

Environmental Science Curriculum Guide

SCI201 2023-2024

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How to use this document:

- The purpose of this guide is to act as a suggestion in planning for instruction and guidance of how you score
- Suggested materials for each target are linked directly below each topic scale. These are shared as high-quality resources to aid in planning and lesson design

This curriculum guide is not...

- A lock-step instructional guide detailing exactly when and how you teach.
- Meant to restrict your creativity as a teacher.
- A ceiling of what your students can learn, nor a set of unattainable goals.

Instead, the curriculum guide is meant to be a common vision for student learning and a set of targets and success criteria directed related to grade-level standards by which to measure and report student progress and provide meaningful feedback.

The curriculum guide outlines the learning that is **most essential** for student success; it is our district's guaranteed and viable curriculum. The expectation is that every student in our district, regardless of school or classroom, will have access to and learn these targets. As the classroom teacher, you should use the curriculum guide to help you to decide how to scaffold up to the learning targets and extend your students' learning beyond them.

Within this document, you will find a foundational structure for planning sequential instruction in the classroom which can be supplemented with materials from any number of the linked resources.

Please consider this guide a living and dynamic document, subject to change and a part of a continuous feedback loop.

Environmental Science: Semester at a Glance

Environmental Science is a course designed to explore underlying causes and effects of earth's natural and man-made environmental problems. The interrelationships between all living things and the interactions between living things and their non-living environment will be the framework for this study of the earth and its environment. There are many different opinions regarding the causes and effects of environmental problems. Students will be expected to practice and display a range of problem solving and critical thinking skills to examine scientific evidence. Students will engage in a semester wide project to help them build understanding of a unique sub problem.

Semester Long-Project

	Topic I: Land and Waste Management	Unit 2: Water and Farming	Unit 3: Human Induced Climate Change	Unit 4: Designing Solutions
Reporting frequency of topic scores	4 weeks	3 weeks	5 weeks	I-2 Weeks
Approximate beginning and end dates for the topics	Semester 1- 9/5 – 9/29 Semester 2- 1/29 – 2/23	Semester I- 10/9 – 11/3 Semester 2- 3/4 – 3/29	Semester I- 11/13 – 12/21 Semester 2- 4/8 – 5/3	S emester I - 1/2 - 1/12 S emester 2 - 5/6 - 5/24
Standards Aligned	HS-ESS3-2, HS-ESS3-4 HS-ETS1-1	HS-ESS2-5, HS-ESS3-4, HS-ETSI-1-2	HS-ESS2-4, HS-ESS2-2, HS-ESS3-6, HS- LS2-7	HS-ETS I-I, HS-LS2-7, HS-ETSI-I-2
Project guidelines	Students should be doing initial research on different topics. Students could select a preliminary course	Final selection of topic and research completed (data, current solutions, questions).	Students should self-evaluate, and peer evaluate their solutions and look closely at the interaction across systems	Students are utilizing feedback to modify their design. Students choose a presentation modality to have ready by due date.

Pacing Note: There is a week in between each unit for students to engage in the work for their final project. The first week of the semester is dedicated to setting the stage. Students should be exposed to the expectations of the project and should see an example of an environmental problem and its solutions. An example that could be utilized is wetland Restoration in lowa (hyperlink). This is not the time to have student critique the solution, this will come in Topic 3. For more details, please click here.

Standards-Referenced Grading Basics

Our purpose in collecting a body of evidence is to:

- Allow teachers to determine a defensible and credible topic score based on a representation of student learning over time.
- Clearly communicate where a student's learning is based on a topic scale to inform instructional decisions and push student growth.
- Show student learning of targets through multiple and varying points of data
- Provide opportunities for feedback between student and teacher.

Start at Level 3 when	
$determining\;a\;topic\;\to\;$	
score.	

Evidence shows the student	Topic Score
Demonstrates proficiency (AT) in all learning targets and success at Level 4	4.0
Demonstrates proficiency (AT) in all learning targets with partial success at Level 4	3.5
Demonstrates proficiency (AT) in <u>all</u> learning targets	3.0
Demonstrates proficiency (AT) in <u>at least half</u> of the learning targets	2.5
Demonstrates some success criteria (PT) toward <u>all</u> learning targets	2.0
Demonstrates some success criteria (PT) towards some of the learning targets	1.5
Does not yet meet minimum criteria for the targets.	1.0
Produces no evidence appropriate to the learning targets at any level	0

Scoring

A collaborative scoring process is encouraged to align expectations of the scale to artifacts collected. Routine use of a collaborative planning and scoring protocol results in calibration and a collective understanding of evidence of mastery. Enough evidence should be collected to accurately represent a progression of student learning as measured by the topic scale. Teachers look at all available evidence to determine a topic score. All topic scores should be defensible and credible through a body of evidence.

