Disasters From History

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Introduction

I am a teacher at the Conrad Schools of Science in Wilmington, Delaware. Conrad is a 6-12th grade allied health and biotechnology magnet school located on the edge of the city of Wilmington and, as such, it is considered an urban school. Over 1200 students have been selected to attend Conrad. Students who are interested in attending complete a School Choice application, are interviewed by staff members, and students meeting minimum requirements are entered into a lottery from which those accepted are chosen. Although Conrad is a fully choice school, our students come from a variety of backgrounds; the majority of students are from other Red Clay district elementary and middle schools, but there are students from private and home school environments who are also admitted. The Red Clay Consolidated School District comprises a wide variety of communities from the more affluent to those in need lending to a diverse student body.

As an allied health and biotechnology magnet school, Conrad has various pathways students can pursue in the high school including Physical Therapy, Nursing, Biomedical Science, Biotechnology, Animal Science, and Computer Science. I teach in the Physical Therapy course of study. My primary courses include the senior Physical Therapy 3 pathway course and freshman Introduction to Health Science exploratory course, but I often teach a semester-long middle school elective course for 7th and 8th grade students entitled Emergency Response Skills. Conrad operates on an A/B block schedule with students attending four classes on A-days and four different classes on B-days with each class block lasting approximately eighty-eight minutes.

Rationale

This unit will focus on the middle school Emergency Response Skills students. This is a semester course and each class is homogeneous in grade, either all 7th graders or all 8th graders, but heterogeneous in ability ranging from students with disabilities on Individualized Education Plans to students in honors courses. The purpose of this course is to teach young students what they can do in an emergency situation to keep themselves, their families, their friends, and their communities safe. One marking period (half of the semester) is devoted to the American Heart Association's Heartsaver First Aid and CPR/AED course. Students may earn first aid and/or CPR/AED certifications if they pass both the written and skills tests. The second marking period of the course focuses on various natural disasters and emergencies including how to identify these

disasters, building a disaster kit, and taking action to protect themselves and others in cases of emergencies.

Although the materials I use are informative, I often feel as if I need to challenge my students and make them think and problem solve at higher levels. At this age and level I would like for the students to learn how to use the sources available to them to do research and find answers on their own rather than always asking for the answer to be given to them. I feel that students have become so used to teachers just giving them answers that they have not learned how to "fend for themselves" and cannot find *legitimate* answers on their own when given an academic task. We all know they can find the latest viral video on YouTube, but they are less able to find sources of legitimate information. My goal is to give these students scaffolded activities in which *they* must do the work to find the answers themselves and then create a presentation. I believe adding activities that promote this type of independence and critical thinking will lead to more student engagement as well as better retention of the subject matter.

At Conrad we have 1:1 technology so every student has his or her own Chromebook. I would like to utilize this technology more effectively in my classroom by having students use their Chromebooks for research and activities on various disaster topics. Although I intend to scaffold the assignments, I still plan to give students some latitude in how they present this information. For instance, students will be creating Google Slides presentations, but some may want to imbed videos into their presentations while others may not know how to do this. My hope is that by viewing each group's work, students can learn from each other about things they like or don't like about the presentations. If a group uses very plain slides, very small font, or colors that are "inappropriate" (too light, too bright, etc.), others can see what that looks like and learn not to do these things. While on the flip side, if a more advanced group inserts videos into their presentation, motivated students may ask how they did it or at least attempt to do something like it in their future projects.

Teamwork and presentation skills are also things that students can always use more practice with. I believe students work best with those with whom they are most comfortable. Although this can sometimes cause problems with too much socializing and not enough working, I believe there are still several things students can learn from working with their friends. Time management, on-task behavior, and dividing the workload are just a few of these lessons. On the other hand, there are definite lessons to be learned in *assigning* students into teams and having the discussion about how, regardless of whether they know and/or like their teammate(s), in the "real world" they need to be able to work with all types of people including whomever they are assigned. There may also be students who do not talk to others in the class or do not seem to have friends to work with. Having them work as part of a team can help them with their socialization into their peer group. Presentation skills are also important for students to practice. Regardless of what they do in the future, they will ultimately need to be able to

talk to or around others. By having students present in front of their peers, they have the opportunity to practice public speaking, experiencing what it is like to speak in front of a rather large group. Whenever I have classes do presentations, I discuss the need for respect of those speaking, for their work, and for their situation. Everyone gets a chance to speak and the idea of empathy for the speakers (i.e., "How would you feel if no one was listening while you were discussing the project you worked so hard to put together?" Or "Public speaking is difficult for most people so think about how you would feel if someone made a rude comment about how you speak.") is an important lesson.

Content Objectives

The objectives for this unit include not only learning about disasters in general and particular events in history, but also for students to utilize various resources. At the end of this unit students will be able to use vocabulary specific to disasters and disaster research such as *vulnerability, recover,* and *resilience,* as well as understand what various types of social capital are. They will also understand why convergence occurs, why it can become cumbersome, and what they can do to help in a disaster. Students will be able to define and categorize the various types of disasters. They will be able to describe different disasters not only in their physical terms, but also by their causes and the impacts they have on the communities they affect. Students will be able to describe a particular disastrous event from history and discuss what could be done to improve the community's resilience and ways to prevent or minimize the effects of another disaster of this type if it should occur again in the future.

