**PRE-HIKE IN-PERSON AND VIRTUAL QUESTION 1**

*What are at least two things you know about the geology of the Grand Canyon? Feel free to list more than two.*  
  
**CODING RUBRIC**

**THEME 1: ROCKS & LAYERS**Student responded that they had knowledge of rocks, rock colors, strata, specific formations, striations, layers and groups. Specified knowledge of age of rocks.

**THEME 2: HOW IT FORMED**Student responded that they had knowledge about the formation of the Grand Canyon via mechanisms such as erosion, wind, water, carving, uplift, incision. Student mentioned the Colorado River as a mechanism for how the canyon formed.

**THEME 3: GEOLOGIC ATTRIBUTES**Student responded that they had knowledge about the Great Unconformity, missing layers, Colorado River, uranium, ancient seas, transgression/regression, caves, volcanism, lava dam, faults, dikes, length, karst, chert, mountain ranges, width, depth, location, age. Specified knowledge of age of Grand Canyon.

**THEME 4: LIFE FORMS**Student responded that they had knowledge of plants, animals, and fossils.

**THEME 5: HUMAN INTERACTIONS**Student responded that they had knowledge of Wesley Powell, explorers, scientists, scientific debates, native inhabitants, geoglyphs, hieroglyphs.

**THEME 6: GRANDUER**Student responded that they the Grand Canyon was a wonder of the World, amazing, awesome, stunning, beautiful, inspiring, visible from space, landmark, national park, history.

**PRE-HIKE IN-PERSON AND VIRTUAL QUESTION 2**

*What are at least two things you would like to know about the geology of the Grand Canyon? Feel free to list more than two.*

**CODING RUBRIC**

**THEME 1: ROCKS & LAYERS**Student responded that they want to know more about rocks, rock colors, minerals, strata, specific formations, striations, layers and groups.

**THEME 2: HOW IT FORMED**Student responded that they want to know more about the formation of the Grand Canyon via mechanisms such as erosion, wind, water, carving, uplift, incision, river, mass wasting, sediment transport. Student mentions current and future processes – are the previous formation mechanisms currently at work and will they continue in the future.

**THEME 3: GEOLOGIC ATTRIBUTES**Student responded that they want to know more about the Isis Temple, Elves Chasm, Horseshoe Bend, landmarks, Great Unconformity, missing layers, Colorado River, uranium, ancient seas, topography, transgression/regression, climate, caves, seismology, volcanism, lava dam, faults, dikes, length, karst, chert, mountain ranges, width, depth, location, age. Specified knowledge of age of Grand Canyon.

**THEME 4: LIFE FORMS**Student responded that they want to know more about of plants, animals, dinosaurs, and fossils.

**THEME 5: HUMAN INTERACTIONS**Student responded that they want to know more about Wesley Powell, explorers, scientists, scientific debates, native inhabitants, geoglyphs, hieroglyphs, tourism, Glen Canyon Dam, sightseeing.

**THEME 6: GEOLOGIC TIME & CHANGE**Student responded that they want to know more about the canyon’s significance, importance uniqueness, the canyon’s future, the canyon’s past, history, time of formation, what the area was like before the formation of the canyon, missing time, how has water changed over time, change in plants and animals over time.

**POST HIKE IN PERSON QUESTION 2**

*Please list and describe any factors that made it difficult for you to learn Grand Canyon Geology today.*

**CODING RUBRIC**

**THEME 1: TRAIL CONDITIONS**Student responded that it was cold, windy, crowded, loud, steps too short.

**THEME 2: STUDENT EXPERIENCE**Student responded that they had trouble seeing, hearing, or understanding the professor. Student experienced cognitive overload or was bombarded with too much information.

**THEME 3: FIELD TRIP CONTENT**Student responded that the FT content was dull or boring. Question packet interfered with learning. Too many rocks. Layers too difficult to discern.

**THEME 4: PERSONAL CHALLENGES**Student responded that they were tired, sick, had to work, or didn’t have enough time, distracted by photo ops, hungry, bathroom, or physically challenged. Students also responded that doing the field trip at the end of the semester was challenging.

