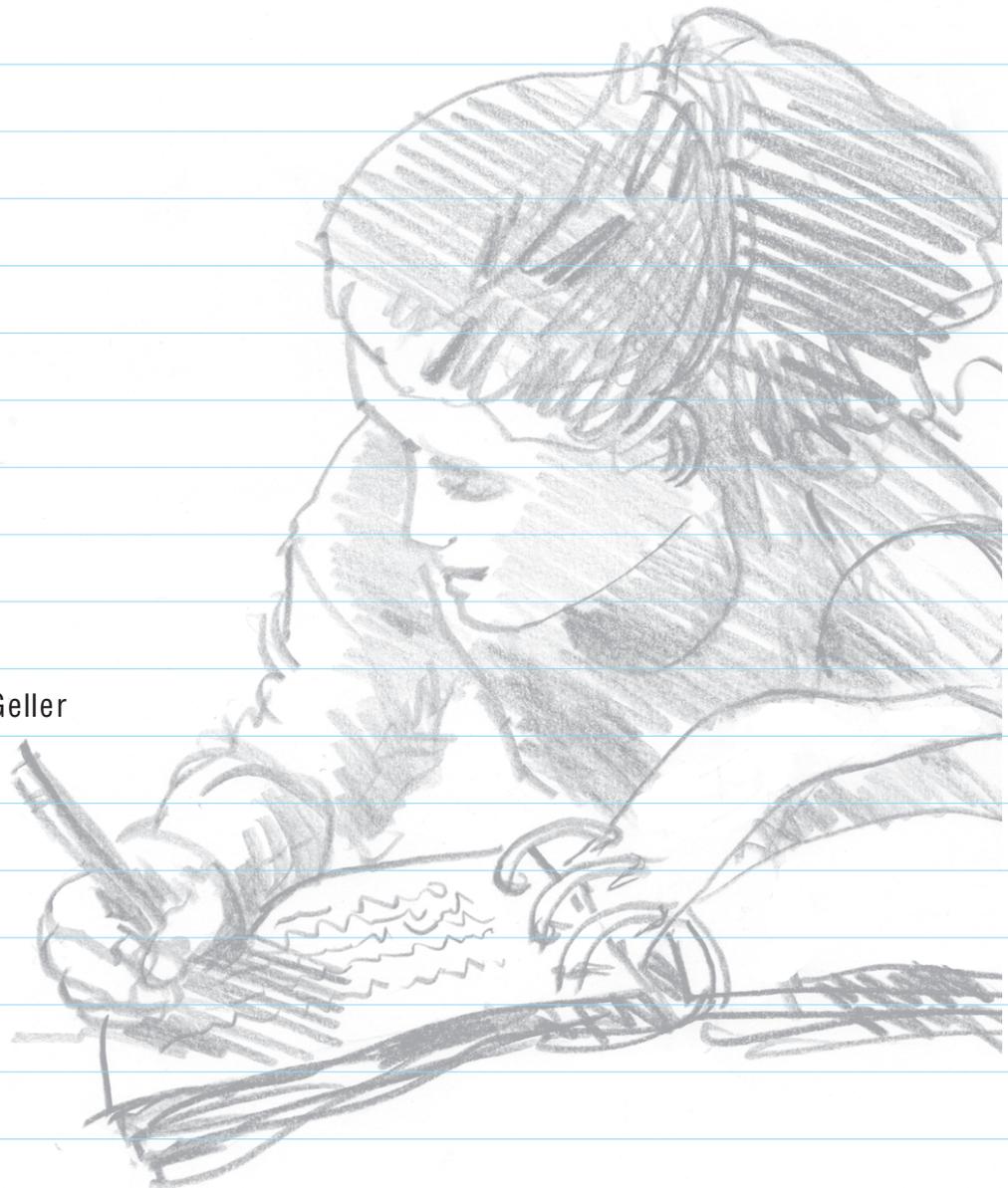


Concept-Based Instruction

Science

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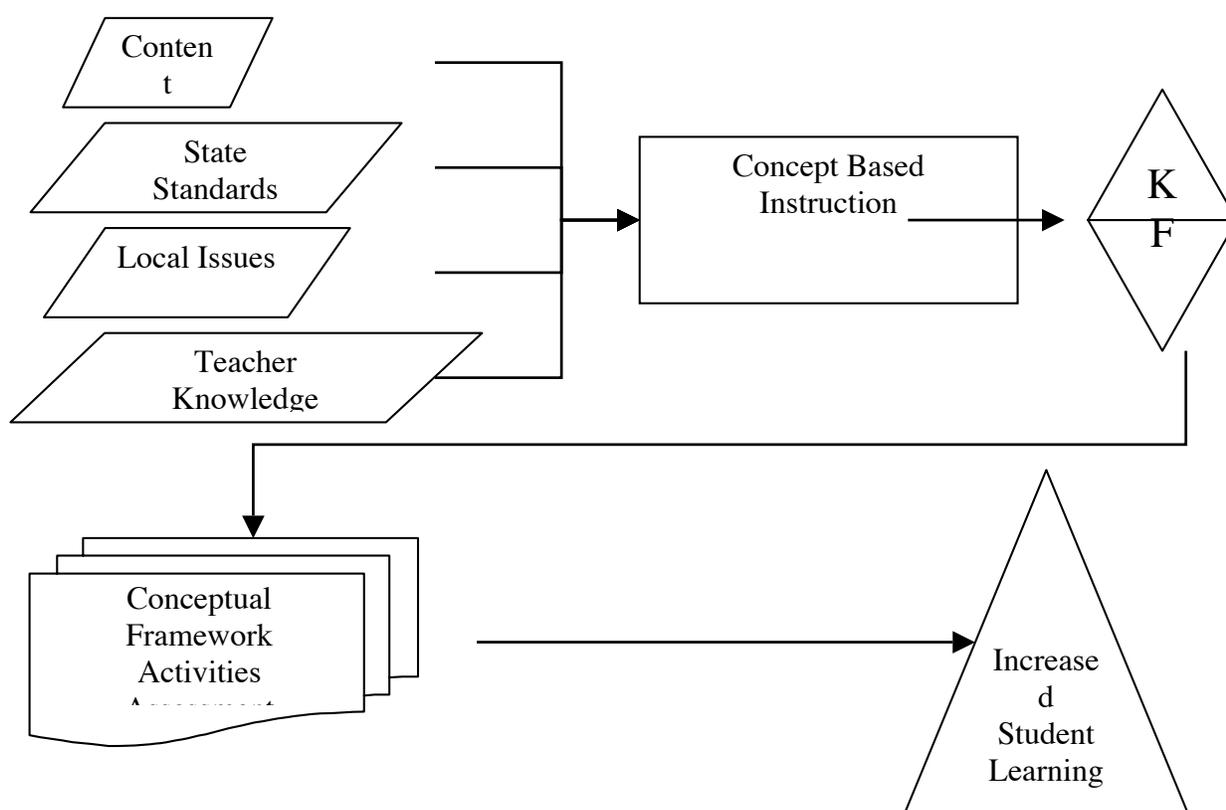
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Introduction

Review of Concept-based Instruction

As our classrooms become more inclusive, the cognitive and affective variability between students increases. Reaching high academic standards within any such classroom is daunting. With these constraints, how do we not teach to the lowest common denominator? How can we ensure success for *all* of our students in the same learning environment without individualizing each student's educational program? How can we be efficient and effective?

Concept-based instruction (CBI) is a model to mediate curriculum, instruction, and assessment into manageable tasks that enables teachers to make the appropriate content-specific information decisions to increase student achievement. CBI is conceptualized below.



For students to make sense of the sheer mass of factual data presented in class, they need an overt and easily accessible strategy to not only organize information into a manageable framework but also link important information in such a way that a meaningful connection between unique and different situations develops overtly. Cognitive psychologists have found that increasing the structure and organization of presented material promotes proper encoding into memory storage (Baddeley, 1999; Mintzes, Wandersee, & Novak, 1997). Data retrieval is foundational to acquiring the relational thinking skills required for understanding (Bransford, Sherwood, Vye, and Rieser, 1986). Relational thinking denotes the ability of the learner to ‘know what to do’ and ‘why to do it’ and is enhanced when thinking is modeled and activated within an intellectual context (Niedelman, 1991). Such intellectual contexts occur when information is organized so that it clearly reflects the “richness of connections between units of knowledge”

(Chi & Koeske, 1983). Overtly organizing and linking information into meaningful units allows for greater amounts of material to be recalled and understood (National Research Council, 2000; Baddeley, 1999).

Design. Concepts provide the bridge to acquiring relational thinking skills by serving as anchors for the cognitive structure. Attributes are critical to conceptual learning in that they represent the rules students use to categorize and distinguish examples from non-examples. Explicitly specifying the attributes is critical to provide students with the organizational rules that enable students to apply information and knowledge to new circumstances, settings, places, events, and eras. For example, a river is an example of a social studies concept that transcends time and place. Its attributes are: (a) a large natural stream of water, (b) flowing from higher to lower elevation, and (c) empties into another body of water. Often, the tendency is to jump from the concept label, in this case “river” to specific examples, such as the Nile or Mississippi. A non-example is a creek. Though it consists of two attributes of river, as defined here, conceptually it is not a large body of water. Attributes help to avoid misrules in learning by providing a fundamental link that is constant across virtually all examples of the concept (Tindal, Nolet, & Blake, 1992).

Delivery. CBI uses graphic organizers (GOs) as a visual and organizational template of knowledge forms to communicate relationships between concepts (Tukey, 1990), rather than requiring students to use cognitive resources that they may not possess to extract relationships from text (Robinson, 1998). GOs provide students with a meaningful conceptual framework from which they can activate their prior knowledge to create new schema in learning material (Ausebel, 1968). GOs improve comprehension by activating prior knowledge better and faster than text itself (Dunston, 1992).

Assessment. Research has repeatedly shown that students with disabilities, non-identified low achieving students, and students at-risk of academic failure do not succeed in factually based assessments (Schulte, Villwock, Whichard, & Stallings, 2001, Prater, 1993), yet these are the most prominent types used. CBI uses assessments that support the development of critical thinking skills by requiring learners to first acquire and control factual information as a basis to manipulate information in establishing relationships between knowledge forms. The process of acquiring critical thinking skills should be viewed as a continuum of both depth and breadth of declarative content knowledge, and procedural problem-solving skills (Tindal & Nolet, 1995). To reflect this continuum, assessment systems should be designed to measure improvement of and be sensitive to all performing students in inclusive general education settings.

Overview of Training Module

Each section first provides you with information about that particular facet of teaching, then presents an in-class practice exercise designed to clarify the concepts and activities you will be using to organize your thoughts in that particular area. Each section concludes with a homework assignment that will allow you to apply concept-based instruction to a unit or units of your own choosing.

The training module is structured in the following format:

- Classroom Example: Each section begins with a general example illustrating each component.

- **Guided Practice:** Following each general example, you will have an opportunity to apply your knowledge in a guided practice activity from the content provided in this training module.
- **Independent Practice:** Using your own content, you will demonstrate your understanding of the model in the Homework Assignment. In this section, you will develop a unit from curriculum you have selected. The Evaluation Form may be used to obtain feedback from a peer and a final evaluation from the instructor.

This training module is divided into five sections, each of which is designed to give you step-by-step practice in developing a concept-based instructional unit.

- **Instructional Planning and Curriculum Analysis:** How do you figure out what concepts you want students to learn in a given unit? What sort of issues do you need to consider in your planning making your teaching effective?
- **Instructional Delivery:** How do you design your curriculum to ensure that it is accessible to as wide a range of students as possible? What modifications and graphic organizers make most sense to use—and when does it make most sense to present them—in a particular unit?
- **Independent Activity:** How do you design activities for students to complete independently which help them learn to apply the concepts presented in a particular unit to other situations?
- **Assessment:** How do you design and implement assessments in a way that provides you with feedback you can use to evaluate and improve both student learning and your own instruction?
- **Teacher Reflection:** What sort of questions should you ask yourself at the end of each unit to allow you to continue to improve as a teacher?

After completing this training module, you will be proficient with the process of designing, delivering, and assessing content material conceptually, thus ensuring that *all* students in your classes have been presented information in a way that makes the important concepts in your curriculum transparent. Your curriculum will be aligned with the state standards, and you will have additional resources to enhance your lessons. Finally, you will be proficient in designing and using assessment measures that will inform your teaching and track students' learning to allow for better instructional decision-making.

Section 1: Instructional Planning and Curriculum Analysis

CLASSROOM EXAMPLE

Key Issues

Concepts and Attributes
Long-term Planning
Review Strategies
Note Taking Strategies
Curriculum Resources
Integration of Technology in the Curriculum
Demonstrations and Experimentation
Student Background and Skill
Student Motivation
Student Accommodations

Curriculum Material

Textbooks

Colella, D., Ryan, S., Engles, E., Martinez-Kane, I., Velasquez, S., & Youngdahl, K. (1996). Earthquakes and volcanoes. *Science insights: Exploring earth and space* (Teacher's ed., pp. 132A-153). Menlo Park, CA: Addison-Wesley.

Freeman, T. (1993). Earthquakes. *Geo Science Laboratory* (pp. 171-179). Colombia, MO: Friendship Publication.

Chapter Summary

The content chapter listed above provided a majority of the content information for the teaching of this instructional unit. Additional web-based and print resources were also used. A detailed list is provided at the end of this section. The laboratory manual was used to supplement the activities identified in the textbook.

The textbook chapter provides a detailed description of the physical characteristics of earthquakes and the damages that occur to natural and constructed structures in their aftermath. Potential energy and types of force are briefly described to demonstrate the impact of an earthquake on the earth's crust. To provide a deeper understanding of the mechanisms of

earthquakes, critical features of the structure are illustrated and defined. Detailed descriptions of the similarities and differences between the three types of seismic waves are provided. Detection methods used by seismologists are described and scaling indices (Richter Magnitude and Mercalli Intensity Scale) are compared. An activity is provided to model the functions of the Richter scale.

Geographical regions with frequent earthquake activity are represented on a map. Common locations of earthquakes in the United States are described. Causes of this increased earthquake activity are hypothesized and important terms, such as subduction zone, are introduced. Following this structural information, the impact of earthquakes on land formations is described.

Evidence of seismic wave activity is provided from topographical changes. Ground-level evidence is described and reasons for variations in the severity of the shift in ground level are presented. Dramatic changes to the landscape are explained and illustrated with images. The similarities and differences between slides, scarps, and fissures are provided with examples from recent earthquakes. Tsunami's are also defined and discussed as possible after effects of quakes.

Damages to human life and property resulting from earthquakes are described and represented with examples. Proximity to the epicenter and soil types are proposed as potential reasons for building collapses resulting from earthquakes. Building designs and materials are critiqued as to their structural integrity under the forces of earthquakes.

The section concludes with a summary of safety precautions that individuals and organizations should consider. A chart is provided with safety measures that should be considered for both inside and outside of a home.

The chapter continues with similar discussions on volcanoes.

Concepts, Attributes, Examples, and Non-Examples

The concept presented throughout this unit is *Structural Changes to the Earth’s Surface*. Each lesson within this unit focused on a different example of this concept. In the lesson you will watch, the classroom teacher presents Seismology as an example of this concept. Other examples of this concept include volcanic eruptions, erosion, and plate tectonics. The attributes that support and define this concept for this unit are (a) *catalyst*, (b) *transfer of energy*, (c) *rearrangement of matter*, and (d) *equilibrium*. Each attribute is thoroughly described below.

Catalyst: a trigger for an event. A catalyst may be the sudden build up of pressure or the slow process of convection. Non-examples include subsequent events that were initially caused by a catalyst, such as a tsunami.

Transfer of Energy: energy is released into the environment as a result of the catalyst. During an earthquake, energy from the build up of pressure is expressed through the release of seismic waves. Pressure from the earth’s interior is released as heat in a volcanic eruption. Non-examples would include the transfer of energy from the sun to a plant in the process of photosynthesis.

Rearrangement of Matter: the structural composition of the earths surface is modified. Examples include significant changes in topography of the earth, movement of landmasses, reformations of physical structures. Non-examples include modifications to local physical features by humans or as a result of human activity.

Equilibrium: forces in play that contrast or oppose each other trying to reach a balance. Examples include gravity pulling unprotected land from mountainsides and tectonic plates moving to release pressure. Non-examples include structures that prevent the natural progression to reach equilibrium, such as dams and levies.

CONCEPT EXAMPLE: EARTHQUAKES

<i>Concept</i>	<i>Attributes</i>	<i>Examples /Non Examples</i>
Structural Changes of the Earth’s Surface	Catalyst	Example: pressure Non-example: strong winds causing trees to fall
	Transfer of Energy	Example: pressure along the plate boundaries releasing seismic waves that transmit energy Non-example: release of heat from a decaying body
	Rearrangement of Matter	Example: landslides formed from shifting of plates Non-example: bulldozing land to form a development
	Equilibrium	Example: tectonic plates shifting to reach a balance between contrasting or opposing forces Non-example: Dam preventing water from flowing downstream

State Standards Alignment

The curriculum unit presented here aligns with the Oregon State Content Standards in Physical and Earth and Space Sciences

Content Domain	Common Curriculum Goal	Content Standard	Benchmark Level: CIM/CAM	Rationale for Including
Physical Science	Energy	Explain and analyze the interaction of energy and matter	Describe differences and similarities between kinds of waves, including sound, seismic, and electromagnetic, as a means of transmitting energy	This unit provides a basis for understanding waves and the mechanisms through which energy is transferred.
Earth and Space Science	Dynamic Earth	Explain and analyze changes occurring within the lithosphere, hydrosphere, and atmosphere of the Earth.	Analyze evidence of ongoing evolution of the Earth system.	This unit provides a description of earthquakes and their effects on the structure of the earth.

Additional Resources

Listed below are resources related to the content of this instructional unit.