While learning these specifics, students will also use many resources. They will work in collaborative pairs to create and present information to their peers. This is an important teamwork skill for them to practice. Using their one-to-one technology, they will create Google Slides and Docs and work together to produce a cohesive product. This will force them to work as a team as well as practice using collaborative technology. In doing these things, students will learn about the important aspects of a professional presentation including using appropriate Slides backgrounds and colors as well as fonts of appropriate type and size. They will practice adding pictures to their presentations and some will hopefully imbed videos into them as well. Creating the 1-pagers will force them to think about what information in their presentation is most important for their peers to know and by writing a quiz they will identify what they feel is the most important information for others to learn from their research. Students will present their research allowing them to demonstrate their command of the material while practicing public speaking.

In their final activity, creating a graphic novel, students will demonstrate their understanding of the disaster they have researched by creating a fictional story with certain parameters. These parameters will allow them to show that they understand how to prepare for a disaster of the type they researched, what to do during such a disaster,

and how a community may recover afterward. They will use vocabulary specific to their disaster in the graphic novel and will create a "call to action" in which they convey to their audience what they think is the most important thing in keeping the community safe.

Student Prior Knowledge

The grade of the students (7^{th} or 8^{th}) and semester in which I teach them will determine the amount of prior knowledge they have about natural occurrences. The eighth graders learn about many weather-related events, such as hurricanes and earthquakes, in their science classes. However, it depends which semester I'm teaching them as to how much background they already have. For this reason, as well as the fact that the seventh graders have no background on the subject, students will use the Weather Wiz Kids and Ready.gov websites to ensure that all students have the same knowledge of each type of weather event – hurricane, lightening, rain and floods, thunderstorms, tornados, winter storms, earthquakes, tsunamis, volcanos, and wildfires. Students will research information about other types of disasters, such as technological or man-made disasters, from sources beginning with sites provided by me.

Teacher Prior Knowledge

Emergency, Disaster, and Catastrophe

Emergencies, disasters, and catastrophes are very different events. Quarantelli notes that disasters aren't merely "bigger accidents" than everyday emergencies, but that the differences between emergencies and disasters lie in 4 different areas. First, the immediate convergence that occurs during a disaster leads more and different organizations to work together. This convergence of unfamiliar groups does not happen in every day emergencies. Secondly, individuals and community organizations lose their independence in a disaster due to oversight by new social entities. Different performance standards occur during disasters due to the heightened need for response and finally private things such as goods, equipment, and personnel are often collapsed into the public sector to aid in response to disaster. Similarly, events that are qualitatively different than the more "typical happenings" have become called catastrophes due to the unique nature of the events and the response needs. Likewise, there are 4 distinguishing factors between disasters and catastrophes. In a catastrophe, not only are most of the community structures affected, but the facilities of emergency organizations are also hit. Local officials are often unable to perform their work duties for long periods of time. This can include medical and police personnel therefore making usual important community services unavailable. Most places of work, recreation, worship, and education are so severely affected that they completely shut down for extensive periods of time and communication and transportation are affected by shortages of electricity, water, mail, and phone services. Finally, in a catastrophe, communities cannot rely on help from nearby communities because they are often stricken by the event as well. Although these

larger-scale things may be affected, research has shown that behavior on a micro level is often very similar in disasters and catastrophes with community support behavior increasing (i.e., community search and rescue teams) and antisocial behavior decreasing (i.e., the low incidence of looting). Quarantelli notes that planning and managing catastrophes as closely to that of disasters is important because asking people to respond in familiar ways will lead to better response. However, he also notes that catastrophes require more creative and innovative thinking and actions due to the actual scale of the event.[1]

More recently, Quarantelli has added prolonged media attention and the complexity of government assistance to these original 4 factors. During a disaster, media attention at a local level is a given and larger disasters will attract attention from outside the immediate community for at least a few days. A catastrophe draws media attention for a much longer time and often at a national level. This may be due to the fact that in a catastrophe, local resources are affected and are unable to report on the situation, therefore national reports are made. A major issue with this type of reporting is that filtering and fact-checking of information is often reduced which can lead to miscommunication or misrepresentation of the event. As for government assistance, as more assistance is needed (such as in a catastrophe versus a disaster), higher government officials become involved. This leads to more complex situations in which organization and communication efforts can cause problems for those attempting to assist in the situation.[2] Wachtendorf, Brown, and Hogluin-Veras also noted the extent of "out-migration" as a factor in determining the severity of an event with more out-migration noted in larger catastrophes leading to increased challenges in recovery efforts. They also noted that, although being able to classify an event as simply an "emergency", "disaster", or "catastrophe" would be helpful, these events are part of a continuum and true classifications are difficult to make.[3] The extent to which the presence of these factors is seen often determines how the event is classified.

Vulnerability

Understanding what makes a population vulnerable to an event can be important in recovery and resilience, as well as finding the root of the problem in order to attempt to resolve the problem so that disasters don't affect as many people in the future. Vulnerability is partially geographic, but also arises from the systems or subsystems that are in place in certain societies.[4] These systems can be physical (geographical locations or naturally occurring land elements) or social (the ability to evacuate) in nature.

