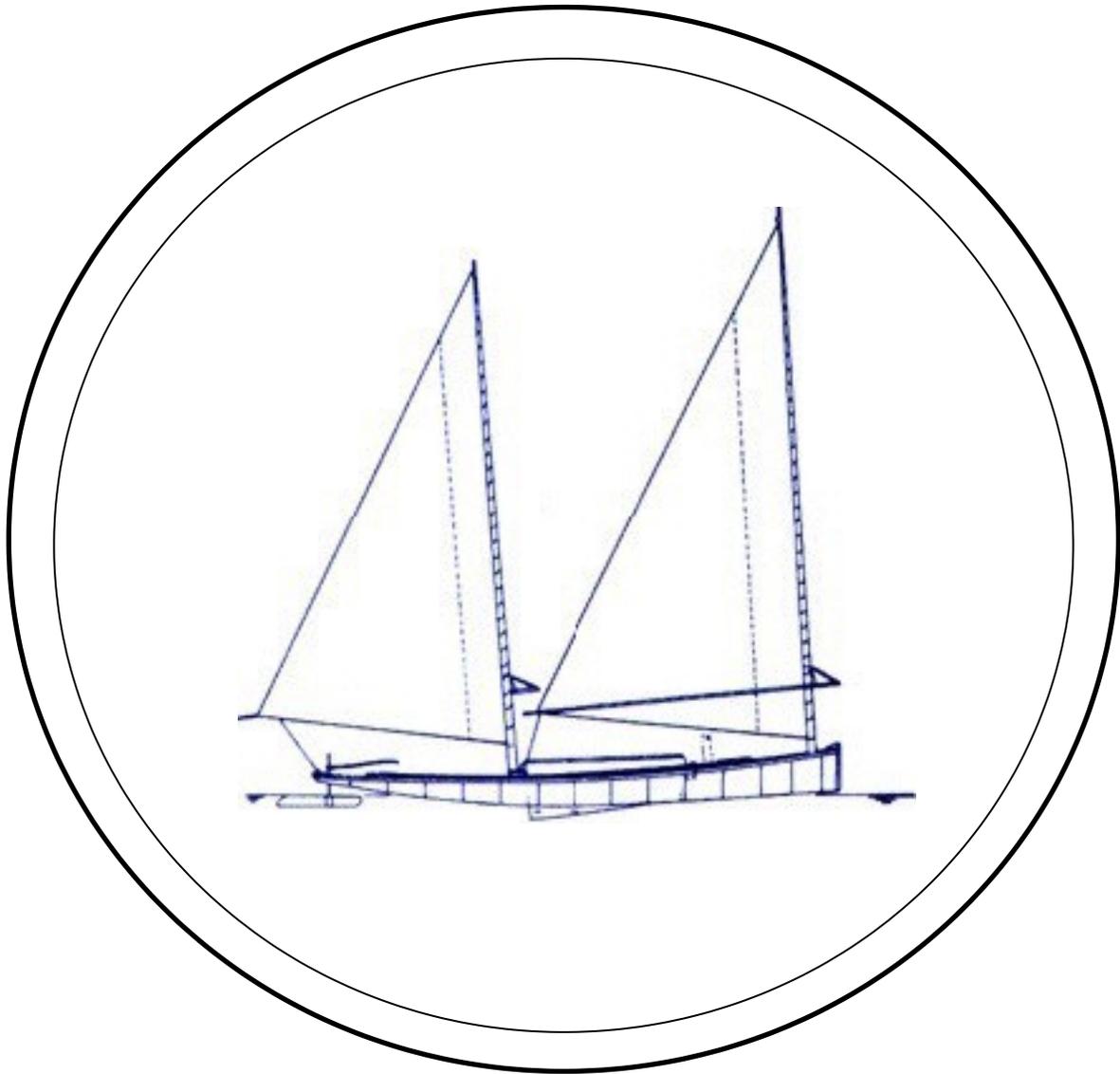


The Sound School

Regional Vocational Aquaculture Center



Program of Studies ASTE

Curriculum Units for the

New Haven Vocational Agriculture Center

FOR AQUACULTURE AND AGRICULTURE

Please note that some information in this document has been updated. It is still in the process of being revised.

New Haven Public Schools

Hon. Toni N. Harp
Mayor of New Haven

Dr. Carol D. Birks
Superintendent, New Haven Public Schools

Dr. Paul Whyte
Assistant Superintendent, New Haven Public Schools

Darnell Goldson
President, New Haven Board of Education

Rebecca Gratz
Principal, The Sound School Regional Vocational Aquaculture Center



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Aquaculture Life Sciences II: Finfish/Shellfish Production

Environmental Science and Natural Resources II

Genetics and Biotechnology II

Aquaculture Technology Courses

Marine Construction II

Marine Engineering II

Ocean Engineering II

Vessel Operations II

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 science 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” paralleled 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 aquacultural 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 and 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 the 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 nine (9) of them. They include:

- Agribusiness Systems (ABS)
- 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)

History of the New Haven ASTE Center

The New Haven Vocational Agriculture 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.

Most of these employment/work or career exploratory experiences are incorporated in what is called Agriculture Education Instructional Practices, which revolve around individual yet connected agriculture practical laboratory practices. The collection of laboratory protocols in an organized review of industrial practices is the foundation of the Agriculture Educational Instructional Model.

