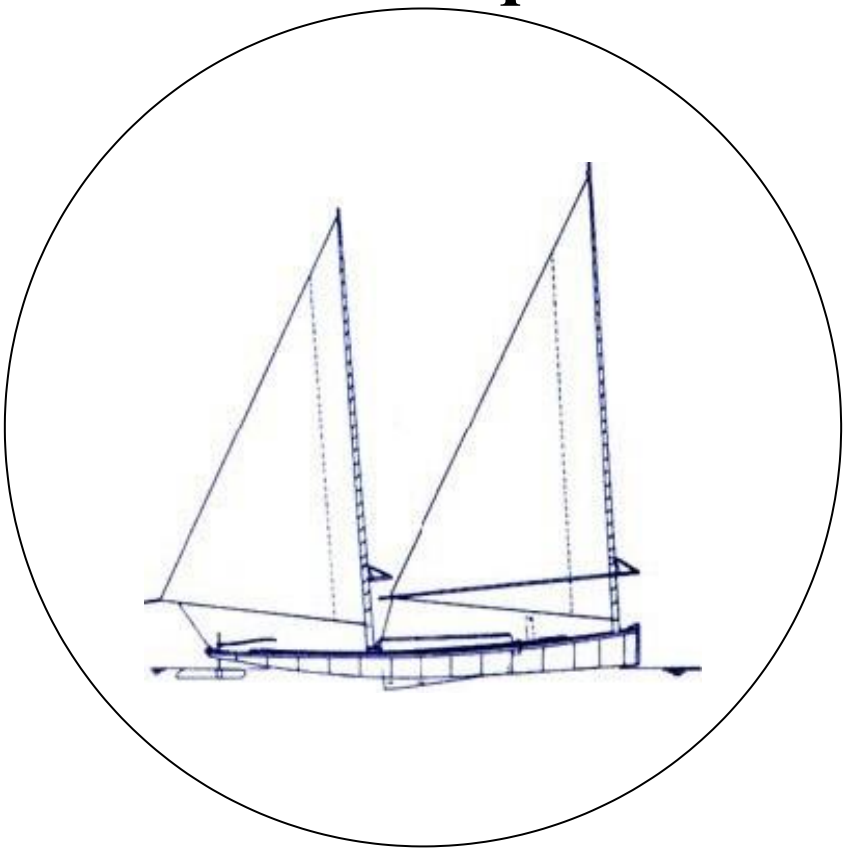
The Sound School
Regional Vocational Aquaculture Center



Program of Studies

Agriculture Science and Technology Education Curriculum Units

FOR AQUACULTURE AND AGRICULTURE

New Haven Public Schools

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Sound School Mission, Vision, and Goals

Our Beliefs:

- It is in our nature, as human beings, to learn.
- The purpose of education is to create the conditions which unlock a student's inherent ability and inclination to learn.
- All students can achieve mastery given the skills and tools to do so.
- Students must actively engage in the learning process.
- Positive relationships between students and adults create opportunities for learning.
- To support student learning, we must implement vision driven, data informed decision-making.
- Working effectively as a team is critical to student success.

Our Vision:

The Sound School is a learning community where students are both challenged and supported as they prepare for the future and achieve more than they thought possible.
The Sound School where education is: Engaging. Authentic. Meaningful. Transformative.

Our Mission:

The Sound School will provide an authentic, highly engaging, 21st-century curriculum utilizing aquaculture and agriculture, our unique setting and resources promoting success for all students. We strive to create meaningful learning opportunities, both in and out of the classroom, so students will develop the skills and abilities to think critically, problem solve effectively and apply learning fluently. We will graduate students who are able use these skills and abilities in any pursuit after graduation whether at a four-year college or in the work force.

Our Goals:

In an effort to realize this mission, we commit to the following goals—that all students will graduate from the Sound School with the ability to demonstrate:

- The use of critical thinking.
- Proficiency in solving multi-step, interdisciplinary problems.
- Proficiency in mathematics, reading, writing, and science.
- Facility with at least one foreign language.
- Appropriate public speaking skills.
- Job readiness skills.
- A working knowledge of the tools of maritime and/or agricultural commerce.
- A working knowledge of marine and/or terrestrial ecology.
- An understanding of the history, geography, and cultures of the United States and the world.
- The ability to function as part of a team.
- A healthy respect for the diversity of individuals found at school, in academia, in the workplace, and in the world at large.
- Knowledge of their role as stewards of the earth.

Freshman Exploratory Courses

Agriculture Science Curriculum

Course Title: **Agriculture Science and Natural Resources**

Scope and Sequence: Exploratory-Year 1

1st Year Students / Double Period / Alternating Cycle / One (1) credit

Course Description:

This course serves as an introduction to Agriculture as it relates to man-made and naturally occurring terrestrial ecosystems. Students will utilize the scientific method to conduct laboratory and field investigations while incorporating skill sets in microscopy, classification, soil monitoring and natural resource conservation. There is a strong emphasis on the earth's major cycles and ecosystem dynamics, incorporating both plant and animal systems. Domestic plant and animal care exploration is also included in this curriculum. Current environmental topics such as energy use and climate change support the coexisting New Haven Schools curriculum requirements.

Units

- Measurement/metric system
- Scientific Method
- Classification
- Soil Testing
- Plant and animal systems
- Climate Change
- Energy Use/conservation
- Earth Cycles
- Ecosystems/resource management

Significant Job Tasks

Microscope operation
Use of dichotomous key
Complete soil profiles and conduct soil chemistry
Analysis of soil chemistry for application in agriculture
Identification of domestic and wild species
Conduct a controlled experiment/analyze data/determine cause and effect

Job Titles

Soil Scientist
Field Biologist
Animal Care Specialist
Biologist
Chemist
Botanist
Ecologist
Science Educator

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards

AFNR: Career Ready Practices

- CRP.02.01, .02
- CRP.10.01,.02

AFNR: Content Skills

- PS.01.CCTC
- PS.01.03
- AS.02.01
- AS.03.01
- AS.06.02
- AS.07.01

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Agriculture Technology Curriculum

Course Title: **Agriculture Technology 1**

Scope and Sequence: Exploratory-Year 1

1st Year Students / Double Period / Alternating Cycle / One (1) credit

Course Description:

Students enrolled in Agriculture Technology I are introduced to a range of agriculture opportunities and pathways of study, including; Animal Science, Aquaculture, Horticulture, Natural Resources, Agriculture Careers and Leadership.

Units

- Plants and Animals
- Natural Resources
- Aquaculture
- Science Processes
- Farm to Food
- FFA Leadership and Development
- Supervised Agricultural Experience
  Agriculture Careers

Significant Job Tasks

Develop an appropriate agriculturally related work experience aligned with student interest and career goals
Maintain accurate record
Identify important historical and current facts regarding the history of FFA nationally and in CT
Participate in a mock FFA meeting
Complete an application for an FFA Greenhand Degree
Work Safely around domestic animals, in the lab, the greenhouse and on campus
Identify key species of livestock and poultry
Apply knowledge of plant anatomy and functions of plant structures
Define aquaculture and describe its importance as a part of agriculture industry
Articulate the important of environmental stewardship
Plan and Execute an SAE program
Identify potential workplace hazards

Job Titles

Landscape contractor
Greenskeeper
Horticulturalist
Plant Production and Sales
Horticulture Marketing
Pest Management

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards

AFNR:

- CRP 01.01, 02.02, 04, 04.02, 04.03, 06,
- CRP 08, 09.02
- AS.01.01, .02
- AS 09.01
- AQ.01.01
- AQ.04.01
- AQ.08.02
- NRS.01.01, .02
- PS.01.01, .02, .03
- PS.02.01

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book
- FFA Greenhand Degree

Aquaculture Science Curriculum

Course Title: **Aquaculture Science and Natural Resources**

Scope and Sequence: Exploratory-Year 1

1st Year Students / Double Period / Alternating Cycle / One (1) credit

Course Description:

This course serves as an introduction to Aquaculture as it relates to the laboratory and marine and fresh water environments, with a focus on local waterways. Students will utilize scientific method to conduct laboratory and field investigations while incorporating skill sets in microscopy, classification and water quality monitoring. There is a strong emphasis on the earth's major cycles, resource management and ecosystem dynamics. Current environmental topics such as energy use, climate change and ocean acidification support the coexisting New Haven Schools curriculum requirements.

Units

- Measurement/metric system
- Scientific Method
- Classification
- DEEP Project search Bio-assessment/mapping
- New Haven Harbor Study
- Climate Change/ocean acidification
- Energy Use/conservation
- Earth Cycles
- Ecosystems/resource management

Significant Job Tasks

Use a Microscope
Identify Invasive and Indigenous Species
Conduct Water Chemistry Analysis
Interpret Maps
Use a Dichotomous Key
Conduct Field Observations and Analysis

Job Titles

Water Quality Specialist
Field Biologist
Biologist
Chemist
Botanist
Ecologist
Science Educator

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards

AFNR: Career Ready Practices

- CRP.01
- CRP.02.01, .02
- CRP.10.01, .02, .03

AFNR: Content Skills

- AQ.03.01, .02
- NRS.01.01
- NRS.02.01

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Aquaculture Technology Curriculum

Course Title: **Aquaculture Technology I**

Scope and Sequence: Exploratory-Year 1

1st Year Students / Double Period / Alternating Cycle / One (1) credit

Course Description:

Aquaculture Technology I is an introductory and exploratory course for all Sound School first year students enrolled in the Aquaculture program. This course provides exposure to, and experience in, a variety of marine-related areas. Students engage in activities that introduce traditional nautical, sail training, and seamanship skills. The course utilizes our waterfront, boats, and maritime heritage to expose students to the 21st Century Skills necessary for them to pursue careers in the marine trades. Emphasis is given to educating students on the importance of effective communication, effective collaboration, and problem-solving skills. On the water instruction is coordinated with laboratory technicians and other aquaculture teachers. Students also obtain 1 credit in physical education during this course.

