Psychological Vulnerability in Disasters

Shelby Borst

Introduction

William Penn High School currently stands as the only high school of the Colonial School District in New Castle, Delaware. The building consistently enrolls approximately 2,100 students each year from New Castle, Delaware City, and Southeast sections of Wilmington. Based on 2017-2018 data provided by the State of Delaware Dept. of Education, William Penn High School houses students of diverse backgrounds, race, educational levels, and socioeconomic status. The school population is diverse with 47.1% of African American students, 25% of Caucasian students, and a growing population of Hispanic students representing 22.9% of the school's population. Students with disabilities represent 17.9% of the student body, with 60% of these students having a learning disorder. At 36.4%, over one-third of the study body served comes from a low-income family. As diverse as the student population is, the goal remains simple, every student will graduate prepared for entering the workforce or continuing their education in college.

With a focus on college and career readiness, students enter high school by choosing their academic pathway to graduation. From three college academies, students choose from twenty unique degree programs ranging from agricultural and culinary arts to international and legal studies. Students are encouraged to participate in authentic vocational programs such as Penn Farm or the Teacher Academy as well as exemplary extracurricular athletics and after-school clubs. The school also offers Advanced Placement programs for students who strive to take college level courses and a vast selection of electives for students who wish to expand their interests. Distance Online Learning courses were also introduced at the beginning of the 2017-2018 school year. The Distance Online Learning program serves students who need additional credits or learning support, or ambitious students who wanted a new learning experience.

In recent years, the Colonial School District has aided with the college and career readiness initiative by emphasizing inclusivity through blended learning models and other effective uses of technology in the classroom. In addition to district professional development opportunities for teachers, the ninth-grade classrooms have been supplied with enough laptops to go 1:1. William Penn High School has also debuted its very own Innovation Center last year in accordance with the goal of college and career readiness. The renovated library now features multiple study rooms equipped with smart TV's, whiteboards, projectors, and laptops for student use. Teachers and staff are often

encouraged to use these means to provide a more effective, individualized learning experience for all students.

By providing this type of learning experience, students of all levels are set up to succeed in their courses and in their pathways. My role in the classroom is to activate and facilitate student learning for our AP Psychology program at William Penn High School. Our students, ranging from 10^{th}-12^{th} grade, enter the college level course to explore the human mind and study our behavior. Although we investigate a variety of topics such as personality, intelligence, and psychological disorders, I find that student understanding and engagement is best when students have cross curricular and authentic learning experiences. By incorporating disasters into our curriculum, students will be able to learn more about disaster science, discover correlations between disasters and trauma, as well as apply psychological concepts pertaining to the brain and behavior to real life situations and conditions. Students will also be able to use their knowledge to implement preventative and support measures for individuals during and after a disaster.

Rationale

The goal for this unit is for students to gain a holistic understanding of individual thoughts and behaviors during and following a disaster, which is not typically represented in the media or in a classroom setting. From the ninth-grade science curriculum, students gain an understanding of how tectonic plates produce earthquakes, volcanoes, and tsunamis. Students also learn about climate change and how climate change increases the magnitude and frequency of some natural disasters. Per the U.S. History curriculum, students will have discussed significant disasters in the past such as the Dust Bowl during the unit on the Great Depression. Students may also encounter natural and man-made disasters in the World Cultures and World Religions elective course when exploring current events. However, there is not yet a course that focuses specifically on disasters or the social science behind them. This unit would therefore be implemented as a cross-curricular enhancement introducing and expanding on the psychological aspects of disasters.

The unit is designed specifically for students in a college level AP course in Psychology, which is a full year, full credit course at William Penn High School. The curriculum currently includes fourteen units, ranging from the history of psychology and research methods to social psychology. The unit created will serve as an enhancement of the second unit on the brain and behavior, which primarily focuses on neurology, neural communication, the endocrine system, and the nervous system. This expansion will be implemented throughout the unit, enabling students to work through a continuous problem that changes parameters based on each new bit of knowledge. With this implementation, the unit will narrow in focus, while still allowing students to discover how various factors contribute to disaster-driven traumas and how those traumas have

real life consequences. Through hands-on experiences and research opportunities, the unit on psychological vulnerability will promote higher level thinking and problem solving.

Throughout the previous units, students will need to build their skills in literacy and research. Our high school has recently rolled out a new Schoology module on academic dishonesty and plagiarism that all 9th-11th grade Social Studies and 12th grade English students will complete. While completing the module, students are also tasked to find reliable and valid sources using their textbook references and online search engines. Although our students have some practice with this, I do assign additional tasks for students to find main ideas, take notes effectively, and cite their sources according to APA format. These skills are essential to student success during this unit, as students will be required to research using reliable search engines and evaluate the content within each source.

Students in my AP course have not been exposed to many, if any, college level texts and additional sources. As a result, students will need to practice and improve their reading skills with higher level text by gradually increasing the rigor of the text that is both age and grade level appropriate. From the first unit on the history of psychology and research methods, students should be exposed to at least one academic journal entry by the unit of the unit. This will allow students to evaluate multiple sources, from blogs to news reports to academic journal publications. As per the CCSS.ELA-LITERACY.RH.11-12.9, students will use these sources to integrate information from primary and secondary sources to gain a coherent understanding of an event. Students will use this information to evaluate the impact of the disaster on both the individual and the community.

This unit on psychological vulnerability will be divided into two sections, the first focusing on the psychological traumas associated with being involved in a disaster either by first or secondhand accounts. Since most students in this course may not have been exposed to a disaster other than reports from the media, we will begin the unit with predictions as to how a disaster would impact an individual's thoughts and behaviors. This will activate student's prior knowledge and build foundational knowledge of what a disaster is and what impact it can have on an individual. Students will then begin research on how disasters impact an individual both short-term and long-term after a disaster. Students will examine news articles, analyze photographs, and create media portfolios to highlight their research on how a disaster may impact a variety of individuals with different experiences, backgrounds, psychological history, and vulnerabilities. Finding relationships between unique accounts of trauma and disasters will pave the way for the second half of the unit.

The goal for the second section is for students to develop a plan or strategy to prevent disaster-driven traumas from negatively influencing an individual's thoughts and behavior before, during, and after a disaster. The second half and the final product will be

to create an extensive guide that answers the following question: What plan or steps should a government, community, and individual have in place to assist those who need psychological support or therapy before, during, and after a disaster? Each guide will have divided sections for the time of the disaster and strategies for a multitude of instances. Creating a guide with set goals, resources, and strategies will create a sense of purpose for the unit. After students have the foundational and extensive knowledge of how disasters can directly influence an individual's brain and behavior, students will then be able to apply their knowledge to create a useful plan- one they could reference in the future. While the final product will be an academic tri-fold or paper, our students will make use of the Innovation Center to present their research and innovative ideas to peers and staff members to demonstrate their knowledge.