Components of Agriculture Education Instruction Practice Laboratory Practicals

The largest different between agriculture teachers preparation programs (for over a century attached to colleges of agriculture at Land Grant Universities) and the Carnegie system (Carnegie unit) of teacher colleges was the delivery of course content. The agriculture instructional model was organized around equipment based industry applications that included many “laboratory practicals,” while the Carnegie Unit instruction was primarily text based and content specific practical application of content knowledge. The Carnegie system evaluation was by grading while agriculture education evaluation measures were based upon performance – industry based applications which eventually became measured performance standards. (Exceeded industry expectations, met industry expectations, did not meet industry expectations).

A large part of agriculture education was “beyond the school walls” including service to the agricultural community such as county fairs, expositions, but later broadened to all members of a local community. An agriculture instructional model included homework, called SAE, community service and industry based performance standards in the school setting, that remains essentially the same today and is termed the three cycle model. The heart of agriculture education instruction remains the lab practical, organized around industry equipment. This agricultural education model did not usually fit the Carnegie model and agriculture education laboratories were often “blocked” to fulfill the longer time for them in the 1930s which remains a state requirement today. The portfolio aspect of a senior special topic, special paper or project and the concept of concentration in the senior year, dates back to 1924 and the student vocational organization FFA formation.

Laboratory practicals have been part of agriculture education classes for over a century. The laboratory practicals had very defined outlines so that the agriculture education labs were often non classroom or out in the field so curriculum guides were used to review instruction before the practical occurred. Although some refer to agriculture education curriculum guides as enhanced course outlines, they had detailed instructional occupational goals defined by skill based activities and elements or exercises leading to a “laboratory practical.” Applications had industry skill based activities which often had supporting lab exercises. The lab practicals often presented operations, protocols and best practices as stand-alone materials which were measurable and collectible. The curriculum guides also sought to eliminate "stranded" applications; those which had no foundation skill based activities and "no end" activities for which no industry application could be found. The practical industry component was always directly linked to the classroom instruction.

Agriculture education classes were "blocked" to allow for skill based activities or industry applications to farm sites, termed "field trips", which took extended periods of time to see plant studies "in the field", or the proper care for animals. In both cases the expectation was on the student performing the activity or application, not just witnessing or exposure to it with printed material. It was participatory, thus the "hands-on" label so often used today. The laboratory practical was always associated with employment/occupational instruction of FFA which also occurred in the classroom setting, offering information about job titles and employment.

Students had the technology and science of the activity and explained why it was important to the occupation or business. That classroom component had features associated with academic instruction especially fact sheets for protocols, best practices and operations. They were presented before the activity or application to be kept in student notebooks. The business aspects were also included in FFA participation such as record keeping, interviewing, public speaking, leading meetings and organizing events. (FFA record books)

Agriculture education instruction directly linked the theory or content material to occupational outcomes, the performance of the activity, or application. The most apparent linkage was the use of job titles in the curricular map or guide. Early scope and sequence diagrams describe the unique role of Agriculture education teachers as connecting the academic "school" instruction to "practical" vocational experiences. Agriculture teachers employment descriptions often had phrases such as "ability to meet with and work with industry" to reflect this unique non-traditional education role, as meeting with industry as compared to comprehensive high school educators. Agriculture educators were expected to meet regularly with area farmers, members of the Agriculture industry and to participate in agriculture contests at regional and district agriculture fairs outside of the "regular school day". These requirements often included evening meetings at local granges, weekend work and extended school day programs.

The special role of ASTE educators between school and work was also realized in the educational specification design criteria of a separate classroom and laboratory space, which sought as much as possible to duplicate what equipment would be found in industry. For example the plant science classroom instruction prepared students for activities/applications in a greenhouse. The agriculture education teacher linked the classroom to the laboratory practical lab (activity or application). In order to do this; up to date and correct industry equipment was required. FFA instruction provided material on agribusiness, cost of production, crop reports and supply demand economics. How did the vocational experiences fit into the four year program for high schools? They did so as a scope and sequence within a separate agriculture education program of studies. Students had a broad based exploratory program the first two years with concentration/specialization in their third and fourth years. The fourth or senior year had a special topic for a large senior portfolio project. Students were largely unassigned that last half of their senior year so they could concentrate on the senior portfolio project.

The assessment process in agriculture education was usually in two sections, written for the class instruction and performance for the industry practical. The assessment for industry applications (practical) was performance based which was also measured. If students performed the lab practical (applications or activity) and met industry expectations they were termed "competent." Critical thinking was termed "trouble shooting" which also contained checklists similar to protocols. For some courses, skill based activities provided the framework to attain industry competency certificates. At this time, we offer two such certificates one for science (HACCP) and one for technology (CT DEEP safe boating). It is hoped to expand that number of industry recognized certificates from two to eight next year.

Scope and Sequence

The previous designation of a concentrator was the completion of a junior/senior sequence of courses that was in a pathway for ASTE that lead both to a concentrator and completer, as a senior student only, in any Connecticut ASTE program. This was changed as of October 2017.

In 2016, the state changed the application process for all ASTE centers, aligning the application process to the ten (10) career pathways of study. Students are asked to numerically rank the pathways 1 through 8 based upon the student's preference of study. (Not all agriculture education centers offer all pathways. Refer to your ASTE's web page for more information.) The ASTE center scheduling should reflect the student's ranked preference choice on the state's application.

