

# DESIGN THINKING IN MATH



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Instructional Sample for Applied Design Skills, and Technologies K-3  
Fostering Design Thinking: Froebel's Gifts

Besides fostering a design mindset, some of the other skills and competencies developed when using the gifts are:

- stimulate imagination and creativity
- contribute to self-confidence and a feeling of accomplishment
- develop a sense of responsibility for block care and clean-up
- explore pre-number skills such as size, shape, matching and classification.
- critical thinking and problem solving is inherent in block play
- visual discrimination is developed which is a pre-reading skill
- learn concepts of inside/outside, open/closed
- development of language and vocabulary through discussion and description
- develop fine motor skills with smaller blocks
- refine eye/hand coordination

**D**esign thinking (ideating, making, sharing) begins in early learning, and the block area of a primary classroom is a logical place to start to introduce a design mindset. Friedrich Froebel (1782-1852) known as the father of kindergarten, is also known for creating a method for teaching design skills using resources he called Froebel's Gifts. The gifts 3 through 6 more specifically focus on the design process. He created the gifts (to suggest both pleasure and responsibility to the playing child) because he felt the geometric forms of the gifts were the basic building blocks of nature. Frank Lloyd Wright

said his inspiration for design started early in life when his mother gave him a set of Froebel's gifts. Froebel felt that children would need to play with and examine these gifts in a certain sequence and would need to look at them in three ways. One with a connection to their own life (forms of life), with a connection to science, nature and math (forms of knowledge), and with a connection to art and design (forms of beauty).

For the most part, these gifts have been forgotten or overlooked over time, and although they were created 200 years ago, they are amazingly relevant to children of the 21<sup>st</sup> century.

# Froebel's Gifts: Lesson Plan for Gift #3<sub>(a set of 8 cubes)</sub>

Let's look at Gift Three which Froebel called "the children's' delight". It is a set of eight wooden one-inch cubes that stack together. Indeed, you can order this resource online, but you can be frugal with this resource (and frugal innovation is an important part of making and teaching). This would be an easy set to put together from materials you already have in your school or classroom. 8 plain wooden blocks will do and if you have blocks of another dimension than one inch, that is okay as well, you just need to adjust the graph paper (if needed) for the forms of beauty exploration. You could do this lesson one to one or with a small group at a centre, and if you can find more than one set of blocks, you can do this as a class. You begin the lesson by turning over the box to reveal a larger cube, so if you have been frugal and have no box, just have the cube arranged and lift a blanket or cover to reveal that whole made out of the parts.

## Forms of Knowledge

Children are then encouraged to stack them together in different ways. There is an emphasis of taking things apart and putting them together in this lesson. In terms of mathematical knowledge (forms of knowledge) this gift



explores: parts in relation to whole (fractions), sorting, differentiation, counting, number operations (addition, subtraction, multiplication, division), and vocabulary (line, cube, square, plus, equal, half, etc.). While working on arranging the blocks, encourage them to count blocks, count corners, sides etc. The students will discover proportions and operations through "half of six is three" or "three from four is one," etc. The blocks can be organized to demonstrate multiplication and division ("two groups or rows of three equals six"). Students will begin to make connections between concrete three-dimensional work and abstract mathematical thinking.

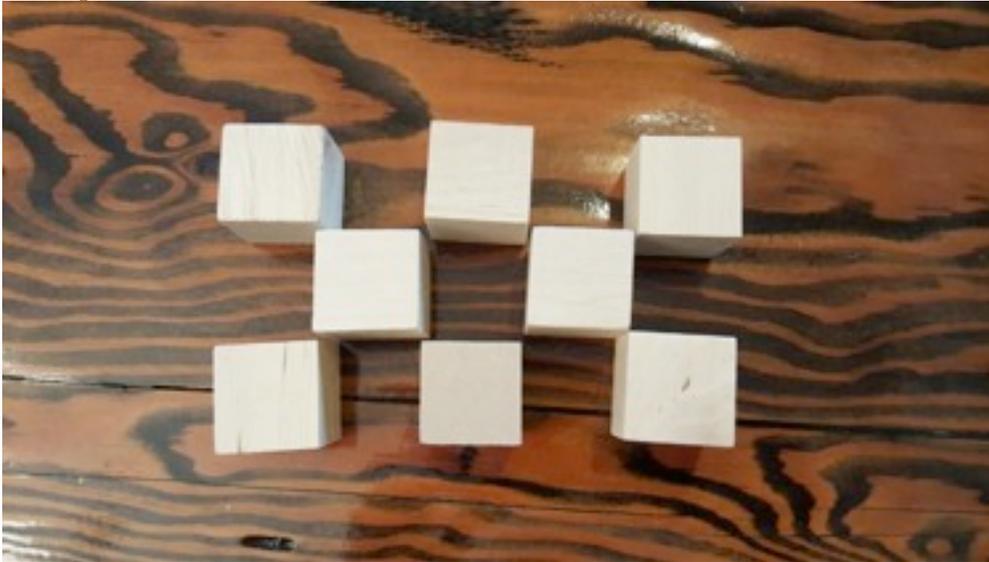
## Forms of Life

You also ask them to focus on making links to their own lives. They are encouraged to use the blocks to create as many shapes as they can think of that look like everyday items (such as a chair, a person etc.) This part of the lesson (forms of life) is what children tend to do naturally with blocks and it is important for them to make stories and talk while they create because associations between their inner and outer worlds is the foundation of real learning.



## Forms of Beauty

Finally, the students are encouraged to organize the blocks into squares on grid paper or they can do it on a table in free form. They will explore concepts like symmetry, proportion, balance, strength of center, rhythm and simplicity. They are encouraged to create designs on a flat surface to see the beauty and art in their work (forms of beauty). They start with one block and progress one block at a time. They should be encouraged to change and evolve a design as opposed to tearing it apart to rebuild because this promotes the logical and orderly development of ideas.



Before cleaning up the blocks and ending the exploration, make sure you encourage children to share their designs and thinking with others. There are communication skills to be developed and self-confidence to be gained. When listening to others, there are ideas to inspire them and guide them for the next time they play with the blocks.

[If you are wanting to find out more about this gift and other Froebel's gifts:](#)

A free printable book is available:

<http://www.gutenberg.org/files/31097/31097-h/31097-h.htm>