***Only scores of 4, 3.5, 3, 2.5, 2, 1.5, 1, and 0 can be entered as Topic Scores.

Multiple Opportunities

Philosophically, there are two forms of multiple opportunities, both of which require backwards design and intentional planning. One form is opportunities planned by the teacher throughout the unit of study and/or throughout the semester. The other form is reassessment of learning which happens after completing assessment of learning at the end of a unit or chunk of learning.

Students will be allowed multiple opportunities to demonstrate proficiency. Teachers need reliable pieces of evidence to be confident students have a good grasp of the learning topics before deciding a final topic score. To make standards-referenced grading work, the idea of "multiple opportunities" is emphasized. If after these opportunities students still have not mastered Level 3, they may then be afforded the chance to reassess.

Guiding Practices of Standards-Referenced Grading

- 1. A consistent 4-point grading scale will be used.
- 2. Student achievement and behavior will be reported separately.
- 3. Scores will be based on a body of evidence.
- **4.** Achievement will be organized by learning topic and converted to a grade at semester's end.
- **5.** Students will have multiple opportunities to demonstrate proficiency.
- **6.** Accommodations and modifications will be provided for exceptional learners.

Anatomy of a Scale

Unit Narrative:

Provide an overview and context of the unit, big understandings, and student experience—including by not limited to vocabulary, inquiry-based questions/concepts, pacing and number of lessons

Topic Title:

Named topic in infinite campus, with approximate number of paced weeks

Exceeding Grade Level (ET):

Possible level four task listed including prior learning, cognitive complexity, integrated skills, real world relevance: authentic application beyond the classroom.

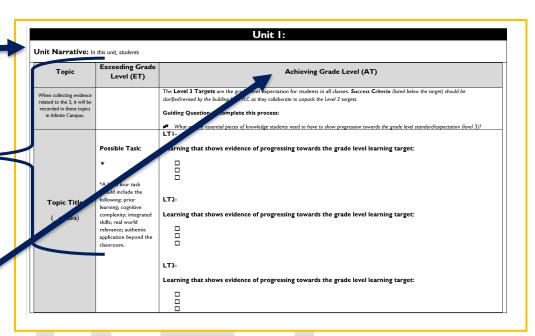
Achieving Grade Level (AT):

Level 3 targets are listed within the topic scale and are the grade level expectation for students in all classes.

Success Criteria (listed below the target) should be clarified/revised by the building level PLC as they collaborate to unpack the Level 3 targets.

Item Bank:

Linked resources for each learning target.
Guiding/Inquiry questions, ideas, and/or
concepts are below the base line
examples to ensure district wide
coherence.



Item Bank:				
Target:	Target:	Target:		
Resources to	Resources to teach:	Resources to teach:		
Standard Language	Standard Language	Standard Language		
ldeas and concepts in the spaces below are base	Guiding Questions, Ideas, and/or Concepts line examples for all to use to ensure district wide coherence.			

Unit I: Land and Waste Management

Unit Narrative/Overview: Historically and currently, land is utilized by a wide variety of stakeholders. Traditionally in lowa, we have prioritized agricultural land use since the state was settled. Currently and into the future lowans are looking to balance wildlife, habitat conservation, water quality, agriculture, waste management and housing. Students will investigate the effects urbanization and subsequent loss of wildlife habitat and farmland are having on the environment, human population, and the climate. Students will also investigate current solutions to these problems, including urban greenspaces and gardens.

Example Topics: Protected habitats (parks, refuges), invasive species, recreational parks/trails, sprawl, dense development, zero waste management systems, composting.

