21st Century Natural Disasters: Exploring Children's Experiences

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Unit Rationale

Children: adorable, vulnerable, teachable. When most people see an image of a child, they instinctively feel tenderness and compassion, even affection for a human they may not even know. Our souls sense that children are adorable, and at the same time, vulnerable. It seems human nature prompts us to protect our young because they are defenseless and susceptible to harm. Perhaps, though, more intriguing is the fact that children are teachable. A newborn, for example, learns her mother's voice and scent and how to feed. I find the ability to learn to be remarkable which is clearly why I am a teacher.

Natural Disasters: unpredictable, inescapable, insurmountable. Destructive acts of nature, contrarily, could not be further from these ideas regarding children. They are downright scary and occur without reason (except for global warming) and usually very little warning. Some may believe that "luck" allows select individuals to escape a natural disaster, but if one hits where you are, you will need more than luck to survive. After a disaster, the recovery is worse than the event; death and destruction bring their own unending pain It is like climbing a steep mountain that has no peak, a tunnel that has no end, a wave that never stops rolling.

The juxtaposition of children and natural disasters evokes both heartache and an urgency to aid. Observation and data indicate that disasters caused by acts of nature are occurring more frequently and aggressively. Likewise, the populations that are affected are greater, including more children. It occurred to me that the reason for weather or other natural phenomena being classified as 'disasters' is that they destroy people's lives. Elementary students are beginning to understand the world in which we live, including the suffering which occurs in the lives of other children as well as their own. Natural disasters can be especially devastating to children because of their lack of physical, mental, and emotional maturity. It is my hope that, through the teaching of this curriculum unit, students will not only understand the basic elements of natural phenomena and their most recent occurrences, but also will broaden their perspective of life and the value it holds.

School Demographics

New Castle Elementary School (K-5) in New Castle, Delaware is much like the other 108 elementary schools in Delaware[1] and probably similar to schools all over the nation. Estimated percentages of race and sex include 40% African American, 35% Hispanic,

55% male, and 45% female. Like most American children, these students have not experienced horrific natural disasters, although they have faced life-altering challenges because of their parents' struggles—financial, social, and political. 25% of the students have parents who do not speak English well and struggle to maintain their homes and families. Even the parents who do understand and speak English have insurmountable financial and social problems, which have led to generational poverty as well as other familial issues.

By increasing our elementary students' knowledge of weather and other natural phenomena along with recent natural disasters, I believe they will begin to become aware and understand how their peers have been affected by the devastation, how they coped with their losses and challenges, and how they have become resilient and regained hope. It is my focus and desire for these upper-elementary students to develop skills and attitudes leading toward life-long resiliency.

Essential Questions

1. What are common weather and other natural phenomena that affect the planet?
2. Which natural phenomena have created disasters in the 21st century?
3. Where and when did the natural disasters occur?
4. How were the children in those areas affected by the disasters?
5. How are the children who survived the disasters living today?

Background Information

Earthquakes

As I began to contemplate the specifics of this natural phenomenon, I recalled having experienced two of them in my lifetime. My first earthquake found me north of Manila in the fall of 1986. The youth group of the naval base chapel had gone on a retreat, and that evening, we were out running around playing tag when suddenly the ground began to move. In that first split second, I didn't recognize it as an earthquake because as a Michigander, I had never felt one before. The other leaders and a few of the kids shouted, "EARTHQUAKE!" But no sooner had I heard them, than the motion stopped. I stood still and waited, hoping it would continue so I could understand it fully, but it didn't. We were all excited to have felt it; it made the get-away that much more fun.

Interestingly, because Delaware rarely has earthquakes, my second earthquake experience took place three years ago as I was standing in my school's office. Very unexpectedly, though not as excitingly as my first, the floor started moving. Our secretary freaked out, but I can remember saying nonchalantly, "It's an earthquake." It stopped within seconds, and most of us returned to our tasks. We later learned that people up and

down the east coast had felt it. The University of Delaware published an article explaining why we rarely experience earthquakes, but that this one was different because of the epicenter's location.