Socratic seminar will give closure to this unit and give students an opportunity to reflect on the real-world impact of disasters on individuals' physical and mental state. Students will be able to incorporate changes to the brain and body, real life experiences and stories, as well as their guides to preventative and psychological support for individuals into their discussion piece. In closing out the unit, I aim to summarize the content knowledge for the biological bases of behavior and engage in our application of that content to an authentic experience. Students will be able to walk away with understanding and closure on the unit content.

Content Objectives

With the completion of this unit, students will be able to:

(1) Identify the impact of a disaster on an individual
(2) Discover the changes to the brain and behavior from disaster-driven trauma
(3) Examine psychological factors that contribute to mental health before, during, and after a disaster
(4) Research the psychological effects of disasters on a variety of individuals in various circumstances
(5) Develop a plan or strategy to prevent trauma and support individuals who need psychological support before, during, and after a disaster

Background Information

Defining Disaster

Although trauma and disaster may seem interchangeable, they are defined quite differently. Disasters are situations or events involving an environmental disruption that leaves large numbers of people negatively affected such in the case of an earthquake, flood, tornado, volcano, tsunami, mass transportation or industrial accident, mass murder,

terrorism, war, or genocide.[1] There are a few concepts here that help to define what a disaster is and what it is not.

First, there must be an environmental disruption. The result of an environmental disruption is typically the destruction or deterioration of the natural environment and its resources. This could include disruptions to ecosystems, changes in water and air quality or temperature, disease outbreaks, severe changes or damage to the land. When discussing the environmental damages, it is also important to note the cause of the disruption. The cause could either be natural or man-made. A natural disaster would be considered a disaster that comes from the natural processes of the earth. Examples of natural disasters would include floods, hurricanes, wildfires, and earthquakes. Man-made disasters are considered environmental disruptions that have happened due to human development and production. Oil spills, oil fires, gas leaks, nuclear power plant incidents, severe pollution, disruption caused by electronic and garbage waste piles, and war tactics such as hydrogen bombs are all considered man-made disasters.

Although the two differ in definition, they often coexist and may negatively impact individuals and communities simultaneously. Most notably, the Fukushima Daiichi Accident is a prime example of this interaction. After a magnitude 9.0 earthquake off the coast of Japan on March 11th, 2011, a large tsunami was created from the movement of the seafloor. Due to the tsunami, three Fukushima Daiichi reactors were compromised causing high radioactive releases over the next few days.[2] In this incident, the country was subjected to environmental disruption due to both natural and man-made disasters. Both natural disasters and man-made disasters could cause or trigger another to happen.

Second, this disruption must affect large numbers of people. Although individuals will certainly experience disasters differently, an isolated, individual experience cannot be considered a disaster. Instead, a disaster must affect many others. Referencing back to the Fukushima Daiichi incident, the UN Scientific Committee released a statement that no locals have been exposed to harmful levels of radiation. However, 160,000 people were evacuated from the area and only half were able to return home two years later.[3] This incident greatly affected hundreds of thousands of individuals, their families, and their livelihood.

Finally, the effect on these individuals must be negative. Negative effects on individuals and communities may include power outages, destruction of infrastructure or property, loss of life, decrease in air quality, public health hazards related to hygiene, lack of available resources, and isolation from rescue and health services. Individuals and communities may be forced from their homes and relocated to shelters or other areas until it is safe to return home. At times, individuals may face permanent relocation. In a disaster, the standard of living will often dramatically decrease due to environmental damage that must be repaired. Depending on the severity and size of the disaster, clean up and restoration costs millions to billions of dollars in environmental damage.

A trauma, although still a negative impact, is a disturbance to an individual rather than the environment on a larger scale. Trauma results from a distressing or negative life event that can then causes psychological harm such as stress, anxiety, guilt, inability to cope. Trauma caused by a disaster can be influenced by the nature of the event but is dependent upon personal and social interpretation of the situation.[4] Individuals can be more at risk for trauma after a disaster, causing psychological harm. Some are more vulnerable to traumas based on their own experiences or history, the severity of the event, relationships with others, current stressors, mental illness, and cultural and collective responses.

Ultimately, in any disaster, an individual will interpret the disaster differently based on their losses. If you think about incomprehensible loss, this is often what causes emotional distress and trouble coping. Through this loss, people experience disaster. Perhaps during a hurricane, someone losses their home, experiences the death of a loved one, or must buy new clothes because of the destruction of their belongings. During an act of terrorism, someone else may not have experienced loss of material goods but rather non-material values. This individual may have lost their freedom or their peace of mind. It is the ways in which people respond and adapt to disaster events that determines the extent of trauma that that individual experiences.

Brain on Trauma

When thinking about how individuals cope with disasters, the brain tells us much about the trauma we have endured and how it affects us. Each part of the brain plays a vital role in interpreting and responding to traumatic events. In a disaster, different areas of the brain are activated and can remain activated for extended periods of time. This brain activation depends on the extent of the disaster as well as the psychological risk and vulnerability that one might have before a disaster strikes.

Fear conditioning, based on classical conditioning principles, occurs when a neutral event is paired with an aversive or negative event. In the classic example of Watson's Little Albert experiment, Little Albert liked to play with a little white rat. Every time Little Albert reached for the white rat, Watson hit a steel bar with a hammer causing a loud noise. As a result, Little Albert learned to be afraid of the white rat even though he had loved playing with it before. Individuals who are subjected to fear conditioning then learn to be afraid of something that they were not afraid of before. Individuals who are subjected to the effects of a disaster may learn to associate something neutral with that aversive or negative condition. In other words, an individual who was simply walking down the street before an earthquake occurred may now associate a leisurely walk with flying debris, collapsed buildings, or being trapped. This activates the part of our brain called the amygdala, the brain region responsible for emotional and fear processing. The most advanced brain imaging technique to date, the fMRI, has shown a clear activation of the amygdala in the beginning stages of fear as well as a decrease in activation over

time.[5] This decrease in activation demonstrates that the fear response will decrease in intensity over time after individuals learn that an action or event will not always be associated with a disaster. The amygdala may be activated shorter or longer depending upon the individual's ability to cope with the situation.

Although less research has been done on the prefrontal cortex, this area of the brain is also believed to play a role in fear conditioning. The prefrontal cortex is located in the front of the brain behind your forehead and is responsible for higher cognitive functions such as planning and decision making. The prefrontal cortex inhibits or reduces the amygdala's fear response allowing for better emotional regulation and quicker recovery from fear conditioning.[6] There is also evidence that there are specific areas within the prefrontal cortex that specialize in fear responses. In a recent study done on a cohort of 30 survivors of the Daegu subway disaster, MRI imaging targeted part of the prefrontal cortex called the dorsolateral prefrontal cortex. The images found that this area was much thicker in individuals who had been exposed to a disaster than individuals who had not been exposed to trauma.[7] After five years of recovering from the disaster, brain imaging techniques showed that this brain region had returned to normal, suggesting that this region of the brain plays a major role in trauma recovery.[8] The changes of this area of the brain indicate that the functions of the prefrontal cortex such as decision making are helpful in recovering from traumatic experiences.