**THEME 5: NO DIFFICULTIES**Student responded that they had no difficulties.

**POST HIKE VIRTUAL QUESTION 2**

*Please list and describe any factors that made it difficult for you to learn Grand Canyon Geology today.*

**CODING RUBRIC**

**THEME 1: TECHNICAL DIFFICULTIES**Student responded that they had trouble with computer, internet connection, browser, hardware, VFT freezing, slow load times, had to reload, no access to printer.

**THEME 2: USER EXPERIENCE / INTERFACE**Student responded that they had trouble or were confused by the navigation. Icons were too small. Difficulty with mouse interaction with iVFT. Not sure what to look at. Students also responded that the interface was clunky, confusing, overwhelming. Sphericals constantly rotated. Student experienced cognitive overload or was bombarded with too much information. Student could not locate videos.

**THEME 3: iVFT CONTENT**Student responded that the iVFT content was dry or boring. Photos were confusing, not relevant, low resolution or lacked information. Video content lacked info or was low resolution. The iVFT was too long or contained too many questions. The questions broke up the flow or were disruptive. Lack of graphs and diagrams. Informational videos appeared after wrong answer instead of before. Content too simple.

**THEME 4: PERSONAL CHALLENGES**Student responded that they were tired, sick, had to work, or didn’t have enough time. Students also responded that doing the assignment on a weekend was challenging. Student responded that they were distracted due to things going on around them, their cell phone, being home, or by being on the internet. Not there in person.

**THEME 5: NO DIFFICULTIES**Student responded that they had no difficulties.

**POST HIKE IN PERSON QUESTION 3**

*Please list and describe any factors that helped you learn Grand Canyon Geology today.*

**CODING RUBRIC**

**THEME 1: TRAIL CONDITIONS**Student responded that it was warm, good weather, clear, or good visibility.

**THEME 2: TRAIL OF TIME**Student responded specifically about the Trail of Time or its components such as wayside panels, signs, photos, rocks, samples, trail markers or the Museum.

**THEME 3: INSTRUCTOR & STUDENT INTERACTION**Student responded that the instructor or guide was helpful, or that the instructor’s previous lectures, background knowledge or learning aides provided by instructor such as mnemonics and scavenger hunt. Student also responded about cooperation between students, fellow students or friends.

**THEME 4: BEING IN THE FIELD**Student responded that physically being there, seeing in person, experiencing the scale and visual contact were helpful.

**POST HIKE VIRTUAL QUESTION 3**

*Please list and describe any factors that helped you learn Grand Canyon Geology today.*

**CODING RUBRIC**

**THEME 1: PERSONAL ENGAGEMENT**Student responded that they had an interest or background knowledge in geology and/or the Grand Canyon that supplemented the iVFT experience.

**THEME 2: USER EXPERIENCE / INTERFACE**Student responded that the navigation was quick or easy. The experience was dynamic, immersive, organized or interactive.

**THEME 3: iVFT CONTENT**Student responded specifically about the content – ie, videos, photos, 360 degree tours, questions, worksheets, drawings, labs, professor, guide. Student also responded that the iVFT content was fun, short, engaging, had depth.

**POST HIKE IN-PERSON AND VIRTUAL QUESTION 4**

*What are the two most important things you learned about the geology of the Grand Canyon?*

**CODING RUBRIC  
  
THEME 1: ROCKS & LAYERS**Student responded that they learned more about rocks, rock colors, minerals, strata, specific formations, striations, layers and groups.   
  
**THEME 2: HOW IT FORMED**Student responded that they learned more about the formation of the Grand Canyon via mechanisms such as erosion, wind, water, carving, uplift, incision, river, deposition, mass wasting, sediment transport. Student mentions current and future processes – are the previous formation mechanisms currently at work and will they continue in the future.  
  
**THEME 3: GEOLOGIC ATTRIBUTES**Student responded that they learned more about the Isis Temple, Elves Chasm, Horseshoe Bend, landmarks, Great Unconformity, missing layers, Blacktail Canyon, Colorado River, uranium, ancient seas, topography, transgression/regression, climate, caves, seismology, volcanism, lava dam, faults, dikes, length, karst, chert, mountain ranges, width, depth, location, age. Specified knowledge of age of Grand Canyon.  
  
