LAB

Laboratory Activity

Using the Modified Mercalli Scale to Locate an Epicenter

Earthquakes are classified using different scales. The Richter scale is a measure of the energy released during the earthquake. The Modified Mercalli scale is a measure of the amount of damage done by the earthquake. Scientists record responses from many people who experience the earthquake and assign a value from I (1) to XII (12). These numbers are plotted on a map and used to locate the epicenter of the earthquake. This method is based on the idea that the area closest to the epicenter will suffer the most damage.

Strategy

You will read simulated reports of people's earthquake experiences and then assign Modified Mercalli scale values to these reports.
You will plot these values on a map and locate the epicenter of the earthquake.

Materials

colored pencils

Procedure

1. Read the Modified Mercalli scale in Table 1 so you become familiar with the descriptions.
2. Read the list of experiences from the various cities in Table 2. Assign a Mercalli value to each of the descriptions. Then write each value on the map (Figure 1) next to the corresponding city.
3. Use colored pencils to draw lines that connect cities having the same Mercalli value.
4. Use the pattern you have drawn to estimate where the epicenter is located.

Laboratory Activity 1 (continued)
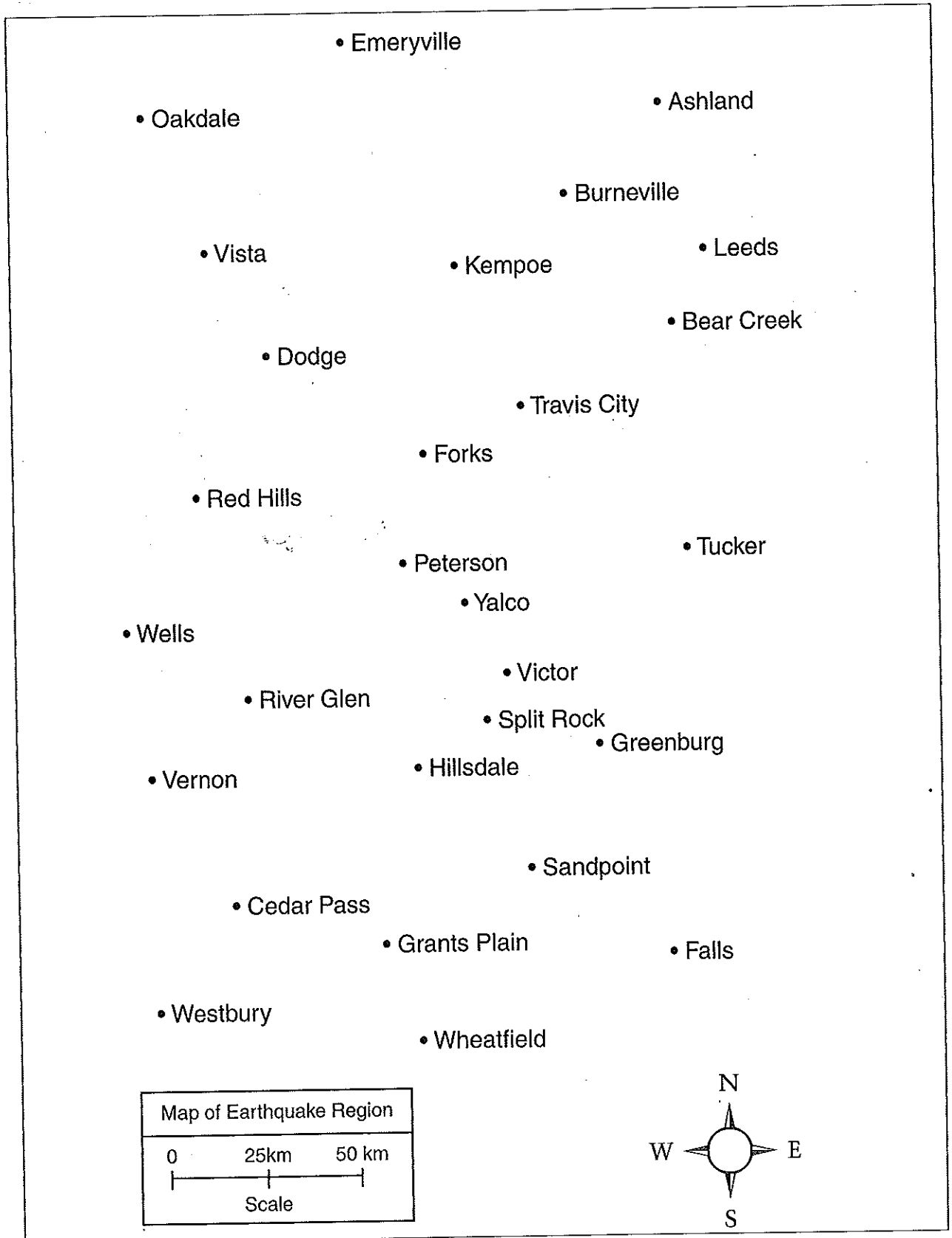
Data and Observations