The Hypothalamus-Pituitary-Adrenal HPA Axis contains three regions of the brain and body: the hypothalamus, the pituitary gland, and the adrenal gland. The hypothalamus is a part of the brain responsible for maintenance functions such as temperature regulation, eating, and sleeping, also controls the pituitary gland. The pituitary gland is located in the brain and controls hormone secretion in the adrenal glands. The adrenal glands sit above the kidneys and aid in our fight, flight, or freeze response. This controls how we respond to a threat. Will you fight and stand your ground? Will you run and hide? Will you freeze up? It is theorized that the HPA Axis differs from person to person. In a study done on rats with similar genetic makeup, trauma significantly affected some while the trauma only minimally affected others.[9] This indicates that some individuals are more at risk and vulnerable to disaster. Those that are vulnerable will have an increased activation of the HPA Axis, causing them to perceive a threat much longer. As individuals perceive that threat to be ongoing, they can experience distress, anxiety, and even physical symptoms since they are constantly in a state of fight or flight. For individual who have recently experienced distress from an event would have higher levels of cortisol, your body's stress hormone, within the first few days of the incident compared to a few months afterward.[10] For individuals who have an overactive HPA Axis due to psychological vulnerability, those individuals would still have raised levels of cortisol weeks and months after that disaster.

Factors of Mental Health

There are several vulnerability factors that contribute to trauma after a disaster. Factors that leave individuals more vulnerable to disaster-driven trauma are age, gender, exposure, time, coping skills, previous experience, and personal history. For example, in being a younger, inexperienced female who does not have strong ties to a support system may have more difficulty dealing with the stressful effects of living through a disaster. If an individual can cope and quickly recover from the disaster, that individual would be considered resilient. Typically, many individuals are resilient. In one study done of rape victims, post-traumatic symptoms decreased 29% within one month of the assault.[11] Unfortunately, if an individual is unable to cope, that individual may experience stress, distrust within the community, guilt, trouble with coping, and psychiatric comorbidity.[12]

Distrust

One psychological aspect of disasters that is not often reported is distrust in authority and in the media during and following a major disaster. Disasters have profound effects on an individual psyche. Often when an individual is adapting to a sudden change, feelings of confusion, fear, and stress can fuel one's thoughts and behaviors. This change in thought and behavior has the potential to hamper the success of evacuations, rescues, and disaster recovery. If individuals are distrustful of politicians and authority, while trusting community and family members, individuals may decide to stay in their homes rather than evacuate during a disaster or even refuse rescue when needed. Distrust can be a dangerous factor in disaster trauma.

Experiencing the disaster first hand and having knowledge about a disaster may alter one's perceptions of the event as well as their behaviors. As found after the terrorist attack of September 11th, maritime rescuers who saw the planes hit the twin towers on September 11th, 2001 were more likely to complete security checks on individuals before boarding than rescuers who did not personally see the planes on that day. Having read headlines or listened to Presidential speeches at the time of 9/11 also plays a hand in having perceived knowledge of events or who is responsible for those events. Similarly, individuals who have knowledge of the event may be more likely to be involved in search and rescue efforts or be involved with spreading the word to others who may not be aware. Using prior knowledge and making assumptions about the disaster can greatly influence our reactions to the disaster and how we adapt to it.

During this time and among many disasters, individuals tend to slip into the us versus them mentality, an idea that we belong to a certain group and that another group not part of our own is the enemy. Referring to the previous example given of September 11th, 2001, individuals often made assumptions about who targeted the American people. Although the attacks were committed by Al-Qaeda, an Islamic extremist group, many Muslim Americans were the target of prejudice and discrimination due to the generalization of who the American enemy was. Another instance like this is found in Toronto, Canada. With just one instance of sexual assault and subsequent murder, Ottawa

Police Services purchased high powered rifles to "eliminate mass murderers".[13] Although there was no threat of mass or serial murders, police forces created a strong sense of 'us versus them' and changed their behaviors because of it. During disasters, what individuals believe they know about the event will affect their connections and behavior towards others following that disaster.

Individual factors that may lead to a greater distrust during times of a disaster are previous experience, socioeconomic status, racial or ethnic background. A primary example of this would be the distrust that was seen in New Orleans after Hurricane Katrina in 2005. In interviews of individuals two weeks after landfall, members of the community reported great distrust in the competency of all levels of authority due to a previous decision to perform a controlled break of the local levees, flooding poorer areas to save important financial institutions.[14] Most attributed the lack of resources or assistance in the hurricane to socioeconomic status or race, with one individual stating:

> *"He sacrificed New Orleans. He cut that 17th bridge, because you've got to sacrifice something. Donald Trump is putting the tower on Canal Street downtown and they saved the French Quarter and the Garden District the historical areas, the rich people, where the money is coming from, casinos and all that. And they drowned out all the poor people and the lower-middle class working people . . . And they do that all over the country, not just in New Orleans . . . they do stuff and then they lie, lie, lie."*[15]

Another individual attributed the lack of resources to authorities not delivering goods to certain parishes for being predominantly black or, referring to the breaking of levees, purposely wanting to flood out black neighborhoods.[16]

This distrust is not only seen in New Orleans. Throughout America, insurance for disasters is often marked high and offered to home owners that have the financial means to afford it. This excludes individuals who are renting property or do not have proper funds to protect their property against a disaster. Without proper insurance coverage, it may financially cost too much in out-of-pocket expenses to rebuild a home. For families of lower socioeconomic status, it may be a more viable option to handle any damages themselves and live with the cost of doing so. In the long run, these individuals may have to deal with additional stressors or health risks such as black mold that grows from previous flooding. The distrust occurs in other countries as well. In Sri Lanka, India after a major earthquake, the government primarily gave money to land and property owners rather than individuals who worked on that very land. Without the financial means to recover, the distrust toward authorities for proper assistance remains high especially in a time of need.

Stress and Anxiety

Stressful situations for individuals before and during a disaster can cause prolonged stress, anxiety, and fear after a disaster ends. Stress related symptoms include lack of motivation, irritability, and restlessness. Stressful situations can lead to medically unexplained physical symptoms as well. Fleeing political violence in El Salvador that threatened their state of well-being, refugee women described their experience as 'nervios', a cultural term to describe both stress and anxiety as well as physical pain and shaking.[17] These physical symptoms also include headaches, fatigue, illness, and sleep deprivation. Symptoms of stress, while healthy in small amounts, become unhealthy when paired with prolonged stressful situations such as relocating, rebuilding homes, or managing finances after a disaster. In the case of the devastating wildfire in Bastrop County, Texas in 2011, individuals who experienced loss during the fires continue to show higher instances of stress 3.5 years later.[18] This example and others would cause an overactive adrenal response, raising cortisol levels and initiating a semi-constant fight or flight state.