Units

- Waterfront Safety
- Seamanship & Small Boat Handling – Dory Rowing
- Seamanship & Small Boat Handling – Sharpie Sailing
- Small Boat Maintenance
- Half Hull Modeling
- State of CT Safe Boating Licensing Course
- FFA Advisory
- FFA Greenhand Degree

Significant Job Tasks

Demonstrate knowledge and understanding of safety procedures in and around the marine environment

Demonstrate the ability to think and problem solve in a dynamic environment

Demonstrate seamanship skills

Demonstrate proper methods of maintaining small wooden boats

Demonstrate ability to operate small boats in variety of situations and conditions

Identify qualities of success and demonstrate effective leadership skills

Create long-term and short-term personal goals

Demonstrate effective communication and collaboration skills

Identify hand tools, and have the ability to work with them safely

Demonstrate ability to perform calculations involving fractions

Obtain Physical Education credit through exposure to lifelong activity experiences

Job Titles

Marina Operator
Marine Construction
Carpentry
Deckhand
Marine Sales
Able Seaman
Launch Operator
Vessel Captain
Sailing Instructor

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards

AFNR: Career Ready Practices

- CRP.01.01.01, 02; 01.02.01; 01.03.02; 02.01.01; 02.02.01; 03.01.01; 04.01.01, 02; 04.03.01, 02; 05.01.01, 02; 06.01.01; 06.02.01, 02; 06.03.01; 07.01.01; 08.01.01, 02; 08.02.01, 02; 09.01.01; 09.02.01, 02; 09.03.01, 02; 10.01.01; 11.02.01; 12.01.01, 02; 12.02.01; 13.01.01-09; 13.03.01

AFNR: Content Skills

- MT.01.02.01; 02.01.01, 02; 02.02.01, 03, 04, 05; 03.01.01; 04.01.01, 03, 04, 05, 06

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book
- FFA Greenhand Degree

Sophomore Intermediate Courses

Agriculture Science Curriculum

Course Title: **Agriculture Biology**

Scope and Sequence: Intermediate- Year 2

2nd Year Students / Double Period / Alternating Cycle / One (1) credit

Course Description:

The primary purpose of this course is to provide a broad overview of key concepts of Biology with an emphasis on Agriculture species. It is designed to offer content and skills necessary for advanced agriculture, aquaculture, biotechnology, and environmental study; college preparation; and good citizenship. Agriculture Biology investigates world terrestrial and water systems as they relate to biology, life processes, habitats, and agriculture/aquaculture production. Student skills are developed and guided in working cooperatively and individually to solve problems using the scientific method.

Units

- Introduction to Biology and characteristics of Life
- Life Processes and Health
- Chemistry, Metabolism and Nutrition
- Cell Biology: Plant and Animal
- Cell Reproduction
- Genetics
- Terrestrial and Aquatic Plants and Animals
- Management Practices for Agriculture and Aquaculture

Significant Job Tasks

Students demonstrate collection, identification, and sampling of microscopic and macro invertebrates from terrestrial and aquatic habitats.

Students can explain the structure and functions of cells, particularly differences between plants and animals.

Students can describe the differences between bacteria and viruses, particularly pathogens.

Students will design and complete Research Project as well as writing a Scientific Report that utilizes the Scientific Method which includes both lab and field experiences for analyzing, soil/water quality, nutrition, breeding, Taxonomic nomenclature, science abstract, works cited, Microsoft Word, Microsoft Excel tables and graphing, and presentation.

Students test the structure and function of Biochemical reactions, especially enzymes and biosecurity.

Student will demonstrate good lab technique dissecting terrestrial/aquatic organisms: Dissection of terrestrial and aquatic organisms when available.

Job Titles

Entomologist
Soil Scientist
Agriculture Scientist
Fisheries and Wildlife Biologist
Biologist/Botanist
Pathobiologist/Toxicologist/Microbiologist
Animal Husbandry Specialist
Lab Technician/Research Scientist
Biochemist
Environmental Analyst
Animal Scientist

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards

AFNR: Career Ready Practices

- CRP.08.CCTC
- CRP.01.01a

AFNR: Content Skills

- AS.07.02 /AS.07.02.01a
- AQ.02.CCTC/AQ.02.01.02a
- CS.01.CCTC/CS.01.01.02a
- BS.02.NCAE/BS.02.01.01b
- BS.03.NCAE/BS.03.01.03a
- ESS.01.CCTC/ESS.01.01.01

NGSS:

- HS-LS3-2
- HS-ETS1-2
- HS-ESS2-2
- HS-LS1-5

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Agriculture Technology Curriculum

Course Title: **Agriculture Technology II**

Scope and Sequence: Intermediate- Year 2

2nd Year Students / Double Period / Alternating Cycle / One (1) credit

Course Description:

Students enrolled in Agriculture Technology II are introduced to agriculture opportunities and their associated pathways of study in more depth. These topics include; Animal Science, Aquaculture, Horticulture, Natural Resources, Agriculture Careers and Leadership

Units

- Plants and Animals
- Natural Resources
- Aquaculture
- Science Processes
- Farm to Food
- Honey bees
- Maple Syrup
- Leadership and Development
- Supervised Agricultural Experience
- Agriculture Careers

Significant Job Tasks

Develop an appropriate agriculturally related work experience aligned with student interest and career goals

Maintain accurate record

Maintain a bee hive

Identify the life cycle of bees and identify them in the hive.

Complete an application for an FFA Chapter Degree

Work Safely around domestic animals, in the lab, the greenhouse and on campus

Identify animal science and careers

Apply knowledge of plant anatomy and functions of plant structures

Define aquaculture species and their needs

Identify types of soil by feel

Utilize a soil texture triangle.

Job Titles

Landscape Contractor
Greenskeeper
Horticulturalist
Plant Production and Sales
Horticulture Marketing
Pest Management
Soil Scientist

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards

AFNR: Career Ready Practices

- CRP 01.01, 02.02, 04, 04.02, 04.03, 06, CRP 08, 09.02
- As.01.01.02.a, AS.01.02.01a, As.01.01.01.a, AS 09.01.01.b, AS.09.01.01.c, AS09.01.02.a, AS.09.01.03.a, AS.09.01.04.a, AS.09.01.05a, AS.09.01.6a, AS.09.01.07a
- AQ.01.01.01a, AQ 01.01.02.a, AQ.01.01.03.a, AQ.04.01.01.a, AQ.08.02.01.a,
- NRS.01.01.01a, NRS.01.02.01.a, NRS01.02.02a, NRS.01.02.03.a, NRS.01.02.04.a, NRS.01.02.05a,
- PS.01.01, PS,01.02, PS.01.03, PS.02.01

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book
- FFA Chapter Degree

Aquaculture Science Curriculum

Course Title: **Aquaculture Biology**

Scope and Sequence: Intermediate- Year 2

2nd Year Students / Double Period / Alternating Cycle / One (1) credit

Course Description:

The primary purpose of this course is to provide a broad overview of key concepts of Biology with an emphasis on major Aquaculture species. It is designed to offer content and skills necessary for advanced aquaculture study, college preparation, and good citizenship. Aquaculture Biology investigates the world's waters as they relate to marine biology, marine life, habitats and aquaculture production. Student skills are developed and guided in working cooperatively and individually to solve problems utilizing the Scientific Method. Laboratory work will explore the foundational knowledge and advanced skills for applying technology to developing hatchery techniques for aquatic species and expanding the understanding of biological systems. Specific emphasis is on laboratory practical and field activities.
Field trips on Long Island Sound extensively study this estuary aboard our research vessels. Marsh, stream, lake studies and coastal processes are essential to fulfill the program objectives. This course is also a prerequisite for the courses offered during third and fourth year of the aquaculture program.

Units

- Introduction and Characteristics of Life
- Chemistry and Nutrition
- Cell Biology: Plant and Animal
- Cell Reproduction
- Aquatic Plants and Animals
- Management Practices for Finfish, Crustaceans, Mollusks, Plants, Frogs, and Alligators

Significant Job Tasks

Students will describe the structure and Function of Biochemical reactions, especially enzymes. (City 10.1 D29)

Students can explain the structure and functions of cells, particularly differences between plants and animals. (City 10.1 D27)

Students can describe the differences between bacteria and viruses, particularly pathogens. (City 10.1- D31 and 10.2 –D32)

Students can explain in general terms how genetic information is transferred leading to genetic diversity and variety. (City 10.3-D36 and D34.)

Students can describe the role of DNA and RNA in protein synthesis and gene inherited traits. (10.3-D28 and D38)

Students will complete Aquarium Fish Project and Scientific Report that utilizes the Scientific Method which includes filters, water quality and analysis, nutrition, breeding, Taxonomic nomenclature, science abstract, works cited, Microsoft word, Microsoft excel tables and graphing, and presentation. (City 10.1 all)

Students demonstrate collection, identification, and sampling of microscopic and macro invertebrates from ponds, rivers and lakes.

Student will demonstrate good lab technique dissecting aquatic organisms: Dissection of Mollusks, Crustaceans, and Finfish.

Job Titles

Aquaculture Scientist
Fisheries and Wildlife Biologist
Biologist/Botanist
Pathobiologist/Toxicologist/Microbiologist
Animal Husbandry Specialist
Lab Technician/Research Scientist
Biochemist
Environmental Analyst

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards

AFNR: Career Ready Practices

- CRP.01.01

NGSS:

- HS-LS3-2, HS-ETS1-2, HS-ESS2-2, HS-LS1-5

AFNR: Content Skills

- AS.07.02
- AQ.02.01
- CS.01.01
- BS.02.01
- BS.03.01
- ESS.01.01
- PS.01.03

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Aquaculture Technology Curriculum

Course Title: **Aquaculture Technology II**

Scope and Sequence: Intermediate- Year 2

2nd Year Students / Double Period / Alternating Cycle / One (1) credit

Course Description:

Aquaculture Technology II follows the freshman introductory course and has been designed as an exploratory course exposing students to four major areas; Vessel Operations, Ocean Engineering; Marine Mechanics; Marine Construction. This course is also a prerequisite for the courses offered during third and fourth year of the aquaculture program. Students in sophomore classes will alternate between science and technology each marking period.