Recovery

Once the immediate needs of a community are met after a disaster, the victims will need to rebuild their homes, services, and lives in general as well as strengthen their ability to cope with future disasters. If communities simply restore themselves to pre-

disaster levels, they may inadvertently be making themselves vulnerable to the next disaster. They must analyze their situation in terms of political, social, and economic contexts to identify the root causes of their vulnerability and then work to fix the things that are creating this cycle. This is the basis of disaster recovery.[5] Social capital, preparedness, and response can help a community recover more quickly and, ultimately may help them recover to a greater functioning level than they were previously.[6]

Resilience

When a disaster or emergency occurs, communities must be able to adapt to the changing conditions and recover from the disruption as quickly as possible. The functioning of a community drops when a disaster hits; by how much is determined by their level of resistance.[7] This directly affects a community's resilience. The COPEWELL model has been developed to assess community resilience after a disaster. This model separates resilience from community function and allows prediction of a community's resistance, resilience, and recovery after a disaster. This allows for identification of areas that need improvement as well as motivates the community to take action to enhance its resilience.[8]

Social Capital

Social capital includes assistance from family, friends, and communities. It encompasses things such as sharing warning information, pre-event preparations, locating shelters and supplies when needed, and obtaining immediate aid. It has been shown that with a high level of fairness and trustworthiness with preparedness communities can link their social capital to reduce the impact of and recover more quickly from a disaster.[9] There are three kinds of social capital: bonding, bridging, and linking. Bonding capital refers to relationships between individuals within certain social groups such as family and close friends. These are people with similar interests and backgrounds that are able to provide material and emotional support to each other in times of need. When those relationships reach beyond one's "inner circle" of friends and family, they enter the realm of bridging capital. Examples of this are neighbors or friends of friends. These relationships form "bridges" across people of different social, ethnic, religious, and racial groups that can provide access to information or other helpful groups to which one may not have access without this bridge. Linking capital provides communities access to higher, more formal organizations such as political leaders, government agencies or corporations that may be of service to the community in its time of need.[10] Dr. Daniel Aldrich explains the importance of social ties and social capital in his PrepTalk "Social Capital in Disaster Mitigation and Recovery".[11]

Convergence

When a disaster occurs, there is typically a spontaneous rush of people, supplies, and information toward the area of the disaster. A disaster of any size, even something relatively small, can become a national or even international event due to today's modern communications and social media. The convergence of local volunteers can be helpful until official authorities and personnel arrive. The convergence of helpers can fill in gaps of assistance during disaster or catastrophic events. Goods coming in from the outside - when requested, appropriate for the context and timing, and when a storage and distribution system is in place – can be essential. Because initial reports can be very dramatic and often exaggerated, the sudden influx of resources is frequently uncoordinated, unplanned, and of an unexpected magnitude. For example, the influx of donations can be overwhelming, especially when they are inappropriate or unneeded. There may be no place store items from the weather. Goods may arrive damaged or with labels that have fallen off. Some items may be needed in a month, but not at the moment. The media may suggest that donations are needed without specifying exactly what is needed or without checking with the local authorities or recipients first. Sometimes officials ask for everything and anything, not appreciating the considerable logistical challenges that will accompany their request. This can lead to using considerable personnel resources to figure out how to manage their distribution or disposal when these people could be more helpful in other areas. For this reason, the public should be encouraged to give cash donations to legitimate organizations that can then be used for appropriate supplies at appropriate times. Proper planning can assist with this.[12]

Types of Disasters

Natural Disasters

Geophysical disasters include events such as earthquakes, landslides, tsunamis, and volcanic activity. Earthquakes are a natural way for the Earth to release stress caused by the movement of plates on the surface.[13] When this energy is released, it can cause violent shaking of the ground and all things in the area. The amount of damaged caused by an earthquake depends on the amount of energy released, or "size", of the earthquake and then any aftershocks that may occur. Volcanic eruptions are caused by gas pressure that builds up under ground and is then released. These can also result in a flow of lava that endangers nearby residents and threatens their homes. Tsunamis are caused by an underwater earthquake or volcanic explosion that causes very large ocean waves that flow straight at the coastline. These happen quickly and without warning leaving little time for residents to seek shelter. Although data can give scientists a rough estimate of the likelihood of any of these events occurring, these are generally thought to be unpredictable events.

Avalanches and floods are included in the category of hydrological disasters. An avalanche is the rapid falling of snow, ice, and rock down a mountainside.[14] People exploring the outdoors or planning to go skiing or snowmobiling should note the

conditions that indicate an avalanche could happen. These signs include a slope of 30-45 degrees, a snowfall of twelve or more inches within the last twenty-four hours, and some sort of trigger such as the added weight of the snow or a person on an area of weak snow.[15] Blizzards and winter storms bring heavy snow and cold temperatures to areas. These can be deadly for many reasons including their effect on travel as well as their cold temperatures. When water from melting snow or heavy rain cannot be absorbed by the ground at the pace at which it is building, flooding may occur.[16] This can cause damage to housing, but flash flooding is particularly problematic for drivers.

Extreme temperatures, droughts, and wildfires are examples of climatological disasters. A prolonged time period of abnormally hot weather is a heatwave. Specifically, if the maximum daily temperature exceeds the average temperature by nine degrees for five days or longer, this time period is classified as a heatwave. These events can eventually lead to emergency situations for those affected. High temperatures combined with lack of precipitation can also lead to drought. A drought is a prolonged period of dry weather causes that both surface and subsurface water supplies to drop below normal levels. This can leave communities with a short supply of water for their everyday tasks including safe drinking water. Droughts can also cause vegetation to die and become very dry. When this happens, along with high winds the risk of wildfires increases. A wildfire can be set by a person, whether it be intentional or not, or any spark that happens even from dry branches rubbing together. Unplanned fires that burn in natural areas for extended periods of time often become wildfires. Affected areas include forests, grasslands, and prairies.

