

Agriculture, Food and Natural Resources Career Cluster
Aquaculture
Course Number: 03.43100

Course Description:

The course introduces aquaculture as an important industry of agriculture. Students will learn some of the issues related to fish production that stem from the characteristics of ectothermic animals and the feed efficiency of fish. Students will become aware of how fish obtain oxygen and how the oxygen is dissolved in water and becomes depleted from the water. Through experiments, students will draw conclusions whether there are acceptable levels of oxygen for fish survival. Students will learn the important factors in fish production, including physical characteristics of the water, fish population and water "power of hydrogen" (pH). Students will analyze the various alternative aquaculture crops that can be grown.

Course Standard 1

AFNR-AQU-1

The following standard is included in all CTAE courses adopted for the Career Cluster/Pathways. Teachers should incorporate the elements of this standard into lesson plans during the course. The topics listed for each element of the standard may be addressed in differentiated instruction matching the content of each course. These elements may also be addressed with specific lessons from a variety of resources. This content is not to be treated as a unit or separate body of knowledge but rather integrated into class activities as applications of the concept.

Standard: Demonstrate employability skills required by business and industry.

The following elements should be integrated throughout the content of this course.

1.1 Communicate effectively through writing, speaking, listening, reading, and interpersonal abilities.

| Person-to-Person Etiquette | Telephone and Email Etiquette | Cell Phone and Internet Etiquette | Communicating At Work | Listening |
|-------------------------------|---------------------------------|-----------------------------------|---------------------------------|---------------------------------|
| Interacting with Your Boss | Telephone Conversations | Using Blogs | Improving Communication Skills | Reasons, Benefits, and Barriers |
| Interacting with Subordinates | Barriers to Phone conversations | Using Social Media | Effective Oral Communication | Listening Strategies |
| Interacting with Co-workers | Making and Returning Calls | | Effective Written Communication | Ways We Filter What We Hear |
| Interacting with Suppliers | Making Cold Calls | | Effective Nonverbal Skills | Developing a Listening Attitude |
| | Handling Conference Calls | | Effective Word Use | Show You Are Listening |
| | Handling Unsolicited Calls | | Giving and Receiving Feedback | Asking Questions |
| | | | | Obtaining Feedback |
| | | | | Getting Others to Listen |

| Nonverbal Communication | Written Communication | Speaking | Applications and Effective Résumés |
|--|-----------------------------------|--------------------------|------------------------------------|
| Communicating Nonverbally | Writing Documents | Using Language Carefully | Completing a Job Application |
| Reading Body Language and mixed Messages | Constructive Criticism in Writing | One-on-One Conversations | Writing a Cover Letter |

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|---|--|---------------------------|-------------------------------|
| Matching Verbal and Nonverbal communication | | Small Group Communication | Things to Include in a Résumé |
| Improving Nonverbal Indicators | | Large Group Communication | Selling Yourself in a Résumé |
| Nonverbal Feedback | | Making Speeches | Terms to Use in a Résumé |
| Showing Confidence Nonverbally | | Involving the Audience | Describing Your Job Strengths |
| Showing Assertiveness | | Answering Questions | Organizing Your Résumé |
| | | Visual and Media Aids | Writing an Electronic Résumé |
| | | Errors in Presentation | Dressing Up Your Résumé |

1.2 Demonstrate creativity by asking challenging questions and applying innovative procedures and methods.

| Teamwork and Problem Solving | Meeting Etiquette |
|------------------------------|---|
| Thinking Creatively | Preparation and Participation in Meetings |
| Taking Risks | Conducting Two-Person or Large Group Meetings |
| Building Team Communication | Inviting and Introducing Speakers |
| | Facilitating Discussions and Closing |
| | Preparing Visual Aids |
| | Virtual Meetings |

1.3 Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.

