

Radioactive Ping-Pong Balls - Engineers Week

OBJECTIVE

Work together in teams to solve a problem.

INTRODUCTION

Although the object of this activity is to be the first team to successfully move all the “radioactive” ping pong balls from one brown paper bag to the other, the deeper significance is to show that an engineering project often depends on teamwork. In this activity, students will devise a system for transporting all the balls from one bag to another without contamination leaks, using only the supplies provided.

CONNECT TO ENGINEERING

The stereotypical image of an engineer is someone who works alone in a cubicle or laboratory or someone who is on a construction site peering at blueprints. In reality, teamwork is critical to solving engineering problems.

As in this activity, teams need to work together to be creative, resourceful, and efficient to get the task done quickly and correctly. Many ideas are needed, and everyone’s input is necessary. The teams are also working against a deadline, which adds to the complexity of the task. Before beginning the activity and again in sharing everyone’s ideas and methods at the end, make sure to point out that there is no single correct way to get the task done – there are many methods that will work.

DISCUSSION

Students may be curious or have concerns about real-world disposal problems concerning radioactive waste or even bio-chemical hazards.

Radioactive waste needs to be handled carefully and many engineers are dedicated to maintaining its safe and secure storage and disposal. Some work to build the pools where nuclear fuel goes after leaving the reactor. Others design the dry cask canisters which store the fuel after it is removed from the pool. Even more engineers transport these canisters thousands of miles without accidents or radiation releases. From the environmental scientists who study geologic repositories to the security guards who protect the nuclear power plant, everyone has a role to play in dealing with radioactive waste.

Engineers are involved in the design, construction, and operation of nuclear power plants for power generation, propulsion of nuclear ships and submarines, and space power systems. Engineers are also involved in the handling of nuclear fuels, the safe disposal of radioactive wastes, and in medical uses of radioactive isotopes.

MATERIALS NEEDED (for each team)

- Stopwatch
- 2 brown paper lunch bags

Place in Bag #1 <ul style="list-style-type: none">• 5 “radioactive” ping pong balls	
Place in Bag # 2 <ul style="list-style-type: none">• 2 paper clips• 3 straws• 4 3”x3” pieces of paper	<ul style="list-style-type: none">• 5 rubber bands• 2 craft sticks• 3 plastic spoons• 3 2/3”x 1-3/4” labels

STUDENT INSTRUCTIONS:

- Divide the group into teams of 4-6 students each.
- Empty the supplies from Bag #2 and place Bag #1 and Bag #2 on the floor approximately 8 feet apart from each other. The bags are to sit on the ground with the opening toward the ceiling, and they may not be moved, slid, tipped, etc.
- The balls need to be transported from Bag #1 to Bag #2 using only the supplies provided. No part of the body or clothes may touch the balls – ONLY the supplies. The team may alter the supplies in any way necessary, but once a supply item has been used to move a ball, it is contaminated and must be dropped into Bag #2 with the transported balls.

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- If a person touches a ball or if a ball gets dropped, there is a contamination leak! The leader (you) may put on your protective gear and return the ball to Bag #1. The ball still must be transported to Bag #2, and the team gets a 15-second deduction.
- There is a six-minute time limit. The team that moves all the balls in the shortest amount of time wins. Remember to deduct for any contamination leaks. Try to enforce the time limit, but you may need to let the teams run over to complete the task. After all the teams have completed the challenge, tally up the times and go around the room to have the teams share their ideas and comments. Provide recognition to the winning team, to any team who completed the project within the time limit, to the team with the most creative transportation tool, to the team with the best teamwork, etc.
- If there is additional time, you can have them try again but only using what materials they have left.

EVALUATION and REFLECTION QUESTIONS:

Did every team use the same process?

How did your team come up with your procedure?

What was essential to help your team accomplish the task?

What is the role of teamwork for engineers?

What is the role of trial and error in developing a procedure for a task?