> The geology of the Middle Atlantic region of the east coast favors the travel of earthquake energy for great distances. The earthquake epicenter was located in the Virginia Piedmont, an area underlain by hard basement rocks that predate the opening of the present-day Atlantic Ocean. Earthquake energy can travel well through these hard, cold ancient rocks, in contrast with areas such as California where there is abundant faulting and softer rocks, which absorb the energy more quickly.[2]

However, I find the phenomenon of the earth moving to be so rare and fleeting that I cannot offer my own explanations, so I will inform the students of the research I have undertaken.

The science "under" earthquakes begins with the composition of the earth: there are four different layers. We live on the surface—the crust—of the earth, and right below the crust is a layer called the mantle. The crust and the top of the mantle do not look like your aunt's smooth and seamless apple pie crust. The earth's crust and mantle top are made of very large, flat pieces of rock, which are constantly moving around each other. These rocks are called tectonic plates. There are 20 named plates around the world, and they have rough edges (faults) that get stuck on each other. Earthquakes happen when these stuck rocks break loose, and the energy waves from the moving plates can be felt on the surface of the earth where we are. The intensity of the earthquake depends on the size of the rocks that are stuck and how deep they are in the earth. Scientists measure earthquakes with a machine called a "seismograph," and use the term "magnitude" to quantify how small or big they are, on a 10-point scale.[3]

Students need to understand the natural science of earthquakes, so that they can more completely comprehend the horrific devastation caused by the earthquake in Haiti in January 2010.

Tsunamis

Even though tsunamis rarely affect the USA, teaching students about them is the next logical lesson because tsunamis are mainly caused by earthquakes under the ocean floor (usually the Pacific Ocean). (Volcanoes and landslides are other causes.) The word "tsunami" /soo-na-mee/ means "harbor wave" in Japanese, but more accurately it is a group of very long and very deep waves that move with the speed of a jet.[4] When the plates under the ocean move against each other and/or separate at the fault, great energy pushes up the water into a column and creates big waves (Steele p. 6). The waves slow down as they approach the coast, but that makes them even bigger because they combine

with each other. Think of it this way: You have planned a party, and your friends arrive one at a time. In the beginning, when only two or three of you are there, it is not very exciting, so you wait for the other friends to get there. That is when things get crazy. Tsunamis work the same way. It looks like one wave, but it is a combination of multiple waves building up together. Other tsunamis usually follow the first one, depending on the intensity of the earthquake. (That would be like another party.) Interestingly, there are different types of tsunamis affected by many variables that make them what they are and what they do.[5]

Studying tsunamis, specifically their creation, movement, and power, will allow the students to understand more fully the large-scale death and destruction of the Tohoku, Japan tsunami that occurred on March 11, 2012.

Hurricanes

My mom and I lived through Hurricane Andrew in August 1992. We were in its path in St. Petersburg, Florida, but, fortunately, it lost some of its strength when it hit Miami first. I remember the strong winds and rain and the news reports, but overall, we were spared. Like with every natural weather event, the effect it has on you depends on your location relative to the event.

Hurricanes (known as cyclones and typhoons, too) are large, powerful storms that need warm ocean water and strong, one-way winds to form.[6] They can begin either a little above or below the equator where the temperature and winds are just right. A special natural force gives the hurricane its spin.[7] The warm water evaporates, giving the storm more energy. In the middle of the storm, you can find the "eye," which is calm and dry, but the rest of the storm has the ability to cause great destruction when it comes ashore. Hurricanes move slowly, though, which benefits the people trying to get out of its way.

Because hurricanes are likely the natural weather phenomena that students hear and know the most about, studying them can increase confidence in active and expressive research.

Floods

Again, the next logical lesson would be to study floods because hurricanes often cause flooding. The flooding along the coast when the hurricane hits land is called a storm surge. All of the water that the hurricane collected as it moved along the ocean is pushed onto the shore and inland. That can be a real mess for low-lying areas. Homes and other buildings can be destroyed by the inundating water.

Floods can be caused by other factors as well. Several inches of rain in a short amount of time can overwhelm drainage systems, especially in cities with mostly non-porous surfaces. As little as six inches of flowing water can wash away cars and other loose objects. Even people can be swept away in a rapid current of rainwater. Also, rivers can overflow from heavy downpours or snow/ice-melts far upstream and create floods at the base of the rivers.[8] When dams or levees break, water can swamp the entire area that was supposed to remain dry. To summarize: "Water is power," and we need to be aware of the dangers of too much water—floods.