| Problem Solving | Customer Service | The Application Process | Interviewing Skills | Finding the Right Job |
|-----------------------------|--|---|---|------------------------------|
| Transferable Job Skills | Gaining Trust and Interacting with Customers | Providing Information, Accuracy and Double Checking | Preparing for an Interview | Locating Jobs and Networking |
| Becoming a Problem Solver | Learning and Giving Customers What They Want | Online Application Process | Questions to Ask in an Interview | Job Shopping Online |
| Identifying a Problem | Keeping Customers Coming Back | Following Up After Submitting an Application | Things to Include in a Career Portfolio | Job Search Websites |
| Becoming a Critical Thinker | Seeing the Customer's Point | Effective Résumés: | Traits Employers are Seeking | Participation in Job Fairs |
| Managing | Selling Yourself and the Company | Matching Your Talents to a Job | Considerations Before Taking a Job | Searching the Classified Ads |
| | Handling Customer Complaints | When a Résumé Should be Used | | Using Employment Agencies |
| | Strategies for Customer Service | | | Landing an Internship |
| | | | | Staying Motivated to Search |

1.4 Model work readiness traits required for success in the workplace including integrity, honesty, accountability, punctuality, time management, and respect for diversity.

| Workplace Ethics | Personal Characteristics | Employer Expectations | Business Etiquette | Communicating at Work |
|-------------------------------|-------------------------------|----------------------------|----------------------------------|----------------------------------|
| Demonstrating Good Work Ethic | Demonstrating a Good Attitude | Behaviors Employers Expect | Language and Behavior | Handling Anger |
| Behaving Appropriately | Gaining and Showing Respect | Objectionable Behaviors | Keeping Information Confidential | Dealing with Difficult Coworkers |

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|-----------------------------|------------------------------|-----------------------------|--------------------------|----------------------------------|
| Maintaining Honesty | Demonstrating Responsibility | Establishing Credibility | Avoiding Gossip | Dealing with a Difficult Boss |
| Playing Fair | Showing Dependability | Demonstrating Your Skills | Appropriate Work Email | Dealing with Difficult Customers |
| Using Ethical Language | Being Courteous | Building Work Relationships | Cell Phone Etiquette | Dealing with Conflict |
| Showing Responsibility | Gaining Coworkers' Trust | | Appropriate Work Texting | |
| Reducing Harassment | Persevering | | Understanding Copyright | |
| Respecting Diversity | Handling Criticism | | Social Networking | |
| Making Truthfulness a Habit | Showing Professionalism | | | |
| Leaving a Job Ethically | | | | |

1.5 Apply the appropriate skill sets to be productive in a changing, technological, diverse workplace to be able to work independently and apply team work skills.

| Expected Work Traits | Teamwork | Time Management |
|-----------------------------------|---|-------------------------------------|
| Demonstrating Responsibility | Teamwork Skills | Managing Time |
| Dealing with Information Overload | Reasons Companies Use Teams | Putting First Things First |
| Transferable Job Skills | Decisions Teams Make | Juggling Many Priorities |
| Managing Change | Team Responsibilities | Overcoming Procrastination |
| Adopting a New Technology | Problems That Affect Teams | Organizing Workspace and Tasks |
| | Expressing Yourself on a Team | Staying Organized |
| | Giving and Receiving Constructive Criticism | Finding More Time |
| | | Managing Projects |
| | | Prioritizing Personal and Work Life |

1.6 Present a professional image through appearance, behavior and language.

| On-the-Job Etiquette | Person-to-Person Etiquette | Communication Etiquette | Presenting Yourself |
|----------------------------|-----------------------------------|----------------------------------|-----------------------------------|
| Using Professional Manners | Meeting Business Acquaintances | Creating a Good Impression | Looking Professional |
| Introducing People | Meeting People for the First Time | Keeping Phone Calls Professional | Dressing for Success |
| Appropriate Dress | Showing Politeness | Proper Use of Work Email | Showing a Professional Attitude |
| Business Meal Functions | | Proper Use of Cell Phone | Using Good Posture |
| Behavior at Work Parties | | Proper Use in Texting | Presenting Yourself to Associates |
| Behavior at Conventions | | | Accepting Criticism |
| International Etiquette | | | Demonstrating Leadership |
| Cross-Cultural Etiquette | | | |
| Working in a Cubicle | | | |

**Support of CTAE Course Standards and Georgia Standards of Excellence
L9-10RST 1-10 and L9-10WHST 1-10:**

Georgia Standards of Excellence ELA/Literacy standards have been written specifically for technical subjects and have been adopted as part of the official standards for all CTAE courses.

