Ozark Plateau Region
Gravel Bar Learning Activity

Objective:

Students will work together to characterize the geology of a gravel bar by conducting their own scientific experiment.

Materials:

One towel per team
One laminated copy of rock identification sheet
A small bottle of acid per group (vinegar)
One data entry sheet
One bar graph template
Several permanent markers
One measuring tape per group *optional*

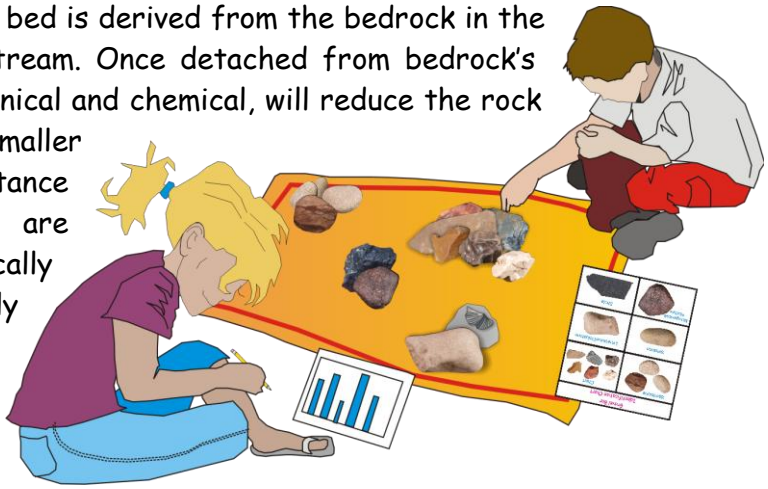
Methods Used:

Data collection
Rock identification
Graphing data – Creating a bar graph
Calculating percentage of rock types
Analyzing rocks by shape and size
Critical analysis

Time: Allow close to one hour, depending on class size and age. This includes the time to discuss findings.

Gravel Bar Lesson

The gravel found in a stream bed is derived from the bedrock in the stream's drainage basin upstream. Once detached from bedrock's outcrop, erosion, both mechanical and chemical, will reduce the rock fragments to gravel and smaller particles with time and distance of transport. Rocks that are mechanically weak or chemically unstable will be quickly reduced, whereas, more durable rocks will be more resistant to weathering.



Gravel Bar Lesson Plan

Directions:

Divide your students into groups of 3 to 5 members. Have each team come up with a team name relating to geology. This makes it more fun for students and gives them team spirit! Assign each group member a job. Jobs include: Rock gathers, sorters, counters, and a recorder to collect data and draw graph.

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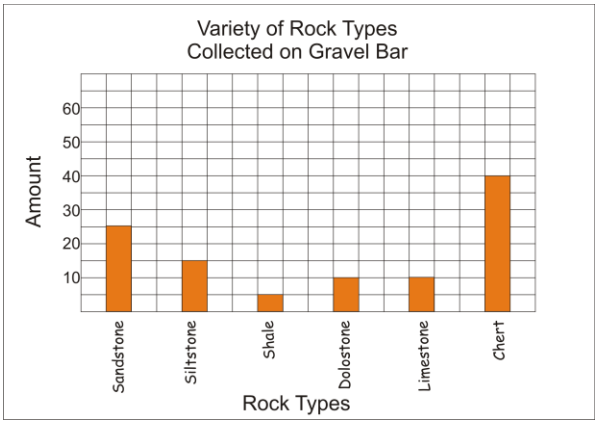
Step 1. Have rock gathers from each team collect 100 gravel particles from the gravel bar at random and place on towel.

Here are some suggestions for getting a random sample:
One way is to mark off a grid (this does not need to be a large area, 10 feet by 10 feet); this can be quickly done with measuring tapes. Mark off corners using water bottles or other objects at hand. Or, have gathers take 2 steps, close eyes, and reach down to pick up a rock. Continue until enough samples are collected. Make sure that gathers are instructed to collect the first piece they touch each time.

Step 2. Once 100 rocks are gathered and placed on the towel, finish sorting using the rock identification sheet provided. All team members can participate in the rock identification. *Hint* Remember to use properties such as hardness and reaction to acid, when identifying rocks types. Sort alike rocks into individual piles.

Step 3. Once the rocks are properly sorted, team members will count the number of rocks in each pile. The recorder writes this data down in the data entry sheet.



Step 4. Once all rocks have been identified, sorted and counted, it is time to construct a bar graph. Use a permanent marker to record data on the laminated graph sheet on the next page to record results.

Further Analysis:
After the graph is completed, instruct team to sort all rocks by size and roundness. Record these observations.

Experiment Summary: You can have a group discussion of findings and compare groups' results.

Results and Discussion:
Gravel deposits found in the stream will reflect these processes and be enriched in the more durable rocks and impoverished in the weaker rocks. So, even though a stream's drainage basin may be dominated by one rock type, that rock type may not be the dominate type in the gravels of the stream.

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Rock Types:

Most of the rocks in Arkansas are one of 6 types: sandstone, siltstone, shale, limestone, dolostone, and chert.

1. **Sandstone-** is nothing more than sand sized particles, mostly grains of quartz, cemented together. Sandstone is generally durable and frequently occurs as one of the more common rock types found in the gravel bars along a river bed.

2. **Siltstone**- is the halfway rock between sandstone and shale. It is generally composed of quartz and clay minerals. It is normally not as durable as sandstone, so not as common in gravel deposits.