Floods, like hurricanes, are well-known natural disasters and sometimes experienced by students and their families. It makes sense to study floods in connection to hurricanes, even though the recent flooding event in Europe was not caused by a hurricane.

Tornadoes

When I was six or seven years old, I remember my mom taking the pans out of the cupboard under the sink and telling me to get in there because she could see a tornado coming from the southwest side of the lake where we lived. That memory is as clear as yesterday. She was listening to the radio weather report while she kept her eyes glued on the storm clouds. We were fortunate that our home was not damaged, but a large oak tree was uprooted and crashed through one of the rental cottages we owned.

Michigan and the rest of the Midwest are home to frequent tornadoes and violent thunderstorms. The warm air coming from the south rises to meet the colder air coming down from Canada. The cold, fast-moving air wraps around the slower, warm air, making it spin in the shape of a cylinder.[9] As it moves, more warm air is brought up into the cloud, causing it to spin faster and faster until a vortex (funnel cloud) is formed. It begins to act like a vacuum as it moves down, close to the ground. Tornadoes are measured by the amount of damage they can cause, indicated by their wind speed and size. The scale starts at F-0 (zero) and goes up to F-5, although the strongest tornadoes are the rarest,[10] thankfully.

Even though tornadoes are not common in Delaware, they do occur occasionally, and that is why our students should study how they form and move. That will help them grasp the disastrous effects caused by the tornado in Moore, Oklahoma on May 20, 2013.

21st Century Events

For this curriculum unit, I have chosen to focus on five recent international natural disasters, although there are plentiful choices, to allow the students to have a broader view of the world, its natural phenomena, and the potential for disaster.

The Haitian Earthquake, 2010

The small, tropical country of Haiti shares the island of Hispaniola with the Dominican Republic. It is the poorest nation in the world, with 77% of the citizens living below the poverty level.[11] Most Haitians live on less than $2 a day. One might agree that this is the last country that needed or deserved a 7.0 magnitude earthquake that demolished the capitol city and killed 220,000 people. 3.5 million inhabitants were affected and needed emergency aid after the quake shook the nation in the late afternoon of January 12, 2010. (Unrelated to the earthquake but causing aid response challenges was the outbreak of cholera in October 2010. By July 2011 5,899 had died as a result of the outbreak, and 216,000 were infected.) Because of the lack of construction and material standards, hundreds of buildings were destroyed. 60% of government and administrative buildings, 80% of schools in Port-au-Prince and 60% of schools in the South and West Departments were destroyed or damaged. In total, 4,000 schools were ruined.[12]

The children of Haiti, however, bore the greatest pain and suffering.[13] Half of the country's 10M population is under the age of 18, and although there is not any exact data on how many died that day and the weeks and months following, it is estimated that at least half of the 220,000 who died were children. The youth who escaped death suffered not only great physical afflictions but also enormous emotional grief. Countless children lost their parents, their homes, and their hope. See Figure 1.

Figure 1

How are these children now, five years after the tragedy? Have their lives improved? Have their wounds healed? Have they stopped crying? Have they found the hope for life that they had lost? The youth of Haiti deserve our attention and concern, our understanding and consideration.

The Tohoku Tsunami, 2011

All tsunamis have a "parent;" that is, they are born of another type of natural phenomena such as a volcano or landslide, or most commonly, an earthquake. Such was the case in the mid-afternoon of March 11, 2011, when a massive 9.0 quake rocked the Tohoku region, 230 miles northeast of Tokyo.[14] It was the strongest earthquake to hit Japan, and there were hundreds of aftershocks, worsening an already unprecedented, horrific event. However, one hour later, the 30-foot wall-like wave started its assault on the east coast[15]

The days following the quake and tsunami gave light to the dark reality of death and devastation. Entire cities had been washed away, including nearly 19,000 people. At one school, where the students had routinely practiced earthquake drills, nearly all of them drowned as they waited outside in the "safety zone, free from falling objects." Neither they, nor their teachers, had known the giant tsunami was coming. Estimates say nearly 2000 children were lost that day. See Figure 2.

