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Sustainable Village Project
Teacher Instruction Sheet

Subjects: Biology/ Ecology / Environmental Science, Environmental Management, Mathematics, Critical Thinking

Overview: Students will assess the environmental conditions of a remote Village in Ethiopia (Africa). The students are Environmental Planners and have a budget of 1.0 Units to plan a long-term sustainable future for this village. Students, in groups or as an individual, must make changes to the village and educate the villagers of the reasoning behind their decisions.

Objective(s): For students to gain an understanding of cause and effect interactions between humans and the environment. (To understand how humans can affect the environment and how those effects, in turn, can affect human's available resources needed for survival). For students to understand that human health is directly related to the environment. To gain knowledge of the importance of biodiversity in the agricultural industry / small farms and introduce organic farming principles. To utilize necessary mathematical skills (percentage, decimals, fractions) for managing a budget. To use critical thinking skills to analyze the Village's needs and find a solution that will support a long-term sustainable village without need for future intervention. Students should be reminded that by carefully explaining to villagers why the new changes will help them overall and in the long-term, the likelihood of the village's success is greatly increased and villagers will be more accepting of the changes if they understand them.

Students will manage their budget following the requirements and guidelines on their instruction sheet. Students can create a wetland to clean the village's water, pay for a water treatment plant, begin farming using organic principles or continue using fertilizers and chemicals. The decisions to help mitigate (reduce negative impacts) of the village's most significant human health and environmental problems are up to the students! The goal is for students to create a plan for the village to be able to sustain itself long after the environmental planners' intervention.

There is a student instruction sheet, a budget worksheet ("shopping list"), a map and a blank map that will be given to each student or group. Students will add their changes to the village onto the blank map using colored pencils, markers, pens, etc. On the budget worksheet or shopping list, students can record descriptions of the items they will be purchasing, the quantity (fraction form), and the value (decimal and percent). Example calculations can be found on the first two lines of the budget worksheet. Prices are listed on the bottom of the last page of the student instruction worksheet. This project is very exceptional for students to experience real world applications of mathematical concepts, no matter what skill level the student is at.

Teachers can request an example shopping list for a sustainable village by sending an email via their school email account (to ensure that students won't have access to the guide).

Teacher's Guide to Major Concepts;
Concepts for students to learn and apply during the project:

Soil Conservation:

<http://soils.usda.gov/sqi/management/management.html>

Organic Farming:

<http://www.ams.usda.gov/nop/FactSheets/ProdHandE.html>

Desertification due to livestock overgrazing

Wetlands as natural filters

Monoculture farming

Polyculture farming

<http://www.tortuga.com/permacultura/English/polycultures.htm>

Biodiversity:

<http://www.ukabc.org/ukabc3.htm#d>

<http://www.esajournals.org/esaonline/?request=get-abstract&issn=1051-0761&volume=014&issue=03&page=0642>

Natural Soil Fertilization - Leguminous Plants:

http://soils.usda.gov/sqi/management/files/sq_atn_6.pdf

Crop Rotation:

http://soils.usda.gov/sqi/management/files/sq_atn_2.pdf