

Note: This project plan has not been localised for South Africa at this stage.

Appendix E Visual Ranking Tool Resources

Sample Project Idea: River City Water

Unit Overview	
Unit Plan Title	River City Water
Unit Summary	In this environmental science unit, students participate in a variety of activities to help them understand how human actions affect the quality of nearby rivers. Students conduct in-depth research about specific environmental factors and learn how to measure water quality indicators. The <i>Visual Ranking Tool</i> helps students compare factors relating to water quality and narrow their focus for research projects.
Subject Area	Environmental Science
Grade Level	9-12
Approximate Time Needed	2 weeks (extended if field work is included)
Unit Foundation	
Higher-Order Thinking Skills	Problem Solving, Evaluation, Cause and Effect, Decision-Making
Key Learnings	Water Quality, Interaction of Systems, Social Justice
Student Objectives/Learning Outcomes	<ul style="list-style-type: none"> Understand how ground water, river water, well water, tap water, and city water interact as a system Understand how human actions affect the quality of nearby rivers

Appendix E: Visual Ranking Tool Resources

Curriculum-Framing Questions	
Essential Question	How do we affect our natural environment?
Unit Questions	What are the challenges of protecting a river ecosystem? How can a community develop in ways that use its water resources wisely?
Content Questions	How do you measure water quality? How do different water sources (ground, well, river, tap) interact as a system?
Visual Ranking Elements	
Visual Ranking Project Name (For the <i>Visual Ranking</i> workspace)	
River City Water	
Project Description (For the <i>Visual Ranking</i> workspace)	
<p>Based on the newspaper articles you've read and the experiments you've conducted, use <i>Visual Ranking</i> to arrange the industries in order of what development is the least harmful to the river and surrounding area and at the same time is the most beneficial to the community. Use the comment feature for each item to explain your reasoning on why you ranked the item where you did. Later in this project, your team will be assigned a role in a city council hearing that is evaluating proposed development projects. You will use the information from your ranking along with additional research to create a presentation to the city council.</p>	
Prompt (For the <i>Visual Ranking</i> workspace)	
Which industries do you believe have the least negative effect on the river environment while at the same time providing the most benefits to the community?	
Sorting List (For the <i>Visual Ranking</i> workspace)	
<ul style="list-style-type: none"> Fish hatchery Office building Shopping center Housing development Recycling Center Hydroelectric plants Parks and recreation Farms Factories Waste treatment plants 	

Unit Details

Instructional Procedures

Description

Ask the Essential Question: How do we affect our environment? Give students two minutes for a quick write in which they list as many factors that come to their mind. Have students evaluate their list and choose the one factor they think is the most critical environmental concern facing our earth. Instruct students to write their chosen factor on a poster board strip and assign a place in the classroom in which all the factors can be visible. With the students' help, group factors by similarities. Select a few students to share their rationale; use this to emphasize the process of sharing thinking and being influenced by others' logic and information. Ask students, Do you think you have enough information in which to make a decision about the one factor that is the most critical facing our world today?

Show a short video clip from the movie, *A Civil Action* (John Travolta, 1998): a true case involving contamination of a river that may have resulted in eight local children being diagnosed with leukemia. Cue the video at the beginning and stop when the lawyer is surveying the river by the factory. Pose the Unit Question: What are the challenges of protecting a river's ecosystem from human activities? Give students some quiet time to reflect on this question; they will answer it at the end of the next activity. Prior to the unit, collect a portfolio of newspaper, magazine and Internet articles reporting about environmental issues concerning rivers. Make copies and hand out different articles to student groups for discussion. Tell students to highlight the factors in the articles that contribute to the environmental concern. Clarify the meaning of factor, cause, effect, and correlation. Have one student from each group share a brief synopsis of their article for the class. As students are sharing, write down the factors they have identified from their article so the list is visible for the whole class. Discuss the factors and then group those that are similar. Now that students have been exposed to some background information, pose the Unit Question again for a free write: What are the challenges of protecting a river's ecosystem from human activities? Assess students' responses based on how well they are able to synthesize information from the articles to construct a response.

Use the Visual Ranking Tool

Based on the newspaper articles and prior experiences, have students decide on ten industries that benefit from being located on or near a rivers to conduct their business (such as fish hatchery, hydroelectric plants, parks and recreation, farms, factories, and waste treatment plants). Working in small groups, students use *Visual Ranking* to arrange the factors in order of what development is the least harmful to the river and surrounding area and at the same time is the most beneficial to the community—based on their current understanding and initial assessment. Instruct students to use the comment feature for each item to explain their reasoning on why they ranked the item where they did. In a whole class activity, student teams analyze the correlation numbers between their group's list to those generated by classmates and view their reasoning through the comments.

Classroom Activities

Assign each team one of the industries and explain that they are to investigate the factors that have a positive or negative effect on a river by this development. Have students use the Internet to find cases that relate to river quality. Students should show how industry and development have impacted the quality of their river and highlight the challenges of protecting

Unit Details

Instructional Procedures

a river ecosystem from human activities. Present classroom activities to introduce students to procedures and equipment used to test water quality and soil properties. At a minimum, students should demonstrate an understanding of how ground water, river water, well water, tap water, and city water interact as a system through classroom activities, lab work, discussions, and/or hands-on field work. Give students time to share findings of their research with the rest of the class through a presentation. As an enrichment, have students learn how to measure water quality and put their understanding to use by conducting field studies at local watershed sites.

Revisit the Visual Ranking Tool

After the presentations, have groups re-evaluate their *Visual Ranking* lists on the order of development factors by logging in with a second team ID. Using the comment boxes, direct students to explain how their thinking has changed by analyzing the errors, misconceptions, or limited understanding found in the original ranking. Tell students to compare their new lists with their original lists through the comparison button of the *Visual Ranking Tool*; have them also compare with the other groups' new lists in order to analyze other perspectives. As an assessment exercise, have groups pair with another group in which they had a low correlation. Explain that the two groups that are paired are to try and achieve a higher correlation through discussion and presentation of their research, rationale, and persuasive arguments.

An extended activity is to have teams participate in a simulation. One team takes on the role of city council and conducts a hearing to evaluate proposed development projects. Other teams come before the council to present the viewpoints of special interest groups, such as project investors, recreational fishermen, or hydropower plant owners. The city council team evaluates each proposal according to which project has the least negative effect on the river and provides the most benefits to the community.

Students could also answer the question: How can communities develop in ways that use their water resources wisely? by exploring a more global perspective. Have them evaluate how the 1972 Federal Water Pollution Control Act (Clean Water Act), the creation of the Superfund (created by the EPA to clean up the worst sites) and the World Water Forum have improved our world's water quality. Direct students to the following Web sites for more information on global solutions that affect the smallest of communities; this information can be incorporated into their proposed development project:

World Bank

www.worldbank.org/depweb/english/modules/environm/water

Environmental Literacy Council

www.enviroliteracy.org/subcategory.php/43.html

World Water Assessment Program

www.unesco.org/water/wwap/case_studies/index.shtml

As a final journal assessment, pose the Essential Question again: *How do we affect our natural environment?* How has your thinking changed from your original quick write in the beginning?