Seismology WebSites	
Source	Rationale for Using
California Department of Conservation http://www.consrv.ca.gov	Provides basic information about earthquakes, fault lines, and recent earthquakes
U.S. Geological Survey http://www.usgs.gov http://quake.usgs.gov http://geohazards.cr.usgs.gov	Provides basic and detailed earthquake information in an easy to read format. Includes student and teacher resources.
U.S.G.S. Earthquake Hazards Program http://earthquake.usgs.gov/4kids/facts.html http://earthquake.usgs.gov/4kids/4teachers/	Provides ready-made activities for students related to earthquakes.
Federal Emergency Management Agency http://www.fema.gov	Provides general information about earthquakes as well as the latest disaster relief. Includes a searchable database.
ABAG Earthquake Maps and Information http://www.abag.ca.gov/bayarea/eqmaps/eqmaps.html	Provides general information on a variety of issues related to earthquakes in a user-friendly format. Includes a “Kids Zone” with activities.
Southern California Earthquake Center http://www.scec.org/	Provides detailed information about recent research into earthquakes. Includes educational information and maps.
Earthquake Engineering Research Institute http://eeri.org/	Provides detailed information about recent research. Includes featured articles and pictures.
Geological Survey of Canada http://www.pgc.nrcan.gc.ca/seismo/eqinfo/q-a.htm	Provides detailed and general information about earthquakes including answers to frequently asked questions and statistics.

IN-CLASS PRACTICE EXERCISE

Key Issues

Considering the content you intend to cover and the student population you will be addressing, identify important issues to take into account prior to instruction. Consider actions you will need to take when planning this unit.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Curriculum Material

Textbook

Maton, A., Hopkins, J., Johnson, S., LaHart, D., Quon Warner, M., & Wright, J.D. (1995). Pollution. *Exploring earth science* (Teacher's ed., pp. 694a-723). Englewood Cliffs, NJ: Prentice Hall.

Content Chapter

Read the following textbook chapter.

Chapter 23: Pollution

The first sign of danger came with the southeast wind. Instruments at a Swedish nuclear power plant detected twice as much radioactivity in the atmosphere as usual on April 28, 1986. At first the Swedes feared a malfunction in their own power plant. But it soon became apparent that the excess radioactivity was being carried by winds from the Soviet Union.

An explosion and fire at the Chernobyl nuclear power plant in the Ukraine had released a huge cloud of radioactive dust. The cloud was blown by winds across Poland and into Scandinavia. Later the winds shifted and blew the deadly cloud over Switzerland and Italy. Everywhere the cloud was blown, people were warned to avoid contaminated water, vegetables, and milk.

The accident at Chernobyl undoubtedly will have an effect on the further development of nuclear power. Once thought to be the energy source of the future, nuclear power is now viewed with skepticism by many people. Our society could not exist without sources of energy. But, as we must keep in mind, using energy presents certain problems. In this chapter you will learn about some of these problems – their causes and solutions.

23 – 1 What Is Pollution?

Of all the planets in our solar system, only Earth (as far as we know) is home to humans and other living things. Earth provides everything – air, water, food, energy – we need to survive. The environment seems to contain such an abundance of the natural resources needed by humans and other living things that it is hard to imagine ever being without them. Yet that is just what might happen if we

are not careful. Despite the richness of Earth's natural resources, a delicate balance between plenty and scarcity exists in our environment.

The balance of the environment can be upset by the way in which humans obtain and use natural resources. If we use renewable resources faster than they can be replaced, the balance will be upset. If we quickly consume nonrenewable resources, which cannot be replaced, the balance will be upset. And if we damage one resource in the process of obtaining or using another resource, the balance will be upset. It is this last problem – the problem of pollution – that is the focus of attention in this chapter.

Pollution has become a household word. But what exactly is pollution? Pollution is the release into the environment of substances that change the environment for the worse. Most pollution is the result of human activities. In obtaining and using the natural resources we depend on, we produce pollutants. As one ecologist (a person who studies the relationships among living things and their environment) has written, pollutants are the “normal byproducts of people.”

The Trail of Pollution

To better understand the process of pollution, consider a can of soda. To obtain the aluminum to make the can, ore containing aluminum is dug out of the ground. This digging scars the land. Later, in various factory processes, chemicals are used to remove the aluminum from the ore. Any remaining chemicals and impurities are often washed away with water. The waste water is then discarded – an may end up in a river or a stream. The chemicals, so useful in the factory, become pollutants in the water.

Next, the purified aluminum is sent to a manufacturing plant to be turned into a can. Energy is needed to make the can. So a fuel such as coal or oil is burned to provide the energy. As a result of burning fuel, smoke, soot, and gases are released as pollutants into the air. Making the soda that goes into the can also produces land, air, and water pollutants.

Finally, the can of soda may be transported to a supermarket by a truck that burns gasoline and releases air pollutants. But the trail of pollution does not end at the market. Eventually, the can of soda ends up in the hands of a consumer. That person drinks the soda and may then carelessly toss the empty can into the gutter at the side of a road. There it becomes part of an unsightly collection of cans, bottles, plastic bags, old newspapers, and all sorts of other trash. In other words, it becomes litter! This litter is more than an eyesore. It is a danger to wildlife, and it can contribute to the poisoning of our soil and water resources.

Sources and Solutions

As the example of the soda can illustrates, pollution can be thought of as the damage done to one resource by our use of other resources. Although pollution cannot be blamed entirely on our use of energy resources, a great amount of pollution is tied directly to energy use. Our heavy dependence on fossil fuels (coal, oil, and natural gas) has made pollution a major concern in the last several decades. The activities involved in obtaining and using fossil fuels have led to serious land, air, and water pollution.

There is no easy answer to the problem of pollution. Fortunately, there are ways to avoid polluting the environment. Maintaining the balance of the environment does not necessarily mean we must abandon all activities that threaten the balance. Rather, the solution may involve new ways to regulate and reuse materials so that they become new resources. Let's now examine more closely the three main types of pollution – land, air, and water pollution – and the ways in which people are fighting them.

23 – 2 Land Pollution

In Chapter 21, you learned about many different types of energy resources: fossil fuels, solar energy, wind and water energy, and nuclear energy, as well as various alternative energy resources. Solar, wind, water, and alternative resources together account for only 5 percent of the energy used by people. Most of our energy (about 90 percent) comes from fossil fuels. The remaining 5 percent of the

energy we use comes from nuclear power plants. **Obtaining and using certain energy resources – fossil fuels and nuclear energy – can pollute the land.**

The use of coal as a fuel was an important step in the industrialization of the United States. Unfortunately, the environment has often paid heavily for our use of coal. Coal near the surface of the ground is obtained by the process of strip mining. As you learned in Chapter 22, strip mines are gouged out of the surface of the land. This process badly damages the land. In addition to scarring the landscape, strip mining also causes land and soil pollution.

During the strip-mining process, fertile topsoil is buried under tons of rock. When the rock is exposed to precipitation (rain, snow, sleet, and hail), acids and other dangerous chemicals may be washed out of the rock by rainwater. The acids and chemicals then seep into the ground, polluting the land and soil.

Hazardous Wastes

Strip mining is just one example of how using energy resources can pollute the land. Another example involves the wastes produced by factories. Wastes from factories may pollute the land with toxic, or poisonous, chemicals. These toxic chemicals are called **hazardous wastes**. Hazardous wastes are any wastes that can cause death or serious damage to human health.

Factories that produce fuels and petrochemicals from petroleum are the major sources of hazardous wastes. When improperly stored in barrels buried in waste dumps, hazardous wastes can seep into the soil and cause land pollution. Cleaning up wastes that were improperly disposed of in the past is a serious problem today.

There are several possible solutions to the management of hazardous wastes. The best way to solve the problem of hazardous wastes, of course, is to produce less of them. In some cases, it might be possible for industry to reuse certain hazardous wastes. Other wastes might be chemically treated to change the toxic substances they contain into nontoxic substances before disposing of them. But chemical treatment of hazardous wastes is usually expensive. Most hazardous wastes wind up buried deep underground, where they are a potential source of land pollution.

Radioactive Wastes

Perhaps the most threatening form of land pollution today involves the disposal of **radioactive wastes**. Radioactive wastes are the wastes produced as a result of the production of energy in nuclear power plants. Radioactive wastes are classified as high-level or low-level wastes.

High-level wastes are primarily the used fuel rods from a nuclear reactor. Low-level wastes are, by definition, any radioactive wastes that are not high-level wastes. Low-level wastes may include contaminated clothing worn by the power-plant workers or contaminated equipment used in the power plant.

Low-level wastes have relatively short half-lives. The half-life of a radioactive substance is the time it takes for half the substance to decay, or change into a nonradioactive substance. Low-level wastes decay quickly. The disposal of these wastes usually does not cause major land-pollution problems. When properly stored, the wastes can be isolated from the environment until they are no longer radioactive.

High-level wastes, however, may have half-lives of 10,000 years or more. Isolating these wastes from the environment for that length of time is practically impossible. In the past, a common practice was to seal high-level wastes in concrete or glass containers and then bury the containers deep underground. The problem with this procedure is that the containers may eventually corrode or leak, allowing the radioactive wastes to escape and pollute the land.

Recently, several alternative solutions for the disposal of high-level wastes have been suggested. These include geologic disposal, or disposal deep in the Earth. For example, wastes can be buried in rock formations that are not subject to movement or in salt mines. Disposal in deep ocean beds is another alternative. Some scientists have even suggested that it might be possible to shoot rockets carrying high-

level wastes into the sun. Finding a way to dispose of high-level radioactive wastes safely is one of the most important environmental issues facing us at this time.

Solid Wastes

Americans produce about 4 billion tons of solid wastes every year. **Solid wastes are useless, unwanted, or discarded materials. They include agricultural wastes, commercial and industrial wastes, and household wastes.** Another word for solid wastes is garbage. The solid wastes found in a garbage dump may include old newspapers and other paper products, glass bottles, aluminum cans, rubber and plastics, discarded food, and yard wastes.

Mountains of garbage in solid-waste dumps once surrounded many cities. Solid-waste dumps are offensive to the eyes as well as to the nose! One way to deal with solid-waste dumps is to cover open dumps with thick layers of soil. In 1976, the United States Congress prohibited open dumps. They ruled that all existing open dumps were to be converted to **sanitary landfills**. In a sanitary landfill, all garbage is compacted, or packed into the smallest possible space. And the garbage is covered at least once a day with a layer of soil. No hazardous wastes are allowed to be dumped in a sanitary landfill. One of the advantages of sanitary landfills is that once they are filled to capacity, they can be landscaped and used as parks, golf courses, and other recreational facilities.

Sanitary landfills can still pose problems, however. Wastes can ooze out of landfills and pollute the surrounding soil. And although sanitary landfills are not supposed to be used for hazardous wastes, household wastes often include pesticides, cleaning materials, paint and paint thinners, and other toxic chemicals.

Another problem with sanitary landfills is that when compacted garbage begins to decompose, or break down, methane gas is produced. Methane gas is dangerous to breathe. It is also a fire hazard. A number of landfill fires have smoldered underground for years, and a few landfills have exploded. This problem can be solved by installing a "gas well" in a landfill. In this way, the methane gas can be removed and used as a fuel.

But the most serious problem with sanitary landfills may be finding a place to put them. At present, sanitary landfills cannot handle more than a fraction of the solid wastes produced in this country. A city of a million people can produce enough garbage to fill a football stadium in just a year! Most residents probably would not be happy with a landfill nearby. So finding sites to build new sanitary landfills is difficult.

Alternatives to sanitary landfills include ocean dumping, burning, and recycling. At one time, solid wastes were commonly towed offshore and dumped into the ocean. Even today, about 50 million tons of wastes are dumped into the oceans every year. Ocean dumping often results in washed-up debris on beaches, causing more land pollution. But because of the low cost of ocean dumping, many coastal cities consider it an alternative to landfills.

Burning garbage in open dumps and in the incinerators of apartment buildings, hospitals, and factories was at one time a popular alternative to landfills. Because burning releases harmful gases, however, this practice is being halted. Sometimes the old incinerators are replaced with highly efficient incinerators fitted with emission controls. But there is another way to burn garbage that is increasingly being used. Since the 1960s, several European countries have used special waste-to-energy incinerators to burn their garbage. The heat produced is used to convert water into steam, which is then used to generate electricity or to heat the buildings. Some of these waste-to-energy incinerators are in use in the United States, and more are planned for the future.

Recycling, which not only gets rid of solid wastes but also creates useful materials, is considered the solid-waste solution of the future by most environmentalists. You will learn more about recycling in Chapter 24. Recycling often involves high technology. Technology alone, however, can do little. People must also be involved. Recycling begins at home. An aluminum can or a glass bottle carelessly tossed to the side of the road can take thousands of years to decompose. Everybody, to a certain degree, causes land pollution. And every body can help to stop it.

Concepts, Attributes, Examples, and Non-Examples

Use the following definitions, explanations, and examples to identify the concepts, attributes, examples, and non-examples from the text passage provided.

- **Concept:** a class of events, names, dates, etc. that share a common set of defining attributes or characteristics. A concept is timeless, universal, abstract and broad, and is usually represented by 1-2 words. When identifying a concept, consider why it is important that students learn this information. This will lead you to a broader vision of the topic and assist in the articulation of the concept.
- **Attribute:** essential element of a concept. Attributes help students gain a deeper understanding of the concept. Once you have identified a concept and several examples, identify the critical characteristics of the concept. To assist in this process, write a dictionary definition of the concept. What defines the concept and is consistent across all examples of the concept? These are the attributes.

CONCEPT EXAMPLE

<i>Concept</i>	<i>Attributes</i>	<i>Examples /Non Examples</i>
Party	Gathering of People	Example: friends, co-workers Non-example: jail inmates
	Distinct Event (particular location, specific time, etc.)	Example: Lava Lounge from 8 – 10 pm Non-example: County Courthouse from 2 – 3 pm
	Intent to Have Fun	Example: celebrating an event Non-example: a somber occasion to mourn an event
	Activities	Example: eating, dancing, games, talking Non-example: none
	Party Items	Example: stereo, food, decorations Non-example: none

Complete the following charts for the information presented in the content chapter provided. Use the “Key Concepts” chart to identify the critical components presented in the chapter. You may find more or less than ten key concepts. Use additional paper if necessary.

KEY CONCEPTS

- | | |
|----------|-----------|
| 1. _____ | 6. _____ |
| 2. _____ | 7. _____ |
| 3. _____ | 8. _____ |
| 4. _____ | 9. _____ |
| 5. _____ | 10. _____ |

From the list above, isolate several main ideas and write these in the space provided for “Important Ideas.” You may have more or less than three important ideas.

IMPORTANT IDEAS

1. _____

2. _____

3. _____

From the list above, determine the concept and supporting attributes for each important idea. Write this information in the “Concept Descriptions” chart below. Identify plausible examples and non-examples for each attribute. Use additional paper if necessary.

CONCEPT DESCRIPTIONS

<i>Concept</i>	<i>Attributes</i>	<i>Examples /Non Examples</i>
1		
2		
3		

* Use additional paper if needed.

Tindal, G., Nolet, V., & Blake, G. (1992). *Research, consultation, & teaching program training module No. 3: Focus of teaching and learning in content classes*. Eugene, OR: University of Oregon, Behavioral Research and Teaching.

State Standards Alignment

Describe the alignment of this curriculum with the state standards. Refer to the Department of Education’s website for an updated version of the state standards in your grade level and content area. Include as much information as is available from your state and/or content area.

Content Domain	Common Curriculum Goal	Content Standard	Benchmark Level: _____	Rationale for Including

* Use additional paper if needed.

**Instructional Planning and Curriculum Analysis
Peer Evaluation Form**

Your Name: _____

Name of the person whose paper you are evaluating: _____

Please review the Planning and Curriculum Analysis plan. Evaluate each section using the criteria provided. Write a positive comment and areas for improvement. Once finished, sign and return the evaluation to the author of the paper. This evaluation will be submitted with the final draft of this section.

Peer Review Evaluation	Points Earned
Key Issues: substantial and significant key issues are unique and relevant to the unit.	/0.5
Positive Comment:	
Areas for Improvement:	
Curriculum Material	
1. Textbook citation is correctly formatted.	/0.5
Positive Comment:	
Areas for Improvement:	
2. Chapter summary is complete and accurate. Important and relevant information is included.	/0.5
Positive Comment:	
Areas for Improvement:	
Concept Analysis	
1. Concepts and attributes are clearly identified. Attributes are critical and important for understanding the concept.	/1
Positive Comment:	

Areas for Improvement:	
2. Examples and non-examples are clearly identified and reasonable. Examples help clarify the concept and attributes.	/1
Positive Comment:	
Areas for Improvement:	
State Standards Alignment	
1. Relevant information is provided relating the state standards to the unit.	/0.5
Positive Comment:	
Areas for Improvement:	
2. Curriculum is appropriately aligned with the state standards identified. Rationale for alignment is clear and reasonable.	/0.5
Positive Comment:	
Areas for Improvement:	
Additional Resources: a variety of relevant and useful resources are included.	/0.5
NOT REQUIRED FOR THE IN-CLASS PRACTICE	
Possible suggestions for sources of additional information:	
Final Comments:	
	/5

HOMEWORK ASSIGNMENT

Key Issues

Considering the content you intend to cover and the student population you will be addressing, identify important issues to take into account prior to instruction. Consider actions you will need to take when planning this unit.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Curriculum Material

Textbook

Locate and photocopy a textbook chapter or section from your area of interest. Provide a citation using the appropriate format as specified in the latest edition of the *Publication manual of the American Psychological Association*.

Chapter Summary

Write a narrative description of the content. Include all important information and issues presented in the text material.

Content Planning Worksheet

Concepts, Attributes, Examples, and Non-Examples

Complete the following planning worksheet for a 2- to 3-week segment of content you plan to teach. This segment probably would correspond to a chapter in the textbook you normally use in the class specified, but it could correspond to an entire unit in the textbook, or a few chapters taught together as a short unit, or selected parts of a chapter. However, please refer to a complete segment rather than a specific lesson or set of lessons. For example, if you generally give a test about every two or three weeks (or three or four times a quarter), think of all the material you teach between each test.

Specific Directions

CONCEPTS

Please use this definition of concept:

- *Concepts are specific words or short phrases that refer to classes of objects or events that share some common defining attributes.*
 - *Concepts involve three parts: a label, key attributes, and a range of examples.*
1. Please identify the key concepts that you consider **critical** for understanding the content you plan to teach during the three-week interval indicated. Learning these concepts would, in your opinion, mark the difference between mastery and nonmastery of the material you will cover.