Although the State Board of Education has endorsed using the AFNR Standards for State ASTE courses and articulated the ten career pathways, it made no recommendations on which ones or minimum numbers of standards for each course. Other questions include using the pathway term, before the standards were distributed over four years, (again with a senior concentrator), but now only two, within course titles of our Scope & Sequence, which match the State frameworks need to be changed. We need to identify what standards are assigned to each course within the pathways, which are the check off boxes on the State ASTE application. Each of the regional ASTE centers, due to the nature of cooperating districts and transportation, were to reflect the employment needs and trends of the local communities. This was by way of regional consulting and advisory committees.

A great deal of additional information has been gathered from the many individuals who serve as members of the Vocational Agriculture Center's Advisory/ Consulting committee and other program committee partnerships. The information has been incorporated into the courses that are being offered at our school. These ongoing and long-term relationships between the industry people, regional employers, researchers, regulatory agencies and the teachers at the school are essential for the continuous revision and updating of the curriculum. The course work in the classrooms and labs must provide the students with the most up-to-date training experiences, which will prepare them for the job site internships they will work in during their senior years. As such, ASTE centers have seen a decline in butcher and milk labs, converting to newer biotech and toxicology labs as employment needs in the community changed.

As mentioned earlier, the freshmen level courses have been designed as exploratory courses to provide students with an overview of aquaculture, marine trades or agriculture. For half the year, the student takes the Aquaculture Science course and then, at mid-year begins the Aquaculture Technology I course. In the sophomore year, the courses are still half-year courses in Aquaculture Science and Aquaculture Technology but the content becomes more specific. At the end of the sophomore year, the student must select the area of “concentration” that he/she wishes to focus on as their career track for the remaining years at the Sound School. During the junior year, the students will again take half-year advanced level courses in Aquaculture (Agriculture) Science and Aquaculture (Agriculture) Technology but the specific courses that they have to choose are geared towards development of the knowledge and skills that they must have for entering certain occupational clusters or continuing on to higher education in that field. It is as seniors that the students receive the most intensive job related training and experience. For the first half of the year, the students will receive even more detailed and comprehensive instruction in two of the subject areas within the occupational field that they have selected. The remainder of the senior year will be spent working on special topics that are a part of the student’s planned program.

Instruction in Special Topics is achieved, through placement of students at sites where they can receive real occupational experience. These placements are of two types. There is the **Cooperative Placement** (Internship), which involves the student being released during the school day to allow education, during that time, in an aquaculture (agriculture) field, marine trade, or agriculture related business. Additionally, the student may attend a co-op class taught by an outside instructor who also supervises the student on the job site if required. The other placement is the **Directed Laboratory Experience** in which the student works with a teacher and/or mentor at one of the school’s labs or at an off-site laboratory on a planned research project beyond the regular school day and the student obtains SAE credit.

The third type of placement includes **Employer Agreements** or the traditional work-site agriculture work experience placement. They require periodic site visits by ASTE teaching staff and the State of Connecticut’s Department of Labor and Department of Education's approval. **Entrepreneurship, Exploratory FFA Research/Experimentation and Non-Research FFA Areas** are additional SAE pathways followed routinely by students in grades nine through eleven.

The Sound School's Vision, Mission, and Goals

At The Sound School our beliefs and values drive our vision and mission. This is what we believe:

- 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 to use these skills and abilities in any pursuit after graduation, whether it is at a two or four-year college, military services or 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 interdisciplinary, multi-step 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

Mastery is the consistently successful application of knowledge (facts), skills (processes), and behaviors (actions) to complex problems and new situations.

Freshman Exploratory Courses

Agriculture Science Curriculum

Course Title: [Agriculture Science and Natural Resources]

Scope and Sequence:
[Exploratory-Year 1]

Course Description:
[1st Year Students / Double Period / Alternating Cycle / One (1) credit]

[This course serves as an introduction to Agriculture as it relates to man-made and naturally occurring terrestrial ecosystems. Students will utilize 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**
- o [Measurement/metric system
 - o Scientific Method
 - o Classification
 - o Soil Testing
 - o Plant and animal systems
 - o Climate Change
 - o Energy Use/conservation
 - o Earth Cycles
 - o 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 Performance Standards CTE

State Department of Education / Industry recognized standards

AFNR: Career Ready Practices

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

AFNR: Content Skills

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

- FFA Activities, Certificates & Awards**
1. Review of SAE Plan and Pathway paperwork
 2. Documentation of Evidence toward goal completion
 3. Updating FFA Record Book]

[Vocational Agriculture Program of Studies]

[Agriculture Technology Curriculum]

Course Title: **[Agriculture Technology I]**

Scope and Sequence:
[Exploratory –Year 1]

Course Description:
[1st Year Students / Double Period / Alternating Cycle / One (1) credit]

[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 Performance Standards CTE

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

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book
4. FFA Greenhand Degree]

[Vocational Agriculture Program of Studies]