Anxiety, characterized by excessive uneasiness and worry, is estimated to affect anywhere from 20% of a disaster population.[19] This estimate is much higher than the estimate of stress for a disaster population, indicating that a large portion of individuals will experience consistent worry after a disaster. It is also supported the prevalence of anxiety may remain constant for a longer period than stress related symptoms. For example, in comparison to the mild earthquake in Yerevan, individuals in Gumri who were subjected to severe earthquake trauma had significantly more anxiety which remained even 4.5 years after the disaster.[20] Vulnerability for developing anxiety increases with more than one disaster or traumatic event within the same period. In the previous study, higher sustained anxiety levels were also reported by individuals in Sumgait who were exposed to severe violence in addition to mild earthquake trauma.[21]

Psychological Disorders

Disasters can often lead to such loss that the trauma associated with that loss leads to depression. Depression is a psychological disorder classified by the DSM-5 as loss of functioning due to feelings of worthlessness, loss of interest in daily activities, depressed mood, and thoughts of death or suicide. It is estimated that 25.6% of the disaster population will experience depression.[22] This is also supported by evidence from Superstorm Sandy in 2012 where it was found that depression levels increased 25% in the most affected areas.[23] Those exposed to disaster related traumas without were found to have higher rates of depression whereas individuals who were resilient have lower depression levels than even the national average.[24] In a comprehensive study of individuals involved in the terrorist attacks of September 11th, 2001, the prevalence of probable depression six months after the attack was 9.4% compared to the average 1.5%-2.8%.[25] Although the prevalence of depression may be higher in individuals who directly experience a disaster, individuals that have been second-handedly been exposed to a disaster-driven trauma may also experience depression. Of 172 individuals who had lost a

family member after a missile attack on flight MH17 in Ukraine, 135 were classified as having mild depression following their loss.[26]

PTSD is a psychological disorder most strongly tied to the experience of a traumatic event. This disorder is characterized by having been exposed to a traumatic experience, resulting in increased stress and anxiety, often including flashbacks of the event, nightmares, and other comorbid disorders. Risk factors for PTSD include females, minorities, lack of education, and younger age.[27] The prevalence of PTSD varies among individuals as well as across circumstances. Individuals who are more directly exposed to the disaster have shown higher rates of PTSD diagnosis. For example, the prevalence of PTSD for the population closest to the Chernobyl nuclear reactor site after 6.5 years was 2.4 percent compared to .4 percent for the population further away from the disaster.[28] Additionally, 95% of children who experienced the Armenian earthquake of 1988 most directly had severe levels of post-traumatic symptoms.[29] Populations most directly exposed to disasters also include first responders. First responders, having been exposed to the disaster itself as well as the aftermath of the disaster, have a higher reported prevalence of PTSD. As cited by the 1983 bush fires of Australia, PTSD was observed in 50 percent of firefighters in the two years following the disaster.[30]

Individuals who are exposed to a disaster and diagnosed with PTSD will experience a multitude of setbacks after a disaster. In a study done on individuals who were exposed to mild-moderate trauma and individuals diagnosed with PTSD following the terrorist attack in the United States on September 11th, 2001, individuals in both groups reported an income decline, higher levels of depression, traumatic events prior to September 11th, and traumatic events post-September 11th.[31] With these additional traumas and PTSD symptoms, individuals may not have proper coping skills and strategies to be resilient after a disaster. Individuals diagnosed with PTSD compared to those who were resilient to the trauma reported higher levels of depression, increased marijuana use, increased alcohol use, and increased tobacco use.[32,33] Negative thinking patterns and learned helplessness leading to depression and some symptoms of PTSD may correlate to self-destructive behaviors and unhealthy coping skills such as drug use.

Additional research also concludes that there are factors that increase an individual's vulnerability to development of PTSD in survivors. Of the teenage and child survivors on board the Jupiter when it sank in 1988, individuals who had previously had contact with a mental health professional or reported violence at home were significantly more likely to develop PTSD.[34] This indicates that prior history with mental health and previously traumatic experiences would make an individual more susceptible to traumas associated with disasters. Traumatic disaster related experiences also play a role in susceptibility to PTSD symptoms. Survivors who had disaster-related experiences such as seeing blood, sustaining injuries, poor swimming skills, and becoming trapped were also more likely to develop PTSD.[35]

Additional Psychological Vulnerabilities

In addition to stress and anxiety, distrust, and psychological disorders, there are many other individuals who may be more psychologically at risk before, during, and after a disaster. Individuals with medical needs are a psychologically vulnerable population due to the potential inaccessibility of needed medical care and supplies. This vulnerable population would include women who are pregnant or women who have recently given birth who need access to healthcare services. The added worry of caring for a unborn or newborn child may cause distress, panic attacks, and can cause physical complications with birth. Individuals with conditions like diabetes or kidney failure may have psychological vulnerability to disasters since they may need medical supplies or electricity to charge batteries or run machines. This concern and threat to their lives may cause additional distress before, during, and after a disaster.

On this note, individuals who are injured or do not have the means to escape if needed are also psychologically vulnerable. When a disaster hits, the environmental effects are unpredictable. An individual who is injured either minimally, such as having a broken leg, or severely, such as being paralyzed, will have difficulty leaving their home in the instance of damaged property or flooding. The distress of not being able to escape quickly and efficiently can result in added stressors and anxiety during a disaster. In a sudden emergency, often those caused by man-made disasters, individuals who are injured may have to wait for rescue or may not be able to get to safety in time.

Individuals who are at an economic disadvantage are also considered psychologically vulnerable to a disaster due to a lack of resources for necessities and for means of recovery. Low income families and individuals may experience an economic loss that could be devastating. Typically, individuals who are of lower socioeconomic status have less access to resources and live in housing that is more vulnerable to disasters. Wealthy individuals can raise their homes, put in additional reinforcement, afford to live in a hotel after a disaster, and can financially afford to replace belongings. Those who cannot afford to rebuild their homes or to replace their belongings may not be able to cope with the aftermath of a disaster. Those who are homeless may be more psychologically vulnerable due to the nature of their previous living conditions and hardships that they have encountered before. As a result, the disaster may be an added, unwanted stressor, setting low income individuals back further economically than before.

Children are more psychologically vulnerable in disasters than their adult parents, guardians, and mentors. Since their brains are still in the process of developing and may not have as many experiences to build resilience, childhood trauma can often stick around much longer than trauma in adulthood. Due to disaster-driven stressors, children may experience nightmares, fear if being alone, irritability, and aggression.[36] Since children benefit from consistency and safety, their vulnerability stems from loss. Children lose their daily routines and often look to parents and guardians for reassurance. If parents and

guardians can handle the stressors or disaster effectively, children will be able to recover more quickly than if the child is exposed to the chaos of a disaster for an extended period. If not, symptoms of childhood traumas can potentially last until adulthood.