List as many concepts as you feel are important, **up to ten**. Concepts you might target could include terms such as "molecule," "fossil fuel," "holy war," or "vassal." However, *specific examples* of concepts would not be applicable. For example, the concept "epoch" might be exemplified by "ancient Greece," "ancient Rome," or "the middle ages." These examples would not qualify as concepts according to the definition used here.

2. List one or two key defining attributes for each concept. These attributes would enable discrimination between what is and is not an example of the concept.
3. Provide 2 or 3 examples of each concept AND when possible or applicable also include non-examples that further aid in discrimination of the critical features of the concept.

IMPORTANT IDEAS

Please list approximately three ideas that you believe are critical to mastery of the content you will teach. Ideas are more general than specific concepts in that they represent unifying themes or topics. Please focus on ideas contained within the context of a single unit rather than global themes or topics that cut across the entire course.

For example, in a unit on fossil fuels, you might want students to understand the idea that "Use of fossil fuels results in environmental damage in the form of increased greenhouse gasses and acid precipitation." This idea would be more context-specific than the global theme, "Humans interact with their environment in a variety of ways, with both positive and negative effects," which could apply to a wide range of applications across a science curriculum.

KEY CONCEPTS

- 1. _____
- 2. _____
- 3. _____
- 4. _____
- 5. _____
- 6. _____
- 7. _____
- 8. _____
- 9. _____
- 10. _____

IMPORTANT IDEAS

- 1. _____

- 2. _____

- 3. _____

CONCEPT DESCRIPTIONS

<i>Concept</i>	<i>Attributes</i>	<i>Examples /Non Examples</i>
1		
2		
3		

* Use additional paper if needed.

Tindal, G., Nolet, V., & Blake, G. (1992). *Research, consultation, & teaching program training module No. 3: Focus of teaching and learning in content classes*. Eugene, OR: University of Oregon, Behavioral Research and Teaching.

State Standards Alignment

Describe the alignment of this curriculum with the state standards. Refer to the Department of Education's website for an updated version of the state standards in your grade level and content area. Include as much information as is available from your state and/or content area.

Content Domain	Common Curriculum Goal	Content Standard	Benchmark Level: _____	Rationale for Including

* Use additional paper if needed

Additional Resources

Please list additional resources related to the content of this instructional unit. State the source and provide a rationale for using this source for this unit.

Additional Resources for: _____	
Source	Rationale for Using

* Use additional paper if needed.

Instructional Planning and Curriculum Analysis Evaluation Form

Your Name: _____

Name of the person whose paper you are evaluating: _____

Please review the Planning and Curriculum Analysis plan. Evaluate each section using the criteria provided. Write a positive comment and areas for improvement. Once finished, sign and return the evaluation to the author of the paper. This evaluation will be submitted with the final draft of this section.

Peer Review Evaluation	Instructor Evaluation (Do not write in these boxes)	Points Earned
Key Issues: substantial and significant key issues are unique and relevant to the unit.		/0.5
Positive Comment:		
Areas for Improvement:		
Curriculum Material		
1. Textbook citation is correctly formatted.		/0.5
Positive Comment:		
Areas for Improvement:		
2. Chapter summary is complete and accurate. Important and relevant information is included.		/0.5
Positive Comment:		
Areas for Improvement:		
Concept Analysis		
1. Concepts and attributes are clearly identified. Attributes are critical and important for understanding the concept.		/1
Positive Comment:		

Areas for Improvement:		
2. Examples and non-examples are clearly identified and reasonable. Examples help clarify the concept and attributes.		/1
Positive Comment:		
Areas for Improvement:		
State Standards Alignment		
1. Relevant information is provided relating the state standards to the unit.		/0.5
Positive Comment:		
Areas for Improvement:		
2. Curriculum is appropriately aligned with the state standards identified. Rationale for alignment is clear and reasonable.		/0.5
Positive Comment:		
Areas for Improvement:		
Additional Resources: a variety of relevant and useful resources are included.		/0.5
Positive Comment:		
Areas for Improvement:		
Final Comments:		
	Total Score	/5

Section 2: Instructional Delivery

CLASSROOM EXAMPLE

Key Issues

Classroom Management
Transitions
Change-ups
Directions
Examples and Demonstrations
Probing Student Knowledge
Feedback and Rejoinders
Review Techniques
Teacher-Student Discourse
Relevance and Importance to Student
Teacher Content Knowledge

Instructional Sequence

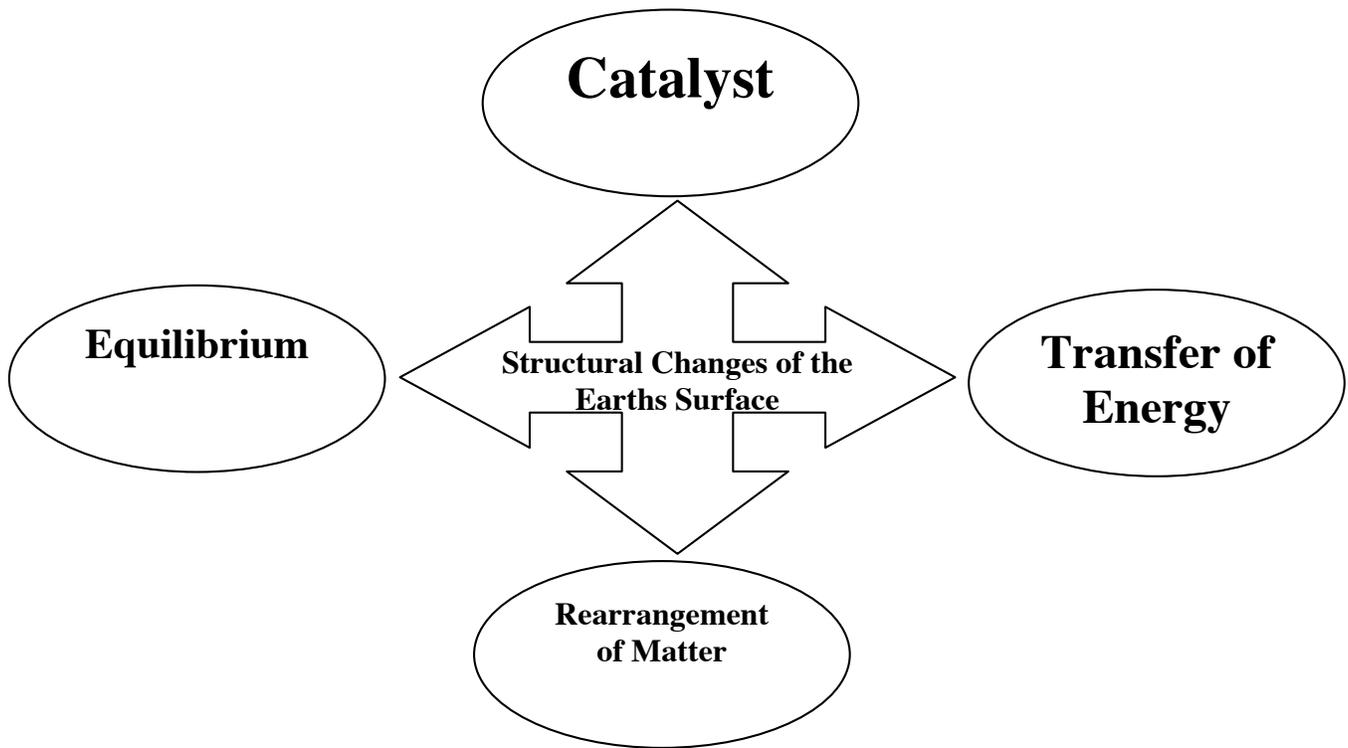
The following sequence of instructional events occurs during the presentation of this unit. Interactive teaching is illustrated by integrating critical thinking skills into the instructional sequence. Only a portion of this is represented on the videotape.

1. The unit introduction will include a discussion of the importance of studying earthquakes given the geographic location of the school and the necessity of preparing for the possible damage that may occur. Earthquake experiences will be solicited from students and shared with the class. Students will be asked to report the movement of the ground and the after effects, both on the land and dwellings.
2. The graphic organizer is introduced and distributed. Each attribute is thoroughly explained and students are encouraged to define the attributes in their own words. Examples of the concept and attributes are solicited from students and written on a master copy of the graphic organizer (*illustration*).
3. The Bull's Eye note-taking strategy will be used to organize the content. Teacher led note-taking will follow a brief introduction of this method of taking notes.
4. Seismology is introduced and explained. Students are probed for the defining characteristics or attributes of earthquakes by referring back to their experiences as described in the unit introduction. Teacher and students will write this information on the Bull's Eye notes.
5. As textbooks are not used in this classroom, the instructor must provide content. Instruction will continue with the teacher presenting detailed information about the attributes that further define the concept. The teacher will ask *reiteration* questions to

make sure the information is cemented in the notes. As an example, the instructor might ask the students to explain what it means to transfer energy during an earthquake.

6. Examples and non-examples will also be stated. Examples will be written in the rings of the bull's eye and non-examples will be recorded outside of the rings. Students will be asked to provide new examples and non-examples for each attribute (*illustration*).
7. The energy and direction of seismic waves will be directly illustrated through a demonstration using a long spring. Students will be engaged in this activity by *summarizing* previously presented facts about specific waves. Students will apply their knowledge of seismic wave energy across the range of examples presented in the demonstration by making *predictions* about the direction of wave energy. Students will also be asked to *predict* possible damage that a specific type of wave could cause.
8. The teacher will return to the note-taking strategy to record and clarify student observations about wave energy.
9. To highlight potential dangers, the instructor will project images from previous earthquakes. Students will be asked to provide an *explanation* of the causes of specific types of damage based on their understanding of seismic waves. Students will also be asked to justify their answers using their knowledge.
10. The lesson concludes with a description of the implications of earthquakes to society, including changes in architecture, patterns of city development, and the necessity for preparation. A choral response quiz will conclude the class session. Students will be asked to *reiterate* important information about the attributes of the concept and specific information about wave types.

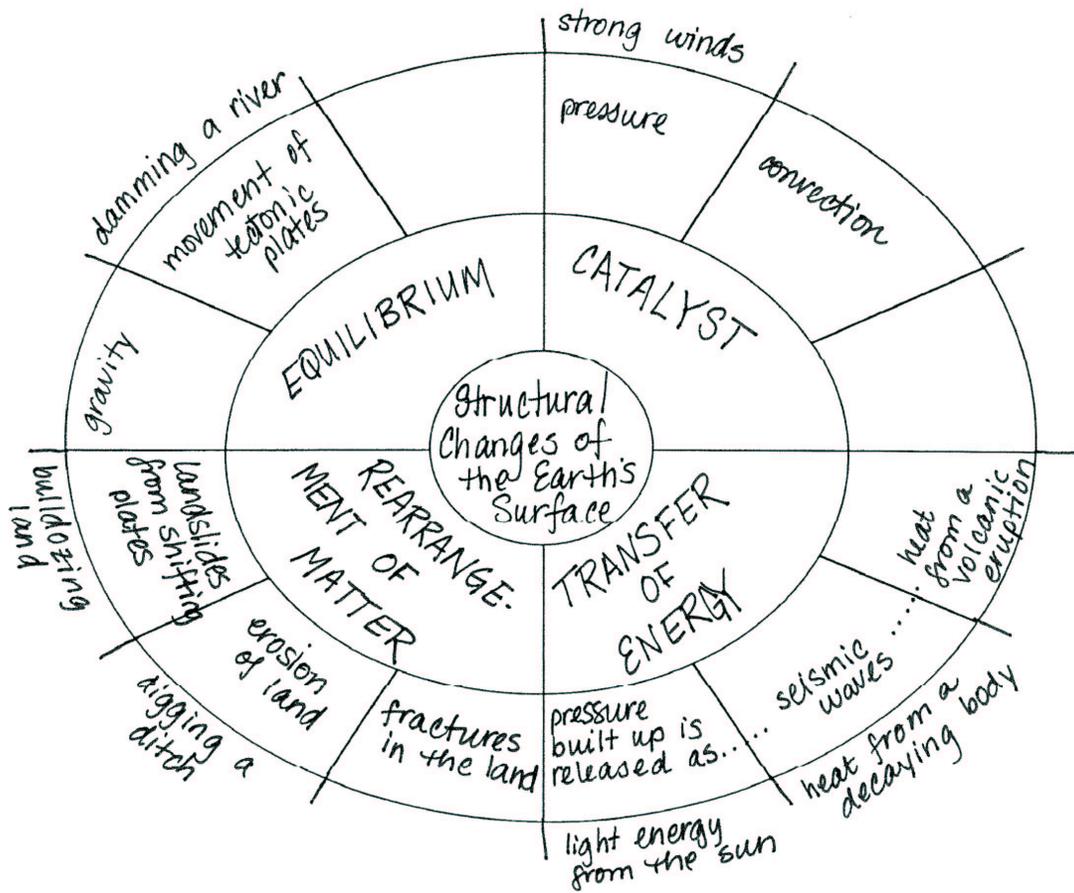
Graphic Organizer



Note-taking Strategy

Bull's Eye notes are taken by placing the name of the concept in the center of the diagram. Attributes are distributed in the boxes composing the next concentric circle. Examples and non-examples are placed in the outermost ring of the graphic.

Student Work Sample



Instructional Modifications

The following instructional modifications can be made to accommodate the diverse community of learners within this classroom.

1. Photocopied notes will be provided for students unable to take notes from the overhead.
2. Supplementary material to address the needs of students with a variety of reading abilities can be provided.
3. A classroom instructional aid may be available to assist students with disabilities and English Language Learners.

IN-CLASS PRACTICE EXERCISE

Key Issues

Considering the content you intend to cover and the student population you will be addressing, identify important issues to consider prior to the presentation of instruction. Consider actions you will need to take when presenting this unit.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Instructional Sequence

Design an instructional plan for the presentation of the information provided. Include a range of examples and non-examples you will use to teach the concept(s) and attributes. Include examples of interactive teaching. Clearly identify problem-solving scenarios that reflect a range of intellectual operations.

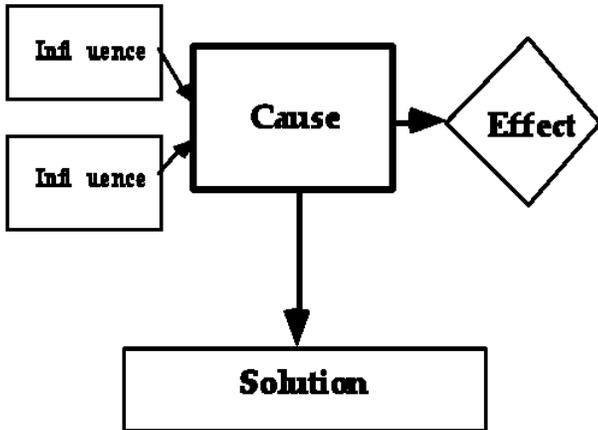
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____

* Use additional paper if needed.

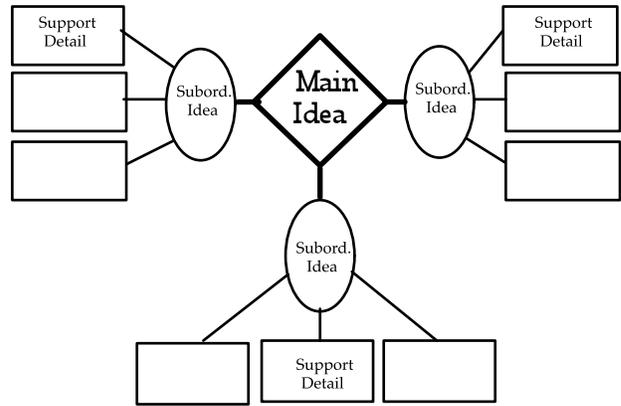
Graphic Organizers

A graphic organizer is a visual, non-linear representation of the linkages among knowledge forms. When designing a graphic organizer, it is important to emphasize the relationships and simplify the information to be presented. Below are several examples of different graphic organizers.