Aquaculture Science Curriculum

<p>Course Title: [Aquaculture Science and Natural Resources]</p> <p>Scope and Sequence: [Exploratory - Year 1]</p> <p>Course Description: [1st Year Students / Double Period / Alternating Cycle / One (1) credit]</p> <p>[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.]</p>	<p style="text-align: center;">Units</p> <ul style="list-style-type: none"> o [Measurement/metric system o Scientific Method o Classification o DEEP Project search Bio-assessment/mapping o New Haven Harbor Study o Climate Change/ocean acidification o Energy Use/conservation o Earth Cycles o Ecosystems/resource management]
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<p style="text-align: center;">Significant Job Tasks</p> <ul style="list-style-type: none"> • Use a Microscope • Identify Invasive and Indigenous Species • Conduct Water Chemistry Analysis • Interpret Maps • Use a Dichotomous Key • Conduct Field Observations and Analysis <p style="text-align: center;">Job Titles</p> <ul style="list-style-type: none"> • Water Quality Specialist • Field Biologist • Biologist • Chemist • Botanist • Ecologist • Science Educator] 	<p style="text-align: center;">Industry Applications or Performance Standards CTE</p> <p style="text-align: center;">State Department of Education / Industry recognized standards</p> <p>AFNR: Career Ready Practices</p> <ul style="list-style-type: none"> o CRP.01 o CRP.02.01, .02 o CRP.10.01, .02, .03 <p>AFNR: Content Skills</p> <ul style="list-style-type: none"> o AQ.03.01, .02 o NRS.01.01 o NRS.02.01
	<p style="text-align: center;">FFA Activities, Certificates & Awards</p> <ol style="list-style-type: none"> 1. Review of SAE Plan and Pathway paperwork 2. Documentation of Evidence toward goal completion 3. Updating FFA Record Book]

Aquaculture Technology Curriculum

<p>Course Title: Aquaculture Technology I</p> <p>Scope and Sequence:</p> <p style="text-align: center;">Exploratory – Year 1</p> <p>Course Description: 1st Year Students / Double Period / Alternating Cycle / One (1) credit</p> <p>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.</p>	<p style="text-align: center;">Units</p> <ul style="list-style-type: none"> ○ [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
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<p style="text-align: center;">[Significant Job Tasks</p> <ul style="list-style-type: none"> • 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 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 <p style="text-align: center;">Job Titles</p> <ul style="list-style-type: none"> • Marina Operator • Marine Construction • Carpentry • Deckhand • Marine Sales • Able Seaman • Launch Operator • Vessel Captain • Sailing Instructor] 	<p style="text-align: center;">[Industry Applications or Performance Standards CTE State Department of Education / Industry recognized standards</p> <p>AFNR: Common Career Technical Core Career Ready Practices</p> <ul style="list-style-type: none"> • 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 <p>AFNR: Marine Trades Career Pathway</p> <ul style="list-style-type: none"> • MT.01.02.01; 02.01.01, 02; 02.02.01, 03, 04, 05; 03.01.01; 04.01.01, 03, 04, 05, 06]
	<p style="text-align: center;">[FFA Activities, Certificates & Awards</p> <ol style="list-style-type: none"> 1. Review of SAE Plan and Pathway paperwork 2. Documentation of Evidence toward goal completion 3. Updating FFA Record Book 4. State of CT Safe Boating Certificate 5. FFA Greenhand Degree]

Sophomore Intermediate Courses

Agriculture Science Curriculum

Course Title: [Agriculture/Aquaculture Biology]

Scope and Sequence:

[Intermediate -Year 2]

Course Description:

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

[The primary purpose of this course is to provide a broad overview of key concepts of Biology with an emphasis on Agriculture and Aquaculture species. It is designed to offer content and skills necessary for advanced agriculture, aquaculture, biotechnology, and environmental study; college preparation; and good citizenship. Agriculture/Aquaculture 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 / Job Titles

- 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
- Aquaculture Technician]

Industry Applications or Performance Standards CTE

State Department of Education /
Industry recognized standards

AFNR: Animal Science,
Environmental Science,
Aquaculture Biology,
Biotechnology
Career Ready Practices
CRP.08.CCTC/CRP.01.01a
NGSS: HS-LS3-2, HS-ETS1-2,
HS-ESS2-2, HS-LS1-5
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.01.01.01a
PS.01.CCTC/PS.01.03

FFA Activities, Certificates & Awards

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book]

[Vocational Agriculture Program of Studies]

[Agriculture Technology Curriculum]

Course Title: [Agriculture Technology II]

Scope and Sequence:

[Intermediate - Year 2]

Course Description:

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

[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 Performance Standards CTE

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.02.01

[FFA Activities, Certificates & Awards

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book
4. FFA Chapter Degree]

Aquaculture Science Curriculum

22

Course Title: Aquaculture Biology

Scope and Sequence:
Intermediate – Year 2

Course Description:

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

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 practica 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.