Units

- Seamanship
- Small Boat Handling
- Job Safety (Shop, Boat)
- Rules of the Road
- Leadership and Success
- Maintenance and Rigging
- Introduction to Ocean Engineering and Marine Mechanics
- Chart Work and Navigation
- Small Boat Construction

Significant Job Tasks

Demonstrate seamanship skills in maintenance of boats, gear and rigging
Demonstrate ability to operate small boat in variety of situations and conditions
Demonstrate ability to manage a crew on board a boat and as a project leader
Identify personal 'Categories of Life', apply to 'Wheel of Life' and evaluate categories on wheel
Create long and short term personal goals, using 4-step model
Describe the parts of the 'Triad', how it relates to leadership and success in the workplace and in life
Demonstrate effective communication skill and teamwork skills
Demonstrate knowledge and understanding of waterfront safety rules, USCG rules and regulations and "Work Mode" while on the water
Identify tools used and uses
Demonstrate effective time management skills
Demonstrate ability to perform calculations involving fractions, decimals and percentages.
Demonstrate ability to read and understand charts, drawings, and their symbols
Demonstrate ability to convert scale and to measure using different scales.

Job Titles

Marina operator
Boat repair
Carpentry
Deck hand
Sales position in Marine Sales
Able seaman
Coastal scientist

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards

AFNR:

- CRP 01.01, 02.02, 04, 04.02, 04.03, 06; CRP 08, 09.02
- As.01.01.02.a,; AS.01.02.01a; As.01.01.01.a; AS 09.01.01.b;AS.09.01.01.c, AS09.01.02.a, AS.09.01.03.a, AS.09.01.04.a, AS.09.01.05a, AS.09.01.6a, AS.09.01.07a
- AQ.01.01.01a, AQ 01.01.02.a, AQ.01.01.03.a, AQ.04.01.01.a, AQ.08.02.01.a,
- NRS.01.01.01a, NRS.01.02.01.a, NRS01.02.02a, NRS.01.02.03.a, NRS.01.02.04.a, NRS.01.02.05a,
- PS.01.01, PS,01.02, PS.01.03, PS.02.0

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book
- FFA Chapter Degree

Junior Advanced Courses

Agriculture Science Curriculum

Course Title: **Veterinary Science I**

Scope and Sequence: Advanced- Year 3

3rd Year Students / Double Period / Alternating Cycle / One (1) credit

Course Description:

The Small Animal industry is enormous and full of employment opportunities for people who have an interest in companion animals. The course explores animal husbandry including disease detection and prevention, parasite identification preventative measures, nutrition, housing requirements and enrichment, animal behavior, genetics, body systems, animal welfare and safety working with animals. Students receive hands on experiences with animals in the lab.

Units

- Safety around Animals
- Taxonomy
- Introductory Anatomy
- Zoonotic Diseases and Parasitology
- Nutrition
- Housing
- Veterinary Tech Skills including first aid, wraps, holds, IV, aseptic techniques and fecal floats
- Microscopy

Significant Job Tasks

Veterinary Technician

Be able to identify common parasites in larval and adult form
Be able to identify common breeds of dogs, cats and other small animals Be able to perform laboratory techniques such as microscopy
Assess animal housing requirements and maintenance
Understand basic anatomy and physiology

Retail Sales in a Pet Supply Business

Effectively communicate with both customers and fellow employees
Be able to identify common breeds of dogs, cats and other small animals Assess animal housing requirements and maintenance
Manage small animal reproduction
Be able to identify and advise appropriate use of various feedstuffs

Animal Groomer

Be able to identify common parasites in larval and adult form
Be able to identify common breeds of dogs, cats and other small animals
Understand basic anatomy and physiology
Be able to perform animal restraints appropriate to different situations with an understanding of animal behavior

Job Titles

Groomer Assistant
Kennel Worker
Pet Store Employee
Veterinary Technician

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards

AFNR:

- CRP 01.01, 02.02, 04, 04.02, 04.03, 06; CRP 08, 09.02
- AS.02
- AS.03

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Agriculture Technology Curriculum

Course Title: **Plant/Greenhouse Technology I**

Scope and Sequence: Advanced- Year 3

3rd Year Students / Double Period / Alternating Cycle / One (1) credit

Course Description:

Students enrolled in Plant Technology I will learn about the science and practice of working with plants. Students will review basic concepts of plant anatomy and physiology and will practice plant propagation, greenhouse crop culture, pest management and marketing. In addition, students will explore current trends in horticulture and current issues such as genetic engineering, and pesticides.

Units

- Plant Structure, Growth and Function
- Soil Science
- Plant Propagation
- Pests and Pest Management
- Indoor and Container Gardening
- Community Gardens
- Environmental Horticulture
- Floral Design and Marketing

Significant Job Tasks

Apply knowledge of plant systems to plant culture in the greenhouse and in the field
Apply knowledge of soils and nutrients to greenhouse and field culture of crops
Identify the role plant hormones play in growth and reproduction of plants
Identify the roles gravitropism, phototropism and thigmotropism play in plants
Propagate plants successfully
Identify common plant pests and disease
Identify and use color harmonies effectively
Implement practices to extend the life of cut flowers and greens
Use available floral materials to plan and create floral arrangements
Create boutonnieres and pinned corsages using a variety of materials
Create Garden Designs
Propagate and grow perennials and annuals for sale.

Job Titles

Landscape contractor
Greenskeeper
Horticulturalist
Plant Production and Sales
Horticulture Marketing
Pest Management

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards

AFNR:

- CRP 01.01, 02.02, 04, 04.02, 04.03, 06, 08, 09.02
- PS 01.01.01 c, 01.01.03c, 01.02, 01.02.01 a, 02.02.02a, 01.03.01a, 02.02.01b, 02.02.02b, 02.02.05b, 03.01.02c, 03.02.01b, 03.02.04b, 03.03.01a, 03.03.03a, 04.01.01a, 04.02.01b, 04.02.03b

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Aquaculture Science Curriculum

Course Title: **Aquaculture Chemistry**

Scope and Sequence: Advanced- Year 3

3rd Year Students / Double Period / Alternating Cycle / One (1) credit

Course Description:

At the completion of this course, the student will have had exposure to the role of Chemical Reactions and Principles that are involved in Agriculture Science and Technology. This class will cover Properties of Matter, Basic Atomic Structure, Chemical Bonding, Acid-Base Reactions and Solutions. Nuclear Chemistry and Energy will also be examined. Computer generation of lab reports is seen as an essential component of this class as well as designing, implementing, and monitoring experiments.

Students will perform laboratories and research based on topics related to Aquaculture, Agriscience and Technology. Water Quality Monitoring of New Haven Harbor and surveys of controlled tank systems may be performed. Soil and Geological Chemistry, Suitable Land Use, and Percolation for Subsurface Waste Disposal will be examined. Underlying chemical principles that provide for the function of various fertilizers, biocides, adhesives, and structural components in the Agriscience and Technology fields will be surveyed. Course will include experimental and control setups, writing hypotheses, designing experimental procedures, observation and data collection, data analysis and conclusion and assessing validity of conclusions.

Units

- Measurements, Problem solving, Metric System, Safety
- Atoms: Subatomic Particles, The Periodic Table, Electron Arrangement
- Bonding: Formulae, Moles, Ionic, Covalent, Hydrogen, Electron Affinity
- Reactions: Solutions, Acids, Bases, Pollution
- Agriculture: Nutrient Cycles, Soil Testing
- Technology: Paints, Adhesives, Composites, Construction
- Thermodynamics: Temperature, Phase Changes, Heat and Heat Transfer
- Nutrition: Carbohydrates, Proteins, Lipids, Vitamins, Minerals
- Energy: Renewable and Non-renewable Energy Technologies
- Organic Chemistry: Carbon, Functional Groups, Reactions

Significant Job Tasks

Performs water quality tests through Colorimetry, Meters, Titration.
Performs calibration and maintenance of meters as needed
Uses YSI 85 Dissolved Oxygen/Salinity meter or other industry standard meter
Understands or relates water quality concerns as part of culturing
Identifies water quality problems and limiting factors for aquaculture production
Performs work on boats and around water safely
Can follow instruction for pesticide or fertilizer application
Can follow instruction for use of lubricants, adhesives, resins, epoxies.

Job Titles

Environmental Technician- CT DEEP
Environmental Protection Field Inspector I (water, air, waste)
Hazardous Material Response Technician
Pesticide Sprayer/ Lawn Care Application Specialist
Boat Yard Technician
Waste Water Treatment Plant Operator

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards

AFNR:
- AS.03
- AQ.08, AQ.09, AQ.11
- ESS.01, ESS.03, ESS.04
- MT.03
- NRS.01, NRS.03
- PS.01, PS.05
- PST.01

NGSS:
- HS-LS-2-6,-7
- HS-ETS1-2, -4
- HS-ESS2-2, -5, -6
- HS-ESS3-2, -3

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Aquaculture Science Curriculum

Course Title: **Aquaculture Life Science I: Finfish/Shellfish Culture**

Scope and Sequence: Advanced- Year 3

3rd Year Students / Double Period / Alternating Cycle / One (1) credit

Course Description:

Aquaculture Production is a junior level applied aquaculture technique course. The intent of the course is to prepare students for advanced senior special topics courses centered upon individual projects run by the student, through work on existing algae, rotifer, finfish and shellfish culture initiatives. Students will be responsible to construct and maintain new and existing culture systems as well as work with laboratory personnel and the senior special topics class to support their projects and the fish production lab.

As directed by the Vo-Ag standards, the curriculum of this course is determined by driven investigation and application of current industry practice. Students have chosen this course and are expected to participate fully in all lecture, laboratory and field aspects of the course. Research into appropriate topics will be an integral part of the course and detailed lab reports and papers will be expected and required. Group discussion and support of classmates will be encouraged to widen experience and knowledge. Final evaluation for this class will involve student presentations of team projects/experiments that each student has participate in throughout the course.

Units

- Introduction to applied aquaculture production principles
- Application of research to culture methods
- Develop appropriate communication skills for discourse in science and industry
- Provide culture system design and implementation experience
- Establishment of familiarity w/monitoring technology & techniques useful to the aquaculture industry
- Provide marketing and processing experience to each student

Significant Job Tasks

Performs/prepare feeds for a variety of organisms
Performs wet chemistry tests as a part of fish culture
Monitors growth of aquatic organisms
Maintenance of recirculating aquaculture systems
Maintenance of shellfish aquaculture open systems
Performs work on boats and around water safely
Uses YSI 85 Dissolved Oxygen/Salinity meter correctly
Uses Refractometer for salinity readings.

