Topic or Content Area: NGSS Engineering design 3-5

What is the relationship between Science, Engineering, and Technology?

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Stage 1 Desired Results		
ESTABLISHED GOALS	*Transfer*	
Big Idea: What is the relationship between Science, Engineering, and Technology? <mark>What is the impact of science, engin, tech on a culture?</mark>	*Students will be able to (SWBAT):* *task one:*	

ESTABLISHED GOALS

Big Idea: What is the relationship between Science, Engineering, and Technology?

<mark>What is the impact of science, engin, tech on a culture?</mark>

3-5 ESS 3.1
Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

3-5 ETS 1.1
I can define a simple problem reflecting a need or want that includes specific criteria for success and constraints on materials, time or cost

1A AP-10
develop programs with sequences and simple loops to express ideas or address a problem.

3-5 ETS 1.2
I can generate and compare possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem

3-5 ETS 1.3
I can plan and carry out fair test in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Transfer

Students will be able to (SWBAT):
task one:
- *SWBAT: ask questions (who what where when why) and make observations about science phenomena.*
- *SWBAT: gather information by defining the problem, criteria, constraints, and cost of material.*

task two:
- *SWBAT: generate models diagrams (heading, labels, captions) and compare possible solutions.*
- *SWBAT: generate a program sequence that allows collection of science data to solve the conservation problem.*

task three:
- *SWBAT: develop and use systematic testing of variables, recording data of each team mates' failure points.*
- *SWBAT Using the failure points of program, determine as team, how you could improve the function of design.*

- *SWBAT: Describe, Justify, and document the process of computational thinking used to develop your program.*

Meaning

UNDERSTANDINGS
<mark>*Students will know that*
The effects of industry impacts more than just the land...</mark>
Studying the science impacts of population growth on the environment, allows engineers to improve technology, protecting the natural resources in the world.

understanding how to develop a program to assist in data collection is

ESSENTIAL QUESTIONS-
Label Facets
1. Explain: How might we address the impact of growing communities and use science ideas to protect and conserve the Earth's resources <mark>and Protect cultures values?</mark>
2. Interpret: How can I gather information about a situation people want to change? (conservation)

computational practices P.6.1 systematically test computational artifacts by considering all scenarios and using test cases. P7.2 Describe and justify and document computational processes and solutions using appropriate terminology consistent with the intendedaudience and purpose.	*important for jobs in science and engineering careers.* *sequence, pattern recognition, and mathematical practice is important to developing computational thinking strategies.*	3.<u>Apply</u>: How can you design a model to represent the program needed to collect target data with robots? 4. <u>Perspective</u>: generate comparisons of the failure points among solutions, how can the strengths and weakness help you improve design? 5. <u>Empathize</u>: How can you effectively collaborate designs to improve performance? 6. <u>Self Knowledge</u>: What was a success and an area that needs improvement for your design?

Acquisition		
	Students will know… 1. how to independently use technology to research about conservation of a natural resource <mark>with least impact on surrounding cultures.</mark>. 2. how to engineer a team solution through comparing models to earth's conservation problems. 3. how to have a growth mindset to adapt and change through reflection.	*Students will be skilled at…* 1. independent **critical thinking** and **creativity** to <u>research a solution to a real world problem</u> 2. **collaboration** and **communication** to <u>solve group problems</u>. 3. growth in learning through **empathy** and **perspective** to <u>improve and reflect through explanation of the process of design.</u>

Stage 2 – Evidence

Evaluative Criteria	Assessment Evidence

<u>Student Performance Assessment Link:</u>
<u>21st Century Learning for Classroom Teachers data Triangulation Report card:</u>

Artifact One: Poster asking and answering gathering evidence (Engage and Explore)	**Artifact Two: Map and written code generating solutions based on evidence and testing**	**Artifact Three: Model Presentation 21st century learning application to design process**

	(Explain and Elaborate)	(Extend and Evaluate)
Explain: How we might address the impact of growing communities and use science ideas to protect and conserve the Earth's resources? performance skill: SWBAT: ask questions, make observations about phenomena. Interpret: how can I gather information about a situation people want to change? performance skill: SWBAT: gather information by defining the problem, criteria, constraints, and cost of material.	Apply: How can you design a model to represent the function of resourcing or conservation? performance skill: SWBAT: generate a diagram (map and key) including headings, labels, and captions to include facts. SWBAT: generate written code to begin to move robots through the map. Perspective: generate comparisons of the failure points among solutions. How can the strength and weakness help you improve your design? performance skill: SWBAT: develop and use models to test variables and controls, recording data of each failure point.	Empathy: How can you effectively collaborate designs to improve performance? performance skill: SWBAT: use the failure points of structure, determining how to improve the function of the design with approval of all designers on the team. Self Knowledge: What was an area of success in your design? What is an area that needs improvement? performance skill: SWBAT: identifying an area of success and an area of improvement in goal setting and reflection video.

