

Winslow Township School District

Zoology CP (Semester Course)

Unit 4: Phyla Arthropoda

Overview: This unit is designed to develop students’ understanding of the phylum Arthropoda. It will guide students through taxonomy and general characteristics. Students will identify behavioral and developmental traits for each subphyla. This unit describes morphology, engaging students with pictures and videos. Animals’ traits based on evolution, nutrition, movement, and reproduction will be analyzed. It will also list general characteristics for some classes of each subphyla. Ecological importance will be emphasized for the phylum. Students will participate in collaborative activities, discussions, and analysis of digital media to reinforce these concepts.

Overview	Standards for Science	Unit Focus	Essential Questions
<p style="text-align: center;">Unit 4</p> <p style="text-align: center;">Phyla Arthropoda</p>	<ul style="list-style-type: none"> • HS-LS2-1 • HS-LS2-2 • HS-LS2-8 • HS-LS4-1 • HS-LS4-5 • WIDA 1, 4 	<ul style="list-style-type: none"> • Describe characteristics of the phylum Arthropoda. • Explain how arthropods impact human society both positively and negatively. • Explain insect metamorphosis and its function. • List and identify the main subphyla of arthropods. • Compare and contrast arthropod subphyla. • Explain the function and significance of arthropod organ systems as compared to other phyla • Identify features of insect social behavior. • Describe the main evolutionary adaptations of arthropods that have led to increased fitness. • Explain insect defense mechanisms. • Create a model of an arthropod and explain its body plan • Compare the different body structures that arthropods use for movement. 	<ul style="list-style-type: none"> • What characteristics of arthropods distinguish them from other animals? • What is the economic and ecological importance of the phylum Arthropoda? • How do insects develop? • What are the main subphyla of Arthropoda? • How do arthropod subphyla differ from each other? • What are the distinguishing characteristics of Arthropod organ systems? • How does insect social behavior aid in survival? • What evolutionary adaptations have led to increased fitness for arthropods?

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Unit 4: Enduring Understandings

- Arthropods include crayfish, lobsters, spiders, insects, and others. They are characterized by metamerism with tagmatization, a chitinous exoskeleton, and paired jointed appendages.
 - Arthropods are members of the Ecdysozoa and are closely related to the Nematoda, Nematomorpha, Kinorhyncha, and others. Living arthropods are divided into four subphyla: Chelicerata, Crustacea, Hexapoda, and Myriapoda. All members of a fifth subphylum, Trilobitomorpha, are extinct.
 - Metamerism of arthropods is most evident externally where body segmentation is most obvious. Internal metamerism is often reduced. Tagmatization has resulted in specialization of the arthropod body for specific functions.
 - The exoskeleton covers the entire body surface of an arthropod. It provides structural support and protection. It also helps prevent water loss and provides surfaces for muscle attachment. The exoskeleton consists of two layers, the epicuticle and the partially hardened procuticle. The growth of an arthropod is accompanied by periodic molting of the exoskeleton, a process called ecdysis. The exoskeleton must be periodically shed to facilitate growth.
 - The hemocoel of arthropods develops from the embryonic blastocoel and provides a cavity for bathing of the internal organs by the open circulatory system. The coelom of arthropods forms small cavities around gonads and sometimes excretory structures.
 - Metamorphosis is a change in form and physiology that occurs when an animal transitions between larval and adult stages. Metamorphosis has contributed to arthropod success by reducing competition between immature and adult arthropods.
 - Members of the extinct subphylum Trilobitomorpha had oval, flattened bodies that consisted of three tagmata and three longitudinal lobes. Appendages were biramous. Trilobites were a dominant form of life 600 to 345 mya.
 - The subphylum Chelicerata has members whose bodies are divided into a prosoma and an opisthosoma. They also possess chelicerae and pedipalps.
 - The horseshoe crabs and the giant water scorpions belong to the class Merostomata.
 - The class Arachnida includes spiders, mites, ticks, scorpions, and others. Their exoskeleton partially preadapted the arachnids for their terrestrial habitats. Coxal glands, Malpighian tubules and book lungs, along with efficient circulatory and nervous systems also contribute to arachnid success in terrestrial habitats. Most arachnids are predators on other invertebrates.
 - The sea spiders are the only members of the class Pycnogonida.
 - The subphylum Myriapoda includes four classes of arthropods.
 - Members of the class Diplopoda (the millipedes) are characterized by apparent segments bearing two pairs of legs.
 - Members of the class Chilopoda (the centipedes) are characterized by a single pair of legs on each of their 15 segments and a body that is flattened in cross section.
- What defense mechanisms have evolved in Arthropoda?
 - What modes of motility are utilized by different arthropods?

