

# STRANDS AND STANDARDS

## AQUACULTURE INTRODUCTION



### Course Description

Students will gain knowledge and develop skills with respect to the scientific method in the context of raising and breeding fish. Course topics include fish ecology, anatomy and physiology, water quality, aquaponics, and commercial and recreational management operations. Emphasis is placed on hands-on skill acquisition. Students will also explore educational preparation and career opportunities in aquaculture.

<b>Intended Grade Level</b>	9-12
Units of Credit	1.0
Core Code	30.01.00.00.116
Concurrent Enrollment Core Code	N/A
Prerequisite	N/A
Skill Certification Test Number	118
Test Weight	1.0
<b>License Type</b>	CTE and/or Secondary Education 6-12
<b>Required Endorsement(s)</b>	
Endorsement 1	Agriculture (CTE/General)
Endorsement 2	Animal Science & Technology
Endorsement 3	Natural Resources Management
Endorsement 4	Agriculture Science (Career & Technical)

## STRAND 1

**Students will explain the role of FFA in agricultural education.**

### Standard 1

Discuss the history and organization of FFA as it relates to the complete program of agricultural education.

- Explain the interrelationship of classroom and laboratory instruction, supervised agricultural experience, and FFA.
- Describe how, when, and why FFA was organized.
- Identify key FFA historical events.
- Identify the mission and strategies, colors, motto, emblem and parts of the emblem, and organizational structure of FFA.
- Recite and explain the meaning of the FFA Creed.
- Discuss the meaning and purpose of a program of activities and its committee structure.
- List FFA chapter officers, and discuss the role of each.

### Standard 2

Identify opportunities in FFA.

- Describe FFA opportunities that develop leadership skills, personal growth, and career success.
- Summarize major state and national activities available to FFA members.

### Standard 3

Describe FFA degrees, awards, and career development events (CDEs).

- List and explain the FFA degree areas.
- Identify FFA proficiency awards.
- List and discuss various team and individual CDEs

### Performance Objective

- Students will be able to recite and explain the meaning of the FFA creed.

## STRAND 2

**Students will explain the role of supervised agricultural experience (SAE) programs in agricultural education.**

### Standard 1

Examine the responsibilities and benefits associated with an SAE.

- Explain the meaning and benefits of supervised agricultural experience.
- Explain the characteristics of an effective SAE program and the responsibilities of those involved.

## Standard 2

Determine the types of SAE programs.

- Compare entrepreneurship SAEs and placement SAEs.
- Describe research/experimentation SAEs.
- Describe exploratory SAEs.

## Standard 3

Plan an SAE program.

- Identify the steps in planning an SAE program.
- Describe the function of a business/training plan and/or agreement in an SAE program.
- Develop a short-range plan and a long-range plan for an SAE program.
- Relate classroom and laboratory instruction to an SAE program.

## Standard 4

Maintain and use SAE records.

- Explain the importance of keeping records on an SAE program.
- Explain how SAE records are organized.
- Follow approved procedures to make entries in SAE records.

## Performance Objective

- Students will be able to develop a plan for a successful SAE.

## STRAND 3

**Students will outline the steps of the scientific method.**

### Standard 1

Identify experimental design components.

- Identify a problem.
- Formulate a question and hypothesis.
- Design and conduct a controlled experiment.
- Collect/document and analyze data.
- Draw conclusions based on the experimental data.

### Standard 2

Explore various examples of scientific work.

- Identify individual steps of the scientific method within real-world examples.
- Summarize how scientific knowledge is gained.

## Performance Objective

- Students will be able to design and conduct a controlled experiment which investigates an aquatic ecosystem using methods of science to gather quantitative and qualitative data.

## STRAND 4

**Students will explain the history, importance, and scope of aquaculture.**

### Standard 1

Discuss the history of aquaculture.

- Discuss how the history of aquaculture helped develop civilization.
- Identify major innovations and milestones in the advancement of aquaculture.

### Standard 2

Discuss the importance of aquaculture with respect to economic development.

- Correlate aquaculture with the characteristics of geography, temperature, oxygen levels, culture, and climate.
- Identify various uses of aquaculture (e.g. food, medicine), including fish being the most common animal protein source in the world.
- Identify and describe major areas or types of aquaculture; e.g. marine, invertebrate and fresh water.
- Identify and describe major types of aquaculture systems; e.g. open, semi-open and closed systems.

### Standard 3

Interpret trends in the aquaculture industry.

- Identify trends in the aquaculture industry.
- Determine the implications of trends on aquaculture production.

### Standard 4

Determine career opportunities in the aquaculture industry.

- Identify the nature of career opportunities in the aquaculture industry.
- Develop a career plan to acquire needed education and skills for entering a career in the aquaculture industry.
- Demonstrate personal and job skills for success in entering and advancing in a career in the aquaculture industry.

## STRAND 5

**Students will understand that living organisms such as fish interact with one another and their environment.**

### Standard 1

Summarize how energy flows through an aquatic ecosystem.