Course Standard 2

AFNR-AQU-2

Learn to work safely in the agriculture lab and work sites, demonstrates selected competencies in leadership through the FFA and agricultural industry organizations, and develops plans for a Supervised Agricultural Experience Program (SAEP).

- 2.1 Explain the role of the Agricultural Education program and the FFA in personal development.
- 2.2 Demonstrate knowledge learned through a SAEP.
- 2.3 Develop leadership and personal development skills through participation in the FFA.
- 2.4 Explore career opportunities in agribusiness through the FFA and Agricultural Education Program.
- 2.5 Explore the professional agricultural organizations associated with the course content.

Course Standard 3

AFNR-AQU-3

Identify and describe trends in the aquaculture industry.

- 3.1 Define and explain aquaculture.
- 3.2 Compare aquaculture to traditional farming.
- 3.3 Analyze the development of aquaculture as a part of agriculture.
- 3.4 Cite evidence of three civilizations that practiced aquaculture more than 200 years ago.
- 3.5 Explore the scope of the aquaculture industry.
- 3.6 Draw a conclusion to why aquaculture is needed.
- 3.7 Identify and provide examples of technological breakthroughs in aquaculture.

Course Standard 4

AFNR-AQU-4

Classify the scientific principles involved in the production of aquatic animals and plants.

- 4.1 Investigate types of aquatic animal and plant production in the United States.
- 4.2 Analyze fish populations in production operations by scientific sampling.
- 4.3 Classify the characteristics of ectothermic animals.
- 4.4 Draw conclusions as to why aquatic crops may be more productive than terrestrial crops.
- 4.5 Analyze uses for aquatic plants besides human food.
- 4.6 Research the morphology, anatomy and physiology of common aquatic animals.
- 4.7 Describe the nine body systems of aquatic animals.
- 4.8 Compare and contrast crustacean's internal anatomy to that of a vertebrate.

Course Standard 5

AFNR-AQU-5

Assess water quality characteristics for aquaculture.

- 5.1 Critique the physical characteristics of water and the relationship to fish production.
- 5.2 Measure and adjust water pH related to fish growth and development.
- 5.3 Investigate how fish obtain oxygen from water.
- 5.4 Analyze how oxygen is dissolved in water.

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- 5.5 Draw conclusions of what causes oxygen to become depleted from water.
- 5.6 Perform scientific tests on pond water to determine dissolved oxygen levels.
- 5.7 Draw conclusions concerning oxygen levels being acceptable for fish to survive and grow.
- 5.8 Apply concepts that add oxygen to water.
- 5.9 Analyze nitrogen compounds in water.
- 5.10 Research and draw conclusions on pH effect on fish health.
- 5.11 Apply concepts for water-chemistry management.
- 5.12 Distinguish turbidity levels in water samples.
- 5.13 Assess the role of temperature in water quality.

Course Standard 6

AFNR-AQU-6

Examine the scientific principles in fish reproduction.

- 6.1 Classify fish according to breed and sex.
- 6.2 Compare the sexual reproduction process of aquatic animals to terrestrial animals.
- 6.3 Evaluate the role of hormones in fish spawning.
- 6.4 Determine the functions and purposes of a fish hatchery.
- 6.5 Research spawning facilities used in aquaculture.
- 6.6 Research harvesting methods used in aquaculture.
- 6.7 Analyze and explain the different phases of fingerling production.
- 6.8 Compare stocking rates for various fish species.
- 6.9 Assess brood fish management.
- 6.10 Assess egg management after fertilization.
- 6.11 Compare production systems for catfish, tilapia, and trout.

Course Standard 7

AFNR-AQU-7

Differentiate controls used in fish reproduction.

- 7.1 Compare water requirements for catfish, tilapia and trout.
- 7.2 Research common diseases for aquaculture fish.
- 7.3 Analyze the effect of bird predation on aquaculture.
- 7.4 Identify and describe the major species of birds that are fish predators.
- 7.5 Create control measures for bird predation.
- 7.6 Identify and provide examples of common weeds in aquaculture systems.
- 7.7 Determine control measures for common weeds.