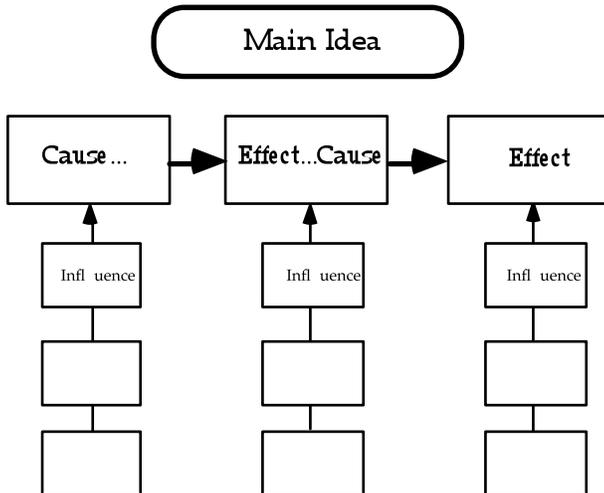
Problem and Solution Map



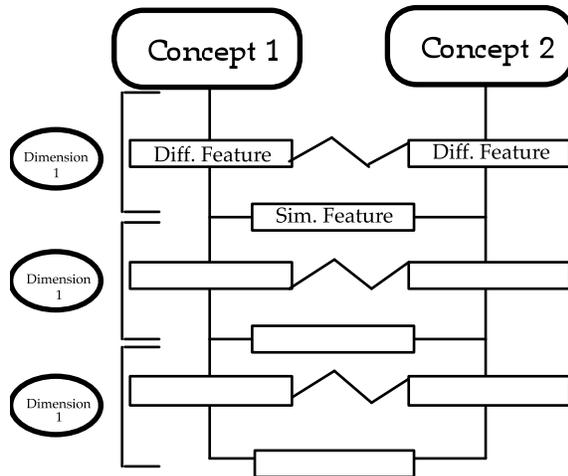
Descriptive or Thematic Map



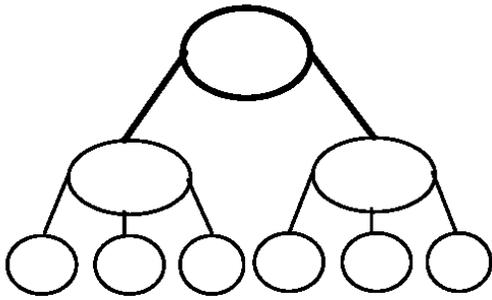
Sequential Episodic Map



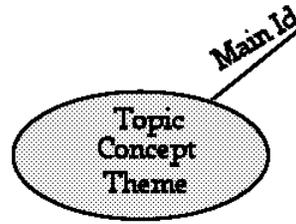
Comparative and Contrastive Map



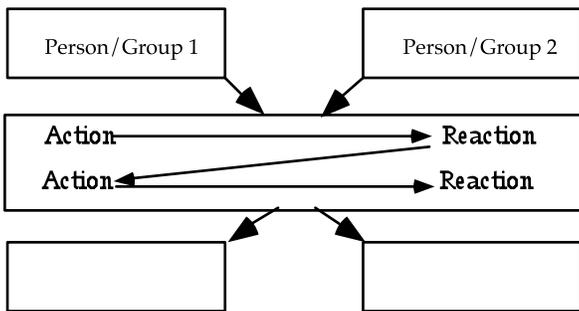
Network Tree



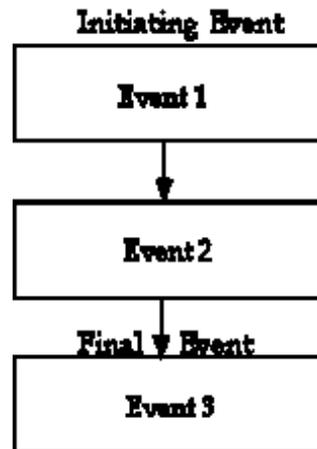
Spider Map



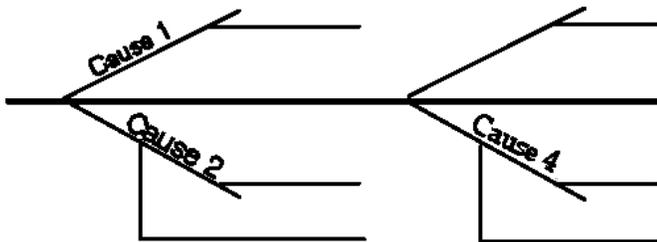
Human Interaction Outline



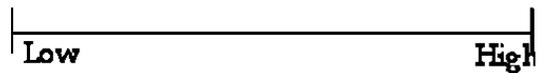
Series of Events Chain



Fishbone Map



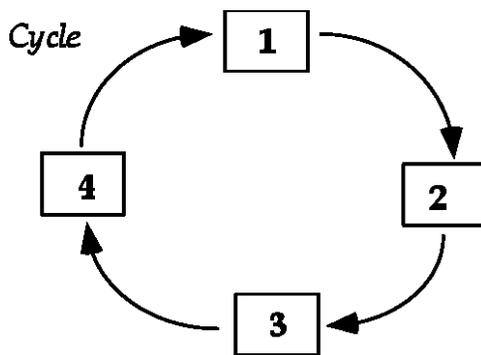
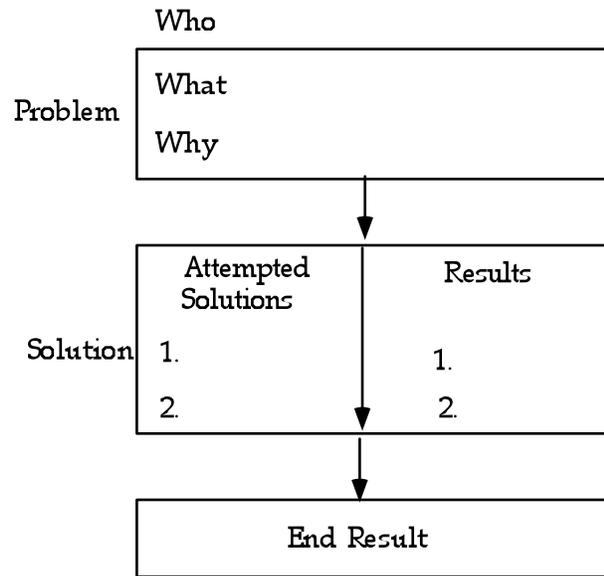
Continuum Scale



Compare-Contrast Matrix

Attribute 1		
Attribute 2		
Attribute 3		

Problem-Solution Outline



Tindal, G., Nolet, V., & Blake, G. (1992). *Research, consultation, & teaching program training module No. 3: Focus of teaching and learning in content classes*. Eugene, OR: University of Oregon, Behavioral Research and Teaching.

Graphic Organizer

On a separate piece of paper, sketch a graphic organizer for the content provided that shows the key relationships among concept(s) and attributes. You may design your own or use one of the above examples.

Instructional Modifications

List instructional modifications you will make to accommodate the diverse community of learners within your classroom.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

* Use additional paper if needed.

Instructional Delivery Peer Evaluation Form

Your Name: _____

Name of the person whose paper you are evaluating: _____

Please review the Instructional Delivery plan. Evaluate each section using the criteria provided. Write a positive comment and areas for improvement. Once finished, sign and return the evaluation to the author of the paper. This evaluation will be submitted with the final draft of this section.

Peer Review Evaluation	Points Earned
Key Issues: substantial and significant key issues are unique and relevant to the lesson described.	/0.5
Positive Comment:	
Areas for Improvement:	
Instructional Delivery	
1. Conceptual framework (concepts, attributes, examples and non-examples) and graphic organizer are explicitly introduced.	/0.5
Positive Comment:	
Areas for Improvement:	
2. Instructional sequence flows in a logical order. Instructional sequence is rich and provides a detailed list of activities to be completed.	/1
Positive Comment:	
Areas for Improvement:	
3. Interactive teaching techniques are integrated into the instructional sequence with clearly identified intellectual operations that elicit higher order thinking.	/1
Positive Comment:	
Areas for Improvement:	

Graphic Organizer	
1. Concepts and attributes are clearly identified.	/0.5
Positive Comment:	
Areas for Improvement:	
2. Graphic organizer explicates the organization and structure of the content.	/0.5
Positive Comment:	
Areas for Improvement:	
Instructional Modifications	
1. Instructional modifications are clearly articulated in sentence format.	/0.5
Positive Comment:	
Areas for Improvement:	
2. Instructional modifications address the need of diverse learners.	/0.5
Positive Comment:	
Areas for Improvement:	
Final Comments:	
	/5

HOMEWORK ASSIGNMENT

Key Issues

Considering the content you intend to cover and the student population you will be addressing, identify important issues to consider prior to the presentation of instruction. Consider actions you will need to take when presenting this unit.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Instructional Sequence

Design an instructional plan for the presentation of the information provided. Include a range of examples and non-examples you will use to teach the concept(s) and attributes. Include examples of interactive teaching. Clearly identify problem-solving scenarios that reflect a range of intellectual operations.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____

* Use additional paper if needed.

Graphic Organizer

A graphic organizer is a visual, non-linear representation of the linkages among knowledge forms. When designing a graphic organizer, it is important to emphasize the relationships and simplify the information to be presented.

On a separate piece of paper, sketch a graphic organizer for the content you have chosen that shows the key relationships among concept(s) and attributes.

Instructional Modifications

List instructional modifications you will make to accommodate the diverse community of learners within your classroom.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

* Use additional paper if needed.

Instructional Delivery Evaluation Form

Your Name: _____

Name of the person whose paper you are evaluating: _____

Please review the Instructional Delivery plan. Evaluate each section using the criteria provided. Write a positive comment and areas for improvement. Once finished, sign and return the evaluation to the author of the paper. This evaluation will be submitted with the final draft of this section.

Peer Review Evaluation	Instructor Evaluation (Do not write in these boxes)	Points Earned
Key Issues: substantial and significant key issues are unique and relevant to the unit.		/0.5
Positive Comment:		
Areas for Improvement:		
Instructional Delivery		
1. Conceptual framework and graphic organizer are explicitly introduced.		/0.5
Positive Comment:		
Areas for Improvement:		
2. Instructional sequence flows in a logical order and provides a detailed list of activities to be completed.		/1
Positive Comment:		
Areas for Improvement:		
3. Interactive teaching techniques are integrated into the instructional sequence with clearly identified intellectual operations that elicit higher-order thinking.		/1
Positive Comment:		

Areas for Improvement:		
Graphic Organizer		
1. Concepts and attributes are clearly identified.		/0.5
Positive Comment:		
Areas for Improvement:		
2. Graphic organizer explicates the organization and structure of the content.		/0.5
Positive Comment:		
Areas for Improvement:		
Instructional Modifications		
1. Instructional modifications are clearly articulated in sentence format.		/0.5
Positive Comment:		
Areas for Improvement:		
2. Instructional modifications address the need of diverse learners.		/0.5
Positive Comment:		
Areas for Improvement:		
Final Comments:		
	Total Score	/5

Section 3: Independent Activity

CLASSROOM EXAMPLE

Key Issues
Change-ups
Monitoring Students
Individual Assistance
Closure

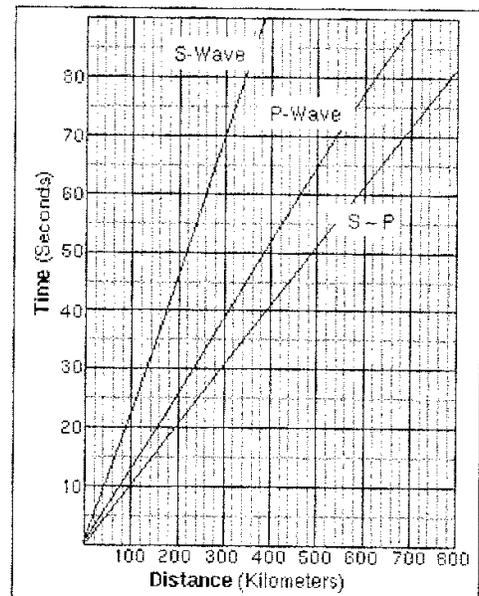
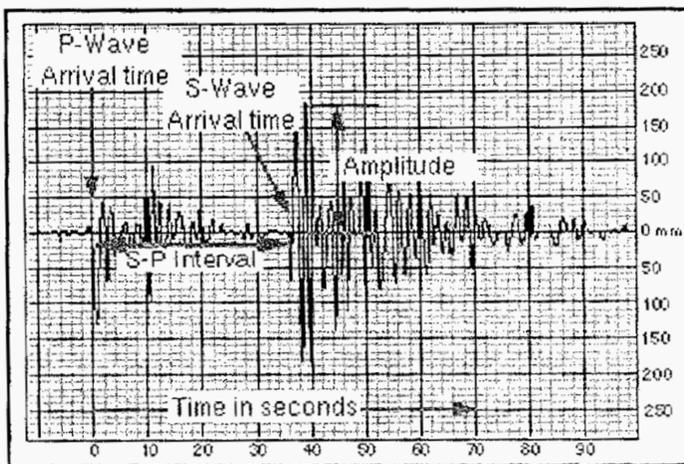
Independent Activity Explanation

After reviewing the information presented in class, the instructor will introduce two independent activities. Activity 1 focuses on the attribute, Transfer of Energy, students will deepen their understanding of structural changes of the earth's surface by following the movement of seismic waves from the epicenter to seismic stations miles away. This *illustration* allows students to apply their knowledge to a new example of the attribute.

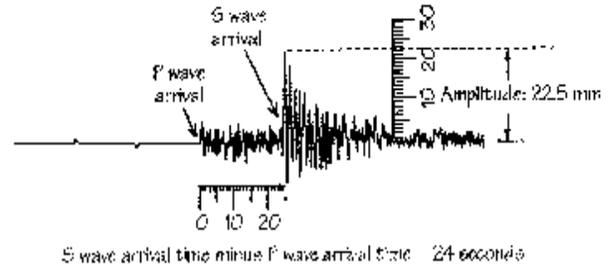
In Activity 2, students are given the following exercise to demonstrate their knowledge of Structural Changes in the Earth's Surface. Part I of this activity requires students to *illustrate* the attributes of the concept by creating a new example for each attribute. Part II allows students to *evaluate* a specific situation and use their knowledge of the concept and attributes when devising a solution.

Independent Activity 1

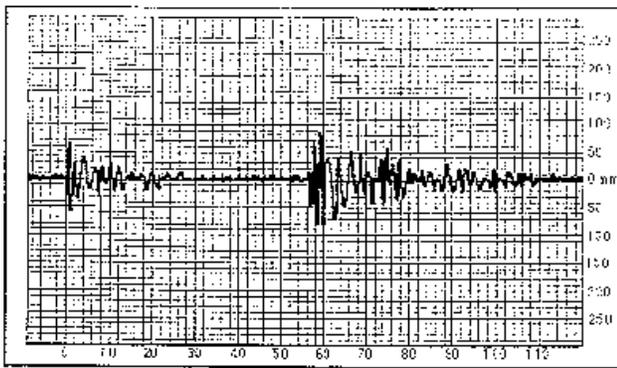
Instructions will be provided in class through verbal directions and modeling of the steps involved in locating the epicenter. The following diagrams are used for this activity. Reproducible copies are provided in Appendix A.



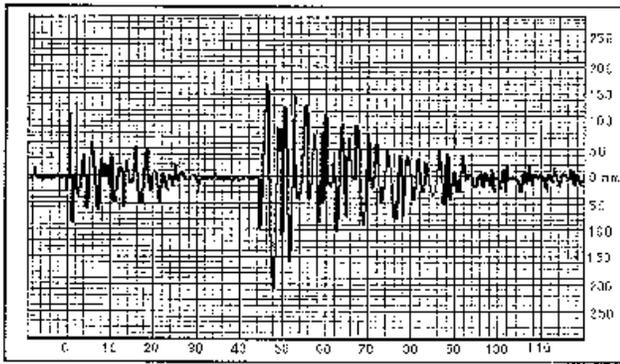
RICHTER MAGNITUDE	EQUIVALENT MERCALLI INTENSITY AND ITS EFFECTS
2	I-II Usually detected only by instruments
3	III Felt indoors
4	IV-V Felt by most people; slight damage
5	VI-VII Felt by all; many frightened and run outdoors; minor to moderate damage
6	VII-VIII Everybody runs outdoors; moderate to major damage
7	IX-X Major damage
8+	X-XII Total and major damage



ble 16-1. Abbreviated Mercalli intensity scale compared with the Richter magnitude scale.

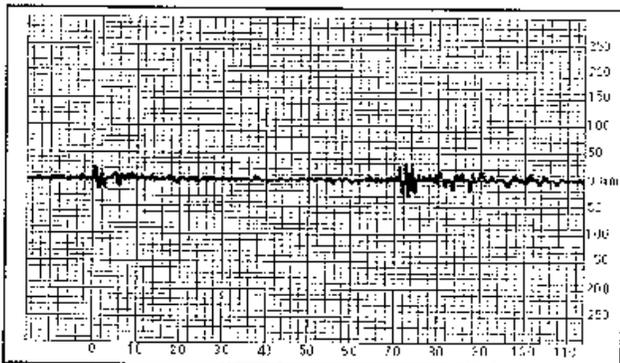


Pusan Seismic Station S-P Interval = _____ seconds

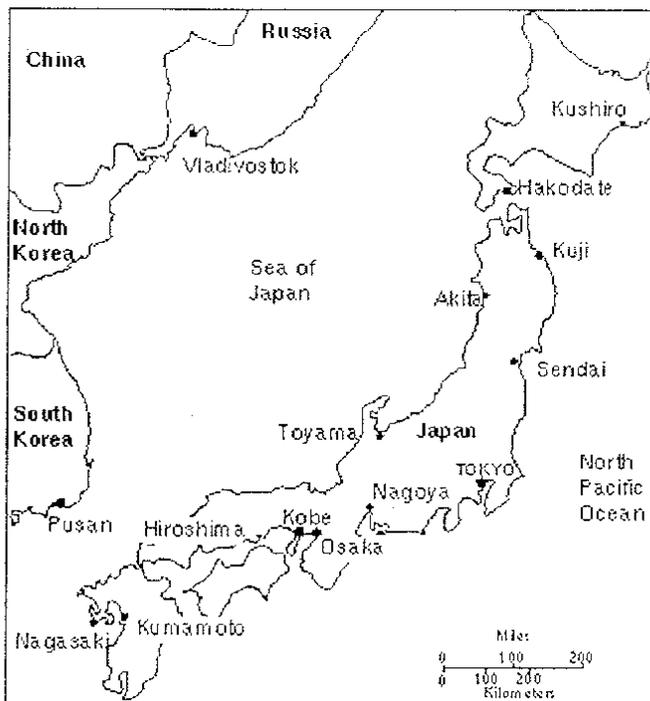
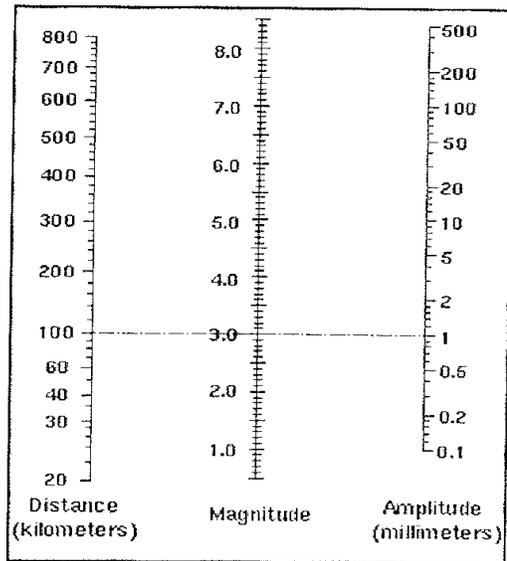


Tokyo Seismic Station S-P Interval = _____ seconds

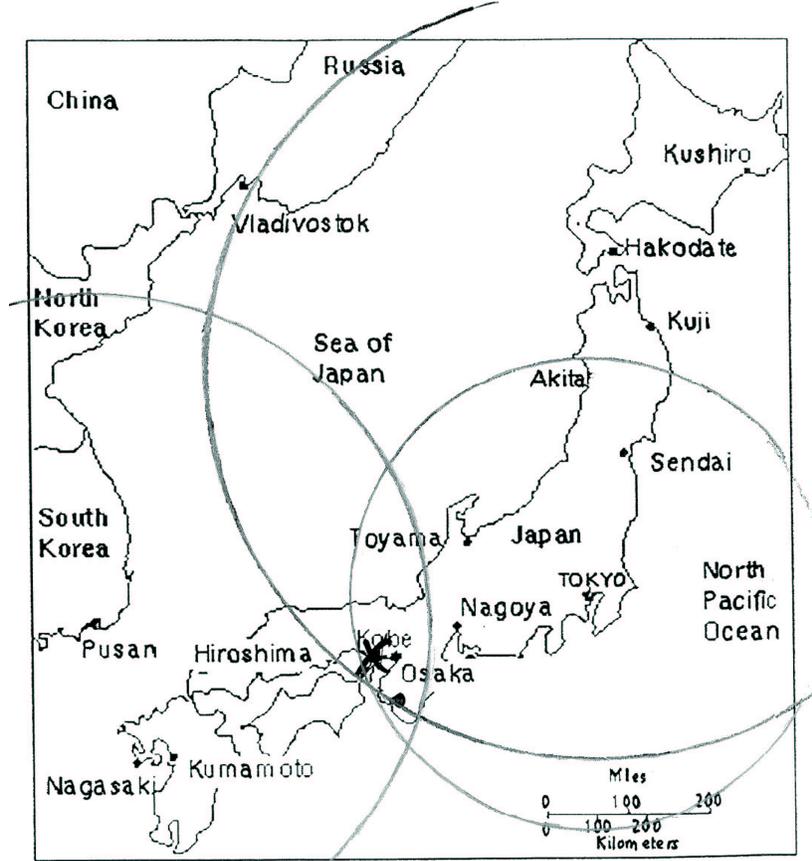
Column by the Langmuir Electric



Akita Seismic Station S-P Interval = _____ seconds



Student Work Sample



Approximate location
Magnitude 6.7
50 Kil below Osaka

Independent Activity 2

Name:
Period:

Structural Changes in the Earth's Surface *Reviewing the Attributes*

Activity: Part I

In the frames provided below, write or draw an original example of each attribute of the concept discussed in class. Use information provided in class to present a realistic representation of the attribute. Label each frame with the corresponding attribute. You may use additional space if needed.

