dexterity
* Mechanical skills
* Physical strength
* Visual ability

Average Salary - $69,920

***(cut here)***

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**Ship and Boat Captain**

Description

Command vessels in oceans, bays, lakes, rivers, or coastal waters.

Education

# Varies by the type of job. Officers and engineers usually must have a bachelor's degree.

# All mariners working on ships with U.S. flags must have a Transportation Worker Identification Credential (TWIC card) from the U.S. Department of Homeland Security and a Merchant Marine Credential (MMC).

General Qualifications

* Customer-service skills
* Hand-eye coordination
* Hearing ability
* Manual dexterity
* Mechanical skills
* Physical strength
* Visual ability

Average Salary - $69,920

***(cut here)***

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**Ship Engineer**

Description

Supervise and coordinate activities of crew engaged in operating and maintaining engines, boilers, deck machinery, and electrical, sanitary, and refrigeration equipment aboard ship.

Education

# Varies by the type of job. Officers and engineers usually must have a bachelor's degree.

# All mariners working on ships with U.S. flags must have a Transportation Worker Identification Credential (TWIC card) from the U.S. Department of Homeland Security and a Merchant Marine Credential (MMC).

General Qualifications

* Customer-service skills
* Hand-eye coordination
* Hearing ability
* Manual dexterity
* Mechanical skills
* Physical strength
* Visual ability

Average Salary - $69,660

***(cut here)***

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**Dredge Operators**

Description

Operate dredge to remove sand, gravel, or other materials in order to excavate and maintain navigable channels in waterways.

Education

* Varies by the type of job. Usually have several years of experience in related occupations.

General Qualifications

* Alertness
* Dexterity
* Mechanical skills
* Visual ability

Average Salary - $39,590

***(cut here)***

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**Sailors and Marine Oilers (Able Seamen and Ordinary Seamen)**

Description

Stand watch to look for obstructions in path of vessel, measure water depth, turn wheel on bridge, or use emergency equipment as directed by captain, mate, or pilot. Break out, rig, overhaul, and store cargo-handling gear, stationary rigging, and running gear. Perform a variety of maintenance tasks to preserve the painted surface of the ship and to maintain line and ship equipment.

Education

* Officers and engineers usually must have a bachelor's degree.
* Most training occurs on the job. Training programs vary depending on service and specialty.
* Individuals must hold government-issued certification and tankerman certification when working aboard liquid-carrying vessels.
* All mariners working on U.S.-flagged ships must have a Transportation Worker Identification Credential (TWIC card) from the U.S. Department of Homeland Security and a Merchant Marine Credential (MMC).

General Qualifications

* Customer-service skills
* Hand-eye coordination
* Hearing ability
* Manual dexterity
* Mechanical skills
* Physical strength
* Visual ability

Average Salary - $38,960

***(cut here)***

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**Transportation Planner**

Description

Prepare studies for proposed transportation projects. Gather, compile, and analyze data. Study the use and operation of transportation systems. Develop transportation models or simulations.

Education

* Bachelor’s degree

General Knowledge

* Transportation
* English Language
* Law and Government
* Geography
* Customer and Personal Service

Average Salary - $76,770

***(cut here)***

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**Occupational Health and Safety Specialists**

Description

Review, evaluate, and analyze work environments and design programs and procedures to control, eliminate, and prevent disease or injury caused by chemical, physical, and biological agents or ergonomic factors. May conduct inspections and enforce adherence to laws and regulations governing the health and safety of individuals. May be employed in the public or private sector. Includes environmental protection officers.

Education

* Bachelor’s degree in occupational health, safety, or a related scientific or technical field, such as engineering, biology, or chemistry.
* For some positions, a master's degree is required in industrial hygiene, health physics, or a related subject.

General Qualifications

* Ability to use technology
* Communication skills
* Detail oriented
* Physical stamina
* Problem-solving skills

Average Salary - $67,960

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**Cargo and Freight Agents**

Description

Expedite and route movement of incoming and outgoing cargo and freight shipments in airline, train, and trucking terminals, and shipping docks. Take orders from customers and arrange pickup of freight and cargo for delivery to loading platform. Prepare and examine bills of lading to determine shipping charges and tariffs.

Education

* High School Diploma

General Knowledge

* Transportation
* Customer and Personal Service
* English Language
* Geography
* Public Safety and Security

Average Salary - $40,250

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**Chefs and Head Cooks**

Description

Direct and may participate in the preparation, seasoning, and cooking of salads, soups, fish, meats, vegetables, desserts, or other foods. May plan and price menu items, order supplies, and keep records and accounts.

Education

* On the job training and typically high school diploma or equivalent.
* Formal classes at community colleges, technical/culinary arts schools, and 4-year colleges.

General Qualifications

* Business skills
* Communication skills
* Creativity
* Dexterity
* Leadership skills
* Sense of taste and smell
* Time-management skills

Average Salary - $42,490