Topic	Achieving Grade Level (AT)
When collecting evidence related to the 3, it will be recorded in these topics in Infinite Campus.	The Level 3 Targets are the grade level expectation for students in all classes. Success Criteria (listed below the target) should be clarified/revised by the building level PLC as they collaborate to unpack the Level 3 targets. Guiding Question to complete this process: What are the essential pieces of knowledge students need to have to show progression towards the grade-level standard/expectation (level 3)?
Land and Waste Management Semester 1- 9/5 - 9/29 Semester 2- 1/29 - 2/23	LTIA- Evaluate design solutions for developing, managing, and using energy and natural resources based on cost-benefit ratios. Learning that shows evidence of progressing towards grade-level learning target: □ Identify the natural resources required to meet human needs. □ Determine the potential options available to meet human needs. □ Develop a list of potential design solutions to meet human needs. □ Evaluate student designed options considering the opportunity costs involved. □ Construct and justify a claim for the energy and natural resources to meet human needs. LTIB- Evaluate a technological solution that reduces impacts of human activities on natural systems. Learning that shows evidence of progressing towards grade-level learning target: □ Develop and evaluate the sustainability factors (ex: ecological, social, financial, cultural, political, etc.) □ Critique a technological solution's feasibility and its impacts on natural systems. LTIC- Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
	Learning that shows evidence of progressing towards grade-level learning target: □ Develop a list of potential design solutions to meet human needs for a given major global challenge. □ Evaluate student designed options considering the opportunity costs involved for a given major global challenge. □ Develop and evaluate the sustainability factors for a given major global challenge. □ Critique a technological solution's feasibility and its impacts on natural systems for a given major global challenge.

Resource Bank:			
IATarget: Resources to teach:	IBTarget: Resources to teach:	ICTarget: Resources to teach: Note: Utilize their knowledge from IA and IB to help analyze a given major global challenge. Though there a few SCs, please refer to the SC in IA and IB to complete understanding.	
Standard Language HS-ESS3-2- Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios	Standard Language HS-ESS3-4 - Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.	Standard Language HS-ETSI-I - Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.	

Unit 2: Water and Agriculture

Unit Narrative/Overview: Water is *the* most critical substance for life, but the quality and supply of water resources in much of the world is in danger. Students will investigate how water is utilized and conserved in our state and consider ways we might foster more sustainability in water management. The focus then turns to the connections between agriculture and water resources, as agriculture has the greatest impact on freshwater consumption and quality. The unit has students use several types of data to assess how agriculture impacts the quality of freshwater resources via nutrient runoff and its effects on water quality in communities using these water sources for drinking water.

Topic	Achieving Grade Level (AT)
When collecting evidence related to the 3, it will be recorded in these topics in Infinite Campus.	The Level 3 Targets are the grade-level expectation for students in all classes. These are directly related to State of Iowa standards. Success Criteria (listed below the target) should be clarified/revised by the building level PLC as they collaborate to unpack the Level 3 targets. Guiding Question to complete this process: What are the essential pieces of knowledge students need to have to show progression towards the grade level standard/expectation (level 3)?
Water and Agriculture Semester 1- 10/9 - 11/3 Semester 2- 3/4 - 3/29	LT2A- Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. Learning that shows evidence of progressing towards grade-level learning target: □ Develop an investigation plan and describe the data that will be collected and the evidence to be derived from the data. □ Collect and record measurements of the predicted outcome. □ Evaluate the precision and accuracy of the collected data. Determine if refinements are needed. LT2B- Refine a technological solution that reduces impacts of human activities on natural systems. Learning that shows evidence of progressing towards grade-level learning target: □ Identify the cause(s) of the problem and the natural systems involved. □ Evaluate given technological solutions. □ Describe the cause-and-effect relationship between the technological solution and identified sustainability factors. □ Construct an argument for improvements on the technological solution.
	LT2C- Design a solution that improves a sub-problem that is part of a given larger real-world problem. Learning that shows evidence of progressing towards grade-level learning target: □ Dissect a complex real-world problem into sub-problems. □ Evaluate a subproblem to identify possible solutions. □ Represent your semester-long project solution in an appropriate format (ex: concept map, illustration, model, etc.) and explain your thinking.

Resource Bank:				
2ATarget:	2BTarget:	2CTarget:		
Resources to teach:	Resources to teach:	Resources to teach:		
Water Quality Sampling in area creeks, rivers, ponds, wetlands	 Explore water quality issues locally (nitrates in Des Moines River, Eutrophication/Dead Zone from Mississippi) or globally (aquifer salinization, water shortages) Prairie STRIPS (local solution for erosion/fertilizer runoff) 			
Standard Language	Standard Language	Standard Language		
HS-ESS2-5 - Plan and conduct an investigation of the	HS-ESS3-4 - Evaluate or refine a technological solution	HS-ETS1-2 - Design a solution to a complex real-world		
properties of water and its effects on Earth materials and	that reduces impacts of human activities on natural	problem by breaking it down into smaller, more		
surface processes.	systems.	manageable problems that can be solved through engineering.		

Unit 3: Human Induced Climate Change

Unit Narrative/Overview: In this unit, students will learn the actions of humans can have global impacts. Students will study how our actions can alter environments and the consequences they have on ecosystems and biodiversity, so they can continue to develop their semester long project. Activities can include looking at instances of countries or organizations coming together to preserve Earth's natural resources, as well as examples of humans causing extensive damage.