Activity: Part II

On a separate piece of paper, respond to the following scenario. Use the information presented in class to thoroughly answer each question. Be specific and include a discussion of the concept and attributes described in class.

You will need additional information to complete this assignment, such as the name of the fault line near the town mentioned and structural safety issues of brick buildings. You may use the Internet, library resources, or other reliable sources.

A county safety inspector told an owner of a hardware store in Oak Harbor, Washington that she must close her store to retrofit the brick structure.

- Why is this process necessary?
- What is the cause of the inspector's concern?
- What are the potential consequences if this structure is not repaired?
- What other safety precautions should the storeowner consider?

Grading

The products from this assignment will be graded holistically. The maximum score possible is 30 points, 10 points for Part I and 20 points for Part II.

Instructional Modifications

These activities are designed to accommodate various learners. The following instructional modifications can also be made to promote the success of all learners in the classroom.

1. Students may compose their responses to Part II on a computer.
2. Students can present their responses orally or through a scribe.
3. The assignments may be extended into a detailed research report for accelerated students.
4. Resources can be accessed in various reading levels.
5. Students can be given time in class to research the topic.
6. More time may be permitted for completion of the assignments if necessary.
7. A classroom aid may be available to assist students with disabilities and English Language Learners.

Intellectual Operations

Reiteration	<p><i>A verbatim reproduction of material that was previously taught.</i></p> <ul style="list-style-type: none">• The emphasis is on <u>verbatim</u>. The wording in the student's response must be very nearly identical to that presented in instruction.
Summarization	<p><i>Generation or identification of a paraphrase, rewording or condensation of content presented during instruction.</i></p> <ul style="list-style-type: none">• The emphasis here is on previous presentation of material. Therefore, summarization involves remembering information to a much greater extent than manipulating it.
Illustration	<p><i>Generation or identification of a previously unused example of a concept or principle.</i></p> <ul style="list-style-type: none">• The emphasis here is on use of an example that was not presented in instruction. In this respect, the student is expected to employ information about the attributes of a particular concept or principle rather than to simply remember whether or not an event exemplifies a knowledge form.
Prediction	<p><i>Description or selection of a likely outcome, given a set of antecedent circumstances or conditions that has not previously been encountered.</i></p> <ul style="list-style-type: none">• Again, the emphasis is on the <u>use</u> of information in a novel context rather than remembering a response from previous instruction.
Evaluation	<p><i>Careful analysis of a problem to identify and use appropriate criteria to make a decision in situations that require a judgment.</i></p> <ul style="list-style-type: none">• Evaluation focuses on decision-making. The student must first recognize or generate the options available and then use a set of criteria to choose among them.
Explanation	<p><i>Description of the antecedent circumstances or conditions that would be necessary to bring about a given outcome.</i></p> <ul style="list-style-type: none">• Application is the reverse of prediction. The student must use information about a concept or principle to work backwards from the circumstances presented and tell what happened to create it.

Some examples of interactions between knowledge forms and intellectual operations:

<p>Reiteration of a fact:</p>	<p><i>T:</i> Salem is the capital of Oregon. –What is the capital of Oregon? <i>S:</i> Salem is the capital of Oregon.</p>
<p>Summarization of a concept: element</p>	<p><i>T:</i> An element is a substance made of only one kind of atom. –Who can tell me what an element is? <i>S:</i> If you have some kind of matter and all of its atoms are exactly the same, that's an element.</p>
<p>Illustration of a concept: energy conservation</p>	<p><i>T:</i> We talked about some examples of energy conservation in the home. Can you think of an example we haven't talked about? <i>S:</i> We can recycle glass—it takes less energy to make glass from old glass than it does to make it from scratch, so that saves energy.</p>
<p>Prediction of a concept: Mass production (Three attributes: •assembly line •standardized parts •division of labor)</p>	<p><i>T:</i> Mass production is a system for rapidly creating large quantities of one kind of product that uses an assembly line and standardized parts. If we want to make a lot of a given product and we want to do it fast, what would jobs be like in this system? <i>S:</i> It seems like it would help if every person on the assembly line only had one kind of job to do; that way they'd get real fast at it.</p>
<p>Evaluation of a principle: The Law of Diminishing Returns: "As units of a variable factor of production are added to a fixed factor of production, at some point the resulting increases in output will begin to diminish in size."</p>	<p><i>T:</i> Farmer Jones has decided that if he can't double his profits from his dairy farm, he's going to sell it. Right now he's trying to figure out if he can meet his goal by increasing the milk output of his herd without buying any more cows. If you were Farmer Jones, what factors would you consider in deciding whether to sell or try to increase your cows' productivity? <i>S:</i> The number of cows is fixed. Obviously, the amount of milk a cow produces can't be increased indefinitely, so we'd need to know what they're producing now and how much it can be increased...</p>
<p>Explanation of a principle If one link in an ecosystem's food chain is broken, the relationship among the organisms may be upset.</p>	<p><i>T:</i> Homeowners on Paradise Lake are very upset—in the past couple of years the mosquito population has increased so much that it has become impossible to stay outdoors for very long. They want to get rid of those mosquitoes. What should they do? <i>S:</i> Well, they shouldn't just run out and get the most powerful bug spray to kill 'em. They ought to try to figure out why the mosquitoes have increased. What eats mosquitoes? Frogs. Maybe something happened to the frogs. . .</p>

Tindal, G., Nolet, V., & Blake, G. (1992). *Research, consultation, & teaching program training module No. 3: Focus of teaching and learning in content classes*. Eugene, OR: University of Oregon, Behavioral Research and Teaching.

Independent Activity

On a separate piece of paper, design an independent activity for the content provided. Be certain to include higher order intellectual operations. Clearly format the assignment by including instructions and a scoring guide. The activity should be ready to present in a classroom setting.

Instructional Modifications

List instructional modifications you will make to accommodate the diverse community of learners within your classroom.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

* Use additional paper if needed.

Independent Activity Peer Evaluation Form

Your Name: _____

Name of the person whose paper you are evaluating: _____

Please review the Independent Activity plan. Evaluate each section using the criteria provided. Write a positive comment and areas for improvement. Once finished, sign and return the evaluation to the author of the paper. This evaluation will be submitted with the final draft of this section.

Peer Review Evaluation	Points Earned
Key Issues: substantial and significant key issues are unique and relevant to the lesson described.	/0.5
Positive Comment:	
Areas for Improvement:	
Independent Activity	
1. Explanation provides a thorough description of the activity. Intellectual operations are explicitly stated.	/1
Positive Comment:	
Areas for Improvement:	
2. Independent activity is clearly linked to the concepts and attributes. Activity provides practice using higher order intellectual operations.	/1
Positive Comment:	
Areas for Improvement:	
3. Activity is appropriately formatted with directions. Activity is ready for distribution in a classroom.	/0.5
Positive Comment:	
Areas for Improvement:	

4. Scoring rubric clearly identifies expectations for completing the activity.	/1
Positive Comment:	
Areas for Improvement:	
Instructional Modifications	
1. Instructional modifications are clearly articulated in sentence format.	/0.5
Positive Comment:	
Areas for Improvement:	
2. Instructional modifications address the need of diverse learners.	/0.5
Positive Comment:	
Areas for Improvement:	
Final Comments:	
	/5

Independent Activity

On a separate piece of paper, design an independent activity for the content you have chosen that aligns with the conceptual framework previously identified. Be certain to include higher order intellectual operations. Clearly format the task with well-articulated directions. Provide a scoring guide.

Instructional Modifications

List instructional modifications you will make to accommodate the diverse community of learners within your classroom.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

* Use additional paper if needed.

Independent Activity Evaluation Form

Your Name: _____

Name of the person whose paper you are evaluating: _____

Please review the Independent Activity plan. Evaluate each section using the criteria provided. Write a positive comment and areas for improvement. Once finished, sign and return the evaluation to the author of the paper. This evaluation will be submitted with the final draft of this section.

Peer Review Evaluation	Instructor Evaluation (Do not write in these boxes)	Points Earned
Key Issues: substantial and significant key issues are unique and relevant to the unit.		/0.5
Positive Comment:		
Areas for Improvement:		
Independent Activity		
1. Explanation provides a thorough description of the activity. Intellectual operations are explicitly stated.		/1
Positive Comment:		
Areas for Improvement:		
2. Independent activity is clearly linked to the concepts and attributes. Activity provides practice using higher order intellectual operations.		/1
Positive Comment:		
Areas for Improvement:		
3. Activity is appropriately formatted with directions. Activity is ready for distribution in a classroom.		/0.5
Positive Comment:		

Areas for Improvement:		
4. Scoring rubric clearly identifies expectations for completing the activity.		/1
Positive Comment:		
Areas for Improvement:		
Instructional Modifications		
1. Instructional modifications are clearly articulated in sentence format.		/0.5
Positive Comment:		
Areas for Improvement:		
2. Instructional modifications address the need of diverse learners.		/0.5
Positive Comment:		
Areas for Improvement:		
Final Comments:		
	Total Score	/5

Section 4: Assessment

CLASSROOM EXAMPLE

Key Issues

Student Expectations
Probing Student Knowledge
Classroom Management
Monitor and Adjust
Directions

Assessment Explanation

At the conclusion of this lesson, the instructor will administer two assessment activities. Prior to distributing these assignments, the teacher will review the content and allow students to share personal earthquake experiences with the class. Student-ready assessment activities are included in Appendix A.

Assessment Activity 1, Earthquake Assessment, is designed to provide the students with an opportunity to *reiterate* and *summarize* information learned about the concept and attributes. It also provides a forum for students to reflect on the information and the value it holds in their lives.

Assessment Activity 2, Earthquake Experience, requires students to *predict* the outcome of an earthquake using their knowledge of the concept and attributes described in class. This assignment allows students to creatively express their understanding of earthquakes. The scoring systems are included in the directions of the assignments.

Assessment Activity 1

Name:

Period:

Earthquake Assessment

Brainstorm everything you learned about the Structural Changes of the Earth's Surface using earthquakes as an example. Recall the information you learned during the instruction, demonstration, and activity. Write this information in the first column. In the second column, identify why it is important to learn about earthquakes and seismic waves. Include information about why scientists study these concepts. In the third column, describe what difference this information makes in your life. You will receive one (1) point for each clearly expressed idea or thought, up to 12 points.

	What I learned	Why I learned it.	What difference does it make?
1			
2			
3			
4			
5			

Student Work Sample 1

Earthquake Assessment

Within the last week, you were led through a "bull's eye" note taking strategy for learning about earthquakes. You learned about different kinds of waves, in particular three attributes: energy, direction, and speed. In a demonstration using a spring, three different kinds of seismic waves were analyzed: S, P, and L waves. Finally, an activity was completed in which waves were measured in time, converted to a common unit of distance, and then overlaid on a map to calculate a range of impact around an epicenter. Brainstorm everything you learned about earthquakes from the instruction and activity. Write this information in the first column. Why is it important to learn about earthquakes and seismic waves? Why do scientists study these concepts? You will receive one (1) point for each clearly expressed idea or thought.

	What I learned	Why I learned it.	What difference does it make?
1	S-waves; secondary waves, their energy travels perpendicular to the wave	To specify the different types of waves and the damage they cause	Different waves cause different amounts of damage. This helped us know what waves do what.
2	Earth quakes might start at one specific spot, but they cover hundreds of miles.	Even if I feel an earthquake in Eugene, it could've happened in Portland	Earth quakes are stronger where they start, but they effect other areas
3	L-waves; Love waves. They are the most destructive waves and come last.	Again, to specify the different types of waves and the effect they have.	Although P & S waves come first, L waves are by far the most damage causing waves
4	The three ways to measure an earth quake S-P interval, distance and amplitude	This info. makes it so I can measure an earth quake on the Richter scale	If in an earth quake, and I know the info. it can help me measure the size of the quake
5	P-waves; Primary waves. These are the waves that are felt first. Their energy runs parallel.	Knowing this will help me if ever in an earth quake	If I know that what I'm feeling is a P-wave then it will give me time to brace myself or get out.

Student Work Sample 2

Earthquake Assessment

Within the last week, you were led through a "bull's eye" note taking strategy for learning about earthquakes. You learned about different kinds of waves, in particular three attributes: energy, direction, and speed. In a demonstration using a spring, three different kinds of seismic waves were analyzed: S, P, and L waves. Finally, an activity was completed in which waves were measured in time, converted to a common unit of distance, and then overlaid on a map to calculate a range of impact around an epicenter. Brainstorm everything you learned about earthquakes from the instruction and activity. Write this information in the first column. Why is it important to learn about earthquakes and seismic waves? Why do scientists study these concepts? You will receive one (1) point for each clearly expressed idea or thought.

	What I learned	Why I learned it.	What difference does it make?
1	I LEARNED ABOUT S, P, + L WAVES	BECAUSE PROBABLY THOUGHT IT TO US SO WE WOULD KNOW THE DIFFERENT TYPES OF WAVES	THE DIFFERENT WAVES MOVE IN DIFFERENT DIRECTIONS AND AFFECT THE EARTH DIFFERENT WAYS
2	I LEARNED HOW TO MEASURE EARTHQUAKES ON THE RICHTER SCALE	SO IF I WANT TO MEASURE AN EARTHQUAKE, I'LL KNOW NOW.	DISTANCE, SP, INTERVAL, AND AMPLITUDE
3	I LEARNED THAT EARTHQUAKES START MAINLY SPAN BUT EFFECTS 100'S OF MILES	SO I KNOW MORE ABOUT EARTHQUAKES	THE EARTHQUAKES CAN EFFECT MANY PLACES, NOT JUST NEAR THE ROOT OF IT.
4			
5			

Student Work Sample 3

Earthquake Assessment

Within the last week, you were led through a "bull's eye" note taking strategy for learning about earthquakes. You learned about different kinds of waves, in particular three attributes: energy, direction, and speed. In a demonstration using a spring, three different kinds of seismic waves were analyzed: S, P, and L waves. Finally, an activity was completed in which waves were measured in time, converted to a common unit of distance, and then overlaid on a map to calculate a range of impact around an epicenter. Brainstorm everything you learned about earthquakes from the instruction and activity. Write this information in the first column. Why is it important to learn about earthquakes and seismic waves? Why do scientists study these concepts? You will receive one (1) point for each clearly expressed idea or thought.

	What I learned	Why I learned it.	What difference does it make?
1	The Different type of waves	Because I was forced	Preperation
2	The Different parts of waves	I am suposto	So people can be read for it
3	How fast the waves are	I wanted to	So scincetist can know about it
4	Cause and affect	to be read in life	We can get read
5	Cause maching used to mesuer earthquake	So I can learn it	prepared

Assessment Activity 2

Assignment# Name:
Earthquake Experience Period:

Pretend you are one of the following:

- ~ A journalist
- ~ A story teller
- ~ An interviewer
- ~ An interviewee
- ~ A photographer
- ~ A search and rescue member
- ~ A member of the police or fire department
- ~ A research scientist
- ~ Other???? (Check with the instructor)

And as this person you have recently experienced an earthquake. From this perspective describe, in as great detail as possible, everything you can about the earthquake.



YOU WILL DO THIS WRITTEN IN CLASS TODAY WITH ANY DRAWINGS TO HELP DESCRIBE YOUR SITUATION AND EXPERIENCE (ALSO TO SHOW YOUR KNOWLEDGE OF EARTHQUAKES).

Be sure to include:

- Where the earthquake happened.
- Where you were in respect to the earthquake.
- What type of rock was around?
- Any information regarding the earthquake (magnitude, time, etc.)
- Information about how and what was recorded (seismic waves)
- Information about what damage was caused by specific seismic waves.
- What you were doing before it happened.
- What you felt and what you did when it happened.
- What you did after it happened.
- The aftermath

I recommend some drawings to demonstrate your knowledge of seismic waves. This is your opportunity to show what you have learned in the last two days.

You will receive credit (three points) for each of the bits of information above that you include in your report. Feel free to be creative and have fun!

