

Activity 2.3 Forces and Interactions in Compound Machines

Introduction

Now that you have gained some skills in building simple machines, you are ready to take the next step!

A **compound machine** is a device that is made of two or more simple machines. Many complex machines are really several simple machines put together to achieve a task. Compound machines that you may use include a bicycle, wheelbarrow, and even a car's transmission, which helps us to shift gears to go faster or drive in different directions. Another example is a lawn mower, which combines several simple machines to make cutting the grass easy.

In this activity you will explore, sketch, model, and evaluate compound machines using any two or more simple machines.

Equipment

- VEX IQ® Equipment
- iPad® tablet
- Tablet applications
 - Popplet Lite
 - Educreations™
- Launch Log
- String

Procedure

How will *you* and your *Design Team* create a compound machine? That is the challenge. We will use the design process to guide your creation. You may use what you created in Activities 2.1 and 2.2 or create a compound machine out of some new simple machines that your team designs. The procedure below is to guide you and your team's thinking and work to a successful activity conclusion.

1. Begin by exploring ideas with your team in a discussion. Think of ways to combine two or more simple machines to complete a task. Record all of the ideas in your Launch Log.
2. Sketch an idea that *you* came up with in your Launch Log. Your team members should do the same with their ideas in their Launch Logs. All ideas do not need to be the same.
3. Compare your sketch with your team members' sketches.
4. Discuss all of the different sketches.
5. Record the following in your Launch Log:

- a. What simple machines did your team members choose?
 - b. What simple machines did you choose?
 - c. What is the work that the compound machines will do?
6. Revise any sketch in your Launch Log so that you and your team members have a final sketch of your team's final design idea.
 - a. Label each type of machine.
 - b. Decide who will build each machine.
 7. Using VEX IQ[®] parts, construct your idea for a compound machine. Each team member should create one simple machine that will fit together and transfer a force to the next simple machine with a push or a pull.
 8. Use your tablet to take pictures of each of the individual simple machines.
 9. After you have assembled your compound machine, use your tablet to take a final construction picture.
 10. Use your tablet to take a video of your compound machine in action to share with your class.
 11. Using your tablet and an app such as Popplet Lite or Educreations, assemble your images to present to the class. Label each of your simple machines' components.

Conclusion

1. How do you think compound machines make work seem easier? Use evidence from this activity.
2. Create a chart like the one below in your Launch Log. Name the simple machines you used in your complex machine design and indicate whether they make the task easier or more difficult.

Machine Type	Is the task easier or more difficult?