Job Titles

Environmental Intern- CT DEP
Environmental Protection Field Inspector I (water, air, waste)
Professional Aquarist
Fish Culturist I and II
Research Assistant
Water Authority Lab Chemist
Aquaculture Production Technician

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards
AFNR:

- CRP 01.01
- CRP 02.01, -.02
- CRP 04.01,-.02,-.03
- CRP 06.01,-.02,-.03
- CRP 08.01,-.02,-.03
- CRP 09.01,-.02,-.03
- CRP 10.01,-.02,-.03,-.04
- CRP 11.01,-.02
- CRP 12.01,-.02
- CRP 13.02
- CS 03.04
- MT 05.01,-.02,-.03
- AQ 01-09
- AQ 11-15

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Aquaculture Science Curriculum

Course Title: **Environmental and Underwater Science and Technology**

Scope and Sequence: Advanced- Year 3

3rd Year Students / Double Period / Full Year / Two (2) credit

Course Description:

Through the integration of scientific dive training within this unique curriculum, students will explore our local ecosystems in order to develop a foundational understanding of the principles of conservation and the natural processes and interactions that shape our environment while earning internationally recognized industry certifications from Scuba Diving International (SDI) and Diver Alert Network (DAN). All students will participate in local restoration efforts and environmental field studies, preparing them for careers in professional diving, conservation, and environmental sciences. While prior dive training is not required it is highly recommended.

Units

- Introduction to Scientific Diving and Open Water Diving Review*
- Introduction to the Environment and Biodiversity*
- Welcome to the American Academy of Underwater Sciences
- Emergency Response and Prevention
- The Physics and Physiology of Diving
- Underwater Navigation and Orienteering
- Coastal Ecosystems*
- Our Changing Coastlines
- Careers in Environmental Science and Professional Diving
- Introduction to Environmental Research Methods*

Significant Job Tasks

Collect and conduct analysis of environmental data
Assess local biodiversity and Evaluate ecosystem status
Identify local species using a dichotomous key
Demonstrate effective communication skill and teamwork skills
Demonstrate knowledge and understanding of laboratory and dive safety protocols
Identify tools used and uses for ecological research
Demonstrate safe and appropriate use of advanced SCUBA diving technology and equipment
Employ proper response during a diving emergency
Demonstrate proper care and maintenance of SCUBA equipment
Articulate ideas clearly and effectively to a variety of audiences using multiple modes
Demonstrate effective time management skills

Job Titles

Climate Scientist
Conservation Biologist
Environmental Field Technician/Water Quality Technician
Environmental Attorney/Law Enforcement
Sustainable Developer/Urban Planner/Coastal Development Manager
Marine Scientist
Scientific Diver
Underwater Photographer/Videographer
Public Safety Diver
Underwater Construction
Commercial Diver
Navy Diver

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards

AFNR:

- ESS.01, 03, 04, 05
- NRS.01,02, 04
- AQ.02, 03, 10, 14
- MT.01, 05
- PST.02, 03
- CRP.01, 02, 04-13
- CS.04, 05, 06

NGSS:

- HS-LS2(1-4)
- HS-LS4(1-5)
- HS-ETS1(1-4)
- HS-ESS3-1

Industry Standards:

- Advanced Diver, Rescue Diver, First Aid/CPR/O2

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Aquaculture Science Curriculum

Course Title: **Genetics and Biotechnology I**

Scope and Sequence: Advanced- Year 3

3rd Year Students / Double Period / Alternating Cycle / One (1) credit

Course Description:

Genetics & Biotechnology I follows the sophomore Biology course and concentrates on Genetics, DNA Structure and Function, Protein Structure and Function, Microbiology and Recombinant DNA Technology. This course is also a prerequisite for its senior year extension, Genetics & Biotechnology II. In this course, students will gain cutting-edge knowledge and laboratory experience in the fast-growing field of biotechnology. The class content is supported by laboratory investigations including DNA extraction, electrophoresis, microbiology techniques, genetic modification of bacteria, analysis of DNA and proteins, transferring genes coding for fluorescent proteins into bacteria using recombinant DNA, ELISA immunoassays, and DNA fingerprinting.

Units

- Introduction
- DNA: Structure and Function
- Proteins: Structure and Function
- Microbiology
- Recombinant DNA Technology

Significant Job Tasks

Demonstrate accurate use of a micropipetter.
Demonstrate proper use of electrophoresis equipment for DNA fingerprinting.
Demonstrate ability to use an autoclave for sterilization of equipment.
Demonstrate ability to properly dilute concentrated stock solutions.
Demonstrate effective sterile technique in microbiology labs.
Demonstrate effective isolation of a single bacterial species in pure culture.
Demonstrate Gram staining of bacterial samples.
Explore and evaluate your fit for career choices.
Build models of DNA Replication, Transcription and Translation and use them to explain these processes.
Build models of proteins, showing primary, secondary, tertiary and quaternary structure; use them to explain post-translational protein synthesis.
Demonstrate DNA karyotyping as a method of diagnosing genetic disease.

Job Titles

Genetic Counselor
Medical Research Scientist
Bioanalytical Scientist
Bioinformatics Research Scientist
Cell Biologist
Forensic Scientist
Gene Editing Manager
Immunology Scientist
Microbiologist
Laboratory Technician
Agricultural Geneticist

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards

AFNR:

- BS.02.02.01.a.
- BS.02.02.03.c.
- BS.02.03.01.c.
- BS.03.01.
- BS.03.06.04.a.
- HL-BRD.4
-

NGSS Standards

- WHST.1-12.9
- HS-LS3-1
- HS-LS1-1

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Aquaculture Technology Curriculum

Course Title: **Ocean Engineering I**

Scope and Sequence: Advanced- Year 3

3rd Year Students / Double Period / Alternating Cycle / One (1) credit

Course Description:

This course introduces students to various areas of physics through application to marine technology and the engineering process. The curriculum includes units on Drafting, Computer-Assisted Drafting/Design (CAD), Analog Electronics, Mechanisms, Pneumatics, Hydraulics and Sub-Sea Physics. These disciplines are brought together in a semester-ending project wherein students design, construct and test a Remotely- Operated Vehicle (ROV) which must perform a variety of underwater tasks. Emphasis is placed on the completion of short-term projects, daily in-class work, and the group project to end the semester. Mathematics and algebraic expressions are utilized frequently. Geometry, Algebra I and Algebra II should have been completed successfully prior to taking this course. The course requires students to document their daily and weekly progress and include reflective writing about their experiences and projects. This course is the first in the Ocean Engineering concentration sequence.

Units

- Computer-Aided Drafting (CAD) using OnShape
- Electronics - Analog Circuits & Theory
- Soldering
- Kinetics
- Pneumatics
- Hydraulics
- Subsea Physics
- Underwater Technology
- Special Project – ROV Design & Construction
- Marine Technology Careers

Significant Job Tasks

Demonstrate ability to visualize perspective views of 3D objects in 2D
Create and model 3-dimensional objects using CAD software
Properly describe the function of simple analog circuit elements
Describe the relationship between current, resistance & voltage in an electronic circuit
Identify and use proper symbols for electronic components
Demonstrate ability to create analog electrical systems using schematic diagrams
Demonstrate ability to make solder connections to electronic components
Demonstrate use of simple machines to perform tasks
Describe the relationship between force, pressure & area in a closed pneumatic/hydraulic system
Demonstrate knowledge and understanding of the parts of a Remotely-Operated Vehicle and its functions
Demonstrate ability to document work performed
Demonstrate use of appropriate technology for presentation
Demonstrate effective interpersonal skills in group work

Job Titles

Mechanical Engineer
Electrical Engineer
Electronics Technician
Oceanographic Instrumentation Technician
Remotely-Operated Vehicle (ROV) Technician
Hydrographic Survey Technician
Marine Technician who works aboard Research Vessels

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards
AFNR:

- CRP 01.01
- CRP 02.01, -.02
- CRP 04.01,-.02,-.03
- CRP 06.01,-.02,-.03
- CRP 08.01,-.02,-.03
- CRP 09.01,-.02,-.03
- CRP 10.01,-.02,-.03,-.04
- CRP 11.01,-.02
- CRP 12.01,-.02
- CRP 13.02
- CS 03.04
- MT 05.01,-.02,-.03

CAD/SolidWorks

- Certified SolidWorks Associate / CSWA

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Aquaculture Technology Curriculum

Course Title: **Vessel Operations I**

Scope and Sequence: Advanced- Year 3

3rd Year Students / Double Period / Alternating Cycle / One (1) credit

Course Description:

In this course, students will be trained as crewmembers aboard a larger vessel. The skills and knowledge they acquire could lead to careers in the merchant marine, Navy or Coast Guard. Students will be exposed to the federal regulations regarding the construction, maintenance and operation of vessels and learn what is required to obtain various Coast Guard credentials. They will practice the operation of larger vessels and navigate by various methods. Students will become familiar with various shipboard systems and learn how each functions to support the vessel's operation. Electronic communication, navigation and piloting systems, including RADAR, AIS, GPS, electronic plotting and VHF radio will be introduced and used. Students will be instructed in shiphandling, watchstanding, emergency response, marine meteorology and heavy weather procedures.

Units

- Large Vessel safety
- Large Vessel Seamanship
- Navigation/Piloting
- USCG Inspection/Licensing
- Vessel Maintenance
- CPR/ First Aid Training
- Introduction to Mechanical & Electrical Systems
- Understanding Basic
- Weather Patterns
- Career Opportunities within Marine Transportation

Significant Job Tasks

Students will be exposed to safety practices and procedures aboard larger vessels.

Students will understand and use standard maritime vocabulary.

Students will identify their skills and interests as they relate to specific career paths for post-graduation.

Students will be introduced to all pertinent navigation rules.

Students will be exposed to the piloting of a training and research vessel.

Students will successfully complete a marine safety, seamanship, and piloting course.

Students will be exposed to basic employability skills.