Meteorological disasters include hurricanes or cyclones and the storm surges often caused by these events. Hurricanes are large storms several hundred miles across with high winds and drenching rains. They form over warm water with windy conditions and then travel toward land where they threaten communities. Once they make landfall they lose their energy because they no longer have the warm ocean water from which to draw moisture. These storms are also called typhoons or cyclones depending on the area of the world in which they occur. As these storms move toward land, their winds push water with them and as they reach land, this water is pushed onto the beaches. This is known as a storm surge. Hurricanes are not only devastating due to their high winds and rain but can also cause flooding of coastal communities due to their storm surges. When a storm is created by warm air from the south and cooler air from the north, thunderstorms often develop and with these can come tornadoes. Changes in wind speed and direction can cause the rotating air to tilt vertically causing a funnel cloud or tornado to develop.[17] These winds can reach 300 miles per hour and can cause much destruction, especially when they touch the ground.

Biological Hazards

Biological hazards are organic in origin and are naturally occurring in the environment in most cases. These become hazardous when they become toxic or harmful to living organisms. Examples include disease epidemics such as malaria, dengue fever, meningitis, and influenza, pest infestations, diseases transmitted to humans by animals, and medical waste including used needles and expired medications.[18] Communities can become vulnerable to these hazards if they have poor sanitation practices, hospitals in the area do not dispose of their medical waste properly or cannot quarantine certain patients to prevent the spread of disease, if people do not practice safe sex or good personal hygiene, there is limited access to vaccines or no vaccine for the particular threat, or they are used with malicious intent or as a terroristic act. These are rather specific hazards that require personnel trained to handle them. Lack of appropriate personnel or training can increase a community's risk.

Technological Hazards

Events that are caused by humans and that occur close to locations where humans live are called technological or man-made hazards. These hazards originate from technological or industrial accidents and are often the result of dangerous procedures, infrastructure failure, or specific human activities that can cause death or injury, damage to property, degrade the environment, or cause social or economic disruption to a community.[19] Complex emergencies, conflicts, famine, the displacement of populations, industrial accidents and pollution, toxic waste, dam failures, factory explosions, chemical spills, fires, and transport accidents including airplane, train, and vehicle accidents all fall in this category.[20] The incidence of these types of disasters has increased as population has increased, and the world has become more industrialized.

Teaching Strategies

I will use a variety of teaching strategies, but the primary strategy will be collaborative pair work. Students will be allowed to choose their own partners for this project because I believe people work best when they are comfortable with their working group. However, I understand that there may be an odd number of students in the class or students who do not pair up with friends. In the case of an odd class size, I will allow the final student left to choose whichever group they wish to work with, as long as it is agreeable to the pair he or she chooses. If the first choice is not agreeable, he or she will make a second choice. For students who do not naturally pair up, I will recommend partners until each student has an acceptable match.

The one-to-one technology initiative in our school district allows for many collaborative strategies to be used. Our district uses Google, so students will create their presentation using Google Slides and their 1-pagers and quizzes using Google Docs. Although students use these programs in many other classes, it is always good to give them more practice. I will give them advice and instruction on creating a professional

looking presentation and document and then give feedback when they actually present to the class.

Vocabulary instruction is always a valuable part of any lesson. In this case I am targeting words that have to do with disasters. Some of the new vocabulary are general to all of the students and their research topics while other words, as suggested by my seminar leader Tricia Wachtendorf, are specific to the particular type of disaster the students are researching. Students must use these words in their presentations and demonstrate their understanding of each. This type of targeted vocabulary in conjunction with language engagement and use of the specific words in context has been shown to increase students' vocabulary.[21]

It is said that public speaking is most people's biggest fear. For this reason, it is important that students begin speaking in front of their peers early and become as comfortable as possible at this skill. The oral presentation strategy will be used for exactly this purpose. Students will practice presenting their research to their peers in a professional manner. We will discuss the importance of things such as making eye contact with the audience, body language, volume of voice, being prepared, and using minimal notes rather than reading from the slides.

Graphic novels are a visual way to tell a story or express an idea. They are particularly effective for teaching concepts to students because they bridge the gap between things we watch and things we read. Students are surrounded by visual materials all the time and a graphic novel is a way they can tell a story with both words and pictures.[22] Students will write a story with a beginning consisting of preparation information about their disaster, a middle telling what to do during the disaster, and an end describing what to do after the disaster. By using a graphic novel approach rather than regular story writing, students can add a visual to their story.

Classroom Activities

In my research I came upon a plethora of disasters, everything from the "usual" natural disasters of hurricanes, earthquakes, and wildfires, to the more "unusual" such as the Challenger Shuttle disaster and the Deepwater Horizon explosion. I would like to begin with a discussion about the differences among the terms *emergency, disaster*, and *catastrophe* as well as an introduction of *vulnerability, recovery,* and *resilience*. We will talk about the importance of social capital and its types (i.e., bonding, bridging, and linking capital) as well as the convergence that occurs after a disaster takes place. This will be done with an opening Disaster Words to Know Vocabulary Hunt activity. Students will describe what the difference is between an emergency and a disaster as well as the difference between a disaster and a catastrophe. They will use their Chromebooks to find and define the words *vulnerability, recovery, resilience, bonding capital, bridging capital, linking capital, convergence, geophysical disasters, hydrological disasters,*

climatological disasters, *meteorological disasters*, *biological hazards*, and *technological hazards.* A discussion of these words will follow the warm up activity. Then I will show the video "Disaster relief donations that don't bring relief" and discuss why these types of donations are more problematic than helpful for relief workers.[23]

