15 Constructing a Device Containing a System of Simple Machines

Materials

- chart paper
- pictures and books of construction vehicles
- markers
- commercially produced gear kits
- Meccano/Lego sets
- pulleys
- other materials as identified by students for constructing their objects

Activity

Display the pictures of construction vehicles. As a class, discuss how vehicles like front-end loaders, graders, and cranes use more than one simple machine in their operation. Using chart paper, list all the simple machines the students can identify with each machine, and the purpose for each simple machine.

Now challenge the students to construct a device that uses at least two simple machines to solve any of the following problems:

1. Design and construct a crane that can lift a brick 1 metre high.
2. Design and construct a model of a machine that will move a piano to the top floor of a house.
3. Design a catapult that can throw a tennis ball across the room.
4. Design a model of a machine that will pull a motorboat out of the water.
5. Design a model of a movable ramp that will transport a wheelchair into a van.
6. Design a machine that can shovel up gravel or sand and move it so it can be dumped at another location.

Divide the class into working groups. Provide the groups with gears, concrete materials, pulleys, as well as any resource materials that may assist them in their planning, designing, and constructing. Also provide the activity sheet for students to use as a guide.

Once the groups have constructed and tested their models, have them present the final projects to the class.

Activity Sheet

Directions to students:

Use the sheets to plan, design, and construct your device (3.15.1).

Extensions

- The book *Cat on a Chimney* by David Drew (Ginn) provides many examples of problems that can be solved with the use of simple machines and mechanical devices. Challenge students to build models that solve some of these problems.
- Visit a heavy machinery shop. Many farm implement dealers, railway shops, and semi tractor shops will let students come and see the work they do. Some students may have family memebers working in these industries and can make the arrangements for you.
- Visit a power mechanics shop at a local high school.

Assessment Strategies

- As a class, develop criteria for the construction project. These may include:
  - a detailed, labelled diagram of the plan
  - an accurate list of materials
  - modifications
  - working final product
  - clear oral presentation

  List these criteria on the rubric sheet on page 15 and record results for each group.
- Have the students complete a student self-assessment sheet on page 18 to reflect on their own learning about this project.

Date: _____ **Name:** _____

_____

_____

_____

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Our group will (state the problem you are trying to solve): _____

_____

_____

_____

Draw a labelled diagram of your design. (Use arrows to show the direction of movement.)

Materials we need:

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

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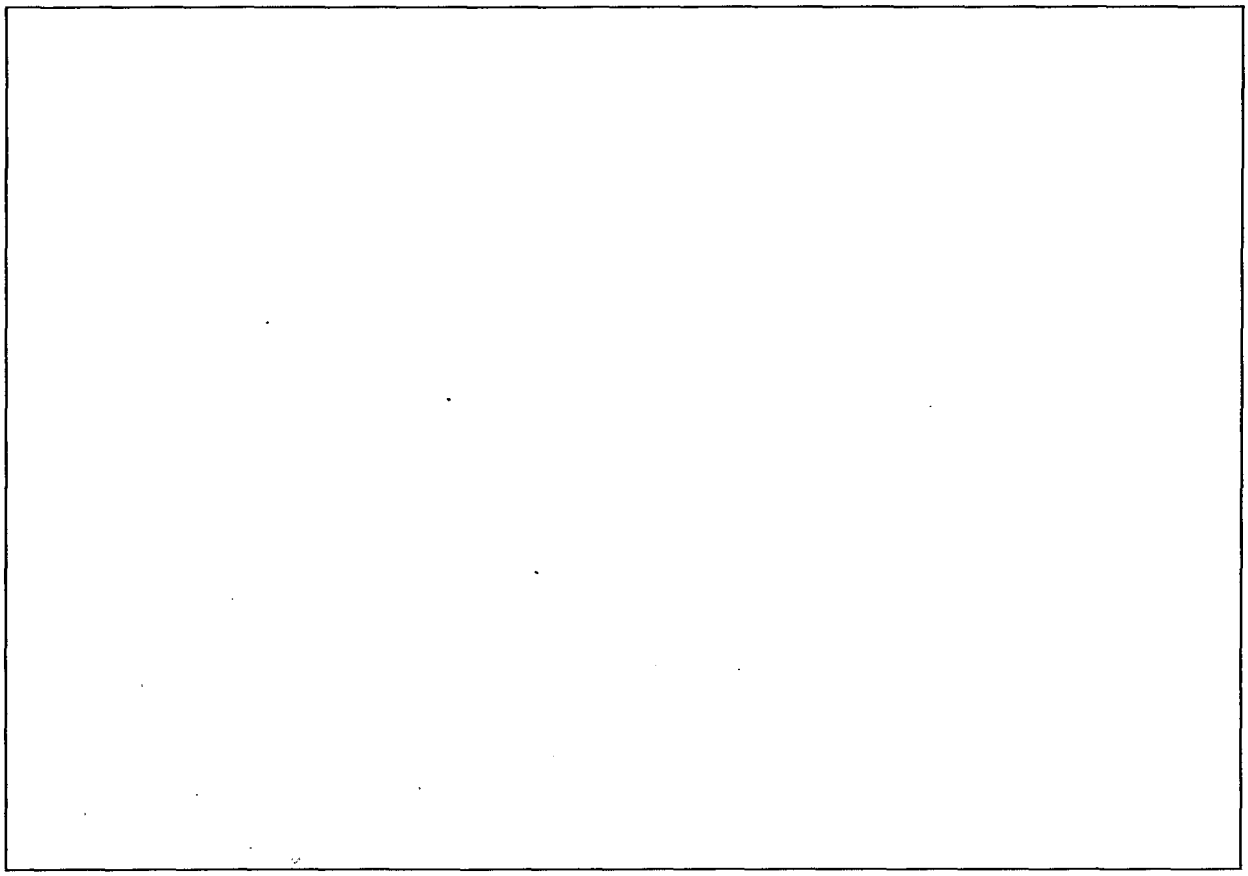
Construct your model and test it. List all modifications you made to your original design and explain why you made these changes:

Draw a labelled diagram of your final product. (Use arrows to show the direction of movement.)



Describe how your product uses simple machines for movement:

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