**Student Group Work – Self-Reflection**

1. Group collaboration skills – How well do you contribute to group work?

1 2 3 4 5

2. Group communication skills – How well do you communicate with other group members?

1 2 3 4 5

3. What is your attitude towards group work?

1 2 3 4 5

4. What do you view as your strengths for this project?

5. Did the role you chose make use of these skills?

1 2 3 4 5

6. How effective are your organization skills?

1 2 3 4 5

7. Consider your organization skills, collaboration skills, communication skills, and attitude.

What would you like to work on during this group project? Why?

**Rocketry Engineering Design Challenge:**

Teacher

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**Group Members and Roles:**

|  |  |  |
| --- | --- | --- |
| **Project Manager** – ensure fair group work, ensure sharing of ideas, ensure project is on track, ensure materials used properly/safely |  |  |
| **Architect and Designer** – record progression of ideas, draw final design with legend, materials and purpose |  |  |
| **Communications Officer** - record notes about successes/failures of design and prototype, record group answers to discussion questions |  |  |

**Engineering Design process:**

**1. Define the problem:**

Build a model of a rocket that uses water as its reaction mass. The action of expelling the water mass causes the reaction of the bottle motion (Newton’s Third Law). Include components on your model to achieve the longest distance flight.

**2. Background research:**

Aerodynamics is the branch of science that deals with the motion of air and the forces on bodies moving through the air. **There are four forces that act on a rocket. They are lift, drag, weight and thrust.** Drag is a force that opposes the upward movement of the rocket. It is generated by every part of the rocket. Drag is a sort of aerodynamic friction between the surface of the rocket and the air. Factors that affect drag include the size and shape of the rocket, the velocity and the inclination of flow. Consider some things that can be done to decrease drag.

**3. Requirements/materials:**

**Materials:**

* Paper
* Plastic cups
* Cardboard
* Aluminum foil
* Popsicle sticks
* Tape
* Modelling clay

**4. Brainstorm, evaluate, choose the best solution:**

**Brainstorm ideas. Sketch at least 2 ideas**. Within the group decide which one you think will work best – be open to ideas that are not your own.

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**5. Build Prototype:**

Sometimes while constructing a model, the limitations of your materials may change your design. **Draw your finalized prototype**. Make sure to include a **legend** that lists the materials used and where they are used.

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**6. Test and Revise:**

What worked well with your design? (at least 2 things)

What did not work as well as you expected? (at least 2 things)

What are some revisions your group plans to make?

**Engineering Design Challenge RUBRIC:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **4 (excellent)** | **3 (good)** | **2 (basic)** | **1 (poor)** |
| **Brainstormed Designs** | Students have **two different designs** from brainstorming. They provided **excellent descriptions** of the designs. | Students have two different designs from brainstorming. They provided sufficient descriptions of the designs. | Students have two designs from brainstorming. They do not provide sufficient descriptions of the designs. | Students have fewer than two designs from brainstorming. They do not describe the designs in the report. |
| **Prototype Design** | Students provide a **detailed sketch** and a **full breakdown** of the design and explain the reasons for each portion of the system. | Students provide a sketch and a breakdown of the design and explain the reasons for each portion of the system. | Students provide a sketch and a breakdown of portions of the system, but do not explain the purpose for all parts in the system. | Students provide a sketch of the system with labels. Little to no explanation is given for each. |
| **Test Analysis** | Students provide **detailed analysis** of the test results and give reasons and **explanations** for various design faults.  Students use their results to **redesign** the prototype thoughtfully. | Students provide detailed analysis of the test results and give reasons and explanations for at least one design fault.  Students use their results to redesign the prototype. | Students provide a short analysis of the experiment, but do not explain the reasoning for the design faults.  Students use their results to redesign the prototype. Reasoning for changes is not well explained. | Students do not provide analysis of the results from the experiment.  Students provide a redesign of the prototype, but do not explain reasons for changes and do not use analysis of results as reasons for changes. |
| **Collaboration and Communication** | Students **communicate effectively** with other group members.  Students **contribute** fully to the project. | Students communicate with group members with some effectiveness.  Students make some contributions to the project. | Students communicate with group members with limited effectiveness.  Students make limited contributions to the project. | Students communicate with group members ineffectively.  Students do not make enough contributions to the project. |
| **Organization** | Students **organize** ideas and materials very well. | Students organize ideas and materials well. | Students organize ideas and materials somewhat. | Students do not organize ideas and materials. |