**THEME 4: LIFE FORMS**Student responded that they learned more about of plants, animals, dinosaurs, and fossils.  
  
**THEME 5: HUMAN INTERACTIONS**Student responded that they learned more about Wesley Powell, explorers, scientists, scientific debates, native inhabitants, geoglyphs, hieroglyphs, tourism, Glen Canyon Dam, sightseeing.  
  
**THEME 6: GEOLOGIC TIME & CHANGE**Student responded that they learned more about the canyon’s future, the canyon’s past, history, time of formation, what the area was like before the formation of the canyon, missing time, how has water changed over time, change in plants and animals over time. **THEME 7: GRANDUER**Student responded that learned the Grand Canyon was a wonder of the World, amazing, awesome, stunning, beautiful, inspiring, visible from space, landmark, national park, history, significance, importance, uniqueness, sense of scale.

**POST HIKE IN-PERSON AND VIRTUAL QUESTION 5**

*Can you articulate any misconceptions you had, either about the geology of the Grand Canyon, or geology in general, that were cleared up after this visit or virtual field trip?*

**CODING RUBRIC**

**THEME 1: NO MISCONCEPTIONS**Student responded that they had no misconceptions.   
  
**THEME 2: AGE OF CANYON & ROCKS**Student responded that they misunderstood the age of the Grand Canyon or the age of rocks.  
  
**THEME 3: GREAT UNCONFORMITY**Student responded that they misunderstood the Great Unconformity, missing rock, missing layers, missing time, or lack of dinosaur fossils.  
  
**THEME 4: COLORADO RIVER**Student responded that they misunderstood the Colorado River, its power, its role.  
  
**THEME 5: FORMATION**Student responded that they misunderstood how the Grand Canyon was formed, the order of formation, the timeline of formation, the size, and elements of formation such as faults, contacts, volcanism, transgression/regression, and life.  
  
**THEME 6: ROCK TYPES & LAYERS**Student responded that they misunderstood rock types, rock groups, layers, composition. **THEME 7: GEOLOGIC TIME**Student responded that they misunderstood geologic time, deep time, time scales. **THEME 8: SIGNIFICANCE**Student responded that they misunderstood the significance of the Grand Canyon in terms of history, tourism, sense of place, scientific importance.

**POST HIKE IN-PERSON AND VIRTUAL QUESTION 6**  
*What are at least two things you would like to know more about after virtually/physically visiting the Grand Canyon today? Feel free to list more than two.*

**CODING RUBRIC  
  
THEME 1: ROCKS & LAYERS**Student responded that they want to know more about rocks, rock colors, minerals, strata, specific formations, striations, layers and groups.  
  
**THEME 2: HOW IT FORMED**Student responded that they want to know more about the formation of the Grand Canyon via mechanisms such as erosion, wind, water, carving, uplift, incision, river, deposition, mass wasting, sediment transport. Student mentions current and future processes – are the previous formation mechanisms currently at work and will they continue in the future.  
  
**THEME 3: GEOLOGIC ATTRIBUTES**Student responded that they want to know more about the Isis Temple, Elves Chasm, Horseshoe Bend, landmarks, Great Unconformity, missing layers, Blacktail Canyon, Colorado River, uranium, ancient seas, topography, transgression/regression, climate, caves, seismology, tectonics, volcanism, lava dam, faults, dikes, length, karst, chert, mountain ranges, width, depth, location, age. Specified knowledge of age of Grand Canyon.  
  
**THEME 4: LIFE FORMS**Student responded that they want to know more about of plants, animals, dinosaurs, and fossils.  
  
**THEME 5: HUMAN INTERACTIONS**Student responded that they want to know more about Wesley Powell, explorers, science, study, scientists, scientific debates, native inhabitants, geoglyphs, hieroglyphs, ruins, history of exploration, history of study.  
  
**THEME 6: GEOLOGIC TIME & CHANGE**Student responded that they want to know more about the canyon’s future, the canyon’s past, history, time of formation, what the area was like before the formation of the canyon, missing time, how has water changed over time, change in plants and animals over time. **THEME 7: TOURISM & EXPLORATION**Student responded that they want to know more about tourism, visiting the Grand Canyon, hiking, camping, kayaking, rafting.