Students will practice proper line handling, knot tying and deck seamanship.

Students will successfully complete an American Red Cross approved course.

Students will gather all necessary information to appropriately select their senior level aquaculture course.

Job Titles

Safety/ First aid (Safety Officer)
Crew duties and responsibilities (Crew)
Understanding weather (Meteorologist)
Boat characteristics (Fleet Manager, Retail)
USCG Launch Operators
Maintenance/ Troubleshooting (Systems Engineer)
Helmsman (Crew)
Navigator (Crew)
Regulatory (Fleet Manager)

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards

AFNR:

- A – 2, 3
- B- 1, 2
- C- 1, 2, 3, 6, 8
- D- 1, 2, 5, 11
- E- 3, 5
- F-1, 2, 4, 5
- H- 3, 4, 5, 6, 7
- I-1, 4

ABYC Standards

- Boating Safety
- Seamanship & Small Boat Handling

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Aquaculture Technology Curriculum

Course Title: **Marine Construction**

Scope and Sequence: Advanced- Year 3

3rd Year Students / Double Period / Alternating Cycle / One (1) credit

Course Description:

This course is the prerequisite for the Marina.Operations course offered during the senior year. Students will build and/or repair boats for the school fleet. Technical drawing reading, boat design, CAD and CNC will expand the scope of this course to include students who aspire to continue on to college in engineering and manufacturing.

Units

- Shop safety
- Tools
- Materials
- Woodworking
- Tool Maintenance
- Small Boat Construction and Repair
- Boat Design
- Intro to CAD
- Intro to CNC

Significant Job Tasks

Demonstrate understanding of and apply shop safety
Identify tools and their proper use and care
Read technical drawings
Measure, estimate and prepare job time, sequence and cost analysis
Perform calculations involving fraction, decimals & percentages
Construct or repair FRP and composite boat hulls
Utilize effective communication and teamwork
Apply effective management skills

Job Titles

Marina, boatyard technician - paint, fiberglass hull repair, rigger, store and move boats
Yacht design firm – draftsperson, apprentice designer
Boatbuilding firm – fiberglass lay-up, mold preparation, gelcoat application,
Marine machinist – CNC operator
Fiberglass Technician – restoration
CAD Technician

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards
AFNR:

- A – 2, 3, 7, 10, 11, 12,
- 16
- B- 19, 20, 21, 22, 23
- C- 24, 25, 26, 27, 28, 29, 20, 31, 32, 33
- D- 34, 35, 38, 39, 40, 41, 42, 43
- I- 74, 75, 76, 77

ABYC Standards

- Composites

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Aquaculture Technology Curriculum

Course Title: **Marine Propulsion**

Scope and Sequence: Advanced- Year 3

3rd Year Students / Double Period / Alternating Cycle / One (1) credit

Course Description:

This course is the prerequisite for the Marina.Operations course offered during the senior year. Participation in this course will provide students with a working knowledge and experience in mechanics and the workings of small gasoline engines, with the focus on outboard engines. Emphasis will be placed on engine systems and how they are integrated to allow the engine to function, with special attention given to common problems and repairs. Knowledge of the fundamental and specialized tools used, safe working practices, and what constitutes a safe working environment will be achieved through hands on experience with engines. Outboard engines will be disassembled, the parts cleaned or replaced as needed, the engines rebuilt and then brought to the test tank to test and monitor operation. Outboard manufacturers' maintenance and repair videos will be used to enable students to work independently at workstations. The topics/units that students will receive instruction in will include ignition systems; engine cooling systems/ water pumps/ propellers/ lower units, fuel systems fuel injection, lubrication systems, 4-stroke cycles, winterization and maintenance.

Units

- Shop Safety
- Tool Identification
- Single cylinder gas engines
- Outboard Systems:
- Rigging
- Ignition
- Cooling
- Power Transmission (lower unit)
- Fuel Delivery
- Lubrication
- De-commissioning
- Winterization/Storage
- Maintenance

Significant Job Tasks

Work safely in the marine mechanics environment
Explain the fundamental principles of 2-stroke and 4-stroke engines
List in sequence the 4 strokes of an internal combustion engine
List the major components of 4-stroke engines and their functions
List and explain the differences between 2-stroke and 4-stroke engines
Identify correct tools for specific tasks and utilize them properly
Perform routine maintenance on outboard engines

Job Titles

Marine Mechanic
Marine Technician
Engine Rigger

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards
AFNR:

- CRP 01.01
- CRP 02.01, -.02
- CRP 04.01,-.02,-.03
- CRP 06.01,-.02,-.03
- CRP 08.01,-.02,-.03
- CRP 09.01,-.02,-.03
- CRP 10.01,-.02,-.03,-.04
- CRP 11.01,-.02
- CRP 12.01,-.02
- CRP 13.02
- CS 03.04
- MT 01.01,-.02
- MT 02.01,-.02,-.03
- MT 03.01,-.02
- MT 04.01,-.02

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Senior Intensive Courses

Agriculture Technology Curriculum

Course Title: **Plant/Greenhouse Technology II**

Scope and Sequence: Intensive- Year 4

4th Year Students / Double Period / Full Year / Two (2) credit

Course Description:

Plant Technology II follows the Plant Technology I introductory course exposing students to more in-depth knowledge of plants. Students will review basic concepts of plant anatomy and physiology. They also will practice plant propagation, floral garden design. Students also help to maintain various garden beds on campus. Units of study include plant identification, greenhouse management, growing greenhouse crops, landscape design, installation, and maintenance, horticulture mechanics, nursery management, and turf production. Agribusiness units will cover operating a horticultural business, pricing work, advertising, and sales. Improving computer and workplace skills will be a focus. Participation in FFA student organization activities and Supervised Agricultural Experience (SAE) projects is an integral course component for leadership development, career exploration and reinforcement of academic concepts.

Units

- Safety
- Basic Plant Structure, Growth and Function
- Soils
- Plant Propagation
- Pests and Pest Management
- Indoor and Container Gardening
- Floral Design and Marketing

Significant Job Tasks

Apply Knowledge of plant systems to plant culture in the greenhouse and in the field.

Apply knowledge of soils and nutrients to greenhouse and field culture crops

Identify the role plant hormones play in growth and reproduction of plants

Successfully propagate plants utilizing various methods and identify the appropriate hormone required

Identify common plant pests and disease

Identify common plants by their latin name

Utilize color harmonies effectively in design

Utilize and maintain hydroponic systems

Grow Microgreens and other salad greens hydroponically

Job Titles

Landscape Contractor
Greenskeeper
Horticulturalist
Horticulture Marketing Manager
Pest Manager
Hydroponic Grower

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards AFNR:

- CRP.01.01, 02.02, 04.04.02, 04.03, 06
- CRP 08.09.02
- PS 01.01.01c, 01.01.03c, 01.02, 01.02a, 02.02.02a, 01.03.01a, 02.02.01b, 02.02.02b, 03.01.02c, 03.02.01b, 03.02.04.b, 03.03.01a, 03.03.03a, 04.01.01a, 04.02.01b, 04.02.03b

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Agriculture Science Curriculum

Course Title: **Veterinary Science II**

Scope and Sequence: Intensive- Year 4

4th Year Students / Double Period / Full Year / Two (2) credit

Course Description:

A continuation of the Junior Veterinary Science course, this course further develops the students understanding of veterinary science through the study of large animals and their use for food and fiber. Students will be better/smarter consumers of animal that provide the products they consume each day. They will do this through knowledge about them including breed identification, behavior, housing and feed requirements, feed analysis, comparative anatomy, selective breeding and genetics, animal welfare, safety working with these animals, biosecurity of our food supply, etc.

Units

- Safety around Animals
- Taxonomy
- Anatomy and Physiology of large animals
- Nutrition
- Uses of Animals
- Issues in Modern Agriculture including sustainability and environmental impacts
- Basic housing and waste management concepts
- Genetics

Significant Job Tasks

Breed Identification for common production animals such as dairy and beef cattle, goats, pigs, sheep and horses

Comparative anatomy- digestive and reproductive systems

Genetic Analysis including recessive and dominant characteristics as well as breeding outcomes

Understanding of products and processes related to production animals

Job Titles

Stable/Farm hand
Laboratory Technician
Veterinary Technician

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards AFNR:

- AS.02, AS.03, AS.04
- AS.06, AS.07, AS.08
- CRP.02, CRP.04, CRP.05, CRP.06, CRP.07, CRP.08, CRP.10, CRP.11

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Aquaculture Science Curriculum

Course Title: **Aquaculture Life Sciences II – Finfish/ Shellfish Production**

Scope and Sequence: Intensive- Year 4

4th Year Students / Double Period / Full Year / Two (2) credit

Course Description:

Finfish/Shellfish Production is an advanced course in Aquaculture Science for seniors. It is designed to expand upon and enhance the investigations begun in the Aquaculture Production courses offered in the student's junior year and establish a foundation for more advanced studies in aquaculture, fish husbandry or marine sciences in post-secondary education. It provides the learner with hands-on career experiences in a wide spectrum of scientific techniques employed in aquatic studies. Hands-on work is a requirement. Student abilities to apply both quantitative and qualitative reasoning, problem solving and higher order thought processes will be facilitated by the instructor in many curricular areas including, but not limited to: tank systems, culture methods, feed and habitats, live feed husbandry, water quality, sampling techniques, data collection, and HACCP certification.

Units

- Safety
- Career Goals
- Carbon Budget
- Journal Reading
- Recirculating Systems
- Live Feeds
- Algae
- Zooplankton
- Husbandry Techniques
- Finfish
- Shellfish
- Crustacean
- Genetics
- Spawning-Practices
- Hatchery Techniques
- Harvest & Handling
- Scientific Methods
- Data Entry- Excel Program

Significant Job Tasks

Complies with the labor and safety regulations on the job.
Exposed to "All aspects of the industry".
Perform calculations involving fractions, decimals and percent
Demonstrate accurate record keeping and accounting procedures required for successful agribusiness management.
Acquire, evaluate, and interpret mathematical data or information
Develop a visual presentation of mathematical data
Utilize necessary tools to determine measurements and record results.
Develop career interests in agriculture science and technology careers through a supervised work experience.
Demonstrate employee traits desirable in the workplace.
Demonstrate personal occupational safety and health measures and security measures as they relate to agricultural science and technology applications
Utilize computer technology and specialized software for specific work application
Effectively choose tools or equipment for task completion.
Demonstrate safe and secure setup and operation of equipment.