Student Work Sample 1

Now, it was oh, about 3:00. I was sitting feeding the fish, while eating a tuna sandwich. The bench I was sitting on, was green, but the paint was chipped. Oh well, you can't have everything. I was by the pond by the retirement home where I live.

My tuna sandwich was very good. It was wheat bread, and the tuna, mmm. It had pickle relish, tomatoes, cheese, and - oh all my tuna sandwiches are - dolphin free. Yum, I could have another now.

My retirement home where my cursed daughter put me there 4 years ago, was in California. Right on the border of the huge city Santa Cruz.

I used to go to the boardwalk every night it was 50¢ a night, which was Tuesday. They had Ice Cream Of the Future. Tiny little pellets of ice cream balls. They are delicious. I can't go there anymore. The retirement home manager wants us in bed by 4:00 pm. It's really not that bad there. We sew, we eat, we paint, we can play

mineral golf. Quite enjoyable, although I never see my family. The visiting hours are from 1-1:30 am. That's when we wake up. It's funny, nobody wants to come then.

Oh my look at what I've said. This was supposed to be about earthquakes, right? Sorry.

There was a cement path surrounding the pond with fish, and soil was everywhere else. After, on the news we get to watch 1:30-2:00 am after visiting hours - they said it had a magnitude of 2 or 3. The earthquake came and went in 5 seconds. The only damage was I was standing when it hit. The earthquake I mean, and I tripped over a fish that jumped out of the water. I think to bite me, but who knows - and when I fell, my hip broke. I have a metal one now. ~~Would~~ Would you like to see? Here let me show you. Oh, no? you don't? Ok, never mind.

When I fell, since I could not get up I thought to see the better side of

things. I looked up at the clouds and made little bunnies and turtles. They were divine. Unfortunately the horse had five legs. ~~I~~ I felt the earth moving under my broken bones and it was almost nice. You know what? I think the horse had 4 legs and one tail. That must be it. Someone found me at 5:30 or so. They thought I ran away. The nurses and helpers yell at me a lot. I went to the hospital of course. I think all that was disturbed, besides my hip, was the water. Little ringlets are what I saw when I turned my head. What a wonderful experience. I hope to have it again soon.

waves

P - smallest, fastest ~~up down~~ back forth

S - medium, medium up down

L - Biggest, slowest rolling

Student Work Sample 2

My Earthquake Experience

Walking out of Starbucks©, I was feeling pretty good. Believe it or not, there wasn't much of a line and I got my double-latte quite quickly.

Sipping my double-latte while walking down Sunset boulevard I felt a little shake. I didn't really take it into consideration. The only thing I thought was, \$! *∂, spilled my coffee. Now, not feeling so happy, I continued to walk to work.

A few minutes later, I felt another shake. This time, moving the ground beneath my feet. I looked around to make sure it wasn't just me, and by the reactions on the peoples' faces around me let me know that it wasn't just me.

This time rushing to my office, looking for shelter and the feel of security, I started to see a wave of concrete flowing down the street. As my eyes widened, I froze. Watching this wave and the buildings and cars rolling under its power, I began to run. I didn't have somewhere to go, but I still ran.

I could see the waves consume building after building. Destroying everything in its path. Looking back, I saw the wave gaining on me, nipping at my heels.

Feeling my legs collapse under me, sent me sprawling onto this humungus wave. Throwing me like a little girl playing with her rag-doll, I flew through the air. Landing on my stomach, just in time for the next wave to hurl me accross the sky. This time, landing on my back, knocking the wind out of me.

Stumbling to my feet, I somehow found my balance and ran into the nearest building. Seeking shelter under the closest doorway, watching wave after wave demolish everything in sight... I fainted.

Waking up with tubes in your arm, mouth and nose is no pic-nic, believe me. Looking around, I found that I was in an ambulance. The paramedic just told me I was going to be alright and that I had just survived one of California's worst earthquakes. Just knowing I had survived gave me some relief.

After being examined by a doctor, and getting a cast for my broken arm, stitches above my left eye, crutches for a sprained ankle and some really good pain killers, I lay in my bed. I turned the T.V. on to see if the 4 o'clock news had anything on the quake.

The reporter beamed in with the news, "Being a 6.8 on the Richter scale, causing 11.4 million dollars worth of damage, and killing 7, it was one of California's bigger earthquakes." I turned the T.V. off and lay in my bed in amazement. I had never been in an earthquake, and was glad to be alive.

I lay back and shut my eyes. As I slipped into unconsciousness, a thought popped into my mind. I hope Starbucks© will be open tomorrow.

Student Work Sample 3

One day when I was on the beach taking pictures of the sun rise this huge earthquake happened. It happened on the California coast next to San de ago. I was about one or two miles away. I was right on the coast and the sand just had sum huge wave in it. The eathquake was about 8.7 to a 9 then the time was not good it was about 6:30 in the morning. I felt this big shake and then these huge wave from the ocean and the sand had some very big wave that tript me up. This earthquake did some major damage It nock down a hole bunch of bildings and killed about 180 people and injure about 500. This was one of the biggest in san de ago that they ever had it happen in 1995 and it the most ever kill in this size earthquake. After it hapend I went in to town and took pictures of the damge and can see what happen to the bildings. The waves were the L wave the most I felt and it did so much damge to everything around.

Student Work Sample 4

There I was going through the Sahara desert, in my sand rider. I was looking for a recked helicopter that was carrying supplies and my ob was to go and recover them. I had just spotted the helicopter when the ground started to vibrate, so I turned of the engine to see what it was, then I realized that it was the P waves of the earthquake really slow. I know it was these because the S waves came almost at the same time. Then as I felt the huge L waves come through I saw the helicopter I was suppose to rescue sink into the sand. I also saw the sand dunes around shrink in size, it seemed. After it was over I over heard on my company radio that the earthquake was 20 miles south of me. The geologist that was on my radio also said that it was a 7.8 on the richter scale and was felt hundreds of mile away. When I first felt the first P wave it was 2:00 o'clock in the afternoon. After I was done listening to the geologist person I went over to the helicopter, which was half covered in sand and I salvaged as much of the supplies on board I could. After I finished my job I road back to my house, witch took some 4 1/2 houres. That night I had dreams about the earthquake and I woke and noticed it was all a dream and relaxed a bit until the nexttime...to be continued.

Student Work Sample 5

Myself and a couple surfer bums were out on the beach, hanging out and burning stuff. It was about 3am that we all decided it was time to fall asleep. At about 6am on the San Diego coast we all were awakened to sudden shake of the ground. As we looked across the beach we saw what looked like ripples of waves through the sand. As we looked out at the ocean the waves looked a little bigger and farther apart.

I realized that these were just the P-waves of an earthquake. After about 5 sec., but seemed more like a minute the shaking stopped. The waves finally break and hit the beach. We realized this would be sweet surfing. We grab our boards and head out. We forgot about the S-waves and as we hit the water they began to hit. We could tell because off in the distance a monster wave was heading for us. We quickly turn around and get ready for the ride of our lives. We ride it into the beach, as we are approaching we notice the beach looks different. The rock cliffs have fallen down and the beach looks longer. We go over the beach and continue above the cliffs. The wave breaks and pounds me into the ground. When the water runs off two more waves hit. After those waves the ocean settles and I am 150 ft off of the coast. Later I found out the quake was merely a 6.4 magnitude, and it took place 10 miles off of the coast. Later after we went home because we know we would not get any better waves.

Instructional Modifications

These assessment activities are designed to accommodate various learners. The following instructional modifications can also be made to promote the success of all learners in the classroom.

1. Students may respond to the second activity through illustrations.
2. Students may compose their responses on a computer.
3. Students can present their responses orally or through a scribe.
4. More time may be permitted for completion of the assignments if necessary .
5. Students may use their graphic organizers or additional resources if appropriate for their instructional plan.
6. A classroom aid may be available to assist students with disabilities and English Language Learners.

Important Features of Classroom-Based Assessment

1. **It samples instruction representatively.**

This means that the tasks used in classroom-based assessment are a fair sample of the goals of instruction. It implies that classroom-based assessment tests what students are taught.

2. **It is technically adequate.**

This means it is *reliable* and *valid*. An assessment task that is designed and administered in a reliable manner is relatively free of potential sources of error that have nothing to do with the purpose of the task. A valid assessment task can be used to answer the question: “Did the students learn what I wanted them to learn?” Reliability and validity are extensively covered in Training Module 4: Focus on Assessment and Learning in Content Classes.

3. **It employs production responses.**

Students are expected to generate a product as a result of the assessment process. This product could be as simple as a few phrases or sentences or as elaborate as an essay. Production responses also may include spoken responses, such as may be elicited in a structured interview, as well as nonverbal constructions, such as maps, graphs, and drawings.

4. **It can provide information for making instructional decisions.**

The information obtained from classroom-based assessment can be used to evaluate the effectiveness of past instruction and to plan future instruction. Classroom-based assessment may or may not be useful for making other decisions, which may be social or political rather than educational (such as assigning grades, or placing a student in special education).

5. **It can be used with a range of evaluation standards.**

This means that classroom-based assessment can be used to (a) compare an individual’s or group’s performance to that of a comparison group (norm-referenced evaluation), (b) estimate the extent to which content or skills have been mastered (criterion-referenced evaluation), or (c) chart an individual student’s progress over time (individual-referenced evaluation).

Nolet, V., Tindal, G., & Blake, G. (1992). *Research, consultation, & teaching program training module No. 4: Focus assessment and learning in content classes*. Eugene, OR: University of Oregon, Behavioral Research and Teaching.

Assessment Activity

On a separate piece of paper, design an assessment task that is oriented toward a specific intellectual operation (as described earlier). Be certain to include higher order intellectual operations. Clearly format the assignment by including instructions and a scoring guide. The assessment should be ready to present in a classroom setting.

Instructional Modifications

List instructional modifications you will make to accommodate the diverse community of learners within your classroom.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

* Use additional paper if needed.

**Assessment
Peer Evaluation Form**

Your Name: _____

Name of the person whose paper you are evaluating: _____

Please review the Assessment section. Evaluate each section using the criteria provided. Write a positive comment and areas for improvement. Once finished, sign and return the evaluation to the author of the paper. This evaluation will be submitted with the final draft of this section.

Peer Review Evaluation	Points Earned
Key Issues: substantial and significant key issues are unique and relevant to the lesson described.	/0.5
Positive Comment:	
Areas for Improvement:	
Assessment Task	
1. Explanation provides a thorough description of the assessment. Intellectual operations are explicitly stated.	/1
Positive Comment:	
Areas for Improvement:	
2. Assessment task is aligned with instructional domain as defined by the instructional unit (review the instructional sequence and independent activity).	/1
Positive Comment:	
Areas for Improvement:	
3. Higher order intellectual operations are the primary focus of the assessment task.	/0.5
Positive Comment:	
Areas for Improvement:	

4. Assessment task is appropriately formatted with directions. Assessment task is ready for distribution in a classroom.	/0.5
Positive Comment:	
Areas for Improvement:	
5. Scoring rubric clearly identifies expectations for completing the assessment task.	/1
Positive Comment:	
Areas for Improvement:	
Instructional Modifications	
1. Instructional modifications are clearly articulated in sentence format and address the needs of diverse learners.	/0.5
Positive Comment:	
Areas for Improvement:	
Final Comments:	
	/5

Assessment Activity

On a separate piece of paper, design an assessment task that is oriented toward a specific intellectual operation (as described earlier). Be certain to include higher order intellectual operations. Clearly format the assignment by including instructions and a scoring guide. The assessment should be ready to present in a classroom setting.

Instructional Modifications

List instructional modifications you will make to accommodate the diverse community of learners within your classroom.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

* Use additional paper if needed.

**Assessment
Evaluation Form**

Your Name: _____

Name of the person whose paper you are evaluating: _____

Please review the Assessment section. Evaluate each section using the criteria provided. Write a positive comment and areas for improvement. Once finished, sign and return the evaluation to the author of the paper. This evaluation will be submitted with the final draft of this section.

Peer Review Evaluation	Instructor Evaluation (Do not write in these boxes)	Points Earned
Key Issues: substantial and significant key issues are unique and relevant to the unit.		/0.5
Positive Comment:		
Areas for Improvement:		
Assessment Task		
1. Explanation provides a thorough description of the assessment. Intellectual operations are explicitly stated.		/1
Positive Comment:		
Areas for Improvement:		
2. Assessment task is aligned with instructional domain as defined by the instructional unit (review the instructional sequence and independent activity).		/1
Positive Comment:		
Areas for Improvement:		
3. Higher order intellectual operations are the primary focus of the assessment task.		/0.5
Positive Comment:		

Areas for Improvement:		
4. Assessment task is appropriately formatted with directions. Assessment task is ready for distribution in a classroom.		/0.5
Positive Comment:		
Areas for Improvement:		
5. Scoring rubric clearly identifies expectations for completing the assessment task.		/1
Positive Comment:		
Areas for Improvement:		
Instructional Modifications		
1. Instructional modifications are clearly articulated in sentence format and address the needs of diverse learners.		/0.5
Positive Comment:		
Areas for Improvement:		
Final Comments:		
	Total Score	/5

Section 5: **Teacher Reflection**

CLASSROOM EXAMPLE

Key Issues

Analysis of Lesson Organization
Instructional Units
Delivery of Instruction
Pacing of Instruction
Authentic Assessment
Delivery of Assessment
Instruction-Assessment Alignment
Range of Performance
Subjective Scoring
Multiple Choice Tests
Access Skills
Student Reactions
Concepts and Attributes
Computers in the Classroom

Lesson Evaluation

Upon conclusion of this unit, the instructor reflects on the strengths, weaknesses, internal validity, external validity, and social validity for three domains of the lesson: content, reading as an access skill, and writing as an access skill.

No example is provided for this section because it is difficult for us to model a personal reflection statement without influencing your reflection. Please reflect on each issue thoughtfully and honestly. Your responses will be evaluated based on the thoroughness of your explanations. The content of your reflection (critique of your unit) will not be graded.

IN-CLASS PRACTICE EXERCISE

Key Issues

Considering the content you intend to cover and the student population you will be addressing, identify important issues to take into account at the end of an instructional unit.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Background Information

To evaluate a unit, you must first have an understanding of different types of validity that are important to consider. A brief introduction is presented below.

Validity

Internal Validity

- Indicates whether there is a causal relationship between the lesson inputs (instruction, activity, and assessment) and the observed outcomes (student performance).
- Can you identify a cause and effect relationship between your instruction and student success?
- Would the students have succeeded without your instructional plan?

External Validity:

- Associated with the generalizability of the outcomes.
- Can the knowledge or skills learned in this lesson be generalized across other activities or content?
- What inferences can be made about the student's abilities upon completion of this unit?

Social Validity

- Identifies the benefits and consequences of participation in this unit for individuals and groups of students in the future
- What is the value of learning this information outside of the classroom?
- Why should students learn the content?

Teacher Reflection

Upon conclusion of this unit, reflect on the strengths, weaknesses, internal validity, external validity, and social validity for three domains of the lesson: content, reading as an access skill, and writing as an access skill.

Content

Strengths: Consider the strengths of the unit you developed for the content provided.

Curriculum Analysis and Instructional Planning:

Instructional Delivery:

Independent Activity:

Assessment:

Weaknesses: Consider the aspects you would change or redesign for the unit you developed for the content provided.

Curriculum Analysis and Instructional Planning:

Instructional Delivery:

Independent Activity:

Assessment:

Internal Validity: Can you identify a cause and effect relationship between your instruction and student success?

Identify the domain of the instructional delivery and independent activity. Look at the sampling plan for the assessment. Is there alignment between the instruction/activity and the assessment? Does the rubric match the sampling plan? Does the rubric address important information covered in the domain of instruction? Thoroughly consider these issues.

External Validity: Can the knowledge or skills learned in this lesson be generalized across other activities or content areas?

If your students are successful on this unit, what else might they be successful in? Can the students extend their knowledge to other examples of the concept? Can the students apply their skills to other intellectual operations? Thoroughly consider these issues.

Social Validity: What are the benefits and consequences of participation in this unit for individuals and groups of students?

Is learning the information in this unit beneficial and/or harmful for the student? What conflicts might the student experience from learning this information? Is it important for the student to learn the information presented? Thoroughly consider these issues.

Reading as an Access Skill

Strengths: How does the students' ability to read positively affect their access or ability to succeed on the unit? Thoroughly consider this issue for each lesson component.

Instructional Delivery:

Independent Activity:

Assessment:

Weaknesses: How does the students' ability to read negatively affect their access or ability to succeed on the unit? Thoroughly consider this issue for each lesson component.

Instructional Delivery:

Independent Activity:

Assessment:

Internal Validity: Can you identify a cause and effect relationship between your instruction and student success?

Does the students' ability to read threaten the internal validity? Is it possible that a student's ability to read may influence the judgment about his/her content ability or knowledge? Thoroughly consider these issues.

External Validity: Can the knowledge or skills learned in this lesson be generalized across other activities or content areas?

What reading skills are developed during this unit? How can these skills generalize across other content areas? How does students' reading skill affect their ability to generalize what they've learned in the unit? Thoroughly consider these issues.

Social Validity: What are the benefits and consequences of participation in this unit for individuals and groups of students?

How does the reading involved in this unit affect the student socially? How might the reading skills you've taught affect the students socially? Thoroughly consider these issues.

Writing as an Access Skill

Strengths: How does the students' ability to write positively affect their access or ability to succeed on the unit? Thoroughly consider this issue for each lesson component.

Instructional Delivery:

Independent Activity:

Assessment:

Weaknesses: How does the students' ability to write negatively affect their access or ability to succeed on the unit? Thoroughly consider this issue for each lesson component.

Instructional Delivery:

Independent Activity:

Assessment:

Internal Validity: Can you identify a cause and effect relationship between your instruction and student success?

Does the students' ability to write threaten the internal validity? Is it possible that a student's ability to write may influence the judgment about his/her content ability or knowledge? Thoroughly consider these issues.

External Validity: Can the knowledge or skills learned in this lesson be generalized across other activities or content areas?

What writing skills are developed during this unit? How can these skills generalize across other content areas? How does students' writing skill affect their ability to generalize what they've learned in the unit? Thoroughly consider these issues.