Many others could potentially be affected by the traumas of a disaster. However, there is no way of knowing who may be more resilient and who may be more vulnerable to a disaster. For example, individuals who have experienced loss before may have learned better coping skills than someone who has not. At the same time, other individuals who have experienced loss may be more prone to stress, anxiety, and depression. Other groups of psychologically vulnerable individuals' worth noting include first responders, individuals who face permanent displacement from their homes, the elderly, communities near a water source such as the ocean or a river, individuals without strong support systems or relationships, and families with many children or animals. Since psychological vulnerability affects everyone differently, not every individual in these groups will experience the same level of psychological vulnerability to disaster-driven trauma. In addition, there are many more individuals who are vulnerable that do not fall into the categories above. Everyone has their own experiences and brain chemistry that influence how they act and adapt to trauma.

Disaster Recovery

In times of disaster recovery, individuals will need to adapt to new circumstances that they may or may not have had experience with before. Communities also will need to adapt to collective trauma, or traumas that many individuals within the community share. For example, an entire community may be dealing with grief for several months before bereavement becomes more of an individual focus.[37] The losses that have been encountered and the ways in which individuals deal with this trauma determines the pathological outcome and path of recovery. Unfortunately, there are not very many plans and strategies implemented for times of disaster. It is essential that individuals, families, and communities are prepared to handle the traumas associated with disasters. When implementing these plans, it is hopeful that levels of anxiety, stress, and depression will decrease and the physical changes to the brain and body will recover much more quickly.

As previously noted, individuals need strategies and plans to be prepared for the stressors associated with disasters. It would be beneficial for individuals to be aware of their vulnerabilities before a disaster and plan for typical reactions after a disaster. Common reactions and responses to disasters include intense feelings, vivid memories, difficulty concentrating, fear, increased conflict with others, feeling withdrawn or disengaged, and having stress-related physical symptoms.[38] If individuals can identify typical versus atypical behaviors, it may reduce the time taken to seek professional care. It would also benefit individuals to have a plan to take steps in recovering from a disaster. These steps may include seeking mental health care if needed. However, it should also include establishing routines, asking for social support, engaging in healthy eating and

sleeping behaviors, and allowing yourself time to mourn and adapt to new experiences.[39] Acknowledging vulnerabilities and creating a self-care plan can make a large difference in feeling prepared and optimistic about recovery.

Not all communities have the proper strategies and plan equipped to cope with disaster-driven trauma either. Mental health surveillance and adaptation monitoring is a strategy that monitors vulnerability within a community so that leaders and experts could get messages out to the community about specific adaptive strategies and promote healthy behaviors.[40] With the goal of trauma prevention, it would be beneficial to arm individuals with the knowledge needed to take care of their mental health before the disaster strikes. This strategy would also be beneficial in instances where neighbors and family members need to care for loved ones with mental health needs. Receiving specific information for how to care for others may also increase community morale and comradery.

It is hypothesized that mental healthcare on a larger scale after a disaster should be a collaborative effort between emergency responders, medical care professionals, and public health officials.[41] Although each spring into action when disasters hit, an integration of the three systems with set responsibilities, approaches, and communication need to be established. Federal and state governments should be included in this collaborative effort as well. The public and media often perceive local, state, and federal governments as primarily responsible for taking the lead on disaster mitigation and response but often failing to do so.[42] The government could improve communication with the public on their emergency preparedness plans or communicate with the media on their efforts during a disaster to build more trust between individuals and government officials.

Classroom Strategies

Note-Taking

Our social studies department has placed an emphasis this year on providing students with proper note taking skills and strategies. This includes note taking in a traditional lecture format, analyzing text or video sources, and organizing information received from peers. Prior to this unit, students will have undergone a workshop in which they learn about and practice a variety of different note taking strategies. These note-taking strategies include Cornell notes, use of titles and subtitles, highlighting and underlining, writing brief summaries for each section of text, paraphrasing, noting page numbers, and use of real world examples.

In this unit, students will need to gather and organize information from their assigned textbooks before coming to class. This strategy was taken from the framework for the blended learning flipped classroom. The blended learning strategy emphasizes the need

for students to utilize as much classroom time as possible. Students will learn basic content at home and then engage in hands on learning, problem solving, and collaboration for in-depth understanding in the classroom setting. By taking notes at home for this unit, students will come in to the beginning of the unit with the prior knowledge needed to make the most of our time in the classroom.

WebQuest's and 3D Models

Our district places an emphasis on individualized instruction using blended learning techniques, so technology will be used as a tool for students throughout the lesson. Students will begin the lesson by making use of Schoology, our learning management system. A WebQuest is an activity designed to guide students to view and gather information from various online resources. In a WebQuest, students may be tasked to watch videos and answer questions, post images with a description, fill in charts with information from the article, or reflect on a social media or blog post. The tasks can be modified to align best with your learning goals.

For this unit, an online module will be created for students to work through, allowing them to access 3D models of the brain to interpret and gather information on various parts of the brain and their functions. Students will also be tasked to navigate the internet for reliable and valid sources on disasters and trauma on the brain. Students will be tasked to use note-taking strategies during this section of the WebQuest to highlight and summarize information about the changes to the brain and body from disaster-driven trauma, as stated in Objective 2.

Simulation Activity with Role Play

Students will engage in a simulation activity that utilizes student role play. Simulation activities are hands-on learning experiences for students. Students often get to participate as if they were in a real-life situation and see first-hand how experiences differ. For this unit, the simulation will focus on how individuals may be psychologically vulnerable to a disaster. How would the brain respond to traumas in various circumstances? Who would be more at risk in a disaster scenario? Students will be tasked to think about an incoming disaster and who would be affected. Each student will have different characteristics, such as having a history of depression or being trained in emergency management. In doing so, students will be able to determine factors of psychological vulnerability and susceptibility, as stated in Objective 3.

Source Analysis

Students will need to utilize both primary and secondary sources to review the factors of psychological vulnerability and susceptibility learned in the simulation activity. It is important for students to gather valid information from sources that are reliable. They

will research the psychological effects of disasters on a variety of individuals in various circumstances, as stated in Objective 4. As students complete their independent-study style research with guided facilitation, they will create an academic tri-fold to represent psychological trauma associated with disaster. This strategy will also include the development of a model, below.

Develop a Model

Students will use appropriate resources to find effective strategies and skills to cope with trauma. They will develop an individualized plan or model that addresses how a psychologically vulnerable group should prepare for and cope with a disaster. Students may also use strategies that have worked for them or skills that they have seen work in their own community. Students will be encouraged to be innovative in their ideas. They will then use those strategies to develop a strategy, plan, or model for disaster preparedness and response specific to individuals who may be more vulnerable. This will allow students to play a role in trauma prevention to support individuals who may need it before, during, and after a disaster, as stated in Objective 5.

Socratic Seminar

After presenting their final product to fellow peers and staff members, students will attend a Socratic seminar the following class period. A Socratic seminar is a strategy used to create an academic discussion on a topic or content area. Students and teachers sit in a circle to discuss academic findings and reflect on them. This Socratic seminar will be used to summarize information presented and allow students to gather information that they may have missed from the presentations. The Socratic seminar will also be used to close out the unit by applying what we have learned from the unit to our own community and our own lives.