Figure 2: Tatsuhiro Karino and wife Masako search for their daughter, Misaki, 8, at Ookawa Elementary School in Ishinomaki, Japan. He found the body of their son,

Tetsuya, 11, earlier in the day. More than 80 students and 10 teachers died in the March 11 earthquake and tsunami. (Carolyn Cole / Los Angeles Times)[16]

How has the Tohoku region of Japan recovered in the past four years? Have the parents found their lost children, are they still searching, or have they borne "replacements?" Do the students now practice tsunami drills in addition to earthquake drills? And what is the drill? What can we learn from this tragedy that could have been less tragic?

Hurricane Sandy, 2012

Superstorm Sandy came ashore on the mid-Atlantic coast of the United States in the early morning hours of October 29, 2012, exactly one week after it had begun as a tropical storm in the Caribbean. Most hurricanes spin around in the tropics for a few days and then get blown out into the ocean. Not Sandy, though. She kept increasing in size and strength, killing people and destroying property along her route up the eastern seaboard.[17] In many ways, she was the "perfect storm" because of the other atmospheric conditions. She was big, she was trapped, and she found her path west and inland instead of east into the ocean.

Figure 3

Even though the number of deaths caused by Hurricane Sandy was low compared to the other natural disasters studied, the widespread destruction was on par with the Tohoku tsunami. There were power outages for days up and down the east coast, nuclear

power plants had slips and shutdowns, and tremendous flooding and wind damage ruined billions of dollars worth of property. The photo of the crumpled and submerged rollercoaster that had been flung from Seaside Heights pier represents how this hurricane not only surprised everyone in and out of its path, but also how it was non-selective in whom or what it destroyed.[18]

Questions remain, two years after Sandy came in without knocking. Which area was affected the most and why? What preparation could have been taken to lessen the toll? Are people still building homes and parks next to the ocean's edge, and should they? Are the east coast inhabitants, including the children, ready for the next Sandy?

Central European Floods, 2013

All over the world, floods have become commonplace disasters. Global warming has slowed down the jet stream, allowing weather patterns to stay in place longer than in the distant past. Often, once it starts raining, it does not stop for, perhaps, days at a time. It rains longer and harder these days, witnessed clearly by central European citizens over the past few years. In fact, flooding is the most devastating natural disaster in Europe.[19]

Last year in June 2013, eight countries, which share borders and multiple rivers, experienced some of the worst flooding seen in years. Many areas received a month's worth of precipitation in just one or two days. Water levels exceeded the 100-year history. The European Commission published a detailed map of the countries, rivers, and flooding concerns[20]

Figure 4: Photo of the flooding near Havelberg (Germany) on 10 June2013.

With regard to loss of life, the Czech Republic was hardest hit with ten deaths reported. There were seven victims in Austria and three in Germany. In Slovakia, Hungary, and Serbia, the flood protection activities near the rivers were reaping success as the waters receded. These floods were the single, most-costly natural disaster in the world in 2013, with damages upward of $16B.[21]

What can be done to stop flooding before the rain begins and after it stops? Where else can people live and work beside next to rising rivers? How have the children of these countries been affected, and what can they do to help to lessen the potential for disaster?

Moore, Oklahoma Tornado, 2013

The tornado that touched down on May 20, less than two years ago in Moore, a suburb of the capitol, was a category F-5, the strongest and most deadly of all tornadoes.[22] It was a stormy Monday afternoon, and all of the children were still in school. Sirens rang out, and the people of the community took shelter as best they could, but there was no failsafe place to hide. 25 people were killed, including seven children found dead in one of the schools. The walls could not withstand the 200-mile-per-hour winds.[23]

Figure 5

The tornado was a mile wide and left a winding path of destruction 17 miles long. It was like a wind tsunami, destroying everything in its way. Two schools were flattened, and rescuers and parents had to work feverishly to find and free their children. See Figure 5. Tornado alley is a dangerous place to live.