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- The class Pauropoda contains soft-bodied animals that feed on fungi and decaying organic matter in forest-floor litter. Members of the class Symphyla are centipede-like arthropods that live in soil and leaf mold, where they feed on decaying vegetation.
- The exoskeleton, and efficient respiratory and excretory systems, preadapted ancient members of the subphylum Chelicerata for life on land. Ancient myriapods invaded terrestrial environments shortly after the chelicerates became terrestrial.

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Curriculum Unit 4	Standards		Pacing	
			Days	Unit Days
Unit 4: Phyla Arthropoda	HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.	2	12
	HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.	2	
	HS-LS2-8	Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce.	2	
	HS-LS4-1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.	2	
	HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.	2	
	Assessment, Re-teach and Extension		2	

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Unit 4 - Zoology CP		
Disciplinary Core Ideas	Indicator #	Indicator
<p>LS2.A: Interdependent Relationships in Ecosystems Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS2-1), (HS-LS2-2)</p> <p>LS2.C: Ecosystem Dynamics, Functioning, and Resilience A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-2), (HS-LS2-6)</p> <p>LS2.D: Social Interactions and Group Behavior Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. (HS-LS2-8)</p> <p>LS4.A: Evidence of Common Ancestry and Diversity Genetic information provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. (HS-LS4-1)</p> <p>LS4.C: Adaptation Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species. (HS-LS4-5), (HS-LS4-6)</p> <p>Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. (HS-LS4-5)</p>	HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
	HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
	HS-LS2-8	Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce.
	HS-LS4-1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
	HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

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Unit 4 – Zoology CP	
Assessment Plan	
<ul style="list-style-type: none"> • Exploratory activities • Warm-up/Ticket Out activities • Class discussions • Student Participation • Teacher Observations • Virtual/Hands-On Labs • Self-Test Assessments • Scientist Timeline Activity 	<ul style="list-style-type: none"> • Quizzes and Tests (Chapters 14, “Zoology (11th edition)” by Stephen Miller and Todd Tupper) • Authentic assessments and projects • Exploratory activities • Presentations • Lecture Notes • Think-Pair-Share • Graphic Organizers • Study Questions at the end of each chapter • Multiple Choice and Critical Thinking at the end of each chapter
Resources	Activities
<ul style="list-style-type: none"> • Chromebooks • Textbook (“Zooloy, 11th edition” Miller and Tupper) • www.My.mheducation.com • Web Quests • Virtual Field Trips • Video Streaming • BrainPOP • Puzzlemaker: Game Based Learning Discovery Education <p>Diversity, Equity & Inclusion Educational Resources https://www.nj.gov/education/standards/dei/</p>	<ul style="list-style-type: none"> • Use various forms of expository writing-procedural writing, narrative writing, descriptive writing, labeling, as well as to create visuals, graphs, tables, diagrams and charts. • Use scientific argumentation with exercises on writing claims, using evidence to support your claim and explaining the reasoning behind their claim. • Mini-lessons • Independent reading • Films • Website exploration • Discussions, dialogues • Debates • Laboratory experiments • Partner or small group work • Student presentations, reports, journals, reflections • In-class assessments • Written reports, essays, research, and homework

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Instructional Best Practices and Exemplars

1. Identifying similarities and differences
2. Summarizing and note taking
3. Reinforcing effort and providing recognition
4. Homework and practice
5. Nonlinguistic representations

6. Cooperative learning
7. Setting objectives and providing feedback
8. Generating and testing hypotheses
9. Cues, questions, and advance organizers
10. Manage response rates

9.1 Personal Financial Literacy, 9.2 Career Awareness, Exploration, Preparation and Training & 9.4 Life Literacies and Key Skills

The implementation of the 21st Century skills and standards for students of the Winslow Township District is infused in an interdisciplinary format in a variety of curriculum areas that include, English language Arts, Mathematics, School Guidance, Social Studies, Technology, Visual and Performing Arts, Science, Physical Education and Health, and World Language.

Additional opportunities to address 9.1, 9.2 & 9.4:

Philadelphia Mint

<https://www.usmint.gov/learn/kids/resources/educational-standards>

Different ways to teach Financial Literacy.