Table 1

		Modified Mercalli Scale
I.	(1)	Earth movement is not felt by people.
II.	(2)	A few people may feel movement if they are sitting still. Hanging objects may sway.
III.	(3)	Felt noticeably indoors, especially on upper floors. May not be recognized as an earthquake.
IV.	(4)	During the day, felt indoors by many people, outdoors by few. At night, some are awakened. Dishes, windows, and doors rattle.
V.	(5)	Felt by almost everyone. Sleeping people are awakened. Some windows are broken and plaster cracked. Some unstable objects are overturned. Bells ring.
VI.	(6)	Felt by everyone. Many people are frightened and run outdoors. Some heavy furniture is moved, and some plaster may fall. Overall damage is slight.
VII.	(7)	People run outdoors. Earth movement is noticed by people driving cars. Damage is slight in well-built buildings and considerable in poorly built structures. Some chimneys are broken.
VIII.	(8)	Damage is slight in well-designed buildings and extreme in poorly built structures. Chimneys and walls may fall.
IX.	(9)	Damage is considerable in well-designed buildings. Buildings shift from their foundations and partly collapse. Ground may crack, and underground pipes are broken.
X.	(10)	Some well-built wooden structures are destroyed. Most masonry structures destroyed. Ground is badly cracked.
XI.	(11)	Few, if any, structures remain standing. Broad open cracks in the ground.
XII.	(12)	Complete destruction. Waves are seen on the ground surface.

Laboratory Activity 1 (continued)

Table 2

		Earthquake Observations and Data
1.	Ashland	Hanging lamps swayed.
2.	Bear Creek	People outdoors did not notice anything, but windows and doors rattled.
3.	Burneville	Felt by people sitting at dinner.
4.	Cedar Pass	Families sitting at dinner noticed the dishes rattling.
5.	Dodge	Dishes, windows, and doors rattled.
6.	Emeryville	Not felt.
7.	Falls	Felt by nearly everybody. A few windows were broken.
8.	Forks	Big windows in stores downtown were broken.
9.	Grants Plain	Church bells rang all over town. Plaster walls developed cracks. Candlesticks fell off the mantel.
10.	Greenburg	Not much damage but felt by everyone.
11.	Hillsdale	Some plaster ceilings fell. Many people were scared.
12.	Kempoe	Felt by some people on upper floors. Some windows rattled.
13.	Leeds	Noticed by many people working late in tall buildings.
14.	Oakdale	Felt by a few people.
15.	Peterson	Felt by almost everyone. Some plaster ceilings fell down.
16.	Red Hills	Some people are awakened out of their sleep.
17.	River Glen	Felt by almost everybody in town.
18.	Sandpoint	Many windows were broken. Some people were scared.
19.	Split Rock	Poorly built structures were badly damaged. A few drivers noticed their cars moving strangely for a moment.
20.	Travis City	Almost everyone felt it. Church bells rang.
21.	Tucker	Books fell off the shelves in the main library, and some windows were broken.
22.	Vernon	Dishes in the cupboard rattled. Felt by people indoors.
23.	Victor	Most people were alarmed and ran outside. Chimneys were broken.
24.	Vista	Felt by people in upper floors of tall buildings.
25.	Wells	Noticed by people on the third floor. Some windows rattled.
26.	Westbury	Some people noticed the vibration but thought it was a freight train.
27.	Wheatfield	People sitting at the dinner table noticed doors and windows rattling.
28.	Yalco	Many people ran outside. Many windows were broken.

Laboratory Activity 1 (continued)

Figure 1

- Emeryville

- Ashland

- Oakdale

- Burneville

- Vista
- Kempoe
- Leeds

- Bear Creek

- Dodge

- Travis City

- Forks

- Red Hills

- Tucker

- Peterson

- Yalco

- Wells

- Victor

- River Glen

- Split Rock
- Greenburg

- Vernon
- Hillsdale

- Sandpoint

- Cedar Pass

- Grants Plain
- Falls

- Westbury

- Wheatfield

Map of Earthquake Region		
0	25km	50 km

Scale

N
W — E
S

Laboratory Activity 1 (continued)

Questions and Conclusions

1. What cities were closest to the epicenter of the earthquake? How did you determine this?

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2. Approximately how wide was the zone with a rating of V or higher?

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3. What are some possible sources of error when using the Modified Mercalli scale to locate the epicenter of an earthquake?

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Strategy Check

_____ Can you determine Mercalli values?

_____ Can you locate earthquake epicenters?