I want my students to understand that disasters can take many forms. These could be the various types of natural disasters that they may be more familiar with such as geophysical, hydrological, climatological, and meteorological, or things they are less likely to be aware of such as biological, or technological (or man-made) disasters caused by humans.[24] Once they understand the different types and how they might come about in general terms, they will learn more about each type of disaster by investigating a specific type and then highlight a historical event. The class will brainstorm examples of events from throughout history that they have heard of and/or learned about that are examples of these types of events and I will lead them to other specific examples that they may not be aware of due to their age and attention to these types of things. I will allow students to choose their own partners and help pair up those without partners and will then randomly assign an event for each pair of students to research. Each pair will create a Google Slides presentation about their assigned event which will include information about the general type of disaster they have been assigned as well as details about a specific event in history. They will discuss what primary type of disaster this is – geophysical, hydrological, climatological, meteorological, biological, or technological – and explain why it is this type. They will tell about this particular type of disaster whether it is an earthquake, tsunami, volcanic eruption, avalanche, winter storm and blizzard, flood, heatwave, drought, wildfire, hurricane, biological hazard, or technological hazard. They will describe what causes this type of disaster, where this type of disaster most commonly occurs, how this type of disaster affects the community, whether people can prepare for this type of event and if so, how. They will describe what people should do during an event of this type and if there are certain procedures or protocols that should be followed. They will also discuss what things people have to do afterward to recover from this type of disaster. As recommended by my seminar leader, students will have certain vocabulary words to define or explain pertaining to their disaster. For earthquake students will define epicenter, after shock, seismic waves, Richter Scale, fault line, seismograph, and Continental Drift. For tsunami, students will define tsunami warning, tsunami watch, tsunami advisory, crest, surge, and trough. For volcanic eruption students will define lava, magma, active volcano, dormant volcano, extinct volcano, pyroclastic flow, pumice, Ring of Fire, geyser, ash, fissure, and vent. For avalanche students will define beacon, bed surface, sluff, slab avalanche, and weak layer. For winter storm and blizzard students will define winter storm outlook, winter weather advisory, winter storm watch, winter storm warning, blizzard warning, wind chill, wind chill advisory, and wind chill warning. For flooding students will define flash flood, flood or flash flood watch, flood or flash flood warning, and urban and small stream advisory. For drought and extreme temperature students will define drought index, drought indicator, reservoir, and heatwave. For wildfire – students will define surface fire, ground fire, crown fire, Santa

Ana Winds, and conflagration. For hurricane or storm surge students will define eye, storm surge, tropical storm warning, tropical storm watch, hurricane watch, hurricane warning, hurricane stages, Saffir-Simpson Hurricane Scale, typhoon, and cyclone. For biological hazards students will define bacteria, virus, infestation, epidemic, sanitation, quarantine, and vaccine. For technological hazards students will define technological, industrial, and infrastructure.

Once information on the general type of disaster is conveyed, students will describe one specific disaster of this particular type from history. In some cases, students will be allowed to choose the specific disaster they present on whereas in others, particularly biological and technological disasters, they will be assigned a specific event. For each disaster, teams will discuss where and when the event occurred. They will discuss whether there were certain communities that were more heavily affected than others as well as how many victims there were (if known), how many people were displaced (if known), if there was destruction of property and if so, how extensive it was. If known, students will discuss the economic impact of the disaster on the community. Specific events that could be researched include earthquakes such as the Alaska earthquake (2018), the San Francisco earthquake (1906), the Valdivia, Chile earthquake (1960), or the Sumatra, Indonesia earthquake (2004). Tsunamis that could be studied include those in Japan (2011), Lisbon, Portugal (1755), and Northern Chile (1868). Volcanic eruptions that may be studied include the Kilauea Volcano (2018), Mount Tambora (1815), and Santa Maria (1902). Avalanche examples include Huascarán avalanche (1970) and Blons, Austria "The White Death" (1964). Winter storms and blizzards include "The White Hurricane" of 1913, The Blizzard of 1996, and the Blizzard of 1978. Students researching floods could report on the 2018 Kerala, India monsoon floods or the 1931 Yangtze River flood. The 1995 Chicago heatwave is an example of a disaster caused by extreme temperatures. Extreme temperatures can also bring about droughts such as the drought in the 1930s that resulted in The Dust Bowl. Wildfires such as those in California (2018), the Black Saturday Bushfires (2009), or the Greece wildfires (2018) could be researched. Many examples of hurricanes exist including Katrina, Mitch, Sandy, Harvey, and Maria to name only a few. Storm surges often accompany hurricanes but can be destructive in their own right such as the storm surge of the Galveston Hurricane of 1900. A wide variety of biological hazards exist. Threats such as the Avian flu, cholera, dengue fever, Ebola, malaria, Yellow Fever, HIV/AIDS, and Tuberculosis make good research topics. Similarly, there are a variety of technological: Deepwater Horizon, Three Mile Island, Space Shuttle Challenger, Italian bridge collapse, and the Hyatt Regency walkway collapse only name a few, but I want to keep these topics to those that can be classified as "accidents" rather than something planned out like a bombing or terrorist attack that, although may be considered a disaster, is not quite of the same type as the others. Once a disaster has been chosen and described, students will tell what, if anything, could have been done to prevent or lessen the impact of the event and what has been or could be done to improve resilience of the community involved. Although moving away may be logical in some cases, students will discuss what could be done by those who stay in that

location. They will conclude by describing whether there is a way this disaster could be prevented or minimized in the future (i.e., not purchasing property in a flood-prone area where levees are aging and not kept up; not building skyscrapers along active fault lines, etc.).

