

East EPO Course Overview for Living Environment:

Disciplinary long-term transfer goals aligned with mission/vision:

- Unit 1: Construct evidence-based explanations of how and why phenomena exist in the natural and designed world(s).
 - Secondary transfer goal: Make, reconcile, and refine evidence-based arguments about phenomena in the natural and designed world(s)
- Unit 2: Construct evidence-based explanations of how and why phenomena exist in the natural and designed world(s).
- Unit 3: Make, reconcile, and refine evidence-based arguments about phenomena in the natural and designed world(s)
 - Secondary transfer goal: Construct evidence-based explanations of how and why phenomena exist in the natural and designed world(s).
- Unit 4: Construct evidence-based explanations of how and why phenomena exist in the natural and designed world(s).
 - Secondary transfer goal: Critically evaluate and persuasively communicate information in order to make informed decisions and solve problems in the natural world
- Unit 5: Critically evaluate and persuasively communicate information in order to make informed decisions and solve problems in the natural world
 - Secondary transfer goal: Make, reconcile, and refine evidence-based arguments about phenomena in the natural and designed world(s).

Pacing Guide:

Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Mammoth Extinction	Diverse diets	Marathon runner	Reproduction	Humans vs. bacteria	Reflect & Review				

Unit 1	Enduring Understandings:	Essential Questions:
Mammoth Extinction	UNDERSTANDINGS <i>Students will understand that...</i> • Models are used to explain or predict specific phenomena, and they are subject to revision as we learn more or focus on different aspects of the system. • Stability & change in ecosystems (resilience) - Ecologists can use their understandings of interactions within an ecosystem to create predictive models of the type and degree of changes that might occur as a result of disruptions • Human impact - Human activities have historically disrupted ecosystems around the world; society's current decisions can restore or further disrupt ecosystems in the future <u>Cross-Cutting Concepts</u> • Stability and Change: Much of science deals with constructing explanations of how things change and how they remain stable.	<i>Students will consider such questions as...</i> • Why do some species go extinct when others do not? • What caused the extinction of the woolly mammoth?
Transfer Goal: <i>At the end of this unit, students will use what they have learned to independently...</i> Make, reconcile, and refine evidence-based arguments about phenomena in the natural and designed world(s).		
Performance Task (PT): Students will generate an extinction model for the woolly mammoths and use this model to inform our ideas on the possibility of bringing the mammoths back from extinction. Students evaluate each of the claims investigated throughout the unit and decide on the best supported claims. Individually or in small groups, students generate a model, and an accompanying written explanation, that represents the causes behind the extinction of the woolly mammoth. Students use their model, and their understanding of ecosystems from the unit, to consider if we should attempt to bring the woolly mammoth back from extinction. Criteria for Success: <u>The explanatory model</u> ☐ Did your group effectively and accurately show how at least 2 factors (claims) caused the extinction of the woolly mammoth? ☐ Does your model show as many cause and effect relationships as possible? ☐ Does your model show the interconnectedness of these relationships? (Life is messy!) ☐ Did your group effectively and accurately show secondary effects of woolly mammoth extinctions (i.e. once woolly mammoths go extinct, what are some effects of that?) <u>The visual</u>		

- ☐ Did you use proper symbols/notations to demonstrate phenomenon components, relationships, and mechanisms?
- ☐ Is your model aesthetically pleasing? Is it neat, colorful and easy to understand? Is it clear that your group put effort and pride into making your visual model?
- ☐ Do the images (for the most part) “speak for themselves”? Did you add legends/keys and written captions to clarify your model?

Written explanation

- ☐ Does your individual written explanation include the components, relationships and mechanism represented in your model?
- ☐ Does your individual written explanation provide clarification for parts of your model that might be unclear or ambiguous?
- ☐ Does your individual written explanation actually match what your visual model shows?

Unit Overviews

Unit 2	Enduring Understandings:	Essential Questions:
Diverse Diets	<i>Students will understand that...</i> - Only producers synthesize organic molecules from raw materials, but all organisms use these molecules to do respiration Macronutrients are assembled in the cell using pieces that are broken down during digestion - For cellular processes to occur the right molecules need to be in the right place <u>Cross-Cutting Concepts</u> - Energy and Matter - Structure and Function	<i>Students will consider such questions as...</i> How does food provide us with energy?
Transfer Goal: <i>At the end of this unit, students will use what they have learned to independently...</i> Construct evidence-based explanations of how and why phenomena exist in the natural world.		
Performance Task (PT): As of Summer 2023: compare 2 people’s muscle mass gains. How did their diet play a role? Criteria for Success: - Construct a logically coherent sequenced explanation of how or why a natural phenomenon occurs based on scientific reasoning, theory, and/or models - Use accurate and compelling evidence to construct or support an explanation by describing the qualitative or quantitative relationships between		

variables

- Consider limitations of data analysis (e.g., measurement error, sample selection) and use statistical analysis where appropriate to describe the relationship between variables
- Apply scientific reasoning, theory, and/or models to assess the extent to which the reasoning and data support the explanation or conclusion of the phenomena in order for the intended audience to understand.

