



LESSON 24. Tools and Machines for Work: Saving your Energy

Grade Level: 8-
10

1. Grades 8-10

2. Overview Every human being does work in one form or the other. Work itself is as a result of the force exerted over some distance. The elements of "force" and "distance" are usually present in the work most people do. Carrying a bucket of water from the ground floor of a building to the first floor of the building involves some work. Clearing grass in a field involves some work. In most instances, tools and machines help us to do work more easily. We save our energy by using them.

3. Purpose The purpose of this lesson is to show through demonstration how tools and machines enable us to do different kinds of work more easily. The choice of a tool or machine for specific types of work makes the work appear easy.

4. Objectives Students will be able to:

- i. Distinguish between tools and machines
- ii. Identify which work needs specific tools and machines
- iii. Discuss the advantages of using machines.

5. Resources/materials

- Simple tools around the home-knife, cutlass, shovel, hoe, claw hammer, pliers, can opener, etc.
- Pictures of simple machines-sewing machine, photo copier, typewriter,
- Pictures of heavy machines-cranes, road grader, train, motor car,
- Simple machines-pulleys, levers, wheel and axle, jack for vehicles.

6. Activities and Procedures In general, when people talk about machines, they are thinking of heavy and complicated pieces of mechanisms like a motor car, printing press or a crane. Some would perceive machines in the form of sewing machines and a motor cycle. Very often the simple devices around our homes are left out. This lesson presents machines in its generally applied way. *A machine is therefore defined as an arrangement that enables us to do work more easily.* It is a device that enables us to save our energy and do work which ordinarily we could not do. The purpose of using a machine is to do work more conveniently. The students should now be guided to give examples of machines using the concept presented.

The examples given may include certain objects the students know as tools. So what is the difference between a tool and a machine. Is a knife a tool or a machine? The teacher should now try to explain. A tool is also a device which enables us to do certain kinds of jobs more easily. To remove a nail from a piece of wood, we can use a claw hammer. Scientifically, both tools and machines enable us to do work more easily so we could then say that a tool is also a machine. Indeed, it is the principle on which a device operates that makes it a machine. Here the teacher will introduce the term mechanical advantage. This term shows the relationship between a load and the force applied.

$$\text{Mechanical advantage} = \frac{\text{Load lifted}}{\text{Force applied}} = \frac{\text{LOAD}}{\text{EFFORT}}$$

It is the practice that whenever we use a machine, the effort/force applied is usually less than the load. The implication of that is that the force ratio above should always be greater than 1 in a good machine. Then it is said that there is mechanical advantage in using the device.

Here the teacher should guide the students to discuss which work would need tools and machines. It is important that appropriate tools and machines are selected for specific jobs so that the principle of mechanical advantage applies. Machines are used to save our energy. The advantages of using machines can then be discussed.

The above concept of a machine can then be illustrated with the simple devices collected-pulleys, levers, etc. The lever system could be discussed giving examples of the three orders of the lever system.

7. Tying it all together The general definition of a machine as energy saving device should be adopted and applied. The definition of technology as the response to a need to do our work more conveniently and more efficiently should be underscored.

8. Assessment The ability to use the general concept of a machine should be explored.

9. Author(s) S. T. Bajah stan@alpha.linkserve.com

10. References Sellers, John et al. (1999). **Understanding Science for Zimbabwe** 4. Harare: John Murray in association with Academic Books.

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