Classroom Activities

Basic Content Knowledge

The first activity will be for students to build foundational knowledge of the structures and function of the brain and endocrine system. Students will be assigned a reading in their textbook holding this information. They will be asked to take notes using one of the strategies we have discussed in class prior to this assignment. The strategy that students use should be best for their own organizational skills, as we have already practiced using a multitude of strategies for in-class readings. In class the next day, a diagram of the endocrine system and the brain will be presented as the activating strategy. This will allow students to review content knowledge from the night prior and organize that information into one coherent piece. Students will be challenged to work independently,

then pair-share with a partner using their memory of the reading. During this pair-share, students will be prompted to check their work and adjust their responses accordingly.

Next, students will use the online learning management system, Schoology, to navigate the internet in the form of a WebQuest. Students will first be prompted to post an image of the part of the brain they find most interesting, its function, and what would happen to an individual if it were to be damaged. Students will then go to the Virtual Koshland Science Museum to explore the 3D model of the brain. They will then be prompted with a problem solver. This problem solver will consist of a short story about an individual who was involved in a disaster. This scenario should be used to get students thinking about disasters and the trauma that someone may endure before, during, and after a disaster. Students must explain what parts of the brain and endocrine system would be affected as well as what this person may be experiencing. After responding to this scenario, students will be prompted to find three reliable and valid sources of information on how disasters impact the brain both short term and long term. Students will identify those sources using APA formatting and record the most important information from each source in a table.

Students will then find a news article written about a recent disaster. As of recent, students may benefit from researching Hurricane Maria and the effects on Puerto Rico, as the country is still in its recovery from major environmental damage. Students at William Penn may benefit from this research since we have a large population of ELL students and some of our students have migrated to Delaware following the disaster. Students may also refer to the recent California wildfires, as many YouTubers and celebrities have been affected by the environmental disruption. Students may research the impact that this had on individuals that they look up to. Students will report what happened as well as who was affected and how their brain may have been impacted. To finish the WebQuest, students will respond to our LEQ for the day: How can the brain change due to disaster-driven trauma? This response will provide feedback to monitor student understanding before the next lesson.

Simulation and Research

The next class period will be our simulation activity. Students will be placed in groups and given an “ID” card. This ID card will include the information that they need to know for the activity. Each ID card will be different in terms of socioeconomic status, previous mental health history, strategies for coping, past experiences, and conditions. For example, one ID card may identify a middle-class woman who is pregnant and has never experienced a disaster before. Another ID card may identify an army veteran who has experienced war conditions and has been diagnosed with PTSD. Students will be read a series of scenarios about an upcoming disaster that will strike the area. Students will stand at the back of the room and will have the opportunity to move forward depending on the scenario. A move forward will indicate how well those individuals will fare

psychologically in the disaster. For example, one scenario may read “There are plenty of volunteers from the medical field that will be stationed in shelters throughout town. If this would benefit you, please take a step forward.” In this scenario, the student who has the ID card of a pregnant woman would move forward. At the end of the simulation, students will look around at the position of others and have an open class discussion about who was better off and who had a psychological disadvantage. Students will end the activity by working together to create a list of individuals who would be more psychologically vulnerable to trauma.

The next three, ninety-minute class periods will be dedicated to student research. Students will choose a topic from the class list of psychological vulnerabilities that they are interested in and would like to know more about. Each student must pick a different vulnerability so that no two projects will be the same. As students’ research, they will record information in a graphic organizer that enables them to identify parts of the brain and endocrine system, how the body and brain would change based on that specific vulnerability, and strategies to implement before and after a disaster. Students will be challenged to use reliable search engines and find high quality sources. Small group meetings should be held during the second half of day one and two to provide feedback from teacher to student. On day three, students should develop a specialized plan for how to best prepare and cope with a disaster if you are at risk for this psychological vulnerability. Students should also be prompted to address the purpose of their project and think about how they would like to present their findings. For day four and five, students will have time to create their academic tri-fold posters using the information they have researched and any images they have collected. Students will also have time to practice speaking on their research, as they will present next class period.

Presentation and Closure

The final two lessons will be dedicated to presentations and the closing Socratic seminar. Students will make use of the Innovation Center, which is William Penn’s newly renovated library and online learning space, to present their information on psychological vulnerabilities in disaster to fellow peers and staff members. Classes and staff will be invited to come up to the Innovation Center to listen to student’s presentations on psychological vulnerabilities in a disaster. Each presentation should highlight which psychological vulnerability they have researched, the parts of the brain and body that are affected, the response this person would have to trauma, and the plan students have developed to prevent and reduce stress and anxiety in these situations. While other groups are presenting, pairs of students will be released at given times from their stations to listen and gather information from their peers. This ensures that students are learning from one another and will gain a wholistic understanding of how each psychological vulnerability differs.

The final lesson after presentations will be a Socratic seminar to summarize and wrap up the unit. Students will be asked to share a short summary of their research and to prepare at least two questions about a peer's research. This will promote discussion of shared ideas. The Socratic seminar will also be used to prompt students to apply their research to their own lives and their communities. For example, how could students use this knowledge for themselves? For their families? For their neighbors? How could we begin to implement these ideas and strategies so that we can be prepared to help individuals who are more psychologically vulnerable to disasters and trauma? Students will be able to share innovative ideas and develop a plan to connect this information to their own lives.

Student Resources

"Interactive: Brain Anatomy." Virtual Koshland Science Museum. 2018. https://www.koshland-science-museum.org/explore-the-science/interactives/brain-anatomy.

> This student source enables students to interact with the brain by moving the model both vertically and horizontally. Students can read about various parts of the brain and their functions while simultaneously identifying its location in the brain.

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> This study aided in determining the correlation between cortisol and stress levels in individuals subjected to disaster. It also discussed the connection between cortisol and PTSD symptoms.

Barnes, Michael D., Carl L. Hanson, Len M. B. Novilla, Aaron T. Meacham, Emily Mcintyre, and Brittany C. Erickson. "Analysis of Media Agenda Setting During and After Hurricane Katrina: Implications for Emergency Preparedness, Disaster Response, and Disaster Policy." *American Journal of Public Health*98, no. 4 (April 2008): 604-10. doi:10.2105/ajph.2007.112235.

> This source was vital to understanding the role of the media in distrust of government officials. The study analyzed newspaper headings and stories related to who is responsible for disaster relief and management.

Bonanno, George A., Sandro Galea, Angela Bucciarelli, and David Vlahov. "What Predicts Psychological Resilience after Disaster? The Role of Demographics, Resources, and Life Stress." *Journal of Consulting and Clinical Psychology*75, no. 5 (2007): 671-82. doi:10.1037/0022-006x.75.5.671.

