

The Leonardo da Vinci Machines at Waterfront City

Understanding Structures

Understanding Structures

PRIMARY Level 3 Design Creativity Technology / Science

Understanding Structures

Time Frame: 6.5 hours (5 activities) + LdV Exhibition visit

Suitable VELS outcomes

Communication

LEVEL 3

Students explore a range of aural, written and visual communication forms such as the Internet, film, texts and music which illustrate a variety of perspectives on a range of topics and ideas. They learn how to identify the main message, develop their own interpretation, and provide evidence to support it. They explore reasons for other interpretations not being the same as theirs and learn to respect the right of others to express opinions.

Design Creativity and Technology

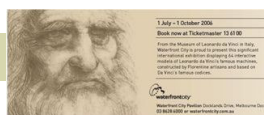
LEVEL 3: Investigating and Designing, Producing and Analysing and Evaluating.

Investigating and Designing

Students, individually and in teams, generate ideas based on a design brief, demonstrating understanding that designs may need to meet a range of different requirements. They use words, labelled sketches and models to communicate the details of their designs, and clarify ideas when asked. They identify simple systems components and common materials/ingredients and explain the characteristics and properties that make them suitable for use in products. Students think ahead about the order of their work and list basic steps to make the product or system they have designed.

Producing

Students use their list of steps and are able to choose appropriate tools, equipment and techniques to alter and combine materials/ingredients and assemble systems components. They use a variety of simple techniques/processes and a range of materials/ingredients to safely and hygienically alter and combine materials/ingredients and put together components to make products and simple systems that have moving parts.



THE
LEONARDO
DA VINCI
MACHINES
AN EXHIBITION OF GENIUS

Understanding Structures

Analysing and evaluating

Students test, evaluate and revise their designs, products or simple systems in light of feedback they have gained from others. They identify what has led to improvements and describe what they consider to be the strengths and drawbacks of their design, product or simple system. They consider how well a product or simple system functions and/or how well it meet the intended purpose.

Science

LEVEL 3 for Science, Knowledge and Understanding

Students identify the actions of forces in everyday situations. They use the words *push* and *pull* in discussing how things can be moved and stopped. They identify forms of energy and energy transformations in the everyday world. They use appropriate scientific vocabulary to describe and explain their observations and investigations.

Students identify and describe the structural features of living things, including plants and animals. They explain how scientific knowledge is used, or could be used, to solve a social issue or problem.

Thinking Processes

LEVEL 3 : Reasoning, processing and inquiry, Creativity and Reflection, Evaluation and metacognition

Reasoning, processing and inquiry

Students collect information from a range of sources to answer their own and others' questions. They question the validity of sources when appropriate. They apply thinking strategies to organise information and concepts in a variety of contexts, including problem solving activities. They provide reasons for their conclusions.

Creativity

Students apply creative ideas in practical ways and test the possibilities of ideas they generate. They use open-ended questioning and integrate available information to explore ideas.

Reflection, evaluation and metacognition

Students identify strategies they use to organise their ideas, and use appropriate language to explain their thinking. They identify and provide reasons for their point of view, and justify changes in their thinking.

For Leonardo teaching resources: refer to School Programs Resource list



Understanding Structures

Suggested material resources :

Classifying natural and human made structure task:

Picture card sets of following (1 image per card) :
(about 7 natural images and 7 human made images ideal)

tortoise, turtle, snail, human skeleton, VW car, crab, mollusc shell, tree, leaf, feather, dandelion flower, beetle, birds nest, bat, climbing frame, Batman, boat sail, peashell, tent, kangaroo with pouch, egg, parachute, spiders web, Spiderman, umbrella, octopus, outstretched birdwing, exposed roof structure, ink and quill, cubby house, window frame, eggbox, Geodesic dome, bicycle helmet, ball, dung beetle and dung ball, fishing net.

Types of structures task:

7 Sets of green, yellow and blue colour pencils
set of paper/card scissors
set of Prittsticks.
recycling paper bin.

For design task:

5x pingpong balls and box to house them
Set of wide and narrow straws.
40 mm lengths of cotton string,
assorted fabric scraps, (stockings material)
oranges sack material (webbed and orange)
cocktail sticks (blunted edges),
fishing nylon thread,
paddlepop sticks,
matchsticks,
cardboard,
blutack.
2 rolls masking tape. (allocated length per student)
Craft knife, metal rule and cutting mat.
rulers

Suggested music track: medieval guitar and lute piece.

For newspaper tower competition:

Large pile of old newspapers
Roll of masking tape and ruler.



THE
LEONARDO
DA VINCI
MACHINES
AN EXHIBITION OF GENIUS

Understanding Structures

Context:

Leonardo's inventions can help younger students understand about how structures work. Several of his designs were inspired by kinds of structures that he first encountered in the natural world. Eg. Tank, inspired by tortoise shell. Boat with blades: crab pincers. Students learn in classroom about natural and human made structures, and consolidate this learning at LdV's Machines exhibition.

Student Challenge:

Learn the difference between natural and human made structures. Learn classification types of structure. Design and make a structure in a pair as part of a class game and identify types of structure used. Evaluate success. Find out about Leonardo's life. Find out about Leonardo's structures by looking at his manuscripts and sketching his designs. What kinds of shapes of structures hold up well? Make a tower from newspaper. Tallest tower wins a prize. Evaluate tower. Consolidate learning from LdV's exhibition.

