Glendale Unified School District

High School

November 15, 2022

Department:	Career Technical Education/Science
Course Title:	Honors Geography of Disasters
Course Code:	6264V/6265V
Grade Level(s):	9-12
School(s) Course Offered:	Clark Magnet High School
UC/CSU Approved (Y/N, Subject):	Yes, College-Preparatory Elective (G) – Integrated Science with honors designation
Course Credits:	10
Required Prerequisites:	None
Recommended Prerequisite:	Technology Literacy
Recommended Textbook:	Natural Hazards: Earth's Earth's Processes as Hazards, Disasters and Catastrophes 5th Edition by Edward A. Keller, Duane E. DeVecchio
Supplementary Textbook:	Open Geography, etext
Course Overview:	Honors Geography of Disasters is the introductory course for the Career Technical Education Geospatial Technologies pathway within the Environmental Engineering, Engineering and Architecture industry sector. Honors Geography of Disaster is a linked learning course that integrates Career Technical Education geospatial technologies with physical

geography and Earth science. Students learn where different natural disasters occur, why they occur, where they occur, and why that matters. (What where, why there, why care). The course incorporates the use of geographic information systems to evaluate and address natural hazards through the focus of emergency management. The use of drones for emergency management is introduced. Field work is emphasized and field trips are an important component of the class. Students collect spatial data through Esri mobile apps, perform data analysis using ArcGIS Pro and/or ArcGIS Online, and communicate their results using Esri story maps. The format of the course is iterative, allowing students to improve their skills and advance their understanding of the process of science throughout each unit.

First Semester

Unit 1: Internal Structure of Earth and Plate Tectonics, Earthquakes, Tsunamis *(10 weeks)*

CTE Career Readiness Standards:

- Apply appropriate technical skills and academic knowledge.
- Communicate clearly, effectively, and with reason.
- Act as a responsible citizen in the workplace and the community.
- Work productively in teams while integrating cultural and global competence.
- Employ valid and reliable research strategies.
- Career Technical Education Engineering & Architecture Standards:
- EA.KP.2.0.2.4 Demonstrate elements of written and electronic communication, such as accurate spelling, grammar, and format.
- EA.KP.2.0.2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- EA.KP.4.0.4.1 Use electronic reference materials to gather information and produce products and services.
- EA.KP.4.0.4.2 Employ Web-based communications responsibly and effectively to explore complex systems and issues.
- EA.KP.4.0.4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
- EA.KP.4.0.4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources.
- EA.KP.5.0.5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.
- EA.KP.7.0.7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.
- EA.PS.C.C1.1 Know historical and current events that have relevance to engineering

design.

- EA.PS.D.D3.1 Know the fundamental stages of geochemical cycles.
- EA.PS.D.D3.3 Classify the three major groups of rocks, according to their origin, on the basis of texture and mineral composition.
- EA.PS.D.D3.5 Assess and evaluate geological hazards.
- EA.PS.D.D3.6 Interpret and evaluate topographical maps and images.
- Next Generation Science Standards
- HS-ESS1-5 Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
- HS-ESS2-1 Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.
- HS-ESS2-2 Analyze geoscience data to make the claim that one change to Earth's surface can create feedback that causes changes to other Earth systems.
- HS-ESS2-3 Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.
- HS-ESS2-6 Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

California K–12 Computer Science Standards

- 9-12.DA.10 Create data visualizations to help others better understand real-world phenomena.
- 9-12S.DA.7 Select and use data collection tools and techniques to generate data sets.
- 9-12S.DA.9 Evaluate the ability of models and simulations to test and support the refinement of hypotheses.

Common Core State Standards:

- Anchor Standards for Informational Text 9-12: 1, 2, 3, 4, 5, 7, 8, 10
- Speaking and Listening Standards 9-12: 1(a-d), 2, 4a, 5
- Reading Standards for Literacy 9-12: 1-10
- Writing Standards for Literacy Science & Technical Subjects 9-12: 1(a-e), 2(a-f), 4, 5, 6, 7, 8, 9

Science and Engineering Practices: 1-8

A. In this unit, students investigate the internal structure of the Earth and the effects of that composition on the processes that shape the lithosphere. Students learn web mapping using ArcGIS Online through a series of tutorials on mapping and analyzing earthquakes and tsunamis from Esri. They learn the academic concepts behind the internal structure of the Earth, earthquakes and tsunamis through close reading strategies of the Natural Hazards textbook and selected chapters from the Open Geography eTextbook.
B. Chapter Presentations (1-4): In this assignment, students work in small groups to create slideshow presentations of each chapter from their college-level textbooks, as that chapter

is covered in class. Each student is given an outline of key content to include in their presentations. They are required to paraphrase material, research appropriate multimedia and additional information to include. They learn proper source citing in the MLA format for referencing the material they've used in their presentations. Students are coached on developing professional presentation skills and given the chance to practice and evaluate their peers' presentations.