Rubrics, assessments and checklists of student performance
https://drive.google.com/open?id=1YHHX9ruT6dfThfy1AGEDKLludna-1UT89K3mN2gXUTw
student quick assessment google form
https://forms.gle/9T52tR5vzfzgcVzP7

Stage 3 – Learning Plan
5E Framework for lesson plan and procedures link:

Unit Big Idea and UBD Framework link
Lessons and Procedures:

5E Lesson Plan	Measurable Objectives and Standards:
Engage: The purpose of the ENGAGE stage is to pique student interest and get them personally involved in the lesson, while pre-assessing prior understanding.	Driving Question: How might we address the impact of growing communities to protect and conserve the Earth's resources? (page 2-4 google slide presentation) Students will be able to ask questions and make observations about a phenomena relating science and technology. procedures:

ESS3.1
ETS1.1
 	
materials: access to teacher computer and projector to view conservation video.
 	
vocab: conservation, resource, community, endangered, responsible resourcing,
	Background: We live in the Black Hills. We see wildlife all around. We are going to see how understanding how to program and work with technology is important to future careers in conservation in the Hills. Being able to write code and develop programs is important and can be used in ways to help conservation on Earth. You are hired as part of the conservation team and will need to complete three tasks for success:
	    a. conduct research on the impact of humans on wildlife, the environment, ==and surrounding CULTURE==. Prepare posters of facts behind your selected wildlife. (artifact one)
	    b. create an area map using grid paper, adding a key to identify resources and path of travel to assist in developing programs for robot. (artifact 2)
	    c. prepare conservation site mode to have robot complete path, using: laminated floor grid area, cardboard, tape, paper, and craft sticks to replicate natural environment (artifact 3)
	play video launch through flighrid :https://flipgrid.com/18da4d17
	you and partner are going to explore epic! conservation collections through the flipgrid platform.
	    d. Use student code nec1365.
	    e. go to mailbox
	    f. collections; conservation
	    g. decide an endangered animal or habitat
	    h. students share out animal or habitat and write as heading on top of poster for next hour.
	Review driving question: How might we address the impact of growing communities to protect and conserve the Earth's resources? How are science engineering and technology involved in this process?

Explore: The purpose of the EXPLORE stage is to get students involved in the topic providing them with a chance to build their own understanding. ESS 3.1 ETS 1.1 materials: Ipad, poster paper, colored pencils, rulers, Flipgrid QR	<u>Driving Question:</u> Interpret: how can I gather information about a situation people want to change? Students will be able to gather information by defining the problem, criteria, constraints, and cost of material. <u>Procedures:</u> You will be selecting your conservation grid number and animal. What happened that caused that animal to become endangered? Research how it is endangered, and what impact humans can play in helping change this situation. Develop a poster that gives facts and evidence to inspire change. Think plan ways for your later model to use these ideas. students will use Ipads to scan into Flipgrid QR for access to videos and lessons (FLIPPED VIDEO 1)

vocab: criteria for success, constraints, facts, evidence	students may also research using epic! login nec1365 link for reference (FLIPPED VIDEO 1)

Explain:
The purpose of the EXPLAIN stage is to provide students with an opportunity to communicate what they have learned so far and figure out what it means.
 	
ESS.3.1
ETS 1.2
1A AP 10
 	
materials: poster, graph paper, laminated area conservation grid, colored pencils, Data collection table
 	
vocab: code, program, sequence, variable, coordinate
	Driving Question:
	Apply: How can you design a model to represent the function of resourcing or conservation to communicate to classmates?
	
	Students will be able to generate a diagram (map and key) including headings, labels, and captions to include facts to explain thinking.
	Students will be able to generate written code to begin to explain their path to resources.
	
	Procedures:
	show students the area of conservation site (laminated floor grid about 10k 0cmx100cm)
	discuss observations and ask questions about criteria for success and constraints
	      i. success would include:
	          i. using the grid your team selected, how can you program a path for dash to collect and tag targets (marked on grid red dots-place block for dash robot to scoop and collect for "tagging")
	          ii.