All research will be completed in class unless the pair falls behind and needs to make up work at home and the Slides presentation will be submitted on Schoology. A one-pager of information on the specific type of disaster as well as a one-pager on the specific historical event will also be created and submitted on Schoology. I will print and make copies of the one-pagers for the presenting group to hand out as part of their presentation. Students may use the one-pagers as notes to help them while they give their oral presentation. Each group will also create a 5-question quiz about their disaster which I will type into Schoology. This quiz will be given immediately following the presentation. Students will use true-false and multiple-choice questions in their quizzes and will be allowed to write one extra credit question if they so choose. The presentation and quizzes will be summative grades while the one-pagers and created quiz questions will be formative grades.

Once students have completed their research, they will give their presentations. For some of the disasters, particularly the weather-related ones, I will supplement their presentations as needed with whole class instruction on some basic information on that particular type of event that may have been missed to ensure students receive certain important information. For example, for natural disasters, I will use information from the Weather Wiz Kids site which gives information on weather-related events in terms young students can understand. For example, if discussing hurricanes, the Weather Wiz Kids website covers basic information on how hurricanes form, how hurricanes are named, shows what a storm surge is, past hurricanes and their routes, important terminology, hurricane stages and classifications, the Saffir-Simpson Hurricane Scale, hurricane safety before, during, and after an event, and evacuation tips. Although I expect good presentations will cover most of this information, I want to make sure it is covered at a basic level. Each student will have a world map handout and we will mark on the map where it is most likely for hurricanes (typhoons, cyclones) to occur and why it is important to know about these disasters and where they occur (i.e., when planning vacations, etc.). We will discuss resilience as it relates to this particular disaster. We will then move on to another type of natural disaster or threat, repeating the same process until all of the natural disasters are complete. We will look at the world map that we have labeled and generally discuss the outcome of our information collection.

Once we finish with natural disasters we will move on to technological disasters and threats. This will encompass a much wider variety of disasters and emergencies including things that were caused by human error or carelessness, or technology. I have decided to not include examples of terrorism because I would like to keep to the general theme of disasters that are “accidents” as opposed to disasters that were planned and carried out by

a particular individual or group. Throughout our discussions, I will keep a running list of the "causes" of the disasters, for example, Mother Nature, governmental agencies, corporate leaders, lack of political will, etc. We will discuss the basics of these types of events as we run through the presentations and will have a more in-depth discussion once everyone has presented. Students will identify areas where they can have an impact on the prevention of and/or recovery from these events as well as things they should watch out for to possibly help minimize or prevent these things from happening and why this is important. We will discuss improvisation, what it means, and how it can be important in many situations. I will share the Coast Guard story from *The Social Roots of Risk* and discuss when is it acceptable to "branch out" or go against protocols leading to discussion about why thinking for yourself, problem solving, and adaptation can be vitally important in an emergency situation.[25] Additionally, we will watch the YouTube video *Improvising Disaster*.[26] In this video, Wachtendorf discusses how boat Captains improvised the rescue of people trapped in Manhattan after the Twin Towers collapsed on September 11, 2001. We will discuss what these people did and why they came together to help those affected by the disaster.

Finally, we will discuss social capital and its types in more depth and why it is an important part of surviving an emergency and/or recovering from a disaster. We will revisit the topic of panic and if it commonly occurs in emergency situations. Students will read an excerpt from *The First 72 Hours: A Community Approach to Disaster Preparedness* entitled "Hesitancy to Evacuate" and will turn and talk to their neighbor about the reading, then share out their thoughts.[27] Convergence in terms of donations and other recovery aid will again be discussed including timeliness and appropriateness of donations and what others who want to support affected communities can do that will help the survivors as opposed to being a nuisance or creating more problems as seen in the video at the beginning of the unit. I will use Answer Garden and ask students to post the 1 thing they think is the most important to donate after a disaster. After this we will again discuss the overwhelming donations previously studied and revisit the best methods of donating to a disaster.

As a final activity, students will complete the Disaster Masters game from the Ready.gov website to review disaster preparedness steps. This activity will be the catalyst for them to create Disaster Master graphic novels. For the graphic novel, they will create an Emergency Hero and tell a story about their disaster and how their Hero "saves the day" with the help of all those involved, noting that everyone can help in a disaster. The graphic novel will include a story with general facts about and vocabulary pertaining to their type of disaster (not the historical event), how their characters react, and how their Hero resolves the issue. This will include a "Call to Action" where the students will convey what they want the public to learn or remember about acting in an emergency. Students will be provided with the Disaster Graphic Novel Planner from Ready.gov to plan their graphic novels. The planner takes them through all of the step in creating their graphic novel including the title, disaster, characters, facts about the disaster, setting,

beginning, middle, end, and call to action. They will be provided with copies of the DIY Disaster Graphic Novel Creator story boards to use in the creation of their graphic novels. The graphic novels will include characters and drawings of the students' own creations, not copyrighted materials or characters. The graphic novel will serve as the final summative grade and culminating activity for this unit.