Where have these children gone to school since their school buildings were destroyed? How have they recovered? Are they afraid to go to school? What has been done to make the citizens and buildings of Oklahoma safer from tornadic disasters?

Implementation Strategies

My vision for implementing this curriculum unit begins with a slideshow, displaying 50 or more photos of 21st century natural disaster events, including several of the children affected. I, and any teacher wanting to implement this unit, will need to create a power point, enabling us to review and/or learn relevant and necessary background information. The slideshow, as a visual activating strategy, will propel the students into the research they will need to accomplish in order to learn from the children's experiences.

With regard to the foundational understanding of natural and weather-related phenomena, I will either give the students a brief lesson on each one or allow students to spend one or two class-periods reading about and sharing the information, perhaps through a "fact-walk" activity where each group writes facts about a different phenomenon, and then all group-walk around the classroom and read/discuss the facts.

After the students have a general understanding of the phenomena, they can embark on the PBL activities. First, they need to choose a natural disaster event to research, which may be complicated if they all want to research the same event. There are multiple ways to deal with this issue; the easiest is to pick out of a hat. I might even "pay" the students who presented the best basic facts by allowing them to choose first.

A significant focus of the research should be on primary sources, specifically the children who have been affected by the disasters. E-Pals is an internet-based pen-pal social network in which both teachers and students can reach out and make contact with the children and their teachers in the disaster locations. The students can directly ask the children questions about their lives before and since the disasters. I believe this networking will give immeasurable meaning to the PBL activities as well as increasing the authenticity of the research and reports. Moreover, the networking may continue after the PBL has been completed.

Finally, an oral presentation of the research will be the culminating activity, but the students need to present their reports using a minimal outline, demonstrating the depth of their knowledge and participation. Reading a report does not qualify as an oral presentation. The student audience need to complete a 3-2-1 activity for each presentation. They should list 3 interesting facts from the presentation, 2 questions for the presenter, and 1 comment about the natural disaster and/or the affected children.

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Appendix

All four of Delaware's content standards for Social Studies--Geography will be taught and explored through the implementation of this curriculum unit.[1]

Geography Standard One: Students will develop a personal geographic framework, or "mental map," and understand the uses of maps and other geo-graphics [MAPS].

Geography Standard Two: Students will develop knowledge of the ways humans modify and respond to the natural environment [ENVIRONMENT].

Geography Standard Three: Students will develop an understanding of the diversity of human culture and the unique nature of places [PLACES].

Geography Standard Four: Students will develop an understanding of the character and use of regions and the connections between and among them [REGIONS].

Notes

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KEY LEARNING, ENDURING UNDERSTANDING, ETC.

By increasing our elementary students' knowledge of weather and other natural phenomena along with recent natural disasters, they will begin to become aware and understand how their peers have been affected by the devastation, how they coped with their losses and challenges, and how they have become resilient and regained hope.

ESSENTIAL QUESTION(S) for the UNIT

1. What are common weather and other natural phenomena that affect the planet?
2. Which natural phenomena have created disasters in the 21st century?
3. Where and when did the natural disasters occur?
4. How were the children in those areas affected by the disasters?
5. How are the children who survived the disasters living today?

CONCEPT A	**CONCEPT B**	**CONCEPT C**
General Knowledge of Natural and Weather Phenomena	Specific Knowledge of Recent Natural Disasters and Their Effects	Analysis of the Experiences of the Children in the Disasters
ESSENTIAL QUESTIONS A	**ESSENTIAL QUESTIONS B**	**ESSENTIAL QUESTIONS C**
What are common weather and other natural phenomena that affect the planet and the Human Population?	Which natural phenomena have created disasters in the 21st century? Where and when did the natural disasters occur?	How were the children in those areas affected by the disasters? What is their current status?
VOCABULARY A	**VOCABULARY B**	**VOCABULARY C**
Earthquake, Tsunami, Hurricane, Flood, Tornado, Phenomenon(a)	Haiti, Tohoku Japan, Sandy, Europe, Oklahoma	Explore, Experience, Challenge, Resilience, Hope

ADDITIONAL INFORMATION/MATERIAL/TEXT/FILM/RESOURCES

Please consult the annotated bibliography in addition to the endnotes.