Rice Mining Activity

Standard ESS.4.2 Use computational thinking to explain the relationships between the sustainability of natural resources and biodiversity within Earth systems. Emphasize the importance of responsible stewardship of Earth's resources. Examples of factors related to sustainability could include costs of resource extraction, per-capita consumption, waste management, agricultural efficiency, or levels of conservation. Examples of natural resources could include minerals, water, or energy resources. (ESS3.A).

Standard ESS.4.3 Evaluate design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios on large and small scales. *Define the problem, identify criteria and constraints, analyze available data on proposed solutions, and determine an optimal solution.* Emphasize the conservation, recycling, and reuse of resources where possible and minimizing impact where it is not possible. Examples of large-scale solutions could include developing best practices for agricultural soil use, or mining and production of conventional, or renewable energy resources. Examples of small-scale solutions could include mulching lawn clippings or adding biomass to gardens. (ESS3.A, ETS1.A, ETS1.C)

Materials:

- 5 Different Colored Beads
- Uncooked Rice
- Bowls (1 per group)
- Trays (1 per group)
- Small Spoons
- Large Spoons

- The Beads or Rice can be a variety of different materials. For example, bird seed can work in place of rice. You could also use different items to represent the valuable minerals/ore and have them be different sizes (larger and easier to find items could be worth less money and smaller harder to find could be worth more, etc.).

Background:

Mining is the process of extracting valuable minerals and materials out of the Earth for human and economic use. This act of mining is very complicated with a variety of concerns beyond where valuable resources may be located, which is in of itself complex. This activity focuses primarily on minimizing waste and managing

Description:

This activity gives the participants a chance to run a fictional mine. They are each given a bowl filled with colored beads, which represent valuable ore or materials, and rice. The rice represents waste material that comes as a by product of mining. The activity is split into three phases: preparation, mining, and reclamation.

The preparation phase is when the groups get a chance to buy the materials they will use to mine [big spoons ($10) and little spoons ($5)]. This is also an opportunity for the participants to divide up the roles in their group. For example, who will scoop out the beads from the container or who will separate the collected rice from the beads in the tray.

The mining phase is when the participants get their chance to collect the beads. This may be for one or two minutes depending on your preference, the group, or if you plan to do multiple rounds. The beads are mixed in with the uncooked rice in a big bowl and the participants need to retrieve as many of the beads as possible while getting as little rice as possible. The major caveat being that they cannot touch the rice or the beads with anything other than the spoons they purchased. They can, however, using the spoons put back excess rice that they have collected.

The reclamation phase is when the participants separate out the beads and the rice (they can use their hands this time). Each of the beads is worth a different amount of money. The participants add up their profit from beads, subtract the costs of their tools, and subtract their reclamation costs. The reclamation costs being related to amount of rice they have left over in their trays at the end of the mining phase. 0-10 grains is $0, 10-25 grains is $10, and 25 and above is $25.

Impact of Reclamation Cost: An interesting change you could make is to reframe the reclamation costs. The reclamation cost could be framed not as a cost linked directly to the extraction of the minerals, but instead as a policy decision from a fictional government. In this way there could be at least two rounds, one with the reclamation penalty and one without.

At the end of each of these rounds you could collect all of the extra rice (as the participants would still need to separate the rice from the beads to calculate profits) and then add the rice of each round to two different “environments”. For example, a small cup or bowl that could represent a wetland or forest down river from the participant’s mines. The participants could compare both their profits and relative impact on the fictional environment in both rounds. This could lead into a discussion the value of regulations on resource extraction or other potential solutions to mitigate environmental impacts.

(Note: Make sure to mention to the participants not to just dump the bowl of rice and beads on the tray during the round without a reclamation cost, or to be too overzealous with the spoons.)