Unit 2: Water Quality
Aquarium Science

20 Classes

Rev. May 2024

Essential Questions

- What water quality conditions need to exist for an aquarium to be healthy?

Enduring Understandings with Unit Goals

EU 1: Unchecked water quality parameters can lead to an unhealthy aquarium.

- Evaluate the water quality parameters in an aquarium.

EU 2: Various equipment and products are used to maintain optimal water parameters.

- Identify products that can stabilize water quality parameters in an aquarium.
- Analyze water quality based on the use of analytical equipment.
- Solve problems associated with wrong water quality parameters.

Standards

Common Core State Standards

- **CCSS.ELA-LITERACY.RST.6-8.1** Cite specific textual evidence to support analysis of science and technical texts.
- **CCSS.ELA-LITERACY.RST.6-8.3** Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
- **CCSS.ELA-LITERACY.RST.6-8.4** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

Next Generation Science Standards

- **MS-ETS1-3 Engineering Design** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

- **MS-LS2-3 Ecosystems: Interactions, Energy, and Dynamics** Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

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ISAAC Vision of the Graduate Competencies

Competency 1: Write effectively for a variety of purposes.
Competency 2: Speak to diverse audiences in an accountable manner.
Competency 3: Develop the behaviors needed to interact and contribute with others on a team.
Competency 4: Analyze and solve problems independently and collaboratively.
Competency 5: Be responsible, creative, and empathetic members of the community

Unit Content Overview

- Importance of Water Changes and Testing Methods
  - Role of Aquarium Filtration
  - Importance of water changes
- Nitrogen Cycle
  - New Tank Syndrome
  - Ammonia - Nitrogen cycle
  - Nitrite
  - Nitrate
  - Ammonia burns in fish
- pH
  - pH water parameters for freshwater and saltwater
  - pH water lab
  - How to adjust when necessary- Alkalinity
- Thermoregulation
  - Endo and ectothermic animals
  - Temperature control
  - Fish respiration lab
  - Chillers
- Phosphates
  - What is phosphate and how to manage it
- Importance of preventing cross contamination

Interdisciplinary Connections
- Chemistry-Water Quality

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Daily Learning Objectives with *TWPS*

Students will be able to…

- Continuously monitor daily operations of aquaria
  - *What needs to be completed each day to make sure our fish are healthy?*
- Explain the effect of temperature on organisms' health
  - *How can temperature impact our organisms?*
- Connect the nitrogen cycle to the aquarium environment
  - *How can the nitrogen cycle affect our animals?*
- Explain why "new tank syndrome" happens to all aquarium systems
  - *What is new tank syndrome and why does it happen?*
- Explain the effect of pH on organisms' health
  - *How can pH impact our organisms?*
- Utilize their understanding of water quality to solve problems related to poor conditions
  - *How can water quality affect animal health?*
- Create a protocol that will allow an aquarist to keep track of water quality parameters
  - *How can we monitor water quality in an aquarium?*
- Assess the importance of various life support equipment to influence water quality
  - *What equipment is available to keep water parameters in range?*
- Analyze issues within an aquarium to identify potential problems
  - *What are some common problems that occur with aquariums that an aquarist should look for?*
- Explain how phosphate levels influence algae growth
  - *How can phosphate levels impact algae growth in an aquarium?*
- Create a solution to common problems affecting aquarium
- Communicate results of an aquarium investigation to the customer
  - *Explain to a customer the reason their fish died using the scenario given.*

Instructional Strategies/Differentiated Instruction

- Daily Warm Up Activities
- Power Point Lecture with guided note-taking
- Flexible grouping
- Exit slips
- Graphic Organizers
- Creating authentic connections for students
- Rephrasing and restatement of information and concepts
- Student use of headphones
- Independent reading
- Outlining of text
- Aquarium Spotlight Organism of the Week
- Determining central ideas, paraphrasing

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- Laboratory Experiences

EL Differentiated Instruction:

- Sentence starters
- Simplified directions
- Prompting and questioning
- Alternate responses when needed
- Explicit modeling
- Key vocabulary
- Visuals
- Graphic organizers
- KWL charts
- Venn diagram
- Glossary

Assessments

FORMATIVE ASSESSMENTS:

- Warm Up Activities
- Daily check-ins with students
- pH water quality check (weekly)
- pH water test lab
- Temperature and Salinity tests (daily)
- Nitrate, Nitrite, and Ammonia parameter checks (weekly)
- Homework/Reading checks
- Aquarium Spotlight Organism of the Week
- Aquarium Audit (Recording Keeping Logs)- ISAAC Teamwork Rubric 3
- Quarantine Procedure Discussion

SUMMATIVE ASSESSMENTS:

- Test for Stress Unit Task- ISAAC Problem Solving Rubric 4
- Unit Test (EU1 and EU2)

Unit Task

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Unit Task Name: Test for Stress

Description: Students will test 3 mystery water samples and use their knowledge of water quality parameters (EU1) to determine what is wrong with the water. Students will create a procedure to correct the water quality to be safe for a designated fish species using the various equipment within the aquarium science lab (EU2). They will then explain their process of solving the issue.

Evaluation: ISAAC Problem Solving Rubric 4

Unit Resources

- Laptop
- Internet Access
- Aquarium Science Lab