<https://www.makeuseof.com/tag/10-interactive-financial-websites-teach-kids-money-management-skills/>

- 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJLSA.W8, Social Studies Practice: Gathering and Evaluating Sources).
- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
- 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.
- 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).
- 9.4.12.GCA.1: Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political, economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).
- 9.4.12.DC.7: Evaluate the influence of digital communities on the nature, content and responsibilities of careers, and other aspects of society (e.g., 6.1.12.CivicsPD.16.a).
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
- 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

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Modifications for Special Education/504

Students with special needs: The students' needs will be addressed on an individual and grade level using a variety of modalities. Accommodations will be made for those students who need extra time to complete assignment. Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Physical expectations and modifications, alternative assessments, and scaffolding strategies will be used to support this learning. The use of Universal Design for Learning (UDL) will be considered for all students as teaching strategies are considered.

- Small group instruction
- Audio books/ Text-to-speech platforms
- Leveled texts/Vocabulary Readers
- Leveled informational texts via online
- Modeling and guided practice
- Read directions aloud
- Repeat, rephrase and clarify directions
- Extended time as needed
- Break down assignments into smaller units
- Provide shortened assignments
- Modify testing format
- Repeat directions as needed
- Graphic organizers
- Study Guides, Study Aids and Re teaching as needed

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Modifications for At-Risk Students

Formative and summative data will be used to monitor student success. At first signs of failure, student work will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. With considerations to UDL, time may be a factor in overcoming developmental considerations

- Audio books and Text-to-speech platforms
- Leveled texts/Vocabulary Readers
- Leveled informational texts via online
- Extended time as needed
- Read directions aloud
- Assist with organization
- Use of computer
- Emphasize/highlight key concepts
- Recognize success
- Provide timelines for work completion
- Break down multi-step tasks into smaller chunks
- Provide copy of class notes and graphic organizer

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English Language Learners	Modifications for Gifted Students
<p>All WIDA Can Do Descriptors can be found at this link: https://wida.wisc.edu/teach/can-do/descriptors</p> <p>Grades 9-12 WIDA Can Do Descriptors...</p> <p><i>Listening...</i></p> <ul style="list-style-type: none"> • Process <u>recounts</u> by... <ul style="list-style-type: none"> ○ Categorizing perspectives of multiple speakers ○ Identifying important information on specific event & concept from lecture/presentation • Process <u>explanations</u> by... <ul style="list-style-type: none"> ○ Recognizing specific language used to enhance clarity and precision ○ Recognizing and following language related to the same event or phenomenon throughout presentations • Process arguments by... <ul style="list-style-type: none"> ○ Identifying strengths, limitations, and potential biases from oral presentations ○ Organizing claims and counter claims presented in debates <p><i>Speaking...</i></p> <ul style="list-style-type: none"> • <u>Recount</u> by... <ul style="list-style-type: none"> ○ Adjusting presentation style, degree of formality, word choice, tone, and information to the context and audience ○ Presenting information that follows discipline specific organization (e.g., orientation to topic, sequence of events, conclusion) • <u>Explain</u> by... <ul style="list-style-type: none"> ○ Providing precision and accuracy in classifications, procedures, processes, and accounts using abstraction, technical language, and a variety of active/passive verb forms ○ Following discipline-specific organization (e.g., orienting the reader, details, conclusion) and supporting presentations with graphs, formulas, quotes or other media • <u>Argue</u> by... <ul style="list-style-type: none"> ○ Organizing claims and counter claims in debates with evidence from multiple sources ○ Negotiating differing cultural perspectives in pairs or small groups <p><i>Reading...</i></p> <ul style="list-style-type: none"> • Process <u>recounts</u> by... <ul style="list-style-type: none"> ○ Analyzing and comparing how authors use language for specific purposes and audiences ○ Identifying how authors develop and maintain cohesion by connecting ideas or events in extended texts • Process <u>explanations</u> by... <ul style="list-style-type: none"> ○ Recognizing discipline-specific patterns (e.g., orienting the reader, part-whole classification, neutral/ authoritative tone) 	<p>Students excelling in mastery of standards will be challenged with complex, high level challenges related to the topic.</p> <ul style="list-style-type: none"> • Raise levels of intellectual demands • Require higher order thinking, communication, and leadership skills • Differentiate content, process, or product according to student’s readiness, interests, and/or learning styles • Provide higher level texts • Expand use of open-ended, abstract questions • Critical and creative thinking activities that provide an emphasis on research and in-depth study • Enrichment Activities/Project-Based Learning/ Independent Study <p>Additional Strategies may be located at the links:</p> <ul style="list-style-type: none"> ❖ Gifted Programming Standards ❖ Webb’s Depth of Knowledge Levels and/or Revised Bloom’s Taxonomy ❖ REVISED Bloom’s Taxonomy Action Verbs

