

> Imposter: Keeping Nuclear Materials Safe

Objectives

Students will:

- Understand that nuclear materials have the potential to be used for non-peaceful purposes, but there are lots of robust systems in place to prevent this from happening.
- Understand that there are measures in place to keep people, the environment and nuclear materials safe.

Fast facts

Subject: Chemistry/Physics

Age range: 11+ years old

Ambassador preparation time: 10 minutes

Demonstration time required: 20 minutes

Location: Science Fair

Overview

The activity is designed to raise awareness and understanding that adoption of advanced nuclear technologies presents challenges that must be addressed.

A critical component of benefiting from nuclear technologies is our ability to ensure that the sector's sites, materials, technology and people remain safe and secure. Jobs involved in these safeguarding activities make up a large and important part of the nuclear sector.

Equipment

- Blu-tac
- Periodic table card packs
- Pin boards
- Pens
- Paper
- Scissors

Procedure

This activity is designed for small groups of between 4 and 10 but could work for slightly larger groups if needed. There are 3 sets of equipment provided in the box, so the kit can accommodate from 1 to 3 small groups. More kits can be purchased to accommodate for more groups.

The activity works best with two or more groups so it can turn into a competition, but can be run with only one group.

In the kit there will be one pin board with radioactive elements cards arranged in a 'random' pattern and blue tacked down. It should look like the below:



If you are making your own kit, then arrange and blu-tac in place one set of cards to look similar to the above.

There needs to be at least one imposter per team and for larger teams you may want two. This is at the discretion of the STEM ambassador. Cut the paper into small pieces and onto one piece of paper write 'imposter'. Deal the paper out to the participants so that one (or 2) participant(s) in each team receive a slip saying 'imposter'.

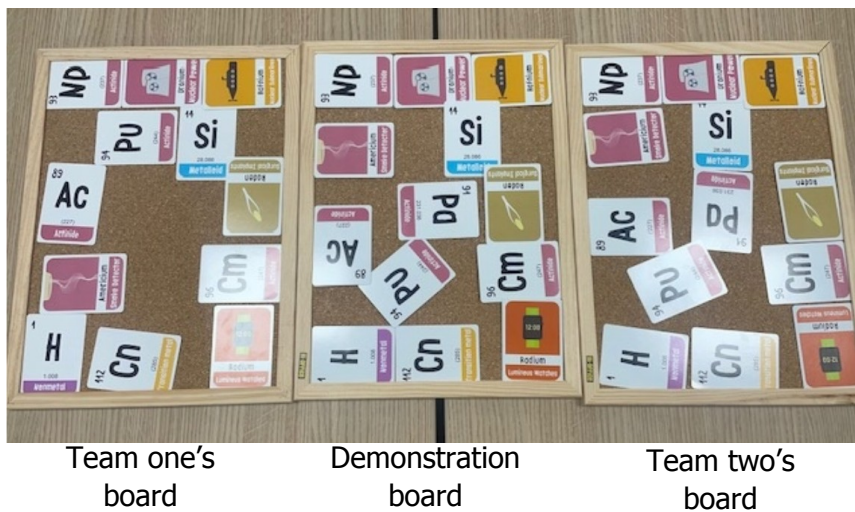
Make it clear that they should not tell the other group members that they are the imposter.

Collect the slips back in. The students will then be given the task to recreate the board above. They will be given a pin board and a full pack of periodic table cards.

The STEM ambassador will stand away from the groups (e.g. outside, round a corner etc...) with the completed pin board. The students will be allowed to come up to the board one at a time, for 10 seconds max, then they will return to their group. The next team member will then be allowed to come up to the completed board for 10 seconds max etc..., working round the entire group for 7 minutes. As a team they will do their best to piece together and recreate the puzzle. **But** there is an imposter. The imposter will attempt to sabotage their team recreating the puzzle. They might hide some of the group's cards, put cards in the wrong place, suggest the wrong card altogether, accuse someone else of being the imposter, or act in other ways to try prevent their group recreating the puzzle correctly.

Before the challenge begins the students are allowed 1 minute to come up with a strategy as to how they will tackle their challenge. They could work to separate the cards out into colours to help find them quicker, memorise the board in a clockwise fashion, work in pairs to check each other's work as some possible suggestions for strategy ideas.

Once time is up each group will present their completed board and it will be compared to the demonstration board. Below, the demonstration board is in the middle, team one's board is on the left and team two's board is on the right. Group two won this challenge.



Once the winner has been revealed ask the group members, one group at a time, who they think their imposter was and why. Then ask the imposter to reveal themselves. Ask the group how it made them feel knowing they were working with an imposter. What measures could be put in place to stop imposters? Why is this especially important in the nuclear sector?

You can now explain to the students that the activity is designed to raise awareness and understanding that working with nuclear materials presents challenges that must be addressed.

Discussion and Real-World Application

Nuclear science is nothing new. Nuclear science is used across the world every day, whether it is contributing to the achievement of net zero through the generation of carbon neutral energy, advancing nuclear science for the delivery of effective healthcare, in food and agriculture, or even in space exploration. However, there is a possibility that nuclear technology can be diverted to non-peaceful purposes. A critical component of a society benefiting from nuclear technology is to ensure that nuclear sites, technologies and materials remain safe and secure.

Nuclear security is the prevention, detection of and response to theft, sabotage, unauthorised access, illegal transfer or other malicious acts involving nuclear material and other radioactive substances or their associated facilities. This is done to protect people, property, society and the environment from the harmful effects of ionizing radiation. Scientists need to work alongside government to create policy, inspections of nuclear material and actions to stop nuclear material being used for non-peaceful purposes.

In the activity the students have just completed, the imposter represents only one of the many potential threats to the nuclear industry. This highlights how important it is for workers in the nuclear industry to be aware of the different threats posed and be vigilant.

Equipment Purchase Links

- Blu-tac

https://www.amazon.co.uk/Bostik-Multipurpose-Reusable-Adhesive-Non-Toxic/dp/B0001OZI70/ref=sr_1_5?crid=1GMD3AMFKVJ1H&keywords=blu+tack&qid=1692346767&srefix=bu+tac%2Caps%2C353&sr=8-5

- Periodic table card packs

https://www.amazon.co.uk/gp/product/B075DFF22T/ref=ppx_yo_dt_b_asin_image_o06_s01?ie=UTF8&psc=1

- Pin boards

https://www.amazon.co.uk/gp/product/B08LQJ6ZN6/ref=ppx_yo_dt_b_asin_image_o04_s00?ie=UTF8&psc=1

- Pens
- Paper
- Scissors