**Lesson 7: Decision Matrix**

**Problem Statement:** The problem is the PUD needs to invest money into alternative energy sources and needs suggestions for the future. This lesson ties into the problem because students must understand what options are going to be available in future years.

**Learning Objectives:**

A solution path is selected and justified by evaluating and comparing competing design solutions based on jointly developed and agreed-upon design criteria and constraints.

Jointly develop a decision matrix based on accepted outcome criteria and constraints.

Clearly justify and validate a selected solution path.

**Materials:**

1.      Microsoft Excel or Google Sheets

2.      Decision Matrix Template Sample (below)

3.      Blank Matrix Template

4. 2 ideas from brainstorming session &/or previous research activity

5. YouTube video <https://www.youtube.com/watch?v=QPat2PULZYw> titled, “Electric Units” (2:41) which explains energy units and some examples of scale so students can compare sources more effectively.

**Lesson Prep:**

Make copies of Decision Matrix

**Time Required**:

2-3 50 minute class periods

**Procedure:**

List Ideas: Student groups will list all ideas. In a team of three, have each student write down two of their favorite brainstorming ideas on the matrix.

Identify Criteria : Teacher will lead a discussion about relevant criteria for the project. For instance the criteria might include manufacturing costs, electricity produced, sustainability, feasibility, environmental impact, efficiency, safety, etc.

Setting a Scale: Students will now work in groups to identify a 1-6 (6-Best for the criteria, 1-Worst for the criteria) ranking for each idea for each criteria. Students total their scores on the right and select the highest score as the best possible project. Teacher will decide whether to weight the criteria or to keep the 1-6 scale. Upperclassmen should weight the scale depending on the importance to the project or their priorities. For example, electricity produced might be the most important factor, so the score in that category is multiplied by 3.

Ranking Choices: Students will need to research information in order to make informed decisions. The YouTube video titled, “Electric Units” (above) may be useful for students with a limited understanding of electrical units. Further support may be needed in order to find reliable information on some topics.

**Decision Matrix Template**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Criteria** | | | | | |  |
| **Ideas** |  |  |  |  |  |  | **Totals** |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
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**Decision Matrix Example**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Criteria** | | | | | |  |
| **Ideas** | Price | Feasibility | Envir. Impact | Reliable | Accessibility | Time | **Total** |
| Carbon Fiber Gears | 3 | 6 | 3 | 6 | 6 | 4 | 28 |
| Piezoelectric Bicycles | 4 | 6 | 1 | 4 | 5 | 5 | 25 |
| Self Charging Car | 1 | 3 | 4 | 3 | 2 | 2 | 15 |
| Piezoelectric Gun | 5 | 5 | 1 | 4 | 3 | 4 | 22 |
| Piezoelectric Wind Turbines | 5 | 4 | 1 | 4 | 5 | 5 | 24 |
| Solar Streets | 1 | 2 | 2 | 3 | 2 | 3 | 13 |

**Assessment**: As students leave, have them fill out and turn in their decision matrix. Have them circle the project that they will proceed with based off of score.

**Accommodations**: A copy of the Decision Matrix Template Sample can be provided. Students may also provide less choices to rank.

**Extensions**: The Decision Matrix Template can be made ahead of time in Excel and shared with class via Internet. Students can also learn how to write formulas in Excel using the template.