Unit 3	Understandings:	Essential Questions:
Marathon Runner	<i>Students will understand that...</i> • Systems of specialized cells within organisms help perform essential functions of life. Any one system in an organism is made up of numerous parts. Feedback mechanisms maintain an organism's internal conditions within certain limits and mediate behaviors. • The hydrocarbon backbones of sugars produced through photosynthesis are used to make amino acids and other molecules that can be assembled into proteins or DNA. Through cellular respiration, matter and energy flow through different organizational levels of an organism as elements are recombined to form different products and transfer energy <u>Cross-Cutting Concepts:</u> • Systems & System Models • Stability & Change	<i>Students will consider such questions as...</i> • How do we survive in an ever-changing environment? • How can you use labels, arrows, and other types of annotations to represent your ideas?
Transfer Goal: <i>At the end of this unit, students will use what they have learned to independently...</i> Construct a logically coherent sequenced explanation of how or why a natural phenomenon occurs based on scientific reasoning, theory, and/or models.		
Curriculum-Embedded Performance Task (CEPT): Based on the marathon runner's data and the investigations conducted throughout the unit, students create a human body model that depicts what caused the runner to collapse. Their models include multiple body systems, and show a zoomed in view of what is happening in an organ or cell. Students also write an explanation to describe the visual representation of their model in which they explain how feedback mechanisms are being used in the runner to maintain homeostasis. Criteria for Success: MODEL • Effectively and accurately shows what is happening within the human body and a specific cell during a homeostatic feedback mechanism and includes all of the elements below: ○ Includes relevant components that are needed to tell the story of how homeostasis is maintained (substances, organs, tissues, etc. ○ Includes a detailed cell model		

- Draws an arrow from the human body model to the detailed cell model
- Shows interactions on multiple levels (organ, tissue, cell)
- The images (for the most part) “speak for themselves.”
- Or contains legends/keys and written captions to clarify the model.
- Model is aesthetically pleasing. It is neat and easy to understand.

EXPLANATION

- Student makes a claim identifying whether the failure of this homeostatic feedback mechanism resulted in the runner’s collapse during the race.
- The claim is supported with relevant/accurate evidence from the medical tent data, lab activity, or reading.
- Reasoning is provided to support the claim.
- Student explanation includes both how the phenomenon occurred as well as reason(s) why it occurred.

Unit 4	Understandings:	Essential Questions:
Continuity	<i>Students will understand that...</i> ● All living things have traits which result from proteins that are coded for by DNA. ● Genetic information is passed from generation to generation when offspring inherit DNA from their parent(s) ● Variations of traits can result from new combinations of existing genes, from mutations, or from influences of the environment. ● The genetics of populations can be acted upon by natural selection and human manipulation. ● Multicellular organisms depend on the processes of mitosis and differentiation in order to grow and become more complex. <u>Cross-Cutting Concepts</u> ● Structure and function ● Systems and system models ● Cause and effect	<i>Students will consider such questions as...</i> ● How can individuals of the same species, and even siblings, be so different? ● Why are organisms both similar to and different from their parents? ● What makes me, me?
Transfer Goal: <i>At the end of this unit, students will use what they have learned to independently...</i> Construct evidence-based explanations of how and why phenomena exist in the natural and designed world(s).		
Performance Task (PT):		

Students will draw and describe how two biracial twins came to be before development. Their task is to figure out how twins can be born with two different skin colors if they come from the same two parents. They will need to apply their knowledge of sexual reproduction and sources of variation, development, and epigenetics.

Criteria for Success:

- Construct a logically coherent sequenced explanation of how or why a natural phenomenon occurs based on scientific reasoning, theory, and/or models
- Use accurate and compelling evidence to construct or support an explanation by describing the qualitative or quantitative relationships between variables
- Consider limitations of data analysis (e.g., measurement error, sample selection) and use statistical analysis where appropriate to describe the relationship between variables
- Apply scientific reasoning, theory, and/or models to assess the extent to which the reasoning and data support the explanation or conclusion of the phenomena in order for the intended audience to understand.

Unit 5	Understandings:	Essential Questions:
Humans vs. Bacteria	<i>Students will understand that...</i> • Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information — that is, trait variation — that leads to differences in performance among individuals. • The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. <u>Cross-Cutting Concepts</u> • Cause and effect	<i>Students will consider such questions as...</i> There is an increasing number of infectious diseases, particularly bacterial infections that may pose a significant health risk. • Why, after decades of declining deaths from infectious disease, have we seen a resurgence of outbreaks? • What can we learn from past disease outbreaks? • Why don't antibiotics work as well as they did in the past?
Transfer Goal: <i>At the end of this unit, students will use what they have learned to independently...</i> Critically evaluate and persuasively communicate information in order to make informed decisions and solve problems in the natural world Make, reconcile, and refine evidence-based arguments about phenomena in the natural and designed world(s).		
Performance Task (PT): Students evaluate each of the claims investigated throughout the unit and decide on the best-supported claim. Students will also provide their evidence and reasoning to why they did not select the other four claims. To frame the decision point around the idea of limited financial resources, you can say something like, “The World Health Organization has only a limited amount of money and would like to use their resources to fund the most effective solution. Keeping that in mind, and all of the evidence we have generated throughout the unit, which solution would you propose?”		

Criteria for Success:

CONTENT criteria

- immunity develops after exposure. Pathogens mutate quickly because of fast reproduction rate
- resistance develops over time through mutations and selection. Overuse of hand sanitizer or antibiotics acts as a selective pressure that promotes the survival of resistant bacteria
- antibiotics only work on bacteria. Vaccines may be a more effective approach to fighting pathogens because they use the body's natural defenses
- Masks interrupt the spread of pathogens by physically blocking them from becoming airborne

ARGUMENT criteria:

- Student limits all of the scientific evidence to the strongest types of sources (empirical measurements and observations).
- Student limits all of the evidence to that which is relevant to the science in the claim and supports the relationship in the claim.
- Student provides more than one piece of evidence (observations or measurements) to support the claim.
- Student connects all of the evidence to the claim.
- Student provides a relevant science concept (to justify the evidence) that is correctly explained.