Job Titles

Commercial Aquarist, Fisheries Biologist, Shellfish Farmer, Marine Biologist, Nurse/Medical Field Technician, Accountant Teacher, Medical Tech/Researcher, Commercial Aquarist, Fisheries Biologist, Archaeologist

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards
AFNR:

- CRP 01.01
- CRP 02.01, -.02
- CRP 04.01,-.02,-.03
- CRP 06.01,-.02,-.03
- CRP 08.01,-.02,-.03
- CRP 09.01,-.02,-.03
- CRP 10.01,-.02,-.03,-.04
- CRP 11.01,-.02
- CRP 12.01,-.02
- CRP 13.02
- CS 03.04
- MT 05.01,-.02,-.03
- AQ 01-09
- AQ 11-15

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Aquaculture Science Curriculum

Course Title: **Environmental and Underwater Sciences II**

Scope and Sequence: Intensive- Year 4

4th Year Students / Double Period / Full Year / Two (2) credit

Course Description:

Through the integration of scientific dive training within this unique curriculum, students will explore our local ecosystems in order to develop a foundational understanding of the principles of conservation and the natural processes and interactions that shape our environment while earning internationally recognized industry certifications from Scuba Diving International (SDI) and Diver Alert Network (DAN). Students will apply skills developed during EUS I in completing their own underwater research projects.

Units

- Open Water Refresher
- The Physics and Physiology of Diving
- Underwater Navigation and Orienteering
- Advanced Open Water Diving- Full Gear
- AAUS Dive Planning and Scientific Diving Procedures
- AAUS Diving Under Special Conditions
- Advanced Environmental Research Methods
- Evolution & Biological Communities
- Resource Management

Significant Job Tasks

Collect and conduct analysis of environmental data
Assess local biodiversity and Evaluate ecosystem status
Identify local species using a dichotomous key
Demonstrate effective communication skill and teamwork skills
Demonstrate knowledge and understanding of laboratory and dive safety protocols
Identify tools used and uses for ecological research
Demonstrate safe and appropriate use of advanced SCUBA diving technology and equipment
Employ proper response during a diving emergency
Demonstrate proper care and maintenance of SCUBA equipment
Articulate ideas clearly and effectively to a variety of audiences using multiple modes
Demonstrate effective time management skills

Job Titles

Climate Scientist
Conservation Biologist
Environmental Field Technician/Water Quality Technician
Sustainable Developer/Urban Planner/Coastal Development Manager
Marine Scientist
Scientific Diver
Underwater Photographer/Videographer
Public Safety Diver
Underwater Construction
Commercial Diver
Navy Diver

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards

AFNR:

- ESS.01, 02, 03, 05
- NRS.01,02, 04
- AQ.02, 03, 04, 06, 10, 13, 14
- MT.01, 05
- PST.02, 03
- CRP.01, 02, 04-13

NGSS:

- HS-LS2(6-8)
- HS-LS4-6
- HS-ESS2-4
- HS-ESS3(1-6)
- HS-ETS(1-4)

Industry Standards:

- Specialty, Nitrox & Scientific Diver, First Aid/CPR/O2

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Aquaculture Science Curriculum

Course Title: **Genetics and Biotechnology II**

Scope and Sequence: Intensive- Year 4

4th Year Students / Double Period / Full Year / Two (2) credit

Course Description:

Genetics & Biotechnology II is a full-year double period extension that follows the junior year Genetics & Biotechnology I course. and concentrates on the applications of biotechnology in agriculture and medical science, as well as the molecular evidence for evolution. Students will conduct individual research projects and participate in ethical debates as well as participate in laboratory procedures and group learning.

Units

- Evolution and Molecular Evidence
- Agriculture Biotechnology
- Medical Biotechnology
- Cancer
- Bioinformatics

Significant Job Tasks

Demonstrate proper use of centrifuge for cytological separation
Demonstrate understanding of and use Polymerase Chain Reaction for gene amplification
Choose a post high school plan for the next steps after graduation
Put that post high school plan into action and secure a path for next year
Use electrophoretic analysis to detect the presence of genes in human DNA
Debate ethical concerns of genetic modification in agriculture
Construct and present a presentation of the cancer of your choice
Debate ethical concerns in medical genetics and biotechnology
Prepare DNA for genetic analysis
Use bioinformatics databases to research human genes involved in disease

Job Titles

Genetic Counselor
Medical Research Scientist
Bioanalytical Scientist
Bioinformatics Research Scientist
Cell Biologist
Forensic Scientist
Gene Editing Manager
Immunology Scientist
Microbiologist
Laboratory Technician
Agricultural Geneticist

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards

AFNR:

- BS.01.01.02.a.
- BS.01.01.04.a.
- BS.03.02.03.a.
- BS.03.03.01.a.
- BS.03.04

NGSS:

- HS-LS4-1
- HS-LS4-4
- LS4.C
- SL.11-12.5

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Aquaculture Technology Curriculum

Course Title: **Marina Operations**

Scope and Sequence: Intensive- Year 4

4th Year Students / Double Period / Full Year / Two (2) credit

Course Description:

This is the second course in the Marina Operations pathway building on skills and knowledge gained by students in either Marine Construction and Marine Propulsion as juniors. Students will be responsible for maintaining Sound School's active waterfront including dock, boat, and outboard motor repairs and winterization. Participation in this course will provide students with a working knowledge and experience in both marine mechanics and construction. Knowledge of the fundamental and specialized tools used, safe working practices, and what constitutes a good working environment will be achieved through hands on experience in the shop and on the water.

Units

- Shop safety
- Tools
- Materials
- Woodworking
- Tool Maintenance
- Small Boat Construction and Repair
- Job Sequence
- Boat Design
- Multiple cylinder gas engines
- Outboard Systems
- De-commissioning
- Winterization/Storage Maintenance
- Marine Technology Careers

Significant Job Tasks

Demonstrate understanding of and apply shop safety
Identify tools their proper care and use
Read architectural drawings
Measure, estimate and prepare job time, sequence and cost analysis
Perform calculations involving fractions, decimals and percents
Demonstrate safe, accurate procedures for laying-up petrochemical resins, core materials and fibers
Construct and repair FRP and composite boat hulls
Utilize effective communication and teamwork
Apply effective time management skills
Explain the fundamental principles of 2-stroke and 4-stroke engines
Perform routine maintenance on outboard engines

Job Titles

Marine Mechanic
Marine Technician
Engine Rigger
Welder / Fabricator
Marina/Boatyard Technician
CAD Technician
Marine Machinist
Fiberglass Technician

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards
AFNR:

- CRP 01.01
- CRP 02.01, -.02
- CRP 04.01,-.02,-.03
- CRP 06.01,-.02,-.03
- CRP 08.01,-.02,-.03
- CRP 09.01,-.02,-.03
- CRP 10.01,-.02,-.03,-.04
- CRP 11.01,-.02
- CRP 12.01,-.02
- CRP 13.02
- CS 03.04
- MT 01.01,-.02
- MT 02.01,-.02,-.03
- MT 03.01,-.02
- MT 04.01,-.02

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Aquaculture Technology Curriculum

Course Title: **Ocean Engineering II**

Scope and Sequence: Intensive- Year 4

4th Year Students / Double Period / Full Year / Two (2) credit

Course Description:

This is the second course in the Ocean Engineering sequence. This course explores in greater depth those topics begun in the junior year course, and expands into further areas of current marine technology. Students continue to develop their skills by completing advanced units in CAD, Digital Electronics, 3-D Printing, Mechanical Engineering, Programming, Robotics, and Underwater Technology/Systems. Emphasis is once again placed on the completion of both short- and long-term projects, as well as daily class work. Class projects include the use of side scan sonar to map a portion of Long Island Sound and the construction, testing and use of a hydrophone, a Conductivity/Temperature/Depth sensor, a fresh water Remotely-Operated Vehicle (ROV) for intra-class competition, and an Autonomous Underwater Vehicle (AUV). The final project involves the construction of an ROV for entry in the National ROV Competition, wherein all phases of project management are studied and incorporated into daily class work. Mathematics and algebraic expressions are utilized a great deal. Completion of (or concurrent enrollment in) Pre-Calculus is preferred, as trigonometric concepts will be used. This course requires students to document the steps of the engineering process and to include reflective writing on their experiences.

Units

- Advanced Solid Modeling in CAD using SolidWorks
- Digital Electronics
- Computer Programming/ Arduino
- Mechanical Engineering/ Subassemblies
- Underwater Technology / Remote Sensing
- Sonar Imaging Technology
- Special Projects – CTD, AUV and ROV Design & Construction
- Marine Technology

Significant Job Tasks

Create advanced solid models of 3-dimensional objects using CAD software
Properly describe the function of simple digital circuit elements
Describe the relationship between current, resistance & voltage in an electronic Circuit
Identify and use proper symbols for electronic components
Demonstrate ability to create digital electrical systems using schematic diagrams
Properly diagnose, troubleshoot and repair electrical systems
Design and construct complex machines to perform tasks
Demonstrate knowledge and understanding of the parts of a Side Scan Sonar Towfish and their functions
Demonstrate ability to document work performed
Demonstrate use of appropriate technology for presentation
Demonstrate effective interpersonal skills in group work
Demonstrate effective group speaking skills
Demonstrate ability to create a technical report

Job Titles

Mechanical Engineer
Electrical Engineer
Electronics Technician
Oceanographic Instrumentation Technician
Remotely-Operated Vehicle (ROV) Technician
Hydrographic Survey Technician
Marine Technician who works aboard Research Vessels

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards
AFNR:

- CRP 01.01
- CRP 02.01, -.02
- CRP 04.01,-.02,-.03
- CRP 06.01,-.02,-.03
- CRP 08.01,-.02,-.03
- CRP 09.01,-.02,-.03
- CRP 10.01,-.02,-.03,-.04
- CRP 11.01,-.02
- CRP 12.01,-.02
- CRP 13.02
- CS 03.04
- MT 05.01,-.02,-.03

CAD/SolidWorks

- Certified SolidWorks Professional / CSWP

FFA Activities, Certificates & Awards

- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Aquaculture Technology Curriculum

Course Title: **Vessel Operations II**

Scope and Sequence: Intensive- Year 4

4th Year Students / Double Period / Full Year / Two (2) credit

Course Description:

This course will allow students to continue their training as crewmembers aboard a larger vessel, and provide skills that can lead to positions as deck officer or captain of passenger vessels, motor launches, charter boats, ferries and fishing vessels. Students will continue to develop skills and knowledge that could lead to careers in the merchant marine, Navy or Coast Guard. Students will also be exposed to the federal regulations regarding the construction, maintenance and operation of vessels and learn what is required to obtain various Coast Guard credentials. They will practice the operation of larger vessels and navigate by various methods. Students will become familiar with various shipboard systems and learn how each functions to support the vessel's operation. Electronic communication, navigation and piloting systems, including RADAR, AIS, GPS, electronic plotting and VHF radio will be introduced and used. Students will be instructed in shiphandling, watchstanding, emergency responses, marine meteorology and heavy weather procedures.

