**3D Science Unit Planner**

**Marietta City Schools**

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| **Grade & Course**: Zoology | **Topic: Unit 4: Invertebrates Part 2:** Arthropods, Mollusks and Echinoderms | **Duration:** 7 Weeks |
| **Teachers:** Zoology PLC Teachers | | |

SZ1b: Analyze and interpret data to explain patterns in structure and function and construct a classification of representative animal taxa
SZ3a: Plan and carry out investigations to determine patterns in morphology
SZ3b: Construct an explanation of life functions at appropriate level of organization for representative taxa.
SZ3c: Construct an explanation based on evidence to relate important structural changes across evolutionary history to key functional transitions.
SZ4a: Construct explanations to relate structure and function of animals to ecological roles, including morphological, physiological, and behavioral adaptations
SZ4b: Develop a model to explain patterns in various life cycles found among animals

| **Narrative / Background Information** |
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| **Prior Student Knowledge: (REFLECTION – PRIOR TO TEACHING THE UNIT)**<br>Students are expected to have background knowledge from their Biology class, including an understanding of basic cell structures, levels of organization, evolution, the geologic history of life, and basic taxonomy and classification. |
| **Year-Long Anchoring Phenomena: (LEARNING PROCESS)**<br>There is a wide variety of animal diversity across the planet. |
| **Unit Phenomena (LEARNING PROCESS)**<br>**Phenomenon:** Animal variety in form and function is still a field of discovery**.** |
| **Inquiry Statement:**<br>Animal form and function within invertebrate animal phyla and across key taxa influence how animals interact with their environment. |
| **Global Context:**<br>SCIENTIFIC AND TECHNICAL INNOVATION - How do we understand the world in which we live? |
| **Related Concepts:**<br>Environment, Interactions, Transformation, Patterns, Movement, Models, Function |
| **Approaches to Learning Skills:**<br>Thinking Skills: Critical thinking & examine and evaluate evidence<br>Communication: Evaluating conclusions and active listening<br>Social: Collaboration, values of diversity<br>Self-Management: Improvements, feedback, and reflection<br>Research: Data methods and forming questions |

**Science and Engineering Practices:**

Developing & Using Models
Constructing Explanations
Plan and carry out investigations
Analyze and interpret data

**Disciplinary Core Ideas: (KNOWLEDGE & SKILLS)**

Structure and function of each phylum

Evidence of common ancestry and diversity between phyla

Investigating symmetry (asymmetric vs radial vs. bilateral), presence of body cavities, segmentation, and cephalization across the five phyla.

Life functions such as digestion, circulation, respiration, and reproduction occur at organ/system levels.

Life functions change through development and complexity.

Transition from radial to bilateral symmetry

Development of a body cavity

Segmentation in Annelida is a precursor to more complex body plans.

Traits influence ecological roles.

**Crosscutting Concepts: (KNOWLEDGE & SKILLS)**

Systems and Systems Model
Stability and Change
Scale, Proportion, and Quantity
Cause and Effect
Patterns

**Possible Preconceptions/Misconceptions: (REFLECTION – PRIOR TO TEACHING THE UNIT)**

Spiders are insects

All insects have six legs attached to the abdomen

All insects live on land

Insects aren't really animals

If it has eight legs, then it is a spider

Starfish are really fish

Starfish have bones

Starfish are less advanced/simpler than other animal phyla

**Key Vocabulary: (KNOWLEDGE & SKILLS)**

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| ● Adaptation<br>● Adaptive advantage<br>● Adult<br>● Ampullae<br>● Arthropod<br>● Asexual reproduction<br>● Behavioral adaptation<br>● Beneficial traits<br>● Bilateral symmetry<br>● Cardiac stomach<br>● Carnivory<br>● Chemoreceptors<br>● Chitin<br>● Circulatory system (open and closed)<br>● Coelom<br>● Comparative anatomy<br>● Complete digestive system<br>● Complete metamorphosis<br>● Compound eyes<br>● Decomposer<br>● Direct development<br>● Dispersal<br>● Echinoderm<br>● Ecological niches | ● Ecological role<br>● Ecosystem<br>● Environmental pressures<br>● Evolutionary history<br>● Excretion<br>● Exoskeleton<br>● External fertilization<br>● Feeding strategies<br>● Filter feeder<br>● Fossil evidence<br>● Functional transition<br>● Ganglia<br>● Gills<br>● Growth<br>● Habitat<br>● Hemocoel<br>● Hemolymph<br>● Herbivory<br>● Hermaphroditism<br>● Incomplete metamorphosis<br>● Jointed appendages<br>● Juvenile<br>● Larva<br>● Life cycle<br>● Locomotion | ● Madreporite<br>● Malpighian tubules<br>● Mantle<br>● Metamorphosis<br>● Mollusk<br>● Morphological adaptation<br>● Morphology<br>● Nephridia<br>● Nerve cords<br>● Niche<br>● Pentaradial symmetry<br>● Physiological adaptation<br>● Predator<br>● Pupa<br>● Radial symmetry<br>● Reproduction<br>● Respiration<br>● Segmentation<br>● Sensory receptors<br>● Structural adaptation<br>● Survival<br>● Tube feet<br>● Visceral mass<br>● Water vascular system |

**Inquiry Questions:**

**Factual**

What are the major characteristics of echinoderms and arthropods?