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- Identifying authors' precision and accuracy in classifications, comparisons, accounts, or procedures as a result of clear language choices
- Process arguments by...
 - Evaluating word choice and nuance as tools for distinguishing facts, claims, reasoned judgment, and opinions
 - Identifying the logical connections among claims, counterclaims, reasons, and evidence

Writing...

- Recount by...
 - Summarizing content-related notes from lectures or readings
 - Producing research reports using multiple sources of information
- Explain by...
 - Developing ideas about phenomena with relevant and sufficient facts, extended descriptions, concrete details, or quotations
 - Maintaining discipline-specific patterns that bridge across key uses (e.g., explanation to argument in history, explanation to recount for information reports)
- Argue by...
 - Evaluating positive and negative implications associated with various positions (e.g., historical events, scientific discoveries, individuals)
 - Organizing information logically and coherently to represent contrasting views

Oral Language...

- Discuss by...
 - Identifying and reacting to subtle differences in speech and register (e.g., hyperbole, satire, comedy)
 - Producing coherent oral discourse appropriate to task, purpose, and audience
 - Synthesizing and sharing information from a variety of sources and perspectives

Students will be provided with accommodations and modifications that may include:

- Relate to and identify commonalities in Social Studies and science in student's home country
- Assist with organization
- Use of computer
- Emphasize/highlight key concepts
- Teacher Modeling
- Peer Modeling
- Label Classroom Materials - Word Walls

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Interdisciplinary Connections

English Language Arts/Literacy

1. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **RST.11-12.1** (HS-LS2-1),(HS-LS2-2),(HS-LS2-6)
2. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.11-12.7** (HS-LS2-6)
3. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.11-12.8** (HS-LS2-6)
4. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **RST.11-12.9** (HS-ETS1-1),(HS-ETS1-3)
5. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.9-12.2** (HS-LS2-1),(HS-LS2-2)
6. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. **WHST.9-12.7** (HS-LS1-3)
7. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. **WHST.11-12.8** (HS-LS1-3)
8. Draw evidence from informational texts to support analysis, reflection, and research. **WHST.9-12.9** (HS-LS1-1)
9. **WIDA Standards 1** English language learners communicate for social and instructional purposes within the school setting
10. **WIDA Standards 4** English language learners communicate information, ideas, and concepts necessary for academic success in the content area of science
11. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL.11-12.5** (HS-LS1-2)

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Mathematics

1. Reason abstractly and quantitatively. **MP.2** (HS-LS2-1),(HS-LS2-2),(HS-LS2-6)
2. Model with mathematics. **MP.4** (HS-LS2-1),(HS-LS2-2)
3. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **HSN.Q.A.1** (HS-LS2-1),(HS-LS2-2)
4. Define appropriate quantities for the purpose of descriptive modeling. **HSN.Q.A.2** (HS-LS2-1),(HS-LS2-2)
5. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **HSN.Q.A.3** (HS-LS2-1),(HS-LS2-2)
6. Represent data with plots on the real number line. **HSS-ID.A.1** (HS-LS2-6)
7. Understand statistics as a process for making inferences about population parameters based on a random sample from that population. **HSS-IC.A.1** (HS-LS2-6)

Integration of Computer Science and Design Thinking NJSL 8

- 8.2.12.EC.2: Assess the positive and negative impacts of emerging technologies on developing countries and evaluate how individuals, non-profit organizations, and governments have responded.
- 8.2.12.ETW.1: Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation, and maintenance of a chosen product.
- 8.2.12.ETW.2: Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment.
- 8.2.12.ETW.3: Identify a complex, global environmental or climate change issue, develop a systemic plan of investigation, and propose an innovative sustainable solution.
- 8.2.12.ED.5: Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).
- 8.2.12.ED.6: Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor).
- 8.2.12.ED.4: Design a product or system that addresses a global problem and document decisions made based on research, constraints, trade-offs, and aesthetic and ethical considerations and share this information with an appropriate audience.