Topic	Achieving Grade Level (AT)
When collecting evidence related to the 3, it will be recorded in these topics in Infinite Campus.	The Level 3 Targets are the grade level expectation for students in all classes. These are directly related to State of lowa standards. Success Criteria (listed below the target) should be clarified/revised by the building level PLC as they collaborate to unpack the Level 3 targets. Guiding Question to complete this process: What are the essential pieces of knowledge students need to have to show progression towards the grade level standard/expectation (level 3)?
Human Induced Climate Change Semester 1- 11/13 - 12/21 Semester 2- 4/8 - 5/3	LT3A- Describe how variations in the flow of energy into and out of Earth's systems result in changes in climate using a model. Learning that shows evidence of progressing towards grade-level learning target:

Resource Bank:				
3ATarget:	3BTarget:	3CTarget:	3DTarget:	
Resources to teach:	Resources to teach:	Resources to teach: Using data sets (Human alterations to climate, intro/predict consequences of climate changes)	Resources to teach:	
		ProPublica U.S. Climate Maps New Climate Maps Show a Transformed United States ProPublica		
Standard Language	Standard Language	Standard Language	Standard Language	
HS-ESS2-4 - Use a model to describe how variations in the flow of energy into	HS-ESS2-2 - Analyze geoscience data to make the claim that one change to Earth's	HS-ESS3-6 - Use a computational representation to illustrate the	HS-LS2-7 - Design, evaluate, and refine a solution for reducing the	
and out of Earth's systems result in changes in climate.	surface can create feedbacks that cause changes to other Earth systems.	relationships among Earth systems and how those relationships are being modified due to human activity.	impacts of human activities on the environment and biodiversity.	

Unit 4: Designing Solutions to Address Human Impacts (Semester-Long Project)

Unit Narrative/Overview: After looking at impacts humans have caused to the environment and climate, students will complete their semester long projects by narrowing in on a specific community's environmental problem in one of the following areas: land use, waste management, water (quality/conservation), agriculture, or climate change. Students will complete their investigation of the causes, consequences and current solutions available for the identified problem. Students will then evaluate the solution and revise or modify the solution to provide the best approach that accounts for human and ecosystem needs and wants while lowering the impact to environment and climate. Students will then prepare a semester end project in the format of their choice to present their findings and suggestions to a pre-determined audience. Formats may include, but are not limited to, a slide presentation, essay, social media campaign, applied research, video, or podcast.

Topic	Achieving Grade Level (AT)			
When collecting evidence related to the 3, it will be recorded in these topics in Infinite Campus.	be Success Circuit (isseed below the target) should be dufficultiested by the building level 12c as they contabolitate to unjuck the Level 3 targets.			
Designing Solutions to Address Human Impacts Semester 1 - 1/2 - 1/12 Semester 2- 5/6 - 5/24	LT4A- Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. Learning that shows evidence of progressing towards grade-level learning target: Develop a list of potential design solutions to meet human needs for the project. Evaluate student designed options considering the opportunity costs involved for the project. Develop and evaluate the sustainability factors for the project. Critique a technological solution's feasibility and its impacts on natural systems for the project. LT4B- Design a solution that improves a sub-problem that is part of a given larger real-world problem. Learning that shows evidence of progressing towards grade-level learning target: Dissect a complex real-world problem into sub-problems to use as potential projects. Evaluate a subproblem to identify possible solutions for a potential project. Represent your solution in an appropriate format (ex: concept map, illustration, model, etc.) and explain your thinking. LT4C- Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. Learning that shows evidence of progressing towards grade-level learning target: Examine existing solutions to create a refined solution to the chosen project. Design and propose an alternative or refined solution to their chosen project. Critique at the project to provide input. Refine solution based on peer evaluation of project.			

Resource Bank:			
4ATarget: 4BTarget: 4CTarget: Resources to teach: Resources to teach: Resources to teach:			
After unit I			
Standard Language	Standard Language	Standard Language	
HS-ETSI-I - Analyze a major global challenge to specify	HS-ETS1-2 - Design a solution to a complex real-world	HS-LS2-7 - Design, evaluate, and refine a solution for	
qualitative and quantitative criteria and constraints for	problem by breaking it down into smaller, more	reducing the impacts of human activities on the	
solutions that account for societal needs and wants.	manageable problems that can be solved through	environment and biodiversity.	
	engineering.		