Significant Job Tasks / Job Titles

- 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, State Aquaculture Standards 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

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

Industry Applications or Performance Standards CTE

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

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

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book]

[Vocational Agriculture Program of Studies]

Aquaculture Technology Curriculum

Course Title: [Aquaculture Technology II]

Scope and Sequence:

[Intermediate - Year 2]

Course Description:

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

[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

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

State Department of Education /
Industry recognized standards

AFNR: Aqua - Marine Related Technology

- o MT.02.01.01.a
- o MT.02.01.02.a
- o MT.02.02.02.a
- o MT.04.01.01.a
- o MT.04.01.01.b
- o MT.04.01.02.c
- o MT.04.01.03.a
- o MT.04.01.03.b
- o MT.04.01.03.c
- o MT.04.01.04.a
- o MT.04.01.06.b
- o MT.04.01.01.c
- o MT.04.02.01.a
- o MT.04.02.01.b]

FFA Activities, Certificates & Awards

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book
4. FFA Chapter Degree]

[Vocational Agriculture Program of Studies]

Junior Advanced Courses

Agriculture Science Curriculum

Course Title: [Veterinary Science I]

Scope and Sequence:
[Advanced -Year 3]

Course Description:

[Third Year Students, Half Year Course (Double Period, 1 credit)

[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 Performance Standards CTE

State Department of Education /
Industry recognized standards

AFNR: Animal Systems

- AS.02
- AS.03]

[FFA Activities, Certificates & Awards

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book]

[Vocational Agriculture Program of Studies]

[Agriculture Technology Curriculum]

Course Title: [

Plant / Greenhouse Technology 1]

Scope and Sequence:

[Advanced - Year 3]

Course Description:

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

[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

- o [Plant Structure, Growth and Function
- o Soil Science
- o Plant Propagation
- o Pests and Pest Management
- o Indoor and Container Gardening
- o Community Gardens
- o Environmental Horticulture
- o 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 Performance Standards CTE

State Department of Education /
Industry recognized standards

AFNR:

- o CRP 01.01, 02.02, 04, 04.02, 04.03, 06, CRP 08, 09.02
- o 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

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book]

[Vocational Agriculture Program of Studies]

Aquaculture Science Curriculum

Course Title:

Aquaculture Chemistry

Scope and Sequence:

Advanced - Year 3

Course Description:

3rd and 4th Year Students / Single Period / Two Semesters / One(1) credit

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 Intern- CT DEP
- 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 Performance Standards

CTE

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

1. Documentation of Evidence toward goal completion
2. Updating FFA Record Book]

Aquaculture Science Curriculum

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

Scope and Sequence: [**Advanced –Year 3**]

Course Description: [**3rd Year Students / Double Period / Alternating Cycle / One (1) credit**]

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]

[Industry Applications or Performance Standards CTE

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]

[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]

[FFA Activities, Certificates & Awards

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book]

[Vocational Agriculture Program of Studies]

Aquaculture Science Curriculum

Course Title: [**Environmental Science and Natural Resources I**]

Scope and Sequence: [**Advanced - Year 3**]

Course Description: [**3rd Year Students / Double Period / 1/2 Year / One (1) credits**]

[Environmental Science and Natural Resources introduces students to ecological field study and research practices. Students will explore our local ecosystems and develop a foundational understanding of the natural processes and interactions that shape our environment. All students will participate in local restoration efforts and environmental field studies.]

Units

- o [Biodiversity
- o Ecosystem Dynamics
- o Climate Change
- o Careers in Environmental Science
- o Waste Water Treatment
- o Environmental Field Study Practices]

[Significant Job Tasks

- Collect and conduct analysis of water and soil samples
- Assess local biodiversity
- Evaluate ecosystem status
- Identify local species using a dichotomous key
- Demonstrate effective communication skill and teamwork skills
- Demonstrate knowledge and understanding of laboratory safety protocols
- Identify tools used and uses
- Articulate ideas clearly and effectively to a variety of audiences using multiple modes
- Demonstrate effective time management skills
-

Job Titles

- Climate Scientist
- Forester
- Conservation Biologist
- Environmental Field Technician
- Environmental Attorney
- Environmental Law Enforcement
- Sustainable Developer/Urban Planner
- Marine Scientist
- Water Quality Technician]

[Industry Applications or Performance Standards CTE

State Department of Education / Industry recognized standards

AFNR:

- o ESS.01, 04, 05
- o NRS.01, 04
- o AQ.03
- o CRP.01-13
- o CS.04, 05, 06

NGSS:

- o HS-LS2-2, 6, 7
- o HS-LS4- 1, 6
- o HS-ESS2-4
- o HS-ESS3-1]

[FFA Activities, Certificates & Awards

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book]

[Vocational Agriculture Program of Studies]

Aquaculture Science Curriculum

Course Title: [

Genetics & Biotechnology I]

Scope and Sequence:

[Advanced –Year 3]

Course Description:

[3rd Year Students / Double Period / One Semester / One (1) credit]

[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 and genetic modification of bacteria.

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 Performance Standards CTE

State Department of Education /
Industry Recognized Standards

AFNR: Biotechnology Systems
Career Pathway Content Standards

- 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

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book]

[Vocational Agriculture Program of Studies]

Aquaculture Technology Curriculum

Course Title: [**Marine Construction I**]

Scope and Sequence: [**Advanced –Year 3**]

Course Description:
[3rd Year Students / Double Period / Alternating Cycle / One (1) credit]

Aquaculture Technology III has been designed as Marine Construction. This course is the prerequisite for the Marine Construction 2 offered during senior year of the aquaculture program. Students will build and/or repair boats for the school fleet. Blueprint reading, boat design, CAD and CNC operation will expand the scope of this course to include student 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
- FFA]

[Industry Applications or Performance Standards CTE

State Department of Education /
Industry recognized standards

AFNR: Aqua - Marine Related
Technology / Agriculture
Mechanics

- A – 2, 3, 7, 10, 11, 12, 16
- B- 19, 20, 21, 22, 23
- C- 24, 25, 26, 27, 28, 29, 30, 31, 32, 33
- D- 34, 35, 38, 39, 40, 41, 42, 43
- I- 74, 75, 76, 77]

ABYC Certification for
Composites]

[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 ABYC Standards
- Utilize effective communication and teamwork
- Composites
- Apply effective time management skills
- Wood Joinery
- Finishes

Job Titles

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

[FFA Activities, Certificates & Awards

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book]

Aquaculture Technology Curriculum

Course Title:

Marine Engineering I

Scope and Sequence:

[**Advanced –Year 3**]

Course Description:

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

[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. This is the first course in the Marine Engineering concentration sequence.]

