

I am a full time online High School Biology teacher. As such I have found that teaching some of the NGSS standards online is tough. The standard HS-ETS1-2 states: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. Yikes what to do?

I have created a lesson that involves looking at global warming and climate change. and how it is causing problems for the villages that are along the waters in Alaska. For this piece, I am just going to look at the engineering part of the assignment. But please realize that before I introduce this to my students, we have spent a few days pouring over images of maps showing how the ice has melted throughout the years, and they have an understanding of how global warming works.

I have used the village of Shaktoolik, but there are other villages in Alaska that are facing similar problems. Enjoy



These photos show the village in summer and in winter. What do you notice about this village? Do you see any potential problems for them? What are your observations. Write your observations on the data chart and then watch the short video and read the Shaktoolik information page and start to plan how you are going to help this village survive for another 100 years.

<http://www.aksik.org/index.php/documentary/stay-and-defend>

(please watch the video first – if the hymns at the beginning are a problem,

you can cut them out before you show to your students)

Engineering Shaktoolik data

What are your observations about Shaktoolik from the winter and summer images?	Winter observation
	Summer observation
What are three potential problems for the village that you can see from these images? Why would these be a problem?	1.
	2.
	3.
Any other observations/questions that you might have on the village after watching the video?	
What human activities might have caused this problem for Shaktoolik?	

A town in need of saving - Shaktoolik, Alaska



Shaktoolik is a small community of about 250 people that is situated near the northern end of a sand spit. The village was the first settlement on Norton Sound, and was occupied as early as 1839. They are bordered to the east by the Tagoomenik River and to the west by Norton Sound. The original village was located six miles up the Shaktoolik River. It was relocated to a more sheltered location in 1930's. The community

was again moved north to its present site in 1975 due to flooding and erosion concerns. The residents are descendants of the Yupik and Inupiat people. They are subsistence residents earning a living from commercial fishing and local jobs with the school, Tribe, city or native corporation.

Many studies have been done and it has been shown that climate change will have an impact in this village. Two most compelling threats are flooding and erosion. Storms are getting fiercer and more frequent. Temperatures are rising and winters are getting shorter. The Norton Sound is later to freeze up. The ice from this freeze has historically served as a buffer between the village and the winter storms. The lack of ice makes the village vulnerable to wave damage from the storm surges. Wave run up has pushed driftwood to within a few feet of some of the buildings.

At this time, Shaktoolik has a subarctic climate with summer temperatures between 45° and 62° F. During the winter the temperatures average between -4° and 11° F. There is usually a strong wind that blows across the area – so wind chill makes the temperatures seem much lower. The Norton Sound usually freezes sometime in November, with all of the



away.

The assignment:

Engineering Shaktoolik!

Your job is to find a way to save the town of Shaktoolik!

The sea is rising, the winters are getting shorter, the town is in the path of potential erosion and flooding. They do not want to move so your job is to help them stay in their homes and make the area safer during the storms. What can they realistically do? Your job will be to research potential solutions and then create 3 power point slides with your findings.



Storm comparison at Shaktoolik Native Corporation Building
(Photo: Gloris Andrew)

ice usually gone by mid-May. Average snowfall for the area is about 43 inches.

There is no high ground near the village. The majority of the sound side is at about 24 feet above the mean/average sea level. On the river side, the average is about 14 feet. There are no roads only trails connecting the area to their nearest neighbor 33 miles

On the **first slide** you will need to include the completed information from your data chart. These are your observations on what needs to happen.

On the **second slide** you will need to have:

A **drawing of your solution** - create it (drawing it on a piece of printer paper) and then either photograph it or scan it into the computer to be put on your slide. It should take up the whole slide. Be creative. And remember they need to try and use what they have. (Please make sure that if you scan the image that it can be seen in detail)

On the **third slide** you will need to have:

A **detailed explanation** of what your solution is and how it will be carried out. Some constraints of this project include that the village is ice bound from October until May and the only way in and out is via ship or very small aircraft. Please remember that these are not rich people - they are fishermen or local business workers. They have some heavy equipment available to them – and the desire is to stay as long as possible in this village.

Engineering Shaktoolik data

	Winter observation
What are your observations about Shaktoolik from the winter and summer images?	Summer observation
What are three potential problems for the village that you can see from these images? Why would these be a problem?	1.
	2.
	3.
Any other observations/questions that you might have on the village after watching the video?	
What human activities might have caused this problem for Shaktoolik?	



Idea to Save Shaktoolik

My mom works along the waterfront in Portland, Oregon and one day I was there when all the ships were in for the Rose Festival. When this assignment came up to come up with ideas to save Shaktoolik what I saw at the waterfront came to mind to save their homes or at least prolong their destruction as long as possible. The big rubber buoys that keep the ships from hitting the seawall are so large that they could be used as floats for the Shaktoolik homes in the event the erosion and flooding from global warming overcome them and their land is covered with water. Putting the buoys in place under each home would involve shipping the large equipment and buoys in as soon as ships can get in in late May or early June to lift the homes and place a large buoy under each side of each home and anchor it to the home. This would involve all towns people working together and going from home to home to accomplish this so everybody is taken care of. I know homes can be lifted because I have seen that happen to move homes from one location to another. Short of Shaktoolik relocating once again, I believe this is an idea that will allow them to stay and have the safety net of knowing that when the water overcomes them their homes will float like a house boat. I would also anchor the homes deep in the ground or anchor each home to each other.



Saving the town of Shaktoolik

I do think the plan of adding gravel will help keep the ocean at bay, however I would like to add some concrete to it and build a 3 to 5 foot wall around the town to try to hold back the ocean when conditions are good enough to achieve success.

In addition I would start raising the homes higher off the ground so if ocean does clear the barrier in some way homes families are saved from damage preferably connected to the bed rock so they stand the water pressure better. Unfortunately it will cost about 30,000 per unit so start with the most important buildings first and see what happens to keep the people stuck in town safe.

I would also leave a good road available at anytime to escape the town if necessary to higher ground that is protected and a building set up for emergency use.

I would practice an emergency escape just in case something happens that cant be avoided to keep the towns people safe.