Teacher Overview:

This unit of work is designed to introduce students to concepts of physical structure by studying examples and understanding the difference between natural structures and human made structures. Students demonstrate their understanding by undertaking a design and make task which forms part of a game.

Leonardo's Machines exhibition will help to consolidate the work done in class by interacting with his inventions and making the link between the natural world and human made designs.

Note. This unit could be integrated with a class text. Its themes could be about building a house, a tortoise and its shell, Noah and his Ark, or a bird and its nest etc.



Understanding Structures

Activity 1 : 1.5 hours

Discuss: what is a structure?

An assembly of parts which support a load etc...

Help arrange understanding of this using student language for this....

Teacher could ask questions such as:

‘is anything in this classroom a structure?’

Eg. ‘a table!’

‘Why is that a structure?’

‘it has legs and the legs hold the flat wood square up..!’

‘Can a structure be small?’ ‘Can a structure be big?’ etc.

In groups of 4, for 5 minutes, students sketch or name minimum of 2 examples of structures each.

Teacher gathers whole class findings on Board. Student group spokesperson tells their examples.

Examples could be:

‘ a house’, ‘ a car’, ‘ a hat’, ‘ a chair’, ‘Southern Cross Station’, ‘ a ball’,
‘ a box’, ‘ a pencil case’, ‘ a computer’, ‘ a tree’, ‘ a leaf’, ‘ a bridge’ etc.

(but they might not be!)

Teacher might ask ‘what do these things support?’

Classification of *natural structures and human-made structures*

Give out set of card images to each group.

Ask them to sort out pictures into ‘natural world’ and ‘human made’ groups.

Words could be printed on a sheet to be cut out and stuck into books.

Classify under headings in books.



1 July - 1 October 2006
Book No. 01 / 1 October 2006 / 12.000
From the Museum of Leonardo da Vinci in Italy
Information and more images: www.leonardodavincimachines.com
© 2006 Leonardo da Vinci Machines Exhibition
All rights reserved.

THE
LEONARDO
DA VINCI
MACHINES
AN EXHIBITION OF GENIUS

Understanding Structures

Activity 2 : 1 hour

Teacher could write these structural groups on Board.

Shell structures.

Web structures.

Frame structures.

Discuss what these are.

Ask class groups to highlight in **green** pencil all the structures they have listed in their books which are **shell structures**.

In **yellow** all the structures they have in their books which are **web structures**.

In **blue** all the structure they have listed which are **frame structures**.

Focused practical task:

Design task and game

In pairs, design and make a structure which will hold a ping pong ball and keep it safe from rolling away. This structure will be a pingpong ball 'nest' and play a part in a game. It must sit on a table. The 'nest' must be a freestanding structure which fully supports the pingpong ball. The pingpong ball must be easily lifted from your nest by 'suction' (you sucking on a straw). You must be able to reach it by sucking it up with your straw, either sitting or standing by the table. During the game you will not be allowed to touch the ping pong ball with your hands.

(Teacher could sequentially theme each 'nest' according to a Leonardo concept:

eg. each structure is given an Italian number, or the name of an Italian town/city.)

Game: You will be sending a ping pong ball on a journey across your class, it will be symbolising a special manuscript of Leonardo's secret drawings that must pass safely through all the regions of Italy. You are an apprentice of Leonardo's and will be assisting him to pass these from one destination to the next. Your 'nest' will be one destination, your neighbours 'nest' will be the next. Warning! You are not allowed to touch this ping pong ball with your hands.



Understanding Structures

You will be passing it to your neighbour using suction. If this secret package is dropped onto the floor, it must begin its journey from the start again. Apprentices must be patient and skilled to allow the successful passage of this special object, and help to prevent Leonardo's ideas from getting lost.

Discuss design brief. What is it asking students to do? Student questions. Class decide on key criteria.

Teacher demonstrate how to work with available materials. Discuss ideas of using materials to construct 'frame' structure and 'web structure' and 'shell' structure.

Activity 3 : 2 hours.

Design activity and Game on!

(Older helpers desirable!)

Stage one: max. 45 minutes Student experiment with materials, modelling structural ideas, experimenting with straw and pingpong ball. They need to decide on plan and draw sketch of it.

Stage two: make idea! 45 minutes.

Stage three: test ping pong nest structure!
And test ping pong suction skill!

Stage four: The Apprentices planned journey of the Secret Manuscript

Game on! Game could be videoed.

(music track of lute and guitar might be deployed here).

Stage five: students evaluate their 'nest'. Did it meet key criteria?

End with talking to class about Leonardo da Vinci.



Understanding Structures

Activity 4:

Download Student Activity sheets on structures to accompany Exhibition visit.

Activity 5: post exhibition : 2 hours

Focused Practical Task

Build a tower from newspaper competition. The tallest and most rigid wins a prize. Maximum team of 4 people. Limited masking tape strips supplied.

Teacher & student demonstration: ways of making newspaper rigid.

Student Evaluation: Make a sketch (or paste in a digital photo) of your model.

What worked and what didn't?

What did tallest tower look like?

What shapes are best for stable structure?

Write 5 things that you have learnt about structures.

Write 5 things that you have learnt about Leonardo da Vinci and his inventions.

