

The Leonardo da Vinci Machines at Waterfront City The Parachute Project

Parachute Project

SECONDARY

Level 5-6

Design Creativity Technology

THE PARACHUTE PROJECT

Time Frame: 10 hours (6 activities) + LdV Exhibition visit

Suitable VELS Outcomes

Communication

LEVEL 5 Listening, viewing and responding and Presenting

Listening, viewing and responding

At Level 5, students modify their verbal and non-verbal responses to suit particular audiences. They interpret complex information and evaluate the effectiveness of its presentation. When responding, they use specialised language and symbols as appropriate to the contexts in which they are working. They consider their own and others' points of view, apply prior knowledge to new situations, challenge assumptions and justify their own interpretations.

Presenting

At Level 5, students use the communication conventions, forms and language appropriate to the subject to convey a clear message across a range of presentation forms to meet the needs of the context, purpose and audience. They provide and use constructive feedback and reflection to develop effective communication skills.

Design Creativity Technology

LEVEL 5 Investigating and designing, Producing, Analysing and evaluating

Investigating and designing

At Level 5, students use various strategies and sources of information to investigate and research a range of factors relevant to more sophisticated design briefs to which they have contributed. During the design process they clarify their understanding of design brief requirements and their design ideas by gathering, responding to and providing feedback to others. They develop evaluation criteria from the design brief to inform their judgments during the design process. They use a variety of drawing and modelling techniques to visualise design ideas and concepts. Students demonstrate understanding of design elements and principles and use appropriate technical language.

Students understand and logically sequence major stages of production, and calculate and list materials/ingredients and quantities needed for production. They record and communicate their ideas using a variety of media that includes information and communications technology equipment, techniques and procedures.



THE
LEONARDO
DA VINCI
MACHINES
AN EXHIBITION OF GENIUS

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Producing

At Level 5, students work safely/hygienically with a range of tools and equipment, including some which are complex, and manage materials/ingredients, components and processes to produce products and systems, taking full account of the appropriateness of their properties, characteristics or expected outputs in meeting requirements of design briefs. They make modifications during production, providing a sound explanation for changes that demonstrates reflection, research, responsiveness to feedback, and use of evaluation criteria.

Analysing and evaluating

At Level 5, students select appropriate equipment and techniques to safely test and evaluate the performance of their products/systems. They suggest modifications to improve their products/systems in light of evaluation of their performance, function and appearance. They recommend improvements to the performance, function and appearance of others' product/systems. They describe and analyse the social and environmental impacts of their own and others' designs, products and technological systems.

Thinking Processes

LEVEL5 Reasoning, processing and inquiry. Creativity and Reflection, evaluation and metacognition.

Reasoning, processing and inquiry

At Level 5, students use a range of question types, and locate and select relevant information from varied sources when undertaking investigations. When identifying and synthesising relevant information, they use a range of appropriate strategies of reasoning and analysis to evaluate evidence and consider their own and others' points of view. They use a range of discipline-based methodologies. They complete activities focusing on problem solving and decision making which involve an increasing number of variables and solutions.

Creativity

At Level 5, students apply creative thinking strategies to explore possibilities and generate multiple options, problem definitions and solutions. They demonstrate creativity, in the ways they engage with and explore ideas in a range of contexts.

Reflection, evaluation and metacognition

At Level 5, students explain the purpose of a range of thinking tools and use them in appropriate contexts. They use specific language to describe their thinking and reflect on their thinking processes during their investigations. They modify and evaluate their thinking strategies. They describe and explain changes that may occur in their ideas and beliefs over time.

[For Leonardo teaching resources: refer to School Programs Resource list](#)

Suggested material resources :

- bin bag liners (assorted strengths)
- range of circular objects to draw shape around
- scotch tape and masking tape
- scissors
- sponge
- hole punch



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- lightweight string
- paper clips
- box of ¼ inch washers
- tape measure
- metre stick
- stop watch
- digital camera/ video camera

Context

Leonardo was devoted to investigating flight and dreamed of applying his findings about flight from the natural world to designing flying devices for human-kind. He meticulously studied dragonflies, bird wings, bat wings, flying fish. From these studies he created a sequence of mechanical wings which imitated his natural wing investigations. He created a working model of an 'aerial screw' (seen suspended from roof of Leonardo da Vinci's Machines exhibition); this was one of the earliest known helicopter designs. He is the first person in recorded history to have designed a parachute and a hang glider.

He also designed an astonishing range of 'ornithopters' (flapping- wing aircraft). He experimented a lot with designs based on a premise that was, unfortunately, practically unfeasible. He imagined that man had sufficient muscle power to emulate the birds. He also concluded, mistakenly, that birds flew by beating their wings downwards and backwards. On the downstroke, birds wing-feathers twist into mini propellers to give thrust, with the inner wing providing lift. In old age he envisaged a more workable approach, integrating fixed-wing structures.

Following a visit to his exhibition students might learn about the history of parachute design and make their own, to take part in an egg carrying contest.

Student Challenge

Learn about Leonardo's flying machines. Learn about the history of parachute design and the abiding principles that make parachutes work. In teams of two design, make and test your own parachute.