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]

Industry Applications or Performance Standards CTE

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

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]

FFA Activities, Certificates & Awards

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book]

[**Vocational Agriculture Program of Studies**]

Aquaculture Technology Curriculum

Course Title: [

Ocean Engineering I]

Scope and Sequence:

[Advanced - Year 3]

Course Description:

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

[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 SolidWorks
- Electronics
- Soldering
- Kinetics
- Pneumatics
- Hydraulics
- Subsea Physics
- Underwater Technology
- Special Project – ROV Design & Construction
- Marine Technology Careers]

[Industry Applications or Performance Standards CTE

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]

[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]

[FFA Activities, Certificates & Awards

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book]

[Vocational Agriculture Program of Studies]

Aquaculture Technology Curriculum

Course Title: [**Vessel Operations I**]

Scope and Sequence: [**Advanced - Year 3**]

Course Description: [**3rd Year Students / Double Period / Alternating Cycle / One (1) credit**]

Participation in this course is designed to train the student as a large vessel crew member and to eventually become captain of a motor launch, charter boat, ferry, fishing vessel, or to develop the knowledge and skills that could lead to a career in the Merchant Marine, the Navy or the Coast Guard. Students taking this course will be introduced to the Coast Guard Regulations applicable to the construction, maintenance and operation of vessels and to obtaining various Coast Guard licenses. They will be introduced to what is involved in the operation of large vessels and how to navigate by various methods. Advanced seamanship skills will be learned such as light cargo handling and towing. They will become familiar with all of the systems that are present aboard a vessel and how each functions to support the operation of the vessel. The use of various communication systems and radar will be practiced. There will also be instruction in watch standing procedures, emergency procedures, heavy weather procedures, and the Coast Guard Auxiliary.

[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]

[Industry Applications or Performance Standards CTE

State Department of Education /
Industry recognized standards

AFNR: Aqua - Marine Related
Technology

- 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]

[Significant Job Tasks

- Students will be exposed to safety practices and procedures aboard larger vessels.
- Students will review marine vocabulary and proper knot tying.
- Students will identify their skills and interests as it relates to a specific career path for post-graduation; Aqua = Marine Related
- Students will be introduced to all pertinent Navigation Rules & Technology
- Students will be exposed to the piloting of Island Rover.
- Students will successfully complete a marine safety, seamanship, and piloting course.
- Students will be exposed to basic employability skills.
- Students will successfully complete an American Red Cross approved course in CPR / First Aid.
- 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)]

[FFA Activities, Certificates & Awards

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book]

[Vocational Agriculture Program of Studies]

Aquaculture Technology Curriculum

Course Title: [

Agri Business / Entrepreneurship]

Scope and Sequence:

[Introductory - Year 1]

Course Description:

[3rd/4th Year Students / Single Period / Full Year / One (1) credit]

This Principles of Entrepreneurship class is a foundational course in entrepreneurship, which incorporates the Network for Teaching Entrepreneurship (NFTE) curriculum framework. This course has been designed for students who are interested in business education, particularly entrepreneurship and small business management. In this course, the students will study the role of entrepreneurs in our free enterprise system. This course will enable students to acquire the knowledge and develop the skills needed to effectively organize, develop, create, and manage their own businesses.

Activities will include reading, writing, discussion, direct and indirect research, business math, accounting principles, teamwork, networking, problem solving, applying technology, and decision-making.

Students will develop business and marketing skills, including work readiness skills, customer service and sales techniques, inventory procedures and calculations, effective communications techniques, payroll calculations, and related marketing functions. Emphasis will also be placed on job search techniques, career opportunities and requirements, and appropriate workplace behaviors.

[Units

- Create a Logo
- Create a Mission Statement
- Recognizing an Opportunity
- Developing a Solution
- Organizing a Legal Structure
- Economics of One Unit
- Market Analysis
- Monthly Sales Projections
- Break Even Units
- Financial Reports
- Return on Sales
- Return on Investment
- Financing Strategy
- Business Responsibility and Philanthropy]

[Industry Applications or Performance Standards CTE

State Department of Education /
Industry Recognized Standards

AFNR Standards:

- CRP.13
 - ABS.01.02.01.a
 - ABS.01.02.02.b
 - ABS.02.01.01.a
 - ABS.02.01.02.a
 - ABS.03.01.01.a
 - ABS.03.01.01.b
 - ABS.03.01.01.c
 - ABS.05.02.02.a
 - ABS.05.03.01.a]

