**AP Environmental Science PBL Des Moines Public Schools**

 **2021-2022 CURRICULUM GUIDE SCI501/502 SCI517/518**

**Standards-Referenced Grading Basics**

The teacher designs instructional activities and assessments that grow and measure a student’s skills in the elements identified on our topic scales. Each scale features many such skills and knowledges, also called learning targets. These are noted on the scale below with letters (A, B, C) and occur at Levels 2 and 3 of the scale. In the grade book, a specific learning activity could be marked as being 3A, meaning that the task measured the A item at Level 3.



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| **The Body of Evidence in a Process-Based Course** |
| **Process-Based SRG** *is defined as an SRG course design where the same scale recurs throughout the course, but the level of complexity of text and intricacy of task increase over time.*AP Environmental Science does have a traditional unit-based design. In some topics, however, students cycle through the same topic repeatedly as they progress through the course, with changing content and an increasing complexity of the text, analysis, and writing expectations throughout. To account for this, process-based courses like this have their evidence considered in a “Sliding Window” approach. When determining the topic score for any given grading topic, *the most recent evidence* determines the topic score. Teacher discretion remains a vital part of this determination, but it is hard to overlook evidence from the most recent (and therefore rigorous) assessments. |

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| 2021-2022 \*CB Redesign |
| Semester 1 Topics: Eco Footprint: Energy, Eco Footprint Atmospheric Pollution, Eco Footprint Aquatic and Terrestrial Pollution, MCE Ecology, MCE Biodiversity, Scientific PracticesSemester 2 Topics: MCE Populations, Foods: Earth Systems & Resources, Foods: Land & Water Use, Oceans in Action, Global Climate Summit, Scientific Practices |

 Suggested Curriculum Resource: [KIA AP Environmental Science](https://sprocket.lucasedresearch.org/home/curriculum/apes)

Follow the link to sign up for free access to the curriculum materials.

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| **Topic** | **4** | **3** |
| **Scientific Practices** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | LT1. Apply scientific practices to the solution of environmental problems. * Interpret data correctly.
* Form conclusions of sustainability using the three lenses.
* Develop an evidence-based argument.
* Communicate conclusions accurately and meaningfully.
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| **Topic** | **4** | **3** |
| **Eco Footprint:** **Energy**  | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | LT2. Discuss the distribution and global consumption of renewable and non-renewable resources.* Describe methods of energy conservation.

 - Battery electric vehicle - Hybrid Vehicles - Public transportation – Green building design LT3. Evaluate the different types of fossil fuels and their impact on the environment.* Describe the formation, extraction, and purification methods for different forms of non-renewable energy.

– Coal – Oil – Natural GasLT4. Evaluate the use of nuclear energy on the environment and human health.* Describe nuclear energy concepts.

– Radiation – Nuclear Fusion – Nuclear fuels – Nuclear reactor typesLT5. Evaluate the use of different forms of renewable energy.* Describe renewable energy types.

– Biomass – Solar – Hydro – Geothermal - Hydrogen fuel cell – Wind |

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| **Topic** | **4** | **3** |
| **Eco Footprint:** **Atmospheric Pollution** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | LT6. Discuss the sources and effects of air pollution.* Describe the environmental impacts of air pollution.
* Describe the health related impacts of air pollution.

LT7. Discuss weather phenomena’s effect on the environment.* Describe the following weather phenomena.

 – Smog – Thermal Inversion – Acid RainLT8. Discuss indoor air pollutants effect on human health.* Describe particulate air pollutants.

– Asbestos – Dust – Smoke* Describe natural source indoor air pollutants.

 – Radon – Mold * Describe human – made indoor air pollutants.

-Insulation – Volatile organic compounds – Formaldehyde – Lead * Describe combustion air pollutants.

 – Carbon monoxide – Nitrogen oxides – Sulfur dioxide – Tobacco smokeLT9. Evaluate different reduction methods for air pollution.* Describe the following reduction methods.

 – Vapor Recovery Nozzle – Catalytic Converter – Wet and dry scrubbers- Electrostatic precipitators* Describe the Clean Air Act.
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| **Topic** | **4** | **3** |
| **Eco Footprint:** **Aquatic and Terrestrial Pollution** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | LT10. Discuss the impacts of human activities on aquatic and terrestrial ecosystems. * Describe the following related terms.

-Eutrophication - Thermal pollution – POPs – Bioaccumulation* Describe the Clean Water Act.
* Describe CERCLA.
* Describe the SWDA.

LT11. Evaluate waste disposal methods and possible waste reduction strategies.* Compare solid waste to electronic waste.
* Describe the following disposal methods.

 - Landfills – Incineration – Illegal Disposal – Dumping* Describe the following waste reduction strategies.

 - Recycling – Composting* Describe the Resource Conservation and Recovery Act (RCRA).

LT12. Discuss the best practices of sewage treatment.* Define primary, secondary, and tertiary treatment of sewage.

LT13. Discuss the effect of pollution on human health.* Describe the following related terms.

 - LD50 - Dose response curve - Pathogens and disease - Endocrine Disruptors -POPs  - Bioaccumulation – Biomagnification * Describe the Delaney Clause of the Food, Drug, and Cosmetic Act.
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| **Topic** | **4** | **3** |
| **MCE:** **Ecology**  | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | LT14. Analyze the global distribution and environmental aspects of terrestrial and aquatic biomes.* Identify biological population, biological communities, species interactions.
* Describe major terrestrial biomes.
* Describe major aquatic biomes.