Units

- Shop safety
- Tools
- Materials
- Woodworking
- Tool Maintenance
- Small Boat Construction and Repair
- Job Sequence
- Boat Design
- Multiple cylinder gas engines
- Outboard Systems
- De-commissioning
- Winterization/Storage Maintenance
- Marine Technology Careers

Significant Job Tasks

Prepare students for positions of responsibility in the operation and management of a variety of private and commercial vessels

Students will comprehend and implement safety practices aboard larger vessels

Students will become proficient in the use of standard marine vocabulary.

Students will develop specific career paths for post-graduation

Students will understand all pertinent navigation rules.

Students will become proficient in piloting a training and research vessel.

Students will successfully complete a USCG approved marine licensing course.

Students will exercise basic employability skills.

Students will become proficient in safe line handling, knot tying and deck seamanship..

Students will successfully complete an American Red Cross approved course.

Job Titles

Safety Officer
Meteorologist
Fleet Manager - Retail
Systems Engineer
Helmsman (Crew)
Navigation (Crew)
Fleet Manager - Regulations

Industry Applications or CTE Performance Standards

State Department of Education / Industry recognized standards

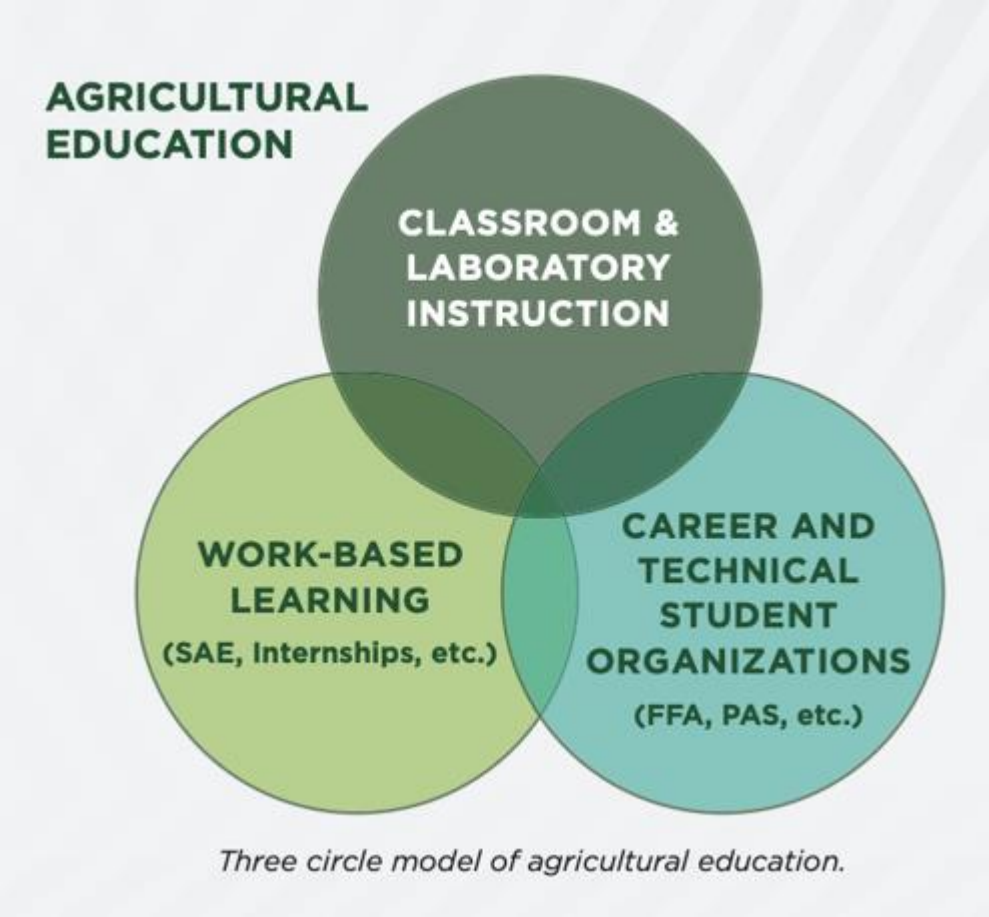
AFNR:

- A – 2, 3, 7, 10, 11, 12, 16
- B- 19, 20, 21, 22, 23
- C- 24, 25, 26, 27, 28, 29, 20, 31, 32, 33
- D- 34, 35, 38, 39, 40, 41, 42, 43
- I- 74, 75, 76, 77

FFA Activities, Certificates & Awards

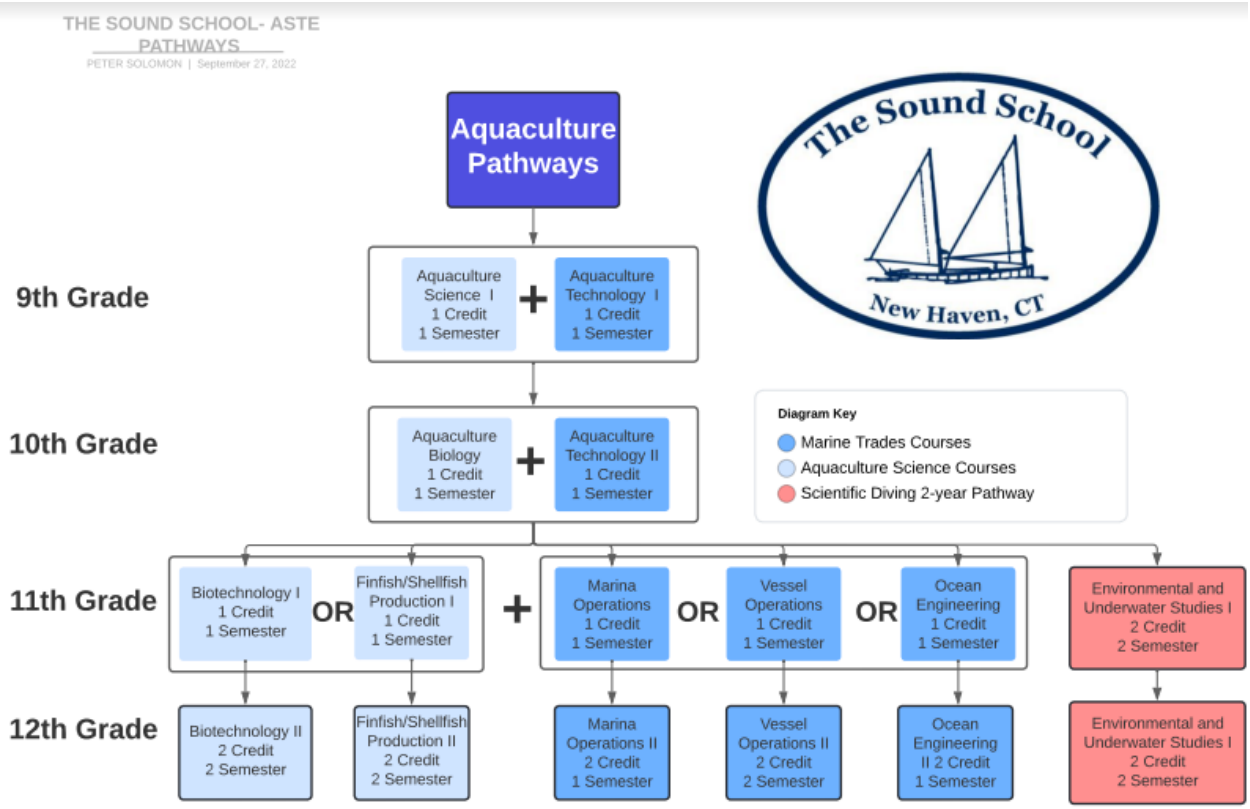
- Review of SAE Plan and Pathway paperwork
- Documentation of Evidence toward goal completion
- Updating FFA Record Book