[Significant Job Tasks

- Create a Business Plan
- Demonstrate Time Management Skills
- Public Speaking
- Field Trips to local business / guest speakers from local businesses
- Demonstrate effective communication skill and teamwork skills
- Demonstrate knowledge and understanding of laboratory safety protocols
- Identify tools used and uses
- Articulate ideas clearly and effectively to a variety of audiences using multiple modes
- Demonstrate effective time management skills
- Creation of a Marketing Slogan / Tag Line
- Demonstrate effective interpersonal skills in group work

Job Titles

- Entrepreneur
- Business Owner
- Office Worker]

[FFA Activities, Certificates & Awards

1. NFTE Business Plan Competition
2. NFTE Certificate of Completion
3. Opportunities for Entrepreneurship SAE Pathway completion

[Vocational Agriculture Program of Studies]

Senior Intensive Courses

Agriculture Science Curriculum

Course Title: [Veterinary Science II]

Scope and Sequence:
[Intensive –Year 4]

Course Description:
[Fourth Year Students, Full Year Course (Double Period, 2 credits)

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 Performance Standards CTE

State Department of Education / Industry recognized standards

AFNR: Animal Systems
AS.02, AS.03, AS.04
AS.06, AS.07, AS.08

Career Ready Practices
CRP.02, CRP.04, CRP.05,
CRP.06, CRP.07, CRP.08,
CRP.10, CRP.11]

[FFA Activities, Certificates & Awards

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book]

Agriculture Technology Curriculum

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

Scope and Sequence:

[**Intensive –Year 4**]

Course Description:

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

[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

- 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 Performance Standards CTE

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

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book
4. [ICEV Plant Certificate]

[**Vocational Agriculture Program of Studies**]

Aquaculture Science Curriculum

Course Title:

Aquaculture Life Sciences II – Finfish/ Shellfish Production

Scope and Sequence:

[Intensive –Year 4]

Course Description:

[4th Year Students / Double Period / Full Year / Two (2) credits]

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.

Students will be graded on their class participation, field work in a variety of settings, materials and information acquired on field trips, class notes, portfolio, PowerPoint presentations, quizzes, tests and laboratory practicals.

Each student will select an area of interest, create a specialized plan of study, and pursue their chosen aspect of aquaculture through in-depth research for their entire senior year. Students will be required to submit a research project that follows a specific format provided by the instructor. Failure to complete the research project will result in loss of credit, regardless of prior class standing.

[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
- Applied Field Work]

[Industry Applications / Performance Standards CTE 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]

[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. All report having received useful training in the aforementioned class.]

[FFA Activities, Certificates & Awards

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book
4. FDA Hazard Analysis & Critical Control Point (HACCP) Certification]

[Vocational Agriculture Program of Studies]

Aquaculture Science Curriculum

Course Title: [

Environmental Science and Natural Resources II

Scope and Sequence:

[Intensive –Year IV]

Course Description:

[4th Year Students / Double Period / Full Year / Two (2) credits]

[ESNR II follows the junior level advanced course and provides an in-depth exploration of ecosystems and sustainability. Environmental threats have biological, economic, political, and legal implications and there are no simple solutions. Through this course students will develop a strong foundation in ecology and principles of conservation. Students will have the opportunity to investigate topics of interest as well as develop capstone projects in conjunction with this course.]

Units

- [History of Earth
- Dynamic Planet
- Biomes and Ecosystems
- Evolution and Adaptation
- Ecology of Individuals and Populations
- Biological Communities
- Resource Management
- Sustainable Development
- Topics in Conservation]

Significant Job Tasks

- Collect and analyze environmental data on water quality, soil, and biodiversity
- Research, examine, and discuss technologies, issues and trends that impact environmental systems
- Make recommendations for the management of environmental systems
- Create long and short term personal goals
- Demonstrate effective communication skill and teamwork skills
- Demonstrate knowledge and understanding of laboratory safety protocols
- Identify tools used and uses
- Articulate ideas clearly and effectively to a variety of audiences using multiple modes
- Demonstrate effective time management skills
- Demonstrates a sophisticated sense of complex civic issues
-

Job Titles

- Climate Scientist
- Forester
- Conservation Biologist
- Environmental Field Technician
- Environmental Attorney
- Environmental Law Enforcement
- Sustainable Developer/Urban Planner
- Marine Scientist
- Water Quality Technician]

Industry Applications or Performance Standards CTE

State Department of Education /
Industry recognized standards

AFNR:

- ESS.01, 02, 03, 05
- NRS.01, 02, 03, 04
- AQ.03
- CRP.01-13
- CS.04, 05, 06

NGSS:

- HS-LS2-6, 7, 8
- HS-LS4-1, 2, 4, 5, 6
- HS-ESS1-5
- HS-ESS2-4
- HS-ESS3-1, 4]

FFA Activities, Certificates & Awards

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book
4. Public Speaking]

[Vocational Agriculture Program of Studies]

Aquaculture Science Curriculum

Course Title: [Genetics & Biotechnology II]

Scope and Sequence:

[Intensive – Year 4]

Course Description:

[4th Year Students / Double Period / Full Year / Two (2) credits]

[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 Performance Standards CTE

State Department of Education /
Industry recognized standards

AFNR: Biotechnology
SystemCareer Pathway Content
Standards

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

NGSS Standards

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

FFA Activities, Certificates & Awards

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book]

[Vocational Agriculture Program of Studies]

Aquaculture Technology Curriculum

Course Title: [Marine Construction II]

Scope and Sequence:

[Advanced - Year 4]

Course Description:

[4rd Year Students / Double Period / Alternating Cycle / Two (2) credit]

[Aquaculture Technology IV, Marine Construction 2, continues with the same overall content as Marine Construction 1 with the addition of project management. Seniors are expected to initiate and complete projects that will benefit their learning goals as well as other programs within the school. Students will continue to build and/or repair boats for the school fleet. Boat design using a CAD program will lead to supervisor/working on models and/or full size boats. This course includes both hands-on and theoretical learning to prepare the seniors for college in engineering and manufacturing or entry level employment in the marine industry.]

