Zoob self-assembly

Instructions for demonstrators

About this activity

‘Zoob self-assembly’ engages participants in hands-on learning by using Zoob pieces to build models. The session aims to demonstrate the versatility of Zoob pieces and their analogy with self-assembly of molecules.

A group of colorful plastic objects

Description automatically generated

Key information

Science topic(s): Crystallisation, Framework materials, Self-assembly

Age range: 5+, including adults.

Activity duration: 5 minutes- 30minutes

Health and safety considerations: Zoob pieces can pinch fingers.

Special requirements: n/a

What’s in the box?

1. These instructions for demonstrators.
2. Risk assessment.
3. Materials for the activity:

a. 5 different types of zoobs (blue, yellow, grey, green and red)

b. 4 different types of connections that can be made between two Zoob piece

c. Example models (either pre-built or images)

d. Tables or flat surfaces for assembly

1. Information to display about the activity (laminated A4 sheet).
2. Postcards about the activity to give out (A6 card).
3. Stickers for giving out to/counting participants.

How to set up this activity

1. Arrange tables and chairs in a way that encourages interaction among participants..
2. Gather same type of Zoobs together in one box, then distribute five boxes separately on the table.
3. Display example models and guides where they are easily visible.
4. Show four different types of connections clearly that can be made between two Zoob pieces which red+ green is Ball-socket; yellow +blue is Indents; green+ red is Socket-centre; red+ blue is Socket socket.
5. Display the laminated information and postcards somewhere nearby (e.g., on a table) and have the stickers on hand to give out when participants have completed the activity.

How to demonstrate this activity

1. Invite people to assemble Zoob pieces themselves which can be irregular. *You can say that we are trying to explore different possibilities with ZOOB pieces*
2. You can show how to connect ZOOB pieces. Emphasize the flexibility and movement that ZOOB joints allow.
3. Build a simple structure or follow one of the example models, to demonstrate the potential of ZOOB for creating functional models, e.g., of porous materials
4. Let people to design their structures themselves, you can provide some ideas through 4 different types of connections.
5. As they add pieces, you can talk about **what crystals are** and remind them to build the structure as beautifully and colourfully as possible!

*Potential discussion points:*

*Crystals are all around us, from metals and rocks to cellulose in plants and polymers in plastics. The Yeung research group at UoB is investigating how crystals form in materials known as ‘metal-organic frameworks’, which are a bit like Zoobs but the building blocks (metal ions and organic linkers) around 109 (a thousand million) times smaller.*

1. Depending on how they add the pieces, you can talk about crystals can also be **irregular** structures. Examples include some plastics and glass.

Taking this activity further

You can use the activity to discuss any of these subjects:

* Defects
* Amorphous material
* Epitaxial growth
* Structures of plastic

How to pack this activity away

* Disassemble all of the crystal constructions, try to sort the Zoob pieces as you go (this helps with the activity next time).
* Discard any broken pieces.

This activity goes well with…

* The Nucleation Game
* Mineral crystals
* Crystallisation of a magic crystal tree

More information about the science and research

In the real world, not all materials form organized, crystalline structures. Many common materials, including various plastics and types of glass, are amorphous which means they lack a defined form or clear structure. This happens because their molecules are arranged more randomly, which can influence their properties like transparency and flexibility.

Frequently asked questions

1. What is free-form assembly?

Answer: Free-form assembly is a creative building activity where there are no rules on how to connect pieces. Participants are able to create unique, colourful, and sometimes whimsical structures without needing to follow any specific patterns or guidelines using their imagination to create

1. What materials are used in free-form assembly?

Answer: Typically, plastic pieces of various shapes, sizes, and colours are used because of their ease of manipulation and bright, engaging colours. They resemble materials like plastics and glass, which do not form regular crystalline structures.

1. What are some examples of amorphous materials?

Answer: Amorphous materials include many types of plastics, glasses. Unlike crystalline materials, these do not have a regular order of atoms and often have different physical properties because of their structure.

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