This academic journal is an excellent source for identifying factors that contribute to psychological vulnerability, including demographics, resources, and additional life stress. The study looks specifically at trauma related to the terrorist attacks on September 11th, 2001.

Cordasco, Kristina M., David P. Eisenman, Deborah C. Glik, Joya F. Golden, and Steven M. Asch. ""They Blew the Levee": Distrust of Authorities Among Hurricane Katrina Evacuees." *Journal of Health Care for the Poor and Underserved*18, no. 2 (May 2007): 277-82. doi:10.1353/hpu.2007.0028.

This publication was essential to understanding the distrust among individuals and authorities. Having interviewed survivors of Hurricane Katrina, the article provides a history, an explanation, and quotes from interviewees.

Delgado, Mauricio R., Katherine I. Nearing, Joseph E. LeDoux, and Elizabeth A. Phelps. "Neural Circuitry Underlying the Regulation of Conditioned Fear and Its Relation to Extinction." *Neuron*59, no. 5 (September 11, 2008): 829-38. doi:10.1016/j.neuron.2008.06.029.

This academic journal aided in brain regions responsible in fear conditioning, including the amygdala and prefrontal cortex. The article also explains the primary functions of each and their role in emotion regulation.

Dowler, Ken, Thomas Fleming, and Stephen Muzzatti. "Constructing Crime: Media, Crime, and Popular Culture." *Canadian Journal of Criminology and Criminal Justice*48, no. 6 (October 2006): 837-50. http://www.zinedine.id.au/uploads/1/0/1/9/10195960/_crime_media_and_popular_cuture.pdf.

This source described the role of the media in framing and altering individual perceptions of events, including disasters.

Faravelli, Carlo, Carolina Sauro, Lorenzo Lelli, Francesco Pietrini, Lisa Lazzaretti, Luica Godini, Laura Benni, Giulia Fioravanti, Gabriela Talamba, Giovanni Castellini, and Valdo Ricca. "The Role of Life Events and HPA Axis in Anxiety Disorders: A Review." *Current Pharmaceutical Design*18, no. 0 (May 9, 2012): 1-12. doi:10.2174/138161212803530907.

This source explained the important role of the HPA Axis in trauma related disorders with an emphasis on its role in PTSD.

FEMA. 2012. Children Vulnerable To Disaster-Related Stress. December 8. http://www.fema.gov/news-release/2012/12/08/children-vulnerable-disaster-related-stress.

This FEMA release highlights the vulnerability of children in a disaster. The source discusses the symptoms children may experience and how to best help them recover.

Foa, Edna B., Dan J. Stein, and Alexander C. McFarlane. "Symptomatology and Psychopathology of Mental Health Problems After Disaster." *Journal of Clinical Psychiatry*67 (2006): 15-25. doi:66.199.228.237.

This publication highlighted the risk factors for PTSD as well as comorbidity with other disorders after a disaster.

Galea, Sandro, Arijit Nandi, and David Vlahov. "The Epidemiology of Post-Traumatic Stress Disorder after Disasters." *Epidemiologic Reviews*27, no. 1 (2005): 78-91. doi:10.1093/epirev/mxi003.

The literature review pulls from a wide variety of disasters to describe the prevalence and course of PTSD. This source includes many examples of disasters and prevalence of PTSD after each example.

Goenjian, A.k., A. M. Steinberg, L. M. Najarian, L. A. Fairbanks, M. Tashjian, and R. S. Pynoos. "Prospective Study of Posttraumatic Stress, Anxiety, and Depressive Reactions after Earthquake and Political Violence." *American Journal of Psychiatry*157 (2000): 911-16. doi:10.1037/e323122004-015.

This study compares instances of mild and severe trauma to determine prevalence of PTSD, anxiety, and depression over time.

Kirmayer, Laurence J., Hanna Kienzler, Abdel Hamid Afana, and Duncan Pedersen. "Trauma and Disasters in Social and Cultural Context." Edited by Craig Morgan and Dinesh Bhugra. *Principles of Social Psychiatry*, 2010, 155-77. doi:10.1002/9780470684214.ch13.

This source was helpful in defining and distinguishing between disaster and trauma. The source explains findings on many different disasters such as genocide and technological disasters and includes interventions for trauma.

Kirsch, Katie R., Bonnie A. Feldt, David F. Zane, Tracy Haywood, Russell W. Jones, and Jennifer A. Horney. "Longitudinal Community Assessment for Public Health Emergency Response to Wildfire, Bastrop County, Texas." *Health Security*14, no. 2 (April 15, 2016): 93-104. doi:10.1089/hs.2015.0060.

This source was a longitudinal study done on the wildfires of Bastrop County. This aided in understanding the prevalence of stress and anxiety years after a disaster.

Komuro, Hazuki, Jun Shigemura, Sayuri Uchino, Sho Takahashi, Masanori Nagamine, Masaaki Tanichi, Taku Saito, Hiroyuki Toda, Mie Kurosawa, Kazumi Kubota, Toshihiro Misumi, Yoshitomo Takahashi, Satomi Takahashi, Soichiro Nomura, Kunio Shimizu, Aihide Yoshino, and Takeshi Tanigawa. "Longitudinal Factors Associated with Increased Alcohol and Tobacco Use in Fukushima Nuclear Power Plant Workers 32 Months After the Nuclear Disaster." *Journal of Occupational and Environmental Medicine*, October 17, 2018. doi:10.1097/jom.0000000000001483.

This abstract was clear with the correlation between an increase in alcohol and tobacco use among workers exposed to trauma in the Fukushima nuclear disaster.

LaBar, Kevin S., J. Christopher Gatenby, John C. Gore, Joseph E. Ledoux, and Elizabeth A. Phelps. "Human Amygdala Activation during Conditioned Fear Acquisition and Extinction: A Mixed-Trial FMRI Study." *Neuron*20, no. 5 (May 1998): 937-45. doi:10.1016/s0896-6273(00)80475-4.

This source was helpful in highlighting the importance of the amygdala in fear and classical conditioning. The images were helpful in explaining acquisition and extinction of fear.

Lenferink, Lonneke I. M., Angela Nickerson, Jos De Keijser, Geert E. Smid, and Paul A. Boelen. "Trajectories of Grief, Depression, and Posttraumatic Stress in Disaster-bereaved People." *Depression and Anxiety*, September 22, 2018, 1-10. doi:10.1002/da.22850.

This source was instrumental in connecting secondhand trauma to depression and PTSD. The study done highlighted bereavement as the main cause of the depression.

Lyoo, In Kyoon, Jieun E. Kim, Sujung J. Yoon, Jaeuk Hwang, Sujin Bae, and Dajung J. Kim. "The Neurobiological Role of the Dorsolateral Prefrontal Cortex in Recovery From Trauma." *Archives of General Psychiatry*68, no. 7 (January 05, 2011): 701-13. doi:10.1001/archgenpsychiatry.2011.70.