Elaborate/Extend The purpose of the EXTEND stage is to allow students to use their new knowledge and continue to explore its implications. materials: Vocab:	Driving Questions: 1. Perspective: generate comparisons of the failure points among solutions. How can the strength and weakness help you improve your design? Students will be able to develop and use models to test variables and controls, recording data of each failure point. students use laminated area conservation grid as floor model to create a model representation of their collecting of items located on map. pick up blocks on the way- and follow direction under block directions include: find gold and new mine, forestry and mining increase to clear area of 60 cm2 -THIS IS NOW A DO NOT TRAVEL include on your map. and create new path if necessary

directions include: deer, elk, and goat crossing either develop an animal safe bridge to avoid being hit, or develop a new path. Include this animal safe zone in your map. Redesign plan

plenty of water and wildlife add 50 for each resource mark on map and data collection

deer tags and fish hatchery monitoring animal conservation add 50 for wildlife

Procedures:

2. Empathy: How can you effectively collaborate designs to improve performance?

Students will be able to use the failure points of structure, determining how to improve the function of the design with approval of all designers on the team.

materials: students will use the "I notice and I wonder" critique
https://www.google.com/url?q=https://www.teachingchannel.org/video/student-to-student-feedback-nea&sa=D&ust=1586387440288000&usg=AFQjCNHKUakSSJsieVXA3NO-U08PQ9bMKA

procedures: watch video and model "i notice I wonder" strategy as whole group.

Evaluate
The purpose of the EVALUATION stage is for both students and teachers to determine how much learning and understanding has taken place.
 	
materials:
vocab:
	Driving Question:
	Self Knowledge: What was an area of success in your design? What is an area that needs improvement?
	
	Student will be able to identify an area of success and an area of improvement in goal setting and reflection video.
	
	Procedures:
	1. teams will present their collection of data
	2. students will complete individual self evaluation using google forms: https://docs.google.com/forms/d/1txSQxz3xnup3pTmKI9af8WC8E6OnT-SHzsi9BZ9vqZA/edit?usp=sharing
	3. students will complete final Fligrid e-portfolio reflection to review Big Idea and essential questions
	    a. What is the relationship between science engineering and technology?
	    b. How are communities addressing population growth to conserve resources?
	        i. task one: ask, answer and communicate plan: poster
	            1. Explain: How might we address the impact of growing communities and use science ideas to protect and conserve the Earth's resources?

	2. 2. <u>Interpret</u>: How can I gather information about a situation people want to change? (conservation)
	ii. task two: develop, test, and use model of area conservation and written plan:
	1. .<u>Apply</u>: How can you design a model to represent the program needed to collect target data with robots?
	2. <u>Perspective</u>: generate comparisons of the failure points among solutions, how can the strengths and weakness help you improve design?
	iii. Team collaboration and demonstration of final project
	1. <u>Empathize</u>: How can you effectively collaborate designs to improve performance?
	2. . <u>Self Knowledge</u>: What was a success and an area that needs improvement for your design?
	Assessment resources, rubrics, checklist: :
	1. for task one and two :
	https://docs.google.com/document/d/1YHHX9ruT6dfThfy1AGEDKLludna-1UT89K3mN2gXUTw/edit?usp=sharing
	2. for task three:
	https://docs.google.com/document/d/1x5upkcdn1AtW20fUb7r37AWOKLvNn8eYXBeznCS41qs/edit?usp=sharing
	3. Examples of Projects finished and "how to navigate" if absent
	https://docs.google.com/document/d/1tUpsTRDu2i_27newZSbOQgBTM7inizO5sKhfDKNJwyk/edit?usp=sharing
Background Information and References The purpose this section is to provide adequate information such that another teacher could implement this lesson plan. This includes essential resources in APA format.	Purdue Owl APA Style Guide ● "Youth Conservation Camp." *Youth Conservation Camp | South Dakota Game, Fish, and Parks*, gfp.sd.gov/youth-conservation-camp/. ● "Hunting and Fishing Licenses." *Hunting and Fishing Licenses | South Dakota Game, Fish, and Parks*, gfp.sd.gov/hunt-fish-license/. ● *Black Hills National Forest - Land & Resources Management*, www.fs.usda.gov/detail/blackhills/landmanagement/?cid=stelprdb5113978. ● *Computational Thinking | Assessing*. (2020). Harvard.Edu.

http://scratched.gse.harvard.edu/ct/assessing.html

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● Epic! Creations Inc. (2020). *Instantly access 35,000 high-quality books for kids*. Epic! - Books for Kids; Epic! - Books for Kids.

  https://www.getepic.com/app/user-collection/8938905

● *Next Generation Science Standards*. (2000). Nextgenscience.Org.

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● *Portal*. (2020). Makewonder.Com.

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