“And She Built a Crooked House”
Understanding Dimensions and Geometric Shapes
Workshop Plan

Background

General themes and learning outcomes from the workshop:

- Maths is in art, and art is in maths
- What a dimension is
- The difference between 2D and 3D
- How dimensions are used in art
- How complex geometric shapes can be the basis for art (In the exhibition)
- How we live in a 3D world, but we are interested in the 4th dimension (in the exhibition)
- Point, line, plane, and shape (polytopes) are the “building blocks of art and design”
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Tips:

If you have access to these additional resources, this may help you deliver the session:

There is a film available for more information about the artist, Gemma Anderson-Tempini and the installation here.
Flatlands the Movie – this short, animated film is a helpful introduction to the world of 2D and 3D and comes with additional classroom resources
Polydron Frameworks set – this set can be a useful practical way of exploring 3 dimensional shapes with pupils and allows them to build a variety of shapes.

Leave plenty of time for the making activity of the Artangel activity sheet. The sheet contains several nets and so we think one big sheet between two is enough, and pupils can cut out one each to start with.

All pupils will work at different paces, and so keep an eye out for pupils struggling, or pupils working faster who may be able to make more 3D shapes and then glue them together.

When pupils are cutting and folding, emphasise that it’s more important that they take their time and their shapes are neat, rather than trying to rush! A neatly folded shape will be easier to stick together.

The Workshop

1. Dimensions

Start off by asking the class, “What is a dimension?”.

Dimensions are the way we see, measure, and experience our world, by using up and down, right to left, back to front, and how long. It is a concept that is important in both maths and art.

<u>Explore dimensions – practical activity</u>

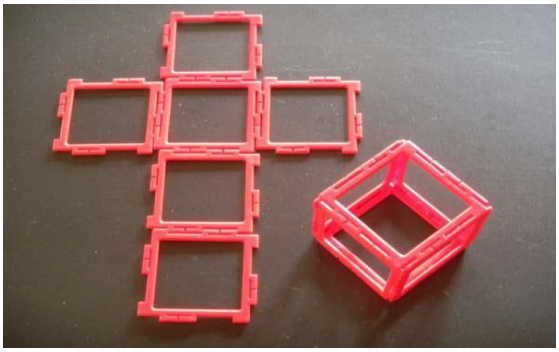
Explore dimension is a hands-on way by getting the pupils up on their feet to show the difference between the dimensions, for example:

- Ask one student to stand up and be a dot – a dot has zero dimensions.
- Ask another student to stand up and be another dot, and if they reach their hands out, they become a line - this is one dimension, length.
- Ask another student to be a dot and join arms to make a triangle – this is 2 dimensions, length, and width.
- Then, ask pupils to reach up and join hands to make a triangular-based pyramid – this is 3 dimensions, length, width, and depth.

What points, lines, planes (2D shapes) and 3D shapes can pupils see around the room? There are lots of great examples in the PowerPoint which you can then go through with pupils! Dimensions are the “building blocks of art and design”.

The exhibition “And She Built a Crooked House” explored a fourth dimension, something we cannot perceive, because we live in 3D. We can explore 4D shapes through the idea of folding and unfolding between dimensions.

2. Folding and unfolding

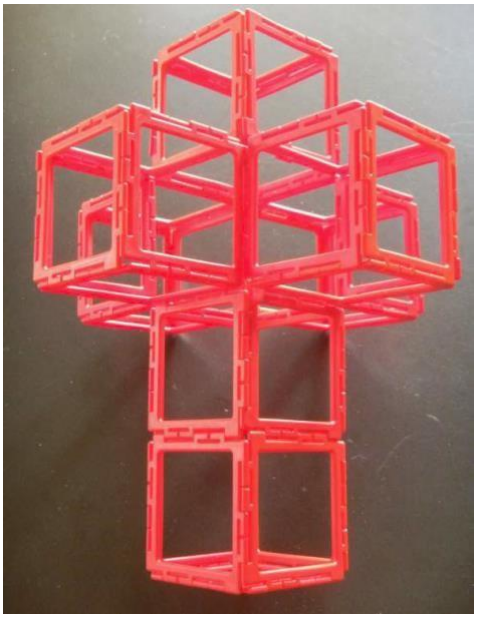


We can use ‘nets’ to fold a 2D shape into a 3D shape.

Ask pupils to create a net for a cube using 6 square polydron units (if you have access to these). There should be enough in the set for one between two. You will need to make 8 within the class.

Then have pupils fold these up to create cubes.

Now how can we do the same for a 4D shape?



A tesseract is the likeness of a cube in four dimensions, just like a square is in two dimensions.

A tesseract can be unfolded into 8 cubes.

Using the cubes, ask pupils to build these into a 3D cross shape from 8 cubes? (Hint: Pupils will need to remove one square face from each cube to allow them to fit together.)

This shape appears throughout the exhibition.

Because it features in a famous painting by Salvador Dali, it's called a 'Dali cross'.

3. Making unfolded 4D polytopes

A polytope is a geometric shape with flat sides. You have explored 2D polytopes (polygons) and 3D polytopes.

Pupils are going to make their own unfolded 4D polytopes, using the activity sheet provided!

Working in pairs, pupils can cut and stick individual shapes from the worksheet and then stick them together to form a larger shape by matching the symbols.

What a complex geometric shape – it's like a 3D jigsaw puzzle!