[Units

- o Shop safety
- o Tools
- o Materials
- o Woodworking
- o Tool Maintenance
- o Small Boat Construction and Repair
- o Job Sequence
- o Boat Design
- o Intro to CAD
- o Intro to CNC
- o FFA]

[Industry Applications or Performance Standards CTE

State Department of Education /
Industry recognized standards

AFNR: Aqua - Marine Related
Technology / Agriculture
Mechanics

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

ABYC Certifications for
Composites]

[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
- Composites
- Apply effective time management skills
- Wood Joinery
- Finishes

Job Titles

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

[FFA Activities, Certificates & Awards

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book]

[Vocational Agriculture Program of Studies]

Aquaculture Technology Curriculum

Course Title: **Marine Engineering II**

Scope and Sequence:

[Intensive –Year 4]

Course Description:

[4th Year Students / Double Period / Full Year / Two (2) credits]

[This is the second course in the Marine Propulsion sequence. Participation in this course will provide students with a working knowledge and experience in mechanics and the workings of outboard engines. 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 with engines both in the shop and on the water. Outboard manufacturers' maintenance and repair videos will be used to enable students to work independently at workstations. The topics/units that students will receive advanced training and instruction in will include ignition systems, engine cooling systems/ water pumps/ propellers/ lower units, fuel systems (fuel injection and carburetion), lubrication systems, 2-stroke and 4- stroke cycles marine diesel engine principles and operation, new engine rigging, winterization and maintenance, diagnosing repairs and trouble-shooting. Time permitting, ME II students may also experience units dealing with Metal Fabrication (cutting and welding). This is the second course in the Marine Engineering concentration sequence.]

Units

- Shop Safety
- Tool Identification
- Multiple cylinder gas engines
- Diesel Engines
- Outboard Systems
- De-commissioning
- Winterization/Storage
- Maintenance
- Marine Technology Careers
- Special Projects]

Industry Applications or Performance Standards CTE

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

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
- Welder / Fabricator]

FFA Activities, Certificates & Awards

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book]

[Vocational Agriculture Program of Studies]

Aquaculture Technology Curriculum

Course Title: [Ocean Engineering II]

Scope and Sequence:

[Intensive - Year 4]

Course Description:

[4th Year Students / Double Period / Full Year / Two (2) credits]

[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.]

[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]

[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 Careers]

[Industry Applications or Performance Standards CTE

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

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book]

[Vocational Agriculture Program of Studies]

Aquaculture Technology Curriculum

Course Title: [Vessel Operations II]

Scope and Sequence:
[Advanced –Year IV]

Course Description:
[4rd Year Students / Double Period / Alternating Cycle / Two (2) credit]

[Requires Previous Course Sequence or Permission of Instructor and Advisor

This is the second course in the Vessel Operations sequence. Participation in this course is designed to train the student as a large vessel crew member and to eventually become captain of a motor launch, charter boat, ferry, fishing vessel, or to develop the knowledge and skills that could lead to a career in the Merchant Marine, the Navy or the Coast Guard. Students taking this course will be introduced to the coast Guard Regulations applicable to the construction, maintenance and operation of vessels and to obtaining various Coast Guard licenses. They will be introduced to what is involved in the operation of large vessels and how to navigate by various methods. Advanced seamanship skills will be learned such as light cargo handling and towing. They will become familiar with all of the systems that are present aboard a vessel and how each functions to support the operation of the vessel. The use of various communication systems and radar will be practiced. There will also be instruction in watch standing procedures, emergency procedures, heavy weather procedures, and the Coast Guard Auxiliary Coast Watch Program. entry level employment in the marine industry.]

[Units

- o Large Vessel Safety
- o Large Vessel Seamanship
- o Navigation / Piloting
- o USCG inspection/ licensing
- o Vessel Maintenance
- o CPR / first aid
- o Mechanical and electrical systems
- o Weather
- o Career opportunities within marine transportation
- o FFA]

[Industry Applications or Performance Standards CTE

State Department of Education / Industry recognized standards

AFNR: Aqua - Marine Related Technology / Agriculture Mechanics

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

[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 aboard larger vessels.
- Students will be proficient in the use and understanding of marine vocabulary.
- Students will develop a specific career path for post-graduation.
- Students will understand all pertinent Navigation rules.
- Students will be proficient at piloting Island Rover.
- Students will successfully complete a USCG approved marine licensing course.
- Students will exercise basic employability skills.
- Students will be proficient in tying knots.
- 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]

[FFA Activities, Certificates & Awards

1. Review of SAE Plan and Pathway paperwork
2. Documentation of Evidence toward goal completion
3. Updating FFA Record Book]

[Vocational Agriculture Program of Studies]