Parachute Project

Teacher Overview

Leonardo's experiments with flight are fascinating to provoke enquiry into the principles behind flight. Parachute drops are a fun and engaging design task to run as hands-on learning experience. This unit of work presents students with an in-depth opportunity to understand working principles of parachute flight. There is a BBC programme about Leonardo da Vinci's life and inventions which will be shown at the exhibition. Episode 1 includes a successful test flight of Leonardo's parachute design (with one modification).

Teachers notes

The word parachute comes from the French words para, protect or shield, and chute, to fall. Therefore parachute really means "fall protection".

- Sketch of parachute by Leonardo da Vinci: 1495
- first practical parachute frequently goes to Sebastien Lenormand who demonstrated the parachute principle in 1783.
- Croatian Faust Vrancic who constructed a device based on Da Vinci's drawing and jumped from a Venice tower in 1617.
- Jean Pierre Blanchard (1753-1809) a Frenchman was probably the first person to actually use a parachute for an emergency. In 1785, he dropped a dog in a basket, to which a parachute was attached, from a balloon high in the air. In 1793, Blanchard claims to have escaped from an exploded hot air balloon with a parachute.
- In 1797 (October 22), Andrew Garnerin was the first person recorded to jump with a parachute without a rigid frame. Garnerin jumped from hot air balloons as high as 8,000 feet in the air. Garnerin also designed the first air vent in a parachute intended to reduce oscillations.
- In 1837, Robert Cocking became the first person to die from a parachute accident.
- In 1887, Captain Thomas Baldwin invented the first parachute harness and in 1890, Paul Letteman and Kathchen Paulus invented the method of folding or packing the parachute in a knapsack to be worn on the back before its release. Kathchen Paulus was also behind the invention of the intentional breakaway, which is when one small parachute opens first and pulls open the main parachute.
- Two parachuters claim to be the first man to jump from an airplane, both Grant Morton and Captain Albert Berry parachuted from an airplane in 1911. In 1914, Georgia "Tiny" Broadwick made the first freefall jump.
- **First Parachute Training Tower - [Switlik Parachute Company](#)**
Polish-American Stanley Switlik founded the "Canvas-Leather Speciality Company" on October 9, 1920. The company first manufactured items such as leather hampers, golf bags, coal bags, pork roll casings, and postal mail bags. However, Switlik soon switched to making pilot and gunner belts, designing flight clothing, and experimenting with parachutes. The company was soon renamed the Switlik Parachute & Equipment Company. According to Switlik's Website:



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In 1934, Stanley Switlik and George Palmer Putnam, Amelia Earhart's husband, formed a joint venture and built a 115 foot tall tower on Stanley's farm in Ocean County. Designed to train airmen in parachute jumping, the first public jump from the tower was made by Ms. Earhart on June 2, 1935. Witnessed by a crowd of reporters and officials from the Army and Navy, she described the descent as "Loads of Fun!"

Main ideas and principles : see School Programs Resources List for link

Pre Exhibition

Activity 1

Introduce examples of Leonardo's experiments with flight.

Introduce Design Brief.

Parachute competition

In pairs, design a parachute from the materials provided to carry a small load safely to the ground from the school roof. The slowest descending parachute is the winner out of three trials. Material tests and test drops must be documented and choice of parachute design should be explained in sketches and in a presentation.

Research and Investigation

Find out the history of Parachute design.

- Invite a parasail/ sky-diver expert to come in and talk about use of parachutes. How they work etc.

Investigate and conduct practical experiments to demonstrate what **drag** is.

During these experiments find out what **terminal velocity** is.

Why is it that a **spread out parachute canopy** can act as a brake?

or How does a parachute affect the speed of an object falling through the air?

Introduce terms such as **drag, resistance, speed, oscillations**



Parachute Project

Activity 2

Visit the Leonardo da Vinci Machines Exhibition and find out about his designs for flight.

[Download Student Activity sheets on flight to accompany Exhibition visit.](#)

Activity 3

Class teams present findings on Leonardo's flight machines.

Activity 4

Parachute team materials tests (washers to act as load)

notes

To give the parachute enough time to open, release the parachute from a height of at least 2 meters (about 6 feet) above the floor.

Try releasing a similar object without a parachute at the same time to compare the drop times. Ensure that the object is released from the same height as the object that is suspended beneath the parachute.

Discussion points

Did your parachute fall quickly to the ground? If so, why or if not, why not?

Why did the parachute produce drag?

What do you think could occur if you release a parachute with an object from a higher point? A lower point?

How could this activity relate to everyday life?

(Eg. parasailing, skydiving, windsurfing, sailing, NASA space shuttle returning to earth for runaway landing. Drag racers slowing down at the end of their races.

Safety perspective, talk about the importance of attention to detail in the packing of a parachute. . A parachute to be packed with care. Though a parachute can malfunction. Most parachutists also carry a reserve parachute to be used in the event of a malfunction of the main canopy. These reserve parachutes have saved many lives.



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Activity 5 Team test drops!

- Establish rules for dropping parachute
- Ensure team member records time trials and best result
- Drops could be filmed

Activity 6

- Conduct evaluations & prize giving.



1 July - 1 October 2006
Book No. 21, 14 November 15 07 00
From the Museum of Leonardo da Vinci in Italy
Information and more details regarding the exhibition
of Leonardo da Vinci's Machines at Waterfront
City can be found at www.braveideas.com

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