C. Learn ArcGIS: Students will go through a series of lesson plans where they learn to map and analyze earthquakes with ArcGIS Online. Tutorials include Map Recent Earthquakes, Querying and Filtering Earthquakes, Analyze Nepal Earthquake Epicenters, and Explore Earthquakes in an Underground Scene. In addition to the tutorials, students will write a description of what they've produced and outline the workflow they used to create the final products.
D. Using Mobile Apps to Collect Spatial Data: Students will use the Survey123 mobile app to design a survey and collect data on earthquake preparedness in their community. They will create a web map of the data from their surveys.

Unit 2: Volcanoes, Floods, Landslides and Mass Wasting *(10 weeks)*

CTE Career Readiness Standards; same as Unit 1 with the addition of:

- Demonstrate creativity and innovation.
- Career Technical Education Engineering & Architecture Standards; Same as Unit 1 with the addition of:
- EA.KP.3.0.3.3 Explore how information and communication technologies are used in career planning and decision making.
- EA.KP.5.0.5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
- EA.PS.D.D14.2 Describe watershed modeling.
- EA.PS.D.D14.3 Understand the principles and applications of drainage engineering.
- EA.PS.D.D14.4 Use the Hydrologic Engineering Centers River Analysis System (HEC-RAS).
- EA.PS.D.D14.6 Describe the concerns and strategies for catastrophic storm water events and management.

Next Generation Science Standards

- HS-ETS1-4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
- California K–12 Computer Science Standards: Same as Unit 1 & 2.
- Common Core State Standards:
- Anchor Standards for Informational Text 9-12: 1, 2, 3, 4, 5, 7, 8, 10
- Speaking and Listening Standards 9-12: 1(a-d), 2, 4a, 5
- Reading Standards for Literacy 9-12: 1-10

- Writing Standards for Literacy Science & Technical Subjects 9-12: 1(a-e), 2(a-f), 4, 5, 6, 7, 8, 9

Science and Engineering Practices: 1-8

A. In this unit, students investigate the processes that shape our world through the construction of new lithosphere from volcanic eruptions, and erosive processes from floods, landslides and mass wasting. Students expand their web mapping skills to incorporate story maps, mapping in 3D and remote sensing. Here they will learn to use the professional version of Esri's software, ArcGIS Pro. They also learn academic Earth science concepts through close reading strategies of the Natural Hazards textbook and selected chapters from the Open Geography eTextbook.
B. Key Assignments: Chapter Presentations (5-7): In this assignment, students work in small groups to create slideshow presentations of each chapter from their college-level textbooks, as that chapter is covered in class. Each student is given an outline of key content to include in their presentations. They are required to paraphrase material, research appropriate multimedia and additional information to include. They learn proper source citing in the MLA format for referencing material they've used in their presentations. Students are coached on developing professional presentation skills and given the chance to practice and evaluate their peers' presentations.
C. Learn ArcGIS: Students will go through a series of lesson plans where they learn to map and analyze natural hazards with ArcGIS Online and ArcGIS Pro. Tutorials include Analyze Volcano Shelter in Hawaii, Get Started with ArcGIS Story Maps, Explore Dynamic Imagery of a Volcano Eruption, Determine Flood Risk for Disaster Response, Using a Mask to Define Flooded Areas in Cedar Rapids IA, Oso Mudslide - Before & After, Build a 3D Scene for the Oso Mudslide, Animate the Oso Mudslide, Identify Landslide Risk Areas in Colorado. In addition to the tutorials, students will write a description of what they've produced and outline the workflow they used to create the final products.

    a. Project: Create an emergency evacuation route map tour. Students will use mobile apps on their smartphones as a data collection tool, and map both main and alternate routes for emergency evacuation from the classroom. They will share their mapped route as a web application.

Semester 2

<u>Unit 3: Soils and Subsidence, Severe Weather, Coastal Hazards</u> *(10 weeks)*

CTE Career Readiness Standards: Same as Units 1 & 2.

- Career Technical Education Engineering & Architecture Standards; same as Units 1 & 2 with the addition of:
- EA.PS.D.D3.7 Locate and evaluate soil or geological conditions or features using global positioning systems equipment and related technology
- EA.PS.D.D4.5 Analyze and predict conditions of meteorological events.

- EA.PS.D.D4.6 Analyze the mechanisms for air mass movement.
- EA.PS.D.D4.7 Analyze atmospheric pressure and weather systems
- Next Generation Science Standards
- HS-ETS1-4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
- California K–12 Computer Science Standards; Same as Units 1 & 2

Common Core State Standards:

- Anchor Standards for Informational Text 9-12: 1, 2, 3, 4, 5, 7, 8, 10
- Speaking and Listening Standards 9-12: 1(a-d), 2, 4a, 5
- Reading Standards for Literacy 9-12: 1-10
- Writing Standards for Literacy Science & Technical Subjects 9-12: 1(a-e), 2(a-f), 4, 5, 6, 7, 8, 9