This source is an academic journal that highlights the role of the prefrontal cortex in survivors of a subway disaster in South Korea. The article also discusses trajectories for PTSD symptom improvement.

Martin, Ursula. "Health after Disaster: A Perspective of Psychological/health Reactions to Disaster." *Cogent Psychology*2, no. 1 (June 15, 2015). doi:10.1080/23311908.2015.1053741.

This article described the scale of mental illness following a disaster using Superstorm Sandy as an example. The article highlights the effects of emotional health of survivors.

Person, Cheryl, Melissa Tracy, and Sandro Galea. "Risk Factors for Depression After a Disaster." *The Journal of Nervous and Mental Disease*194, no. 9 (2006): 659-66. doi:10.1097/01.nmd.0000235758.24586.b7.

This source was particularly useful in describing factors that contribute to the development of depression. The study reporting findings on event experiences and sociodemographic characteristics of individuals with depression after September 11th, 2001.

“Recovering emotionally from disaster.” American Psychological Association. August 2013. https://www.apa.org/helpcenter/recovering-disasters.aspx.

This source highlights common reactions and responses to disasters. It also has useful strategies for individuals who are recovering emotionally from a disaster.

Rubonis, Anthony V., and Leonard Bickman. "Psychological Impairment in the Wake of Disaster: The Disaster-psychopathology Relationship." *Psychological Bulletin*109, no. 3 (1991): 384-99. doi:10.1037//0033-2909.109.3.384.

This source identified characteristics of disaster populations and the type of pathology developed after a disaster.

Udwin, Orlee, Stephanie Boyle, William Yule, Derek Bolton, and Dominic Oryan. "Risk Factors for Long-term Psychological Effects of a Disaster Experienced in Adolescence: Predictors of Post Traumatic Stress Disorder." *Journal of Child Psychology and Psychiatry*41, no. 8 (2000): 969-79. doi:10.1017/s0021963099006460.

This study was done on survivors of a sinking ship to evaluate risk factors for developing PTSD. The source also includes demographic and situational factors that were determined to be reliable predictors of PTSD symptoms.

Ursano, Robert J., Carol S. Fullerton, Lars Weisaeth, and Beverly Raphael. "Public Health and Disaster Mental Health: Preparing, Responding, and Recovering." *Textbook of Disaster Psychiatry*, 2007, 311-26. doi:10.1017/cbo9780511544415.016.

This source was helpful in providing a comprehensive view of what mental health prevention measures and outreach should look like. The authors also highlight the response to terrorism pre- and post- disaster.

World Nuclear Association. Fukushima Daiichi Accident. October 2018. http://www.world-nuclear.org/information-library/safety-and-security/safety-of-plants/fukushima-accident.aspx.

This source gave an in-depth description of what occurred on March 11th, 2011 in the Fukushima Daiichi Accident. The source describes the events that occurred as well as how the reactors were compromised. The article also includes the impact the disaster had on human lives.

Appendix 1

Currently, the AP Psychology program uses the National Standards for High School Psychology Curricula created by the American Psychological Association (APA) as well as Common Core Literacy Standards. Since most of the AP students in my courses this year are 11th grade juniors, I will be using the 11th-12th grade Common Core literacy standards.

APA Content Standards 11A: Biological Bases of Behavior

APA Content Standard VA-4.1 Consider factors that influence vulnerability to abnormal behavior

CCSS.ELA-LITERACY.RH.11-12.7
Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.

Notes

[1] Laurence J. Kirmayer et al., *Trauma and Disasters in Social and Cultural Context*, 155-77.
[2] (World Nuclear Association 2018)
[3] Ibid.
[4] Kirmayer et al., 155-77.

[5] Kevin S. LaBar et al., *Human Amygdala Activation during Conditioned Fear Acquisition and Extinction: A Mixed-Trial FMRI Study*, 937-45.
[6] Mauricio R. Delgado et al., *Neural Circuitry Underlying the Regulation of Conditioned Fear and Its Relation to Extinction*, 829-38.
[7] In Kyoon Lyoo et al., *The Neurobiological Role of the Dorsolateral Prefrontal Cortex in Recovery From Trauma*, 701-13.
[8] Ibid.
[9] Ibid.
[10] Elisabeth Aardal-Eriksson, Thomas E. Eriksson, and Lars-Håkan Thorell, *Salivary Cortisol, Posttraumatic Stress Symptoms, and General Health in the Acute Phase and during 9-month Follow-up*, 986-93.
[11] Edna B. Foa, Dan J. Stein, and Alexander C. McFarlane, *Symptomatology and Psychopathology of Mental Health Problems After Disaster*, 15-25.
[12] Sandro Galea, Arijit Nandi, and David Vlahov, *The Epidemiology of Post-Traumatic Stress Disorder after Disasters*, 78-91.
[13] Ken Dowler, Thomas Fleming, and Stephen Muzzatti, *Constructing Crime: Media, Crime, and Popular Culture*, 837-50.
[14] Kristina M. Cordasco et al., *"They Blew the Levee": Distrust of Authorities Among Hurricane Katrina Evacuees*, 277-82.
[15] Ibid.
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[18] Katie R. Kirsch et al., *Longitudinal Community Assessment for Public Health Emergency Response to Wildfire, Bastrop County, Texas*, 93-104.
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[22] Anthony V. Rubonis and Leonard Bickman. *Psychological Impairment in the Wake of Disaster: The Disaster-psychopathology Relationship*, 384-99.
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[25] Cheryl Person, Melissa Tracy, and Sandro Galea, *Risk Factors for Depression After a Disaster*, 659-66.
[26] Lonneke I. M. Lenferink et al., *Trajectories of Grief, Depression, and Posttraumatic Stress in Disaster-bereaved People*, 1-10.
[27] Bonanno et al., 671-82.
[28] Sandro Galea, *The Epidemiology of Post-Traumatic Stress Disorder after Disasters*, 78-91.
[29] Ibid.
[30] Ibid.

[31] Bonanno et al., 671-82.
[32] Ibid.
[33] Hazuki Komuro et al., *Longitudinal Factors Associated with Increased Alcohol and Tobacco Use in Fukushima Nuclear Power Plant Workers 32 Months After the Nuclear Disaster*.
[34] Orlee Udwin et al., *Risk Factors for Long-term Psychological Effects of a Disaster Experienced in Adolescence: Predictors of Post Traumatic Stress Disorder*, 969-79.
[35] Ibid.
[36] (FEMA 2012)
[37] Robert J. Ursano et al., *Public Health and Disaster Mental Health: Preparing, Responding, and Recovering*, 311-26.
[38] (American Psychological Association, 2013) https://www.apa.org/helpcenter/recovering-disasters.aspx.
[39] Ibid.
[40] Ursano et al., 311-26.
[41] Ibid.
[42] Michael D. Barnes et al., *Analysis of Media Agenda Setting During and After Hurricane Katrina: Implications for Emergency Preparedness, Disaster Response, and Disaster Policy.*