

Education and Outreach Challenge Activities

Science outreach and educational incursions are opportunities for practising scientists to share their passion and stories of their work, to inspire younger people to pursue careers in the sciences, and increase science literacy (and support) in the general community.

In the spirit of the oft-used quote: “What I hear, I forget. What I see, I remember. What I do, I understand.” get your audience to participate in a fun and engaging challenge that demonstrates the skills and thinking processes that scientists employ in their every day work.

This resource contains examples of activities for school groups, retiree groups, amateur astronomy groups, and even groups of peers or professional scientists.

The selection in this document formed an Education and Outreach Challenge at the ASTRO 3D Retreat in December 2023, to huge acclaim. There are many more activities of this type out there; these are just a taster.



ACTIVITIES

Listed below are six activities. They can be used individually, or in combination to create a challenge.

They can be completed by people individually, or in teams, depending on the purpose of the session or the audience.

In most cases, this document links to the original activity on a science museum or similar website - no need to re-invent the wheel!

1. MYSTERY TUBE

<https://learning.sciencemuseumgroup.org.uk/wp-content/uploads/2020/11/SMG-Learning-Activities-Mystery-Tubes.pdf>

WHY: Mathematical skill is reasoning – making deductions based on logical analysis of available information. Logical reasoning.

Activity: Make a replica and draw how the strings are threaded. Sheet to draw on provided.

Materials:

- 1 tube made up for demonstration
- Tube for the challenge, with holes for strings
- 2 pieces of string per tube (each twice as long as tubes) or shoelaces
- Sticky tape
- Answer sheet
- Pen



2. MYSTERY BOXES

<https://learning.sciencemuseumgroup.org.uk/wp-content/uploads/2020/04/SMG-Academy-Mystery-Boxes.pdf>

WHY: ‘Working scientifically’ and how a variety of skills and processes are used to generate scientific theories based on evidence.

Activity: Collaborate, log your observations and make a conclusion on what you think is in the tins.

Materials:

- 4 boxes/tins
- Objects such as shells, key, toy car, straw or similar
- recording sheet

3. INQUIRY CUBES

<https://passionatelycurioussci.weebly.com/blog/patterns-in-science-inquiry-cubes>

WHY: Science is all about finding patterns.

Sometimes, those patterns are very clear.

Sometimes, there are several patterns that all describe the same thing

Sometimes, there don't seem to be any patterns at all

Sometimes, we find patterns that trick us into thinking unrelated data sets are connected

Activity: Decode the missing sides of four cubes.

Materials:

- Cubes printed out and assembled (scissors and sticky tape or glue to a wooden cube of the appropriate dimensions)
- Sheet for answers
- Recording sheet



4. PHYSICS QUESTIONS

E.g., <https://www.wtamu.edu/~cbaird/sq/category/physics/>

WHY: Answering questions for a particular audience is important.

Activity: Groups come up with an answer for a series of questions that could be asked by a member of the public or school students at an outreach/education event.

Materials:

- List of questions
- Rubric
- Paper/pens

Rubrik: plain language, analogies (if possible), no or limited maths, 100 words or so, age-appropriate.

Supply 10 questions and age group. Freedom to choose which ones to answer.

Question	Audience
Can one bit of light bounce off another bit of light?	adult audience
Do flames contain plasma?	12 year old
Does a source of electricity ever run out of electrons?	upper high school student
Does an atom have a colour?	lower primary school student
Does time go faster at the top of a building compared to the bottom?	first year physics student
Is the reason that nothing can go faster than light because we have not tried hard enough?	12 year old
Since gravity is unlimited, can we use it as an infinite energy source?	politician
What is the Universe expanding INTO?	retiree
How do you know that the Universe is really that old?	climate change denier
How do you know the stars are really that far away?	conspiracy theorist

5. FACTORY BALLS FOREVER

<https://www.engineering.com/GamesPuzzles/FactoryBallsForever.aspx>

WHY: Trial and error. Problem solving. Improves logical and computational thinking.

Activity: Logic puzzle game: custom craft each ball to a specific order.

Materials:

- Computers/tablet/smartphone
- Internet connection



6. 3D YOUR SCIENCE

WHY: For fun. Representing your science differently using a material you wouldn't normally use.

Activity: Build your science in playdough.

Groups put their finished creations on a sheet of paper (to reduce mess).

Materials:

- Playdough - 4 colours - reducing the number of colours forces creativity in the shapes
- Zip-loc bags
- A4 paper (to put finished creation onto)
- Optional: matchsticks, paddlepop sticks, pom poms, sequins, shaping tools