Resources

Teacher Resources

Resources for the teacher can include various websites with information on the specific events throughout history by searching for the event in a web browser. *The Social Roots of Risk: Producing Disasters, Promoting Resilience* by Kathleen Tierney is an outstanding resource that discusses various aspects of many different events and their impact on the societies they affected. These accounts include some specific lessons that can be learned about how various entities affect each other during the recovery from disaster. The Weather Wiz Kids website is another great resource for basic information on various natural disasters and interesting facts. It also has ideas for other lessons. The YouTube video of the CBS story "Disaster relief donations that don't bring relief" does a nice job of explaining why too many and certain types of donations can become problematic. It also gives ideas as to how the public can truly be helpful to communities affected by disaster. Another great YouTube resource to demonstrate spontaneous problem solving in an emergency situation is the presentation "Improvising Disaster" given by my seminar leader Tricia Wachtendorf. The FEMA video "PrepTalks: Dr. Daniel Aldrich "Social Capital in Disaster Mitigation and Recovery"", gives detailed information on the importance of social ties during disaster and a thorough explanation of social capital. Ready.gov is a resource teachers can use for printable materials for the graphic novel portion of this unit such as planners and story boards.

Student Resources

Students will use their Chromebooks and Google Slides and Docs to create their presentations, one-pagers, and quizzes. They will use a web browser to look up information on their disaster type and event. They will take the quizzes on their Chromebooks on Schoology, our online "classroom".

Bibliography

Aldrich, Daniel. 2018. *PrepTalks: Dr. Daniel Aldrich "Social Capital in Disaster Mitigation and Recovery".* FEMA HQTV. February 26. https://www.fema.gov/media-library/assets/videos/159962.

This presentation is a great description of social capital and how important social ties are in the recovery from a disaster. Dr. Aldrich uses Hurricane Katrina recovery as a basis for his research.

American Red Cross Preparecenter.org. 2018. *Technological hazard.* Accessed November 16, 2018. https://www.preparecenter.org/topics/technological-hazard.

This website describes technological disasters.

Auf der Heide, Erik. 2003. "Convergence Behavior in Disasters." *Annals of Emergency Medicine* 41 (4): 463-466.

This article describes convergence, particularly of medical supplies and personnel. This convergence of resources is expanded to donations and volunteers in general and advice is given on being more specific about needs rather than allowing the media to put out a general call for help.

Auf der Heide, Erik. 2004. "Common Misconceptions about Disasters: Panic, the "Disaster Syndrome", and Looting." Chap. 27 in *The First 72 Hours: A Community Approach to Disaster Preparedness*, by M O'Leary, 340-380. Lincoln, NE: iUniverse Publishing. Accessed October 10, 2018. https://www.atsdr.cdc.gov/emergency_response/common_misconceptions.pdf.

The idea of panic and the misconception of looting are described in this chapter, along with a discussion of why people are hesitant to evacuate when warned of a pending disastrous event. The chapter also describes social capital and how planning that includes community disaster preparedness training can be highly effective in the event of a disaster.

Britt, Robert Roy. 2010. *What triggers an avalanche?* March 12. Accessed November 15, 2018. https://www.livescience.com/32138-what-triggers-an-avalanche.html.

This website describes avalanches and their triggers.

Butler, Shari, Kelsi Urrutia, Anneta Buenger, Nina Gonzalez, Marla Hunt, and Corinne Eisenhart. 2010. *A Review of the Current Research in Vocabulary Instruction.* A Research Synthesis, National Reading Technical Assistance Center.

This report is a metanalysis describing research-based best practices in teaching vocabulary.

CBS Sunday Morning. 2016. *Disaster relief donations that don't bring relief.* April 24. Accessed October 27, 2018. https://www.youtube.com/watch?v=pzH-7k035sM.

This YouTube video discusses the appropriateness and timing of donations after a disaster.

International Federation of Red Cross and Red Crescent Societies. n.d. *Types of Hazards: Definition of Hazard.* Accessed October 10, 2018. http://www.ifrc.org/en/what-we-do/disaster-management/about-disasters/definition-of-hazard/.

This website describes vulnerability and disasters. It also defines and categorizes hazards into various natural and technological types. It ends by discussing recovery and the need for advancement in disaster planning.

Johns Hopkins Bloomberg School of Public Health. n.d. *The COPEWELL Model.* Accessed October 14, 2018. https://www.jhsph.edu/research/affiliated-programs/copewell/the-copewell-model/index.html.

This website describes the COPEWELL (Composite of Post-Event Well-being) Model which measures the pre-event functioning of a community and predicts post-event functioning using a dynamics model. It discusses community resistance, recovery, and resilience.

Links, Jonathan M., Brian S. Schwartz, Sen Lin, Norma Kanarek, Judith Mitrani-Reiser, Tara Kirk Sell, Crystal R. Watson, Doug Ward, Cathy Slemp, Robert Burhans, Kimberly Gill, Tak Igusa, Xilei Zaho, Benigno Aguirre, Joseph Trainor, Joanne Nigg, Thomas Ingelsby, Eric Carbone, and James M. Kendra. 2018. "COPEWELL: A Conceptual Framework and System Dynamics Model for Predicting Community Functioning and Resilience After Disasters." Disaster Medicine and Public Health Preparedness 127-137.

This article offers a model for predicting community functioning after a disaster. It separates resilience from community functioning identifying key components of each.

National Geographic. 2015-2018. *Avalanches.* Accessed November 8, 2018. https://www.nationalgeographic.com/environment/natural-disasters/avalanches/.

This website describes avalanches and how they are formed.

Office of Disaster Preparedness and Management. 2013. *Biological Hazards.* Accessed November 16, 2018. http://www.odpm.gov.tt/node/28.