Social Validity: What are the benefits and consequences of participation in this unit for individuals and groups of students?

How does the writing involved in this unit affect the student socially? How might the writing skills you've taught affect the students socially? Thoroughly consider these issues.

Areas for Improvement:

Reading as an Access Skill: consider the discussion of the strengths, weaknesses, internal validity, external validity, and social validity.

Positive Comment:

Areas for Improvement:

Writing as an Access Skill: consider the discussion of the strengths, weaknesses, internal validity, external validity, and social validity.

Positive Comment:

Areas for Improvement:

Final Comments:

HOMEWORK ASSIGNMENT

Key Issues

Considering the content you intend to cover and the student population you will be addressing, identify important issues to take into account at the end of an instructional unit.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Teacher Reflection

Upon conclusion of this unit, reflect on the strengths, weaknesses, internal validity, external validity, and social validity for three domains of the lesson: content, reading as an access skill, and writing as an access skill. Respond to each section on a separate piece of paper.

Content

Strengths: Consider the strengths of the unit you developed for the content you chose.

Curriculum Analysis and Instructional Planning:

Instructional Delivery:

Independent Activity:

Assessment:

Weaknesses: Consider the aspects you would change or redesign for the unit you developed for the content you chose.

Curriculum Analysis and Instructional Planning:

Instructional Delivery:

Independent Activity:

Assessment:

Internal Validity: Can you identify a cause and effect relationship between your instruction and student success?

Identify the domain of the instructional delivery and independent activity. Look at the sampling plan for the assessment. Is there alignment between the instruction/activity and the assessment? Does the rubric match the sampling plan? Does the rubric address important information covered in the domain of instruction? Thoroughly consider these issues.

External Validity: Can the knowledge or skills learned in this lesson be generalized across other activities or content areas?

If your students are successful on this unit, what else might they be successful in? Can the students extend their knowledge to other examples of the concept? Can the students apply their skills to other intellectual operations? Thoroughly consider these issues.

Social Validity: What are the benefits and consequences of participation in this unit for individuals and groups of students?

Is learning the information in this unit beneficial and/or harmful for the student? What conflicts might the student experience from learning this information? Is it important for the student to learn the information presented? Thoroughly consider these issues.

Reading as an Access Skill

Strengths: How does the students' ability to read positively affect their access or ability to succeed on the unit? Thoroughly consider this issue for each lesson component.

Instructional Delivery:

Independent Activity:

Assessment:

Weaknesses: How does the students' ability to read negatively affect their access or ability to succeed on the unit? Thoroughly consider this issue for each lesson component.

Instructional Delivery:

Independent Activity:

Assessment:

Internal Validity: Can you identify a cause and effect relationship between your instruction and student success?

Does the students' ability to read threaten the internal validity? Is it possible that a student's ability to read may influence the judgment about his/her content ability or knowledge? Thoroughly consider these issues.

External Validity: Can the knowledge or skills learned in this lesson be generalized across other activities or content area?

What reading skills are developed during this unit? How can these skills generalize across other content areas? How does students' reading skill affect their ability to generalize what they've learned in the unit? Thoroughly consider these issues.

Social Validity: What are the benefits and consequences of participation in this unit for individuals and groups of students?

How does the reading involved in this unit affect the student socially? How might the reading skills you've taught affect the students socially? Thoroughly consider these issues.

Writing as an Access Skill

Strengths: How does the students' ability to write positively affect their access or ability to succeed on the unit? Thoroughly consider this issue for each lesson component.

Instructional Delivery:

Independent Activity:
Assessment:

Weaknesses: How does the students' ability to write negatively affect their access or ability to succeed on the unit? Thoroughly consider this issue for each lesson component.

Instructional Delivery:
Independent Activity:
Assessment:

Internal Validity: Can you identify a cause and effect relationship between your instruction and student success?

Does the students' ability to write threaten the internal validity? Is it possible that a student's ability to write may influence the judgment about his/her content ability or knowledge? Thoroughly consider these issues.

External Validity: Can the knowledge or skills learned in this lesson be generalized across other activities or content areas?

What writing skills are developed during this unit? How can these skills generalize across other content areas? How does students' writing skill affect their ability to generalize what they've learned in the unit? Thoroughly consider these issues.

Social Validity: What are the benefits and consequences of participation in this unit for individuals and groups of students?

How does the writing involved in this unit affect the student socially? How might the writing skills you've taught affect the students socially? Thoroughly consider these issues.

Teacher Reflection Evaluation Form

Your Name: _____

Name of the person whose paper you are evaluating: _____

Please review the Teacher Reflection section. This section will be evaluated using the scoring rubric provided. Use the Peer Review Evaluation side of the form below as a guideline for evaluating the responses provided. Provide positive comments and areas for improvement. Once finished, sign and return the evaluation to the author of the paper. This evaluation will be submitted with the final draft of this section.

Scoring Rubric for Teacher Reflection

- 5 All issues were identified and addressed that related to the strengths, weaknesses, internal validity, external validity, and social validity for three domains of the lesson: content, reading as an access skill, and writing as an access skill. Practices or topics of reliability and validity were considered with specific details, examples, and references. Format of presentation is clear.
- 4 Most issues were identified and addressed that related to the strengths, weaknesses, internal validity, external validity, and social validity for three domains of the lesson: content, reading as an access skill, and writing as an access skill. Discussion was provided in specific terms but incomplete in the reference to specific practices or topics of reliability and validity.
- 3 Some issues were identified and addressed that related to the strengths, weaknesses, internal validity, external validity, and social validity for three domains of the lesson: content, reading as an access skill, and writing as an access skill. Discussion was provided in general terms or incompletely. Little reflection on specific practices or topics of reliability and validity.
- 2 Information was completed with brief statements.
- 1 Information was incomplete.

Peer Review Evaluation	Instructor Evaluation (Do not write in these boxes)
Content: consider the discussion of the strengths, weaknesses, internal validity, external validity, and social validity.	
Positive Comment:	

<p>Areas for Improvement:</p>	
<p>Reading as an Access Skill: consider the discussion of the strengths, weaknesses, internal validity, external validity, and social validity.</p>	
<p>Positive Comment:</p>	
<p>Areas for Improvement:</p>	
<p>Writing as an Access Skill: consider the discussion of the strengths, weaknesses, internal validity, external validity, and social validity.</p>	
<p>Positive Comment:</p>	

Areas for Improvement:	
Final Comments:	
<i>Total Score</i>	
<i>15</i>	

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Appendix A

Lesson Materials

Figure 1. Concept Map: Structural changes of the earth's surface.

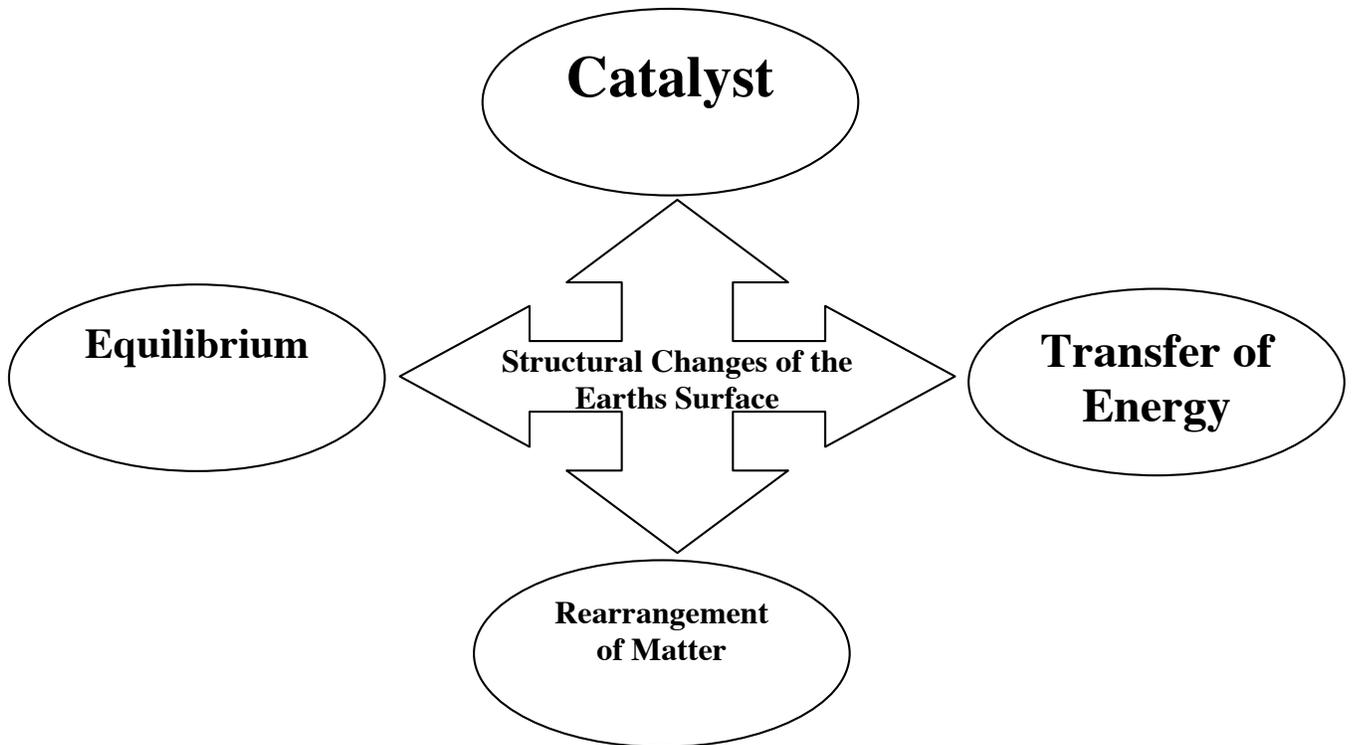


Figure 2. Bull's Eye Notes

Figure 3. Amplitude diagram, <http://vcourseware5.calstatela.edu/VirtualEarthquake/>

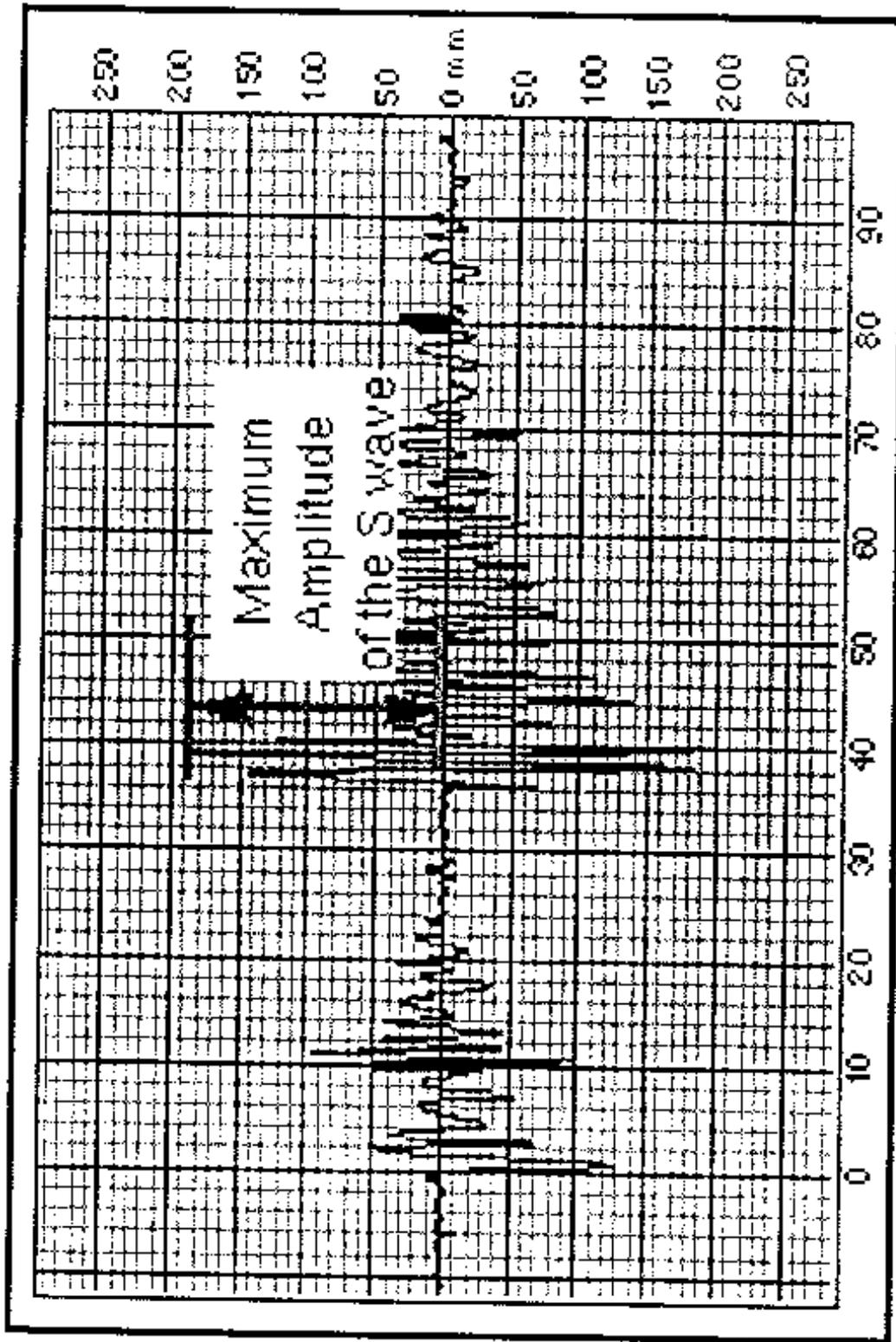


Figure 4. Seismogram, <http://vcourseware5.calstatela.edu/VirtualEarthquake/>

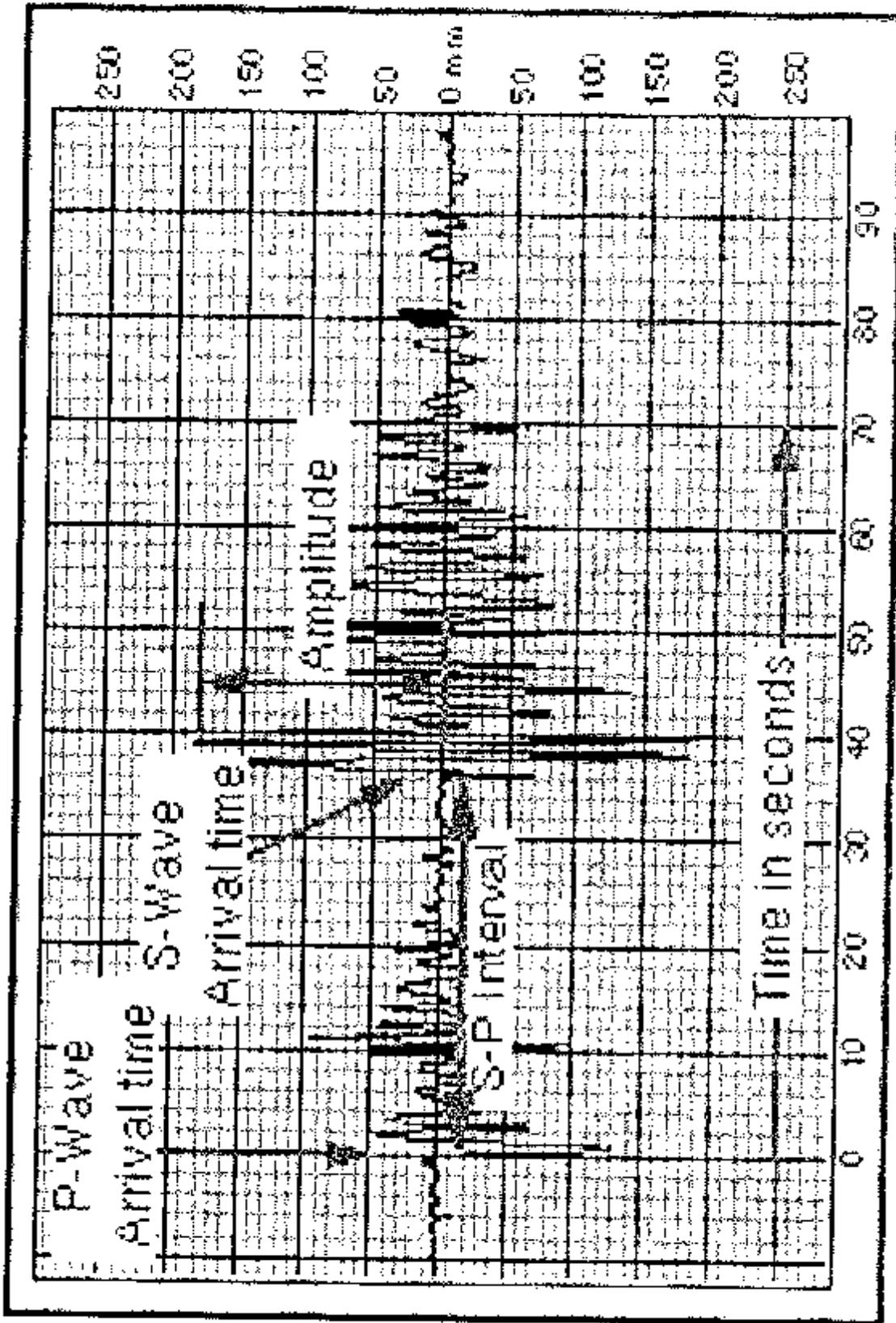


Figure 5. Earthquake location map, <http://vcourseware5.calstatela.edu/VirtualEarthquake/>



Figure 6. Calculating distance diagram, <http://vcourseware5.calstatela.edu/VirtualEarthquake/>

