

IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
Hands-on Space Education and Outreach (8)

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THINKING INSIDE THE BOX: A HANDS-ON STUDENT ACTIVITY FOR BUILDING A
CONTAMINATION CONTAINMENT GLOVEBOX TO ENCOURAGE PROBLEM SOLVING IN A
COLLABORATIVE ENVIRONMENT**Abstract**

Contamination containment gloveboxes are sealed containers where operators outside the glovebox can safely manipulate hazardous or contamination-sensitive materials inside the glovebox through glove ports on the container. Containment gloveboxes are used in the space industry to study sample materials returned from space such as lunar, asteroid, and comet materials, to manufacture sensitive instruments and space flight hardware, and to perform contamination-sensitive experiments. A hands-on activity has been developed by contamination control engineer and STEM education experts as part of the Virginia Earth System Science Scholars (VESSS) summer academy program to teach high school students about gloveboxes and about problem solving in a collaborative environment. In this activity, student teams are given a list of common household materials (e.g. plastic bags, plastic straws, aluminum foil, tape, disposable gloves, etc.) for building their own glovebox. Students work together to sketch and design their glovebox before being provided a kit of materials, which they must purchase along with any extra materials with a mock team budget. They are given 30 minutes to build their glovebox, however, they do not know what will be placed inside the glovebox or what operations they will need to perform within the glovebox. At the end of the build time, teams are given a small, sealed paper envelope which they place in the glovebox. Each team selects a team member to be designated as the operator, and the operator places their hands in the gloves of the glovebox. The operator uses their gloves to open the envelope in the glovebox, and they discover they have 20 minutes to assemble a jigsaw puzzle. However, the puzzle is “contaminated” with talcum powder. After the 20 minute time period, teams are judged on how well they completed and cleaned the contaminated puzzle. In a post-activity debrief, teams discuss lessons learned such as how the actual built box differed from the sketched design, the challenge of managing a budget for materials, how the team dealt with surprises, and if their glovebox allowed enough room for the operator to perform the task. This activity has been part of the VESSS summer academy since 2016, and teaches students teamwork, creativity, hands-on experimentation, communication, and reasoning skills. In a demonstration at IAC, a volunteer from the audience will be chosen to assemble a glovebox during the presentation using the same kit of materials and will demonstrate handling puzzle pieces in the completed glovebox.