Science and Engineering Practices: 1-8

A. Students will investigate characteristics of soils, and research major cities around the world that are currently experiencing subsidence. Students will determine the cause and effects of the subsidence and report on what is or could be done to mitigate the problem. In this unit, students also learn how unequal heating of the Earth's surface drives wind patterns and ocean currents. They will come to understand Earth's energy balance and energy exchanges that produce climate and weather. Extreme weather, including tornadoes, hurricanes, and extratropical cyclones will be explored.
B. Key Assignments: Chapter Presentations (8-11): In this assignment, students work in small groups to create slideshow presentations of each chapter from their college-level textbooks, as that chapter is covered in class. Each student is given an outline of key content to include in their presentations. They are required to paraphrase material, research appropriate multimedia and additional information to include. They learn proper source citing in the MLA format for referencing material they've used in their presentations. Students are coached on developing professional presentation skills and given the chance to practice and evaluate their peers' presentations.
C. Learn ArcGIS: Students will go through a series of lesson plans where they learn to map and analyze natural hazards with ArcGIS Online and ArcGIS Pro. Tutorials include Thailand's Miracle Cave Rescue, Exploring Real-Time Data Sources, Make a Severe Weather Map, Predict Weather with Real-Time Data, Oversee Snowplows in Real-Time, Analyze 30-Years of Tornadoes, Assess Tornado Damage to Mainstreet Nashville, Tracking Super Typhoon Yolanda, Change Detection After Hurricane Matthew, Explore Hurricanes in 3D, Breaching the Swine Lagoons, and Model Coastal Inundation Impact. In addition to the tutorials, students will write a description of what they've produced and outline the workflow they used to create the final products.

Unit 4: Climate Change and Natural Hazards, Wildfires, Impacts and Extinctions *(10 weeks)*

- CTE Career Readiness Standards; same as Units 1 & 2 with the addition of:
- Model integrity, ethical leadership, and effective management.
- Work productively in teams while integrating cultural and global competence.
- Career Technical Education Engineering & Architecture Standards:
- EA.PS.C.C4.2 Understand the degree of accuracy necessary for engineering design.
- EA.PS.D.D1.1 Know the current industry standards for illustration and layout.
- EA.PS.D.D2.1 Understand the steps in the design process.
- EA.PS.D.D2.4 Understand the process of developing multiple details into a single solution.
- EA.PS.D.D8.3 Apply the concepts of environmental and natural science to the tools, equipment, projects, and procedures of the Environmental Engineering Pathway.
- EA.PS.D.D10.4 Demonstrate the need for, and methods of, land use planning.
- Next Generation Science Standards:
- HS-ESS3-5 Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.

California K–12 Computer Science Standards; Same as Units 1, 2 & 3 with the addition of:

- 9-12S.DA.8 Use data analysis tools and techniques to identify patterns in data representing complex systems.
- 9-12S.DA.9 Evaluate the ability of models and simulations to test and support the refinement of hypotheses.

Common Core State Standards:

- Anchor Standards for Informational Text 9-12: 1, 2, 3, 4, 5, 7, 8, 10
- Speaking and Listening Standards 9-12: 1(a-d), 2, 4a, 5
- Reading Standards for Literacy 9-12: 1-10

Writing Standards for Literacy Science & Technical Subjects 9-12: 1(a-e), 2(a-f), 4, 5, 6, 7, 8, 9
Science and Engineering Practices: 1-8

A. Students will review the current literature and analyze data to understand climate change. They will use the Nullschool Earth application to visualize near-real time data for global temperatures, temperature anomalies and carbon dioxide levels. They will use the calendar tool to see seasonal and change over time trends in the climate.
B. Key Assignments: Chapter Presentations (12-14): In this assignment, students work in small groups to create slideshow presentations of each chapter from their college-level textbooks, as that chapter is covered in class. Each student is given an outline of key content to include in their presentations. They are required to paraphrase material, research appropriate multimedia and additional information to include. They learn

proper source citing in the MLA format for referencing material they've used in their presentations. Students are coached on developing professional presentation skills and given the chance to practice and evaluate their peers' presentations.

C. Learn ArcGIS: Students will go through a series of lesson plans where they learn to map and analyze natural hazards with ArcGIS Online and ArcGIS Pro. Tutorials include, Warming Alaska with Map Notes, Map a Fire in a Minute. Learn About the Thomas Fire, Visualizing La Tuna Canyon Fire Damage, Construct a Dashboard to Monitor CA Fires, Monitor Real-Time Emergencies.
    a. Projects: Students will map and analyze effects of sea level rise in the USA using National Oceanic and Atmospheric Administration data. They will bookmark five locations of their choice that show significant impacts. They will use the transparency tool on the inundation layer over an imagery basemap to document affected areas. They will enrich the areas they've chosen to feature by using Esri data on land use types, current population and economic values, then create a web app to share their results.
    b. Students will create a map of global impact craters and create a story map, choosing five impact craters to research and feature in their story.

D. Final Project: Students collaborate in groups to design and create a model city. They will use an unmanned aerial vehicle to fly above their cities and create imagery of the cities before disaster strikes. Each team will inflict a natural disaster upon their city, then document the aftermath with the UAV. Students will follow their first disaster with a second natural disaster that was caused by the first. Again, they will collect imagery with a UAV to document the status of their city. Each student individually will create a story map of the events that includes two swipe before & after maps for each disaster. They will play the part of an emergency manager and analyze the imagery to determine what emergency response resources would be needed in the city and prioritize their response through a triage approach.

Comprehensive Written Final