LT15. Develop a model of the cycling of nutrients (biogeochemical cycles) in an ecosystem.* Illustrate the following biogeochemical cycles. -Water -Carbon -Nitrogen -Phosphorus

LT16. Make a claim on how energy flows through trophic levels.* Identify trophic levels.
* Describe primary productivity.
* Identify energy, biomass, and ecological pyramids.
* Describe the laws of thermodynamics.

LT17. Create a food web for a given ecosystem and predict the effects of the removal of a species.* Describe food webs.
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| **Topic** | **4** | **3** |
| **MCE:****Biodiversity** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | LT18. Explain levels of biodiversity and their importance to ecosystems.* Describe genetic, habitat, and species diversity.
* Describe population bottleneck and how it affects genetic diversity.
* Identify the role genetic diversity has on adaptations.

LT19. Describe how natural and human disruptions impact ecosystem services and biodiversity.* Describe the following ecosystem services.

 – Provisioning – Regulating – Cultural – Supporting* Define ecological tolerance
* Identify conditions that can affect biodiversity.

LT20. Describe the process of succession in an ecosystem and how succession can impact biodiversity.* Differentiate between primary and secondary succession.
* Describe the following types of species and their role in an ecosystem.

– Indicator - Keystone - PioneerLT21. Develop an argument for the conservation of biodiversity in a given ecosystem.* Explain how species become endangered.
* Describe strategies to combat the problem of endangered species.
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| **MCE:****Populations** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | LT2. Explain the relationship between survivorship curves and reproductive strategies.* Describe Type I, Type II, and Type III survivorship curves.
* Describe the life history strategies of r-Selected species and K-selected species.

LT3. Discuss the impacts of population growth on land use, resources, water quality, and human health.* Describe the following terms and their relationship to population growth. – Carrying capacity – Logistic growth – Exponential growth – Biotic potential

LT4. Determine the need for the expansion of an area due to demographic changes over time. * Analyze representations of populations over time using age structure diagrams.
* Describe the stages of demographic transition.
* Describe the impacts of population growth. – Habitat destruction – Suburban sprawl – Urbanization – Principles of Smart Growth

LT5. Describe the dynamics of human populations due to social/cultural, political, and environmental factors.* Describe the impacts of population growth. – Hunger – Diseases – Economic effects
* Describe various strategies to control population growth.
* Calculate doubling time, fertility rate, crude birth rate, crude death rate, and growth rates of a population.
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| **Topic** | **4** | **3** |
| **Foods:** **Earth Systems & Resources** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | LT6. Describe the physical and chemical properties of soil.* Describe the process of soil formation.
* Explain soil composition using a soil triangle.
* Describe the layers of soil horizons.
* Describe the effect of water holding capacity on soil fertility.

LT7. Evaluate appropriate soil conservation strategies to minimize soil degradation. * Explain the causes of soil degradation.
* Provide examples of soil conservation techniques.

LT8. Evaluate the characteristics of a watershed.* Describe the effects of area, length, slope, soil, and vegetation types on a watershed.
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| **Topic** | **4** | **3** |
| **Foods:** **Land & Water Use** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | LT9. Discuss the characteristics of historical agricultural strategies. * Describe The Green Revolution.
* Describe GMOs.

LT10. Evaluate the sustainability of different agricultural practices.* Describe the following agricultural terms.

 – Tiling - Slash/Burn Farming – Fertilizers – Irrigation – Pest Control – Meat Production – Cover cropping – Tilling LT11. Describe the impacts of urbanization on the environment.* Identify mitigation strategies for urban runoff.

LT12. Develop a model for sustainable resource use.* Compare and contrast strategies in the following sectors: - Mining – Agriculture – Forestry
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| **Topic** | **4** | **3** |
| **Oceans in Action** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | LT13. Discuss how the sun’s energy affects the Earth’s surface.* Describe the layers of the Earth’s atmosphere.
* Describe the Coriolis effect and explain its impact on global wind patterns.
* Describe the global ocean current patterns and their effects on el Nino/la Nina.

LT14. Describe the concept of island biogeography. * Define island biogeography.
* Explain the impact of invasive species on island populations.

LT15. Compare and contrast aquaculture with traditional fishing practices.* Define aquaculture.
* Summarize traditional fishing practices.
* Explain impacts of overfishing.

LT16. Identify patterns in the causes and effects of ocean warming and acidification.* Define acidification.
* Describe ocean warming.
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| **Topic** | **4** | **3** |
| **Global Climate Summit** | *In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond the learning goal.* | L17. Explain U.S. environmental legislation that has impacted our ecosystems.* Clean Air Act
* Clean Water Act
* CERCLA
* Endangered Species Act
* Safe Drinking Water Act
* Delaney Clause of Food, Drug, and Cosmetic Act
* Resource Conservation and Recovery Act

L18. Discuss relevant environmental protocols that influence global climate conversations.* CITES
* Montreal Protocol
* Kyoto Protocol

LT19. Compare and contrast how short term and long term climate changes impact ecosystems.* Identify how short term climate changes impact ecosystems.
* Identify how long term climate changes impact ecosystems.
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