3. **Shale**- is mud that has become stone. It is basically clay, often with trace amounts of fine sand and silt. Shale is not very durable and hardly found in gravel deposits unless recently introduced.

4. **Limestone**- Calcite (calcium carbonate) is the dominate mineral in limestone. A limestone is frequently nothing more than a layer of seashell fragments cemented together. Limestone normally erodes more rapidly than many sandstones or cherts in a gravel environment; therefore, you will generally not find as much limestone in the gravel bars.

5. **Dolostone**- Dolomite (calcium magnesium carbonate) is the dominate mineral in dolostone. Dolostone has durability in a gravel environment close to limestone.

6. **Chert**- is an amorphous form of quartz with no obvious crystalline texture. Chert is frequently the most common constituent of gravel bars in Arkansas streams due to its durability. Chert is often fossiliferous, displaying molds and impressions of various creatures.

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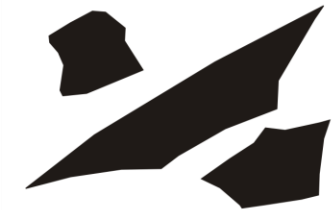
Roundness: is a measure of the amount of abrasion that causes the smoothing and rounding of edges, corners, and faces of the particles.

Angular: particles show little or no effects of abrasion. The edges and corners are sharp and angular to very slightly worn.



Sub-Angular/ Rounded: particles show definite to considerable wear; the edges and corners are rounded sometimes to smooth curves.

Rounded: Most surfaces of the particle show considerable wear. Edges and corners are reduced to broad curves.

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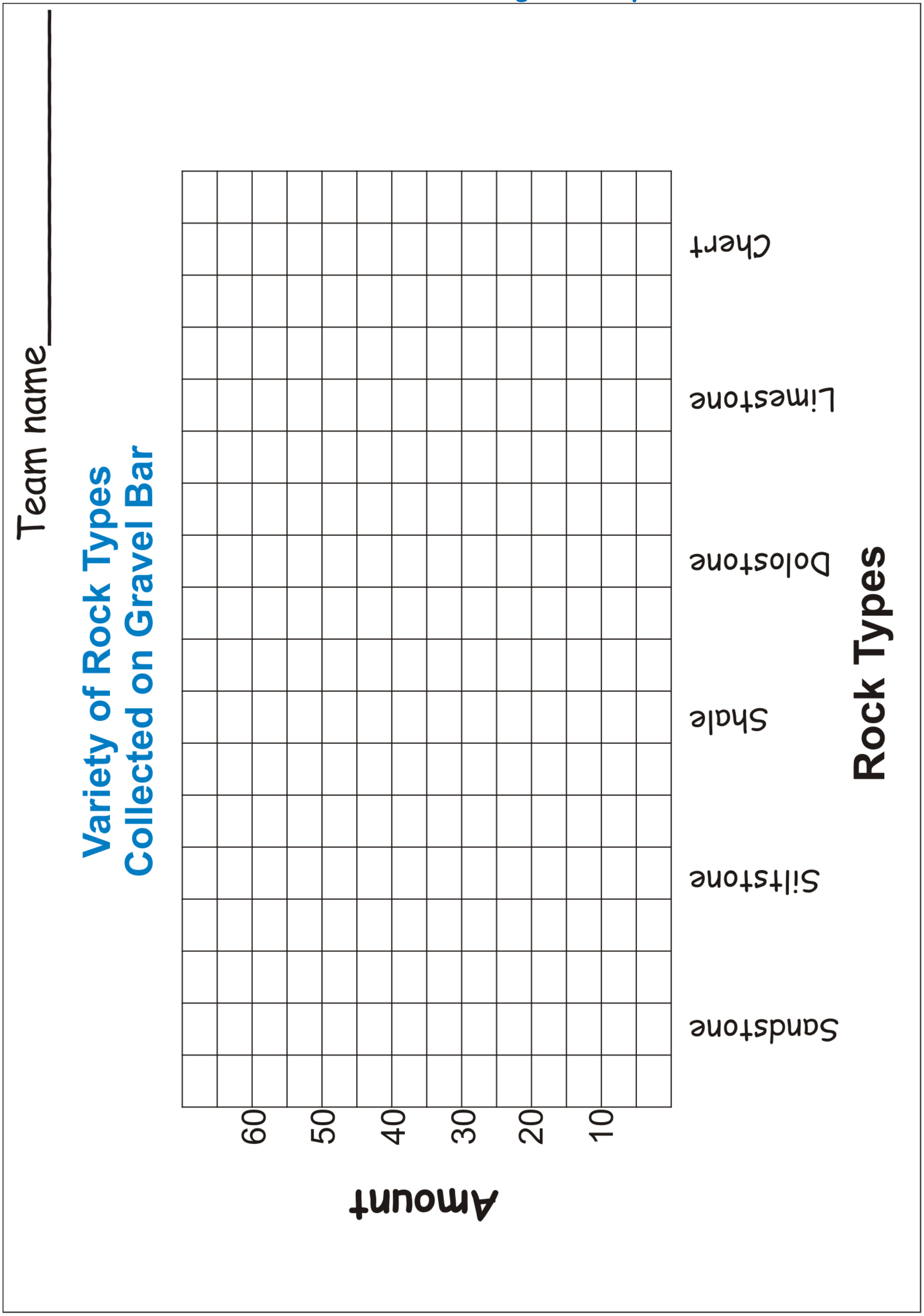

Gravel Bar Identification Chart

Sandstone

Chert

Siltstone

Limestone/Dolostone

Phosphate Nodule

Shale