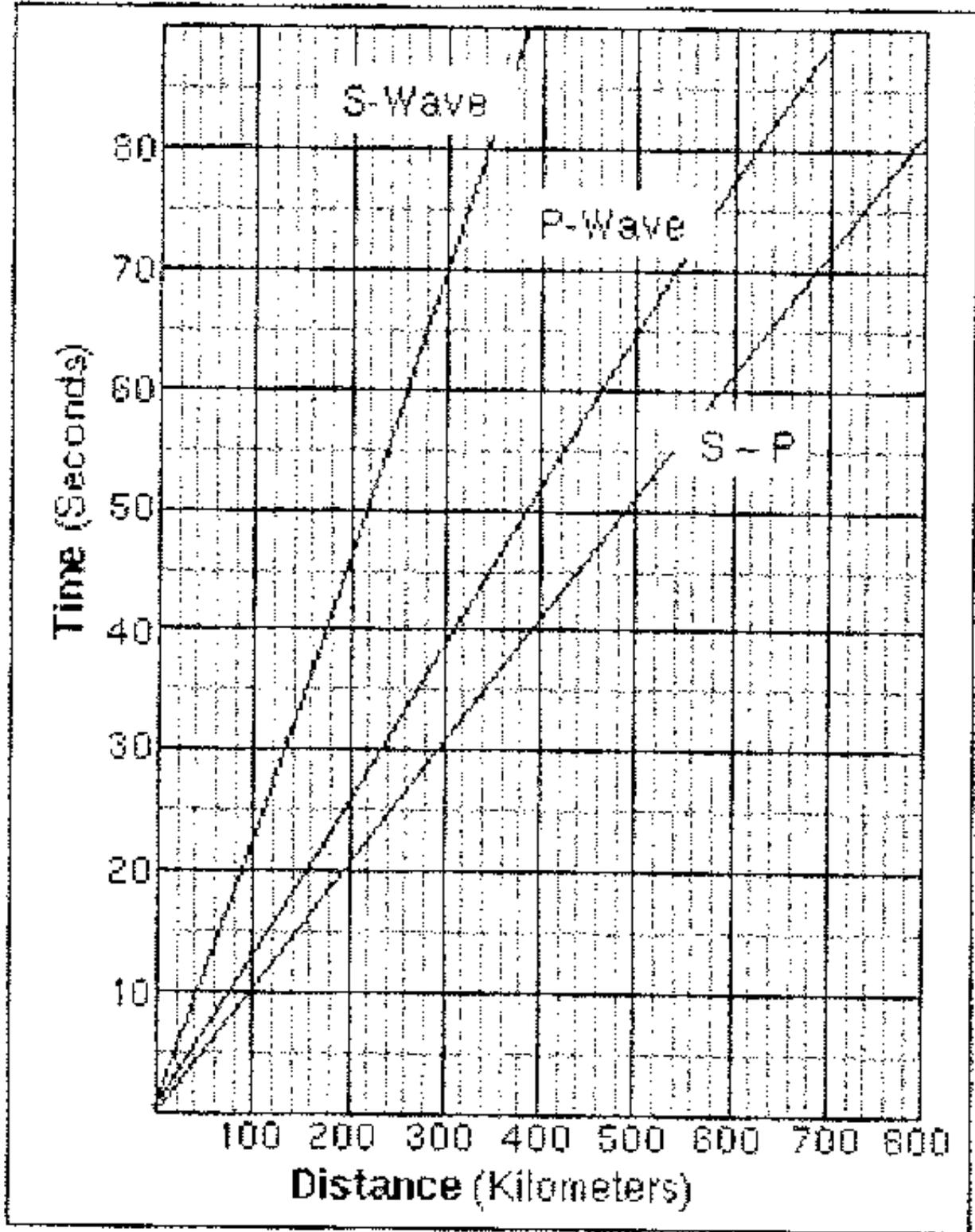


Figure 7. Mercalli Scale, Freeman, T. (1993). Earthquakes. Geo Science Laboratory (pp. 171-179). Colombia, MO: Friendship Publication.

RICHTER MAGNITUDE	EQUIVALENT MERCALLI INTENSITY AND ITS EFFECTS	
2	I-II	Usually detected only by instruments
3	III	Felt indoors
4	IV-V	Felt by most people; slight damage
5	VI-VII	Felt by all; many frightened and run outdoors; minor to moderate damage
6	VII-VIII	Everybody runs outdoors; moderate to major damage
7	IX-X	Major damage
8+	X-XII	Total and major damage

Table 16-1. Abbreviated Mercalli intensity scale compared with the Richter magnitude scale.

Figure 8. Seismogram, Freeman, T. (1993). Earthquakes. Geo Science Laboratory (pp. 171-179). Colombia, MO: Friendship Publication.

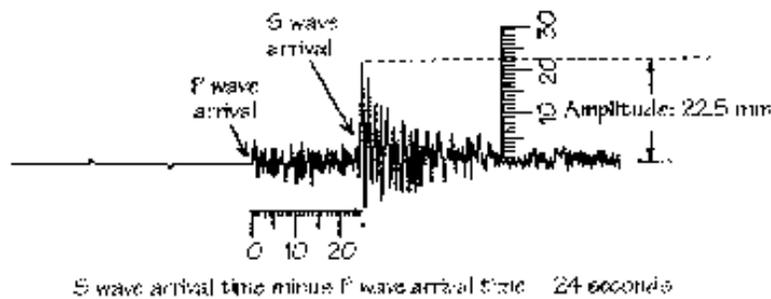


Figure 9. Calculating magnitude diagram, <http://vcourseware5.calstatela.edu/VirtualEarthquake/>

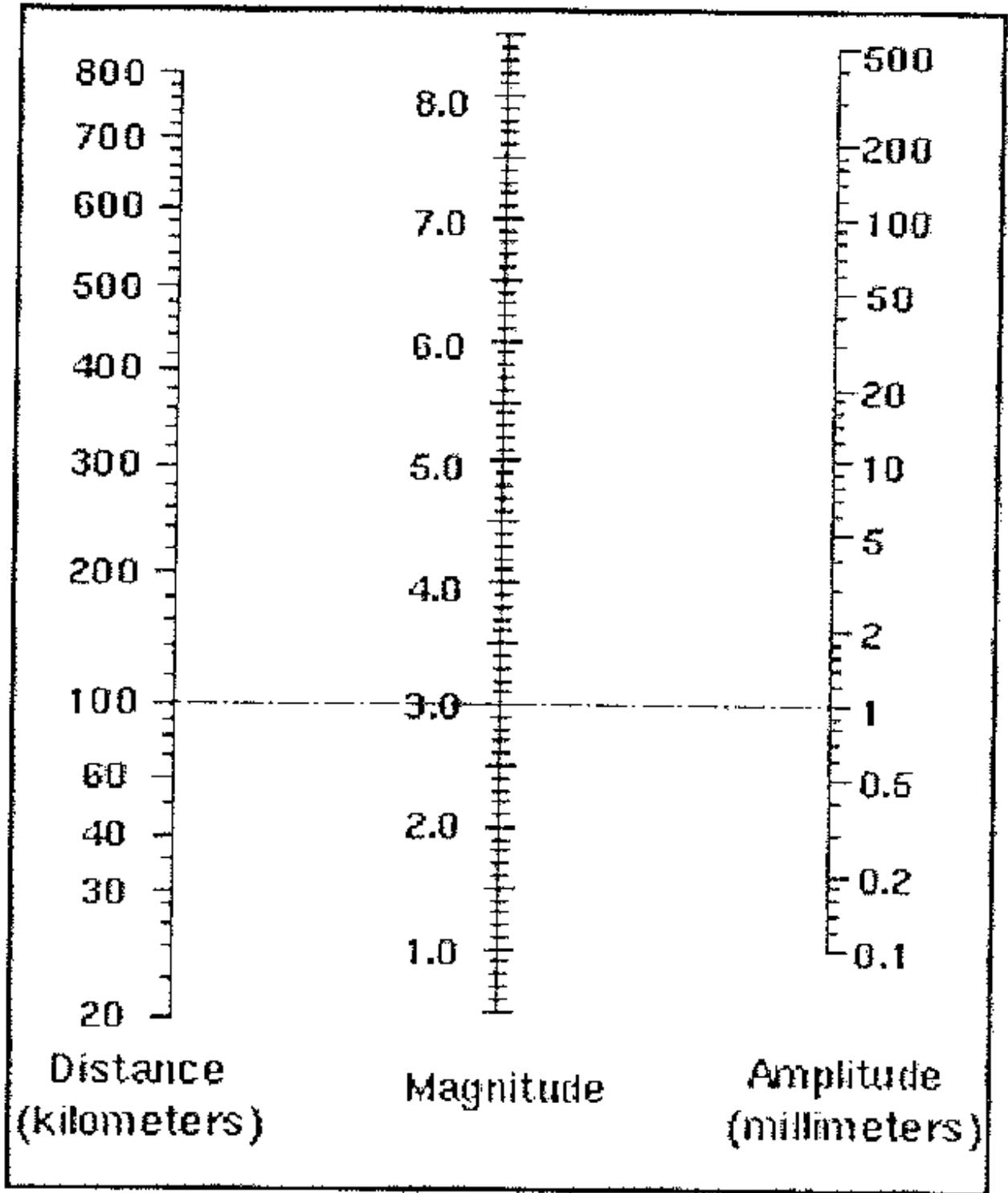
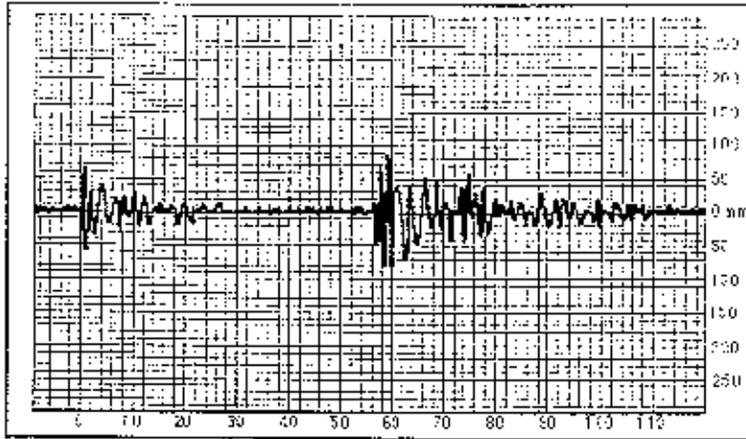
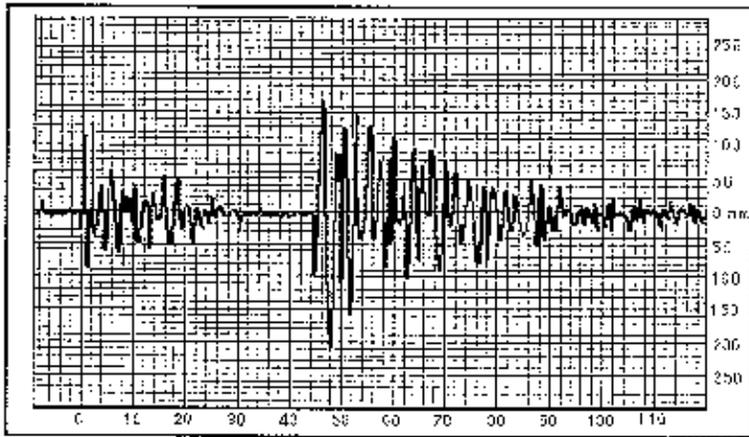


Figure 10. Locator seismograms, <http://vcourseware5.calstatela.edu/VirtualEarthquake/>

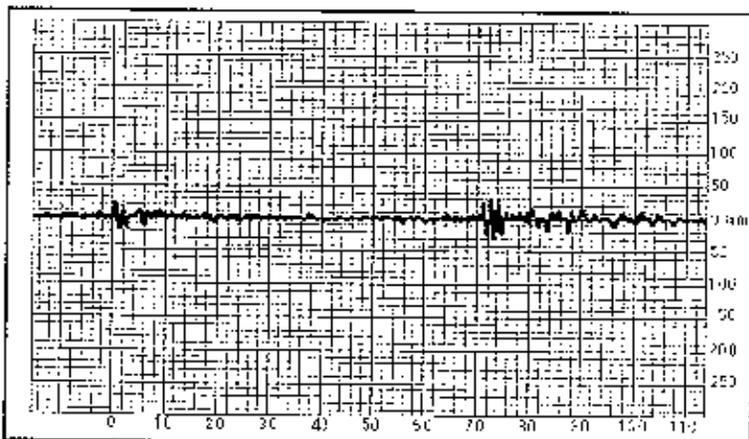


Pusan Seismic Station S-P Interval = seconds



Tokyo Seismic Station S-P Interval = seconds

Submit my Earthquake Entries



Akita Seismic Station S-P Interval = seconds

Figure 11. Student independent activity.

Name:
Period:

Structural Changes in the Earth's Surface
Reviewing the Attributes

Activity: Part I

In the frames provided below, write or draw an original example of each attribute of the concept discussed in class. Use information provided in class to present a realistic representation of the attribute. Label each frame with the corresponding attribute. You may use additional space if needed.

Activity: Part II

On a separate piece of paper, respond to the following scenario. Use the information presented in class to thoroughly answer each question. Be specific and include a discussion of the concept and attributes described in class.

You will need additional information to complete this assignment, such as the name of the fault line near the town mentioned and structural safety issues of brick buildings. You may use the Internet, library resources, or other reliable sources.

A county safety inspector told an owner of a hardware store in Oak Harbor, Washington that she must close her store to retrofit the brick structure.

- Why is this process necessary?
- What is the cause of the inspector's concern?
- What are the potential consequences if this structure is not repaired?
- What other safety precautions should the storeowner consider?

Grading

The products from this assignment will be graded holistically. The maximum score possible is 30 points, 10 points for Part I and 20 points for Part II.

Figure 12a. Student assessment activity.

Name:
Period:

Earthquake Assessment

Within the last week, you were led through a "bull's eye" note taking strategy for learning about earthquakes. You learned about different kinds of waves, in particular three attributes: energy, direction, and speed. In a demonstration using a spring, three different kinds of seismic waves were analyzed: S, P, and L waves. Finally, an activity was completed in which waves were measured in time, converted to a common unit of distance, and then overlaid on a map to calculate a range of impact around an epicenter. Brainstorm everything you learned about earthquakes from the instruction and activity. Write this information in the first column. Why is it important to learn about earthquakes and seismic waves? Why do scientists study these concepts? You will receive one (1) point for each clearly expressed idea or thought.

	What I learned	Why I learned it.	What difference does it make?
1			
2			
3			
4			
5			

Figure 12b. Student assessment activity.

Name:

Period:

Earthquake Experience

Pretend you are one of the following:

- ~ A journalist
- ~ A story teller
- ~ An interviewer
- ~ An interviewee
- ~ A photographer
- ~ A search and rescue member
- ~ A member of the police or fire department
- ~ A research scientist
- ~ Other???? (Check with the instructor)

And as this person you have recently experienced an earthquake. From this perspective describe, in as great detail as possible, everything you can about the earthquake.

YOU WILL DO THIS WRITTEN IN CLASS TODAY WITH ANY DRAWINGS TO HELP DESCRIBE YOUR SITUATION AND EXPERIENCE (ALSO TO SHOW YOUR KNOWLEDGE OF EARTHQUAKES).

Be sure to include:

- Where the earthquake happened.
- Where you were in respect to the earthquake.
- What type of rock was around?
- Any information regarding the earthquake (magnitude, time, etc.)
- Information about how and what was recorded (seismic waves)
- Information about what damage was caused by specific seismic waves.
- What you were doing before it happened.
- What you felt and what you did when it happened.
- What you did after it happened.
- The aftermath

I recommend some drawings to demonstrate your knowledge of seismic waves. This is your opportunity to show what you have learned in the last two days.

You will receive credit (three points) for each of the bits of information above that you include in your report. Feel free to be creative and have fun!

Appendix B

Suggested Readings

Suggested Readings in Science Education

Below is a small selection of articles related to science education.

Graphic Organizer Research

- Dunston, P.J. (1992). A critique of graphic organizer research. *Reading Research and Instruction, 31*(2), 57-65.
- Kinchin, I.M. (2001). If concept mapping is so helpful to learning biology, why aren't we all doing it? *International Journal of Science Education, 23*(12), 1257-1269.
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Cognitive Sciences

- Georghiades, P. (2000). Beyond conceptual change learning in science education: Focusing on transfer, durability and metacognition. *Educational Research, 42*(2), 119-139.
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Appendix C
Training Module Suggestion Sheet

TRAINING MODULE SUGGESTION SHEET

We would like to request your comments regarding this training module. Please use this response sheet to provide suggestions that may help us improve subsequent modules. We greatly appreciate your insights and perspectives.

Please return this suggestion sheet to Holly Vance in Educational Leadership, ED 170.

Curriculum Instruction Assessment Alignment: Science

- 1. What aspects of this training module are not clear to you? Please be specific, include brief description, and note the page number.

___ How can we improve the content of this training module?

___ How can we improve the structure of this training module?

___ Other suggestions:

-

Glossary

Attribute: a defining characteristic of the concept; provides criteria for distinguishing between what is and what is not an example of the concept.

Concept: clusters of events, names, dates, objects, places, etc. that share a common set of defining attributes. Timeless abstractions that cut across time and setting.

Example: positive description of the concept or attribute that aids in discrimination of the critical features of the concept; includes a wide range (far and near) of acceptable responses that describe or define the concept or attribute; far positive and near negative examples should be similar but differ based on the critical features that define the concept or attribute.

External validity: associated with the generalizability of the outcomes.

Fact: a simple association between names, objects, events, places, etc. that use singular exemplars.

Graphic organizer: a visual, non-linear representation of the linkages among knowledge forms.

Intellectual operation: classification of behaviors that are identifiable or observable; allows teacher to determine whether or not students are able to manipulate content area knowledge forms in meaningful ways.

Interactive teaching: dialogues between teachers and students to check for understanding; integrates critical thinking skills into instruction by modeling intellectual operations.

Internal validity: indicates whether there is a causal relationship between the lesson inputs (instruction, activity, and assessment) and the observed outcomes (student performance).

Knowledge form: form of information presented to learners; includes principles, concepts, and facts.

Non-example: negative description of the concept or attribute that aids in discrimination of the critical features of the concept; includes a wide range (far and near) of responses that would not describe or define the concept or attribute; far positive and near negative examples should be similar but differ based on the critical features that define the concept or attribute.

Principle: a consistent relationship among events, objects, or behaviors; indicates relationships among different facts or concepts.

Social Validity: identifies the benefits and consequences of participation in an activity (unit, lesson, assessment, etc.) for individuals and groups of students in the future.