- Arrange components of a food chain according to energy flow.
- Compare the quantity of energy at each level of an energy pyramid.

## Standard 2

Explain relationships between matter cycles and organisms.

- Use diagrams to trace the movement of matter through a cycle (i.e., carbon, oxygen, nitrogen, water) in the context of aquatic ecosystems.
- Evaluate the impact of personal choices (e.g. human impact on greenhouse gases, oil spills) in relation to the cycling of matter within an aquatic ecosystem.

## Standard 3

Describe how interactions among organisms and their environment help shape ecosystems.

- Categorize relationships among living things according to predator-prey, competition, and symbiosis.
- Investigate an aquatic ecosystem using methods of science to gather quantitative and qualitative data that describe the ecosystem in detail.

## STRAND 6

**Students will apply principles of nutrition to ensure the proper growth, development, reproduction, and economic production of aquatic animals.**

### Standard 1

Compare and contrast the digestive systems of aquatic animals.

- Describe the structure and function of the herbivore digestive system.
- Describe the structure and function of the carnivore digestive systems.
- Describe the structure and function of invertebrate digestive systems.

### Standard 2

Explain the role of nutrition in aquatic animal productivity.

- List essential nutrients, (protein, vitamins, minerals and fat) and describe the importance of each.
- Compare and contrast common feedstuffs in the diets of various aquatic animals. (i.e. clams, crustacean, fish, amphibians)
- Discuss the meaning and use of feed additives.

### Standard 3

Provide appropriate nutrition for aquatic animals.

- Relate the role of nutrition to the age, performance, and condition of aquatic animals.
- Determine feed rations for specific species, ages, and conditions of aquatic animals.
- Using the Pearson Square, calculate balanced rations for aquatic animals.

### Performance Objective

- Students will be able to correctly use the Pearson Square to determine optimal feed rations for their animals bearing in mind such factors as species, age, and condition, and implement their findings in the feeding of their animals

## STRAND 7

**Students will describe fish anatomy and physiology concepts.**

## Standard 1

Explain fish classification.

- Explain the classification scheme currently used in biology.
- Discuss the concept of binomial nomenclature.
- Compare and contrast the hierarchical classification of various fish species (trout, bass, catfish, and carp) to the “family” level

## Standard 2

Describe the anatomical features of various fish species and their functions.

- Outline major fish body systems with their respective functions.
- Identify major fish organs with their respective functions.
- Compare and contrast various modes of fish reproduction.

## STRAND 8

**Student will be able recognize and manage the health and well-being of aquatic animals.**

### Standard 1

Summarize the role of animal well-being in the animal industry.

- Explain the meaning and importance of animal well-being.
- Utilize safe practices in working with animals.
- Relate concepts of animal welfare and animal rights to animal well-being.

### Standard 2

Apply animal anatomy and physiology to maintain aquatic animal health.

- Discuss common diseases, parasites, and physiological disorders of aquatic animals. (e.g. Fungal-cotton wool, egg fungus; Bacterial-fin rot, dropsy; Viral-herpes, pox; Parasitic-Ick, Anchor worm.)
- Design and implement an aquatic animal health plan to promote efficiency of production.

### Standard 3

Provide for the health and well-being of agricultural animals.

- Prescribe and implement prevention and treatment for animal diseased, parasites, and other disorders.
- Perform simple health checks on animals.
- Diagnose species-specific illnesses and disorders based on symptoms and problems caused by diseases, parasites, and physiological disorders.

### Performance Objective

- Students will be able to optimize their animals’ health by designing and implementing an animal health plan.

**STRAND 9**

**Students will explain the inter-relatedness of fish and plants in the context of aquaponics.**

**Standard 1**

Describe aquaponic techniques.

- Outline ecological inter-relatedness of fish and plants.
- Explore types of aquaponic systems (e.g. gravel bed/media based, nutrient film technique, deep water culture-DWC).
- Hypothesize how altering the autotroph to heterotroph ratio would influence an aquatic ecosystem.
- Explore economic factors regarding various aquaponic systems (i.e. scale up, commercial, hydroponic types).
- Investigate the rate at which photosynthesis occurs in an aquatic ecosystem by altering one factor, e.g. light, temperature, and nutrient levels.

**Standard 2**

Relate water monitoring to aquaculture.

- Understand the importance of the following water quality parameters; pH, ammonia, nitrates, dissolved oxygen, chlorine and turbidity.
- Determine and document pH, ammonia, nitrate, and nitrite levels in a fish tank over time.
- Demonstrate basic methods used to adjust basic water parameters i.e. water change, pH adjustment, de-chlorination, and oxygenation.

**Performance Objective**

- Students will be able to determine, document, and make appropriate corrective adjustments to various water parameters such as pH, and ammonia, nitrate, nitrite, and oxygen levels.

**Skill Certificate Test Points by Strand**

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		
<course name>	000												