Describe how each major phylum feeds, respires, and excretes waste.

Compare and contrast major classes of arthropods and echinoderms.

What stimulates feeding behaviors in each of the phyla?

Describe adaptations that survive.
Compare and contrast the segmentation of arthropods and annelids.

Describe the features that have contributed to the success of arthropods.

Describe how a sea star feeds

**Conceptual**

Which major group of arthropods do you think is most successful and why?

Justify the evolutionary relatedness of arthropods and echinoderms using a cladogram.

Research and discuss the ecological roles of arthropods and their economic health effects on humans

Research and discuss the pros and cons of the variety of echinoderm body plans

**Debatable**

Pick one of the phyla studied in this unit. If it goes extinct, use your knowledge of evolution and zoology to explain and justify if it would be detrimental or beneficial.

Choose one adaptation of arthropods. Debate how this adaptation is the most successful.

| **Summative assessment** | |
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| Assessment Tasks:<br>**CSA X 1**<br>**CFA X 2**<br><br>Arthropod dissection/exploration<br><br>Arthropod, Echinoderm, and Mollusk Modeling Activity<br><br>Cladogram characteristics activity<br><br>Echinoderm dissection/exploration<br><br>Mollusk dissection/exploration | Relationship between summative assessment task(s) and statement of inquiry:<br><br>The tasks allow students to demonstrate their knowledge of the last two major invertebrate groups. Students will create models, participate in dissections to analyze morphology, refine their animal behavior lab from units 1/2, and analyze data and models to determine the evolutionary history of these major animal phyla. |

**Unit Objectives:** - Teaching and learning is focused on effective teamwork and collaboration

| **Inquiry & Obtain: (LEARNING PROCESS)** | **Evaluate: (LEARNING PROCESS)** | **Communicate: (LEARNING PROCESS)** |
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| **Weeks 1-2**<br>Mollusks<br><br>- Mollusk Dissection/ Exploration<br>- Mollusk modeling activity<br>- Cladogram characteristics activity | - Students will build a model of a mollusk. They will use these models to analyze specimens during dissection.<br>- Students/student groups will use models to hypothesize about how major structures/functions are similar across phyla.<br>- Students will work in small groups to create authentic cladograms/phylogenies of | - Receive and discuss feedback on dissecting skills from the teacher.<br>- Student/student groups create a hypothesis backed with evidence. They will then debate/discuss with peers for feedback.<br>- Students will verbally (in person or through recording) justify their placement of major traits. Teachers will address misconceptions in a small-group setting. |

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| | the significant characteristics of the invertebrate phyla. | |
| **Weeks 3-5**<br><br>Arthropods<br><br>- Arthropod Dissection/ Exploration<br><br>- Arthropod modeling activity<br><br>- CFA #1 | - Students will analyze arthropods to investigate how structure and function have driven adaptation to different habitats.<br><br>- Students will build a model of an arthropod. They will use these models to analyze specimens during dissection. | - Students will revise one another's arthropod analyses and provide feedback through group discussion.<br><br>- Receive and discuss feedback on dissecting skills from the teacher.<br><br>- Students will be formally assessed in a CFA. |
| **Week 6**<br>Echinoderms<br><br>- Echinoderm dissection/ Exploration<br><br>- Echinoderm modeling<br><br>- CFA #2 | - Students will build a model of an echinoderm. They will use these models to analyze specimens during dissection.<br><br>Students/student groups will use models to hypothesize how primary structures/functions are similar to other phyla. | - Receive and discuss feedback on dissecting skills from the teacher.<br><br>- Students and student groups create a hypothesis supported by evidence. They will then debate/discuss with peers for feedback.<br><br>Students will be formally assessed in a CFA. |
| **Week 7**<br>**CSA and remediation**<br><br>- CSA | - Evaluate skills learned in this unit through a CSA (both multiple-choice and short response questions). | - Provide feedback and allow time for remediation to show growth/improvement. |
| **Resources (hyperlink to model lessons and/or resources):**<br><br>- Shape of Life website videos and activities<br>- Glencoe Science Biology book<br>- YouTube videos of Dissections of specific animals<br>- Eyewitness videos<br>- Preserved specimens slides for observation and dissection<br>- BBC nature documentaries<br>- Schoology school course | | |

**Reflection: Considering the planning, process and impact of the inquiry**

| Prior to teaching the unit | During teaching | After teaching the unit |
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