Appendix A- Three Circle Model



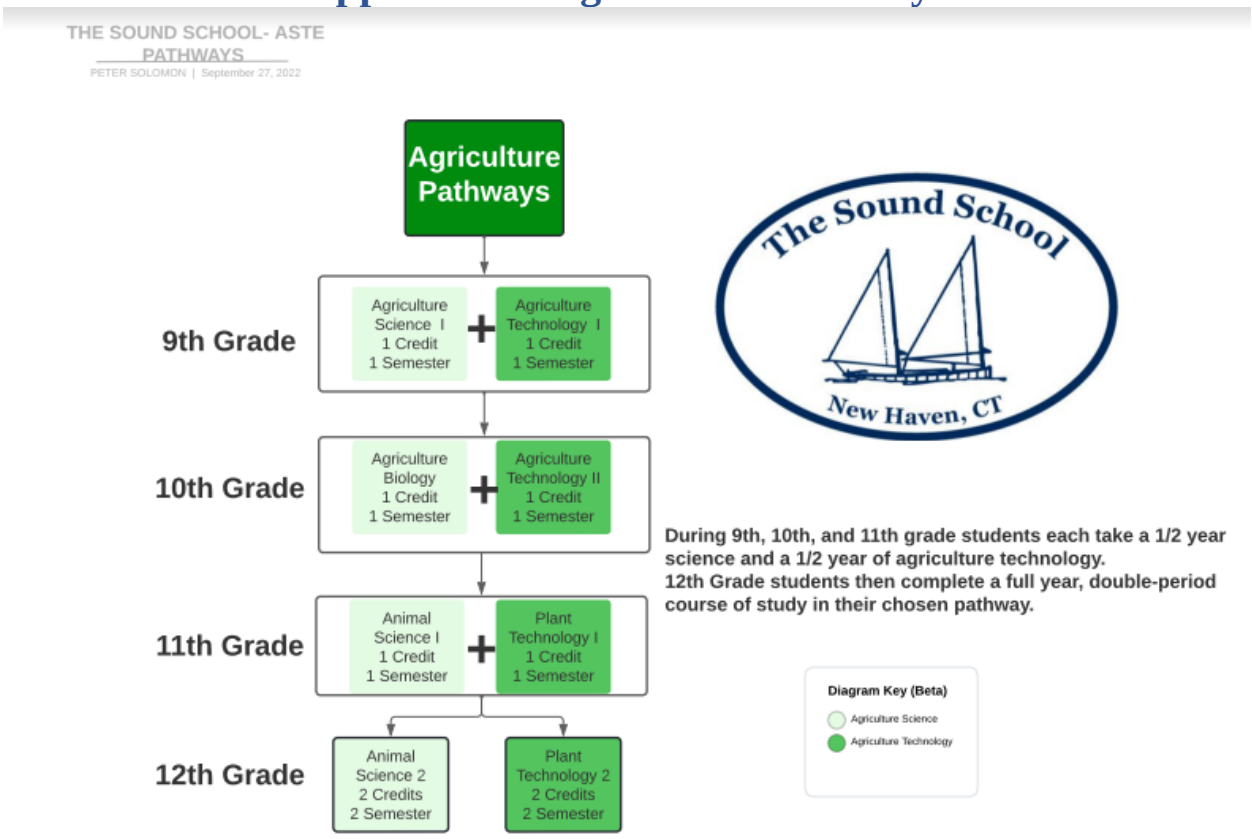
Three circle model of agricultural education.

Appendix B- Aquaculture Pathways



During 9th, 10th, and 11th grade students each take a 1/2 year science and a 1/2 year of a marine technology. 12th Grade students then complete a full year, double-period course of study in their chosen pathway.

Appendix C- Agriculture Pathways



Appendix D- The History of Aquaculture Education Programs and Instructional Practices

In the "traditional" Agriculture Education Center by the 1880s, land was often set aside for production agriculture education. These educational activities included the production of meat, eggs, vegetables, ornamental plants and greenhouse horticulture. The vocational agriculture curriculum had major divisions in which teachers often had a primary assignment. All teachers involved in the science and technology of agriculture had a piece of the production "farm". The operation of the farm was the scientific study of agriculture production. Today, agriculture education provides opportunities for students to study many agriculture sciences and expanding industry applications.

With the new agriculture/aquaculture centers, the "farm" had to be nearly enclosed but all aquaculture teachers would still have a role. A large difference between agriculture and aquaculture "farms" is the time for a crop to mature. The only indoor agriculture production facility was the greenhouse at the turn of the century, which used plant stock for finishing or for the production of immature plant stock for outside planting. Aquaculture "farms" parallel agriculture greenhouses with the development of fish hatcheries in the late 1890s. Only recently has aquaculture sought to produce harvestable crops totally inside. Greenhouse aquaponics is a modern day "indoor" agriculture equivalent. This sector today is one of the fastest growing, with Scandinavia leading technology innovations.

The aquaculture "farm" is a combination of technical, experimental and research aquaculture operations. They are integrated within the unit concept of vocational agriculture education. Vocational Agriculture Education Curriculum units of varying lengths (3 to 12 weeks) provided opportunities to experience different agricultural production applications and employment job skills. This is the same model which requires flexibility in laboratory / production facility design. The Vocational Agriculture Curricula and Performance Standards were initially developed in 1987 as five distinct pathways of study. The educational initiatives of the 1990s relate to the integration of problem solving, critical thinking skills and descriptive application (writing) of science to the principles of modern-day life. The National Council for Aquaculture Education developed a series of five Aquaculture Curriculum Guide Modules in 1992 for the US Agricultural Education Programs. National science standards formulated by the National Academy of Science, the American Association for the Advancement of Science and the National Science Foundation Advanced Technology Education (ATE) program has been incorporated into the Connecticut Science Standards, endorsed by the Connecticut State Department of Education documents focusing on application of science rather than the theory of science. In this regard, the Vocational Agriculture System, now known as the ASTE system (Agriculture, Science and Technology Education), has been a leader in "application based" science curricula. Comprehensive high schools have addressed the theory of science instruction/content in a four-year sequence, known as Carnegie Units.

Vocational Agricultural Education curricula were practical in function, with science theory the domain of the comprehensive high schools. With the increase of high school graduation requirements, less and less schedule space existed for students to take vocational agriculture electives in the 1980s. Vocational agriculture centers started to "cross credit in science" in

order to keep students enrolled in the program in the 1990s. At the same time, vocational agriculture programs looked at comprehensive high school curricula to align theory "content," while comprehensive high schools looked at vocational agriculture science for instructional practices, for guidance in block scheduling, the concept of a portfolio and work-based experience, which comprehensive schools often refer to as internships.

The science scope and sequence for our program here in New Haven cross credits for science courses. Science teachers attend in-service and CIA meetings conducted by Richard Therrien, New Haven Public Schools Supervisor of Science. Technology teachers attend CTE staff meetings conducted by Dolores Garcia-Blocker, CTE Coordinator. We obtain much support from CTE department in the way of Perkins funds for course expansion, improvement with new equipment and professional development and certification opportunities.

Curriculum

The Connecticut Vocational Agriculture education curriculum was first developed by vocational agriculture teachers under the direction of Dr. Alfred Mannebach, University of Connecticut agriculture educator, with the guidance from the staff of the then Bureau of Vocational Services of the Connecticut State Department of Education. There are were originally six volumes, each with over 100 pages of curriculum guides in the areas of plant science, animal science, agricultural mechanics, natural resources/aquaculture, agribusiness management and career development/FFA/ Supervised Agriculture Education. Each center received a copy of the 6-volume set, which was intended to serve as a model curriculum for individual programs to use in organizing the instructional material that will be used for high school students.

The curriculum is developed based on a unit concept with varying lengths of time from three to twelve weeks for each unit. The amount of time allotted depends upon the amount of information to be recovered and the depth of understanding that is to be imparted to the students. (Using multiples of three weeks, in setting lengths of units, allows for multiple teacher departments to develop a coordinated schedule for start-up and completion of units, so that students may have crossover of areas of study and of teacher assignments for upper level course choice).

Today, the vocational agriculture education curriculum is divided into pathways of plant science, animal science, natural resources, aquaculture/marine trades, agriculture mechanics and agribusiness. Students entering a four-year program are usually involved for the first year or year and a half, in an exploratory program covering all of the areas of agriculture or aquaculture. For the final two and one-half to three years, the students elect units from one area or a combination of areas to coincide with his/her work-learning goals.

At the May 2018 Connecticut State Board of Education (Board) meeting, the Board approved the *Agriculture, Food and Natural Resources (AFNR) Career Cluster Content Frameworks, Connecticut Edition* for use by Connecticut Agricultural Science and Technology Education (ASTE) centers and school districts.

In December 2015, the Connecticut State Department of Education (CSDE) engaged the Connecticut State Consulting Committee for ASTE in a review of the National AFNR Standards. This committee voted to support the creation of a Connecticut Framework version of the National AFNR Standards to replace the previous Connecticut ASTE Standards. In 2016, the CSDE began a multi-stage review and revision process focused on ensuring that the *Agriculture, Food and Natural Resources (AFNR) Career Cluster Content Frameworks, Connecticut Edition* to reflect the following:

• reflect essential and up-to-date knowledge and skills that students need to be ready for college and career in a variety of agriculture, food and natural resources fields;
• provide a sound basis upon which to design Connecticut focused agriculture, food and natural resources related courses; and
• afford a wide-ranging source for creating meaningful formative and summative assessments to measure student's attainment of essential knowledge and skills.

Based on the feedback gathered in the review process, the CSDE organized committees of experts to create two Connecticut-specific pathways, aquaculture and marine trades, and added frameworks for beekeeping and maple syrup production.

Source: Melissa K. Wlodarczyk Hickey, Reading/Literacy Director, Academic Office, June 25, 2018, Subject: Agriculture, Food and Natural Resources (AFNR) Career Cluster Content Frameworks, Connecticut Edition

Of the ten (10) Approved Career Pathway Content Frameworks Concentrations as detailed in the memo dated July 17, 2018 for the AFNR standards, The Sound School can offer eight (8) of them. They include:

- Aquaculture Systems (AQ)
- Animal Systems (AS)
- Biotechnology Systems (BS)
- Environmental Service Systems (ESS)
- Marine Trades (MT)
- Natural Resource Systems (NRS)
- Plant Systems (PS)
- Power, Structural and Technical Systems (PST)

Appendix E- History of the New Haven ASTE Center

The New Haven Vocational Aquaculture Center, established in 1994, has an aquaculture focus but also provides a semi-traditional agriculture program for New Haven students. In 2014, this option was made available to all participating districts. The focus of the freshmen educators and students is to develop an understanding of environmental sciences and natural resource management. The application of these concepts is the control of inputs (food resources) to sustain natural resources within specific ecosystems. Sophomores have a biological role with nursery and hatchery systems. Juniors maintain production systems (either aquaculture or agriculture) while studying nutrition, chemistry and environmental water quality. As seniors, students focus on advances in genetics, biotechnology, disease control, hatchery production, toxicology and veterinary sciences related to aquaculture or agriculture. Laboratories designed to industry standards are located adjacent to classroom areas to facilitate practical application of research and scientific principles. Manuals of operations, protocols and procedural guidelines used in classroom/laboratory instructional settings complement assigned and supervised agricultural experiences that students must participate in outside of the normal school hours.