This website describes biological hazards including examples of various types of biological hazards and gives general information on how biological disasters occur and how to manage them.

Quarantelli, E. L. 2006. "Catastrophes are Different from Disasters: Some Implications

for Crisis Planning and Managing Drawn from Katrina." Understanding Katrina. June 11. Accessed January 21, 2019. http://understandingkatrina.ssrc.org/Quarantelli/.

This article delves deeper into the 6 major elements Quarantelli believes differentiate disasters from catastrophes and discusses the continuum of destruction.

Quarantelli, E. L. 2000. *Emergencies, Disaster, and Catastrophe are Diffferent Phenomena.* Preliminary Paper #304, Newark: University of Delaware Research Center.

This paper discusses the major elements differentiating every day emergencies from disasters and disasters from catastrophes.

Social Capital Research and Training. 2018. *What is Bonding Social Capital?* January 6. Accessed December 6, 2018. https://www.socialcapitalresearch.com/what-is-bonding-social-capital/.

This article describes the different types of social capital and how they are related to one another.

Sudeka, Sumaiya, Mohd Suhaimi Mohamed, Mohammad Imam Hasan Reza, Jamiah Manap, and Md. Sujahangir Kabir Sarkar. 2015. "Social Capital and Disaster Preparedness: Conceptual Framework and Linkage." *E-Proceeding of the International Conference on Social Science Research.* Lumpur, Malaysia: Researchgate. 178-188.

The availability of social capital and linking different sources can combine to aid in quicker recovery from a disastrous event.

Tierney, Kathleen. 2014. *The Social Roots of Risk: Producing disasters, promoting resilience.* Stanford, CA: Stanford University Press.

This book describes various disaster events and the social reasons they happened. It goes into ideas of social capital, preparedness, and resiliency. The events described are both natural and man-made disasters.

Wachtendorf, Tricia. 2017. Improvising Disaster. July 13. https://www.youtube.com/watch?v=TlGJGfZA9MQ.

This presentation describes how people, particularly boat captains, came together and problem solved to help evacuate those who were trapped in Manhattan after the September 11th attacks.

Wachtendorf, Tricia, Bethany Brown, and Jose Hogluin-Veras. 2013. "Catastrophe Characteristics and their Impact on Critical Supply Chains: Problematizing Materiel Convergence and Management Following Hurricane Katrina." Journal of Homeland Security and Emergency Management. September 12. Accessed January 21, 2019. https://www.degruyter.com/view/j/jhsem.2013.10.issue-2/jhsem-2012-0069/jhsem-2012-0069.xml.

This article focuses on Hurricane Katrina and proves Quarantelli's characteristics of catastrophe. It also proposes a seventh characteristic of mass out-migration of people following extreme events.

Wicker, Crystal. 2017. *Weather Wiz Kids.* Accessed October 28, 2018. https://www.weatherwizkids.com/.

This is a fantastic resource for teachers and students for general information on weather and disasters. It describes many weather related and other natural disasters including definitions of terms related to the various events, safety measures that should be taken, and other information specific to each type of disaster. It also has an extensive list of experiments that can be done relating to each type of disaster complete with a list of materials and detailed instructions.

Yang, Gene. 2008. "Graphic Novels in the Classroom." *Language Arts*, January: 185-192.

This article, written as a graphic novel, describes graphic novels and why they are such a great way for students to tell a story due to the combination of visual and print material.

Appendix

Implementing the National Health Science Standards

As a teacher of skilled and technical sciences in physical therapy, I teach the National Health Science Standards of the National Consortium for Health Science Education rather than district standards. Many of these national standards are addressed in this unit. Standard 2 centers on concepts of effective communication including modeling verbal and nonverbal communication, practicing speaking, utilizing proper elements of electronic communication (spelling, grammar, and formatting), and preparing informative writing. Standard 7.5 directly addresses emergency procedures and protocols including applying principles of basic emergency response in natural disasters and other emergencies such as finding safe locations, contacting emergency personnel, and following emergency protocols. Because students are working in pairs, standard 8 of

team member participation is met including building positive team relationships, working on interpersonal skills, managing roles and accountability, and managing team conflict with clear expectations and negotiation. Finally, standard 11.3 is addressed by the use of basic computer skills including the use of various computer applications and evaluating the validity of web-based resources.

Notes

[1] (Quarantelli 2000)
[2] (Quarantelli 2006)
[3] (Wachtendorf, et al. 2013)
[4] (Tierney 2014)
[5] (International Federation of Red Cross and Red Crescent Societies n.d.)
[6] (Johns Hopkins School of Public Health n.d.)
[7] (Johns Hopkins School of Public Health n.d.)
[8] (Links, et al. 2018)
[9] (Sudeka, et al. 2013)
[10] (Social Capital Research and Training 2018)
[11] (Aldrich 2018)
[12] (Auf der Heide 2003)
[13] (Wicker 2017)
[14] (National Geographic 2015-2018)
[15] (Britt 2010)
[16] (Wicker 2017)
[17] (Wicker 2017)
[18] (Office of Disaster Preparedness and Management 2013)
[19] (American Red Cross Preparecenter.org 2018)
[20] (International Federation of Red Cross and Red Crescent Societies n.d.)
[21] (Butler, et al. 2010)
[22] (Yang 2008)
[23] (CBS Sunday Morning 2016)
[24] (International Federation of Red Cross and Red Crescent Societies n.d.)
[25] (Tierney 2014, 216)
[26] (Wachtendorf 2017)
[27] (Auf der Heide 2004)