Course Standard 8

AFNR-AQU-8

Analyze the scientific principles in aquaculture nutrition.

- 8.1 Identify and describe parts of the digestive system of fish.
- 8.2 Research the protein, energy, vitamin and mineral requirements for fish.
- 8.3 Draw conclusions on how anatomy and behavior affect feeding.
- 8.4 List and describe ten essential amino acids.
- 8.5 Categorize essential fatty acids, fat-soluble and water soluble vitamins.
- 8.6 Research methods for preparing feed and feeding fish.
- 8.7 Evaluate ingredients in fish feed.
- 8.8 Assess the importance of winter feeding catfish.
- 8.9 Compare the different feeding practices of different species of fish.
- 8.10 Calculate the amount of feed needed.

- 8.11 Formulate a feed conversion ratio.
- 8.12 Formulate feed cost.

Course Standard 9

AFNR-AQU-9

Investigate the scientific principles of health management of fish.

- 9.1 Analyze behavioral signs of sick fish.
- 9.2 Assess common physical signs of sick fish.
- 9.3 Evaluate signs of stress and disease of fish.
- 9.4 Compose a general management plan for preventing disease outbreaks.
- 9.5 Describe fungal infections.
- 9.6 Investigate common pathogenic parasites of fish.
- 9.7 Compare treatment methods for fish.
- 9.8 Calculate treatments for fish ponds.
- 9.9 Describe the immunization of fish.

Course Standard 10

AFNR-AQU-10

Categorize the management practices for crustaceans and mollusks.

- 10.1 Investigate selection, management and culture of broodstock.
- 10.2 Define spawning, hatchery and raising methods for common crustaceans and mollusks.
- 10.3 Design a plan to culture crawfish.
- 10.4 Analyze the culturing techniques for shrimp, clams and oysters.

Course Standard 11

AFNR-AQU-11

Distinguish the management practices for alligator production.

- 11.1 Analyze problems associated with alligator production.
- 11.2 Investigate uses for alligator products.
- 11.3 Research the requirements for alligator culture.
- 11.4 Research the dietary needs of alligators.

Course Standard 12

AFNR-AQU-12

Justify the management practices for frog production.

- 12.1 Analyze problems associated with frog production.
- 12.2 Research the requirements for frog culture.
- 12.3 Compare the diets of tadpoles to those of frogs.

Course Standard 13

AFNR-AQU-13

Describe the management practices for alternative aquaculture plant production.

- 13.1 Research the various alternative aquaculture crops grown for profit.
- 13.2 Categorize plants used for aquatic plant production.
- 13.3 Research the potential needs for aquatic plants.
- 13.4 Research the methods and facilities used in the production of alternative aquaculture crops.
- 13.5 Analyze economic and production considerations of plant aquaculture.

Course Standard 14

AFNR-AQU-14

Compare the structures and equipment used in aquaculture production.

- 14.1 Differentiate between the four major types of ponds.
- 14.2 Critique sites for pond locations.
- 14.3 Research pond construction requirements.
- 14.4 Analyze site-specific factors and determine costs for pond construction.
- 14.5 Analyze factors used to determine pond size.
- 14.6 Design a pond layout and design.
- 14.7 Compare large versus small ponds.
- 14.8 Define and explain tank and raceway culture.
- 14.9 Analyze advantages and disadvantages of tank and raceway culture.
- 14.10 Define and provide examples of cage culture.
- 14.11 Analyze advantages and disadvantages of cage culture.
- 14.12 Research and design a cage culture.
- 14.13 Analyze aerators used in closed or recirculating systems.
- 14.14 Compare seines used in ponds.
- 14.15 Analyze the need for boats, tractors, trucks and pumps in aquaculture.

Course Standard 15

AFNR-AQU-15

Interpret the marketing practices used in aquaculture production.

- 15.1 Research the process of marketing aquaculture products.
- 15.2 Formulate a marketing plan for an aquaculture product.
- 15.3 Hypothesis potential markets for aquaculture products.
- 15.4 Formulate a budget for an aquaculture product.
- 15.5 Apply concepts to increase the gain of an aquaculture unit while decreasing the input.