TEACHER RESOURCE

LIFE ART MIND

Science

Technology

Mathematics and Statistics

Mirror Magic

Until 22 December 2009

Education Programme Suitable for: Year 3 – Year 8

Exhibition Suitable for: New Entrant - Adult

Discover the magical realm of mirrors and explore the world of light through this fun and interactive exhibition.

To book this programme please call 06 355 5000 x 7230.

Supported by the Ministry of Education

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Te Manawa
MUSEUM GALLERY SCIENCE CENTRE
LIFE ART MIND

INTRODUCTION

Mirror Magic is a great example of science and maths made fun. Developed at Te Manawa, *Mirror Magic* explores the world of light and mirrors in over 20 different interactive exhibits.

ABOUT THE EXHIBITION

Explore the world of mirrors - convex, concave, multiple, and moving. Challenge yourself to decode some anamorphic art. Use the light table to demonstrate how light is reflected off mirrored surfaces and how it refracts (bends) going through materials such as perspex. Investigate lenses alongside kaleidoscopes and a 'build-it-yourself' periscope.

For each exhibit additional information is provided explaining the Science behind the exhibit.

You may want to bring your secondary school students in to gain an understanding of some of the physics principles behind the exhibits. The exhibition is suitable as a self-led programme as well as an educator-led programme. We recommend teachers view the exhibition before bringing in students. This viewing is free to teachers – simply present your teacher registration card (or similar) to reception when visiting.

ABOUT THE EDUCATION PROGRAMME

The education programme is suitable for **Year 3 – Year 8** students and takes **1 1/2 hours**. This may be shortened for younger students.

After a brief introduction students will have plenty of time to explore the exhibition and have a go at all the interactives. Students will be provided with directed learning activities to assist them in their exploration. The session will end with a discussion/demonstration of what they have discovered.

Special Requirements:

Some prior knowledge of students' level of understanding within this subject area would be appreciated, and can be provided by filling out our pre-visit questionnaire or by contacting a Science Educator via email: barbara.arnold@temanawa.co.nz or mary.sheridan@temanawa.co.nz
This will mean that your students' specific learning needs will be better catered for.

CURRICULUM LINKS

Science
Nature of Science Level 1 – 4
Investigating science
Communicating science

Physical World
Physical inquiry and physics concepts Level 1 - 4

Technology
Nature of Technology Level 1 - 2

Mathematics and Statistics
Geometry and Measurement Level 1 - 2
Transformation

English
Listening, Reading, and Viewing Level 1 - 4
Processes and Strategies, Language Features, Purposes and Audiences, Ideas, Structure

LEARNING INTENTIONS

We are learning to:

- Follow instructions in an exhibition.
- Make observations about the properties of mirrors.
- Make observations about the properties of light.

We will know we have achieved this when:

- We can make the exhibits work for us by following the instructions provided.
- We can explain to someone else at least one important property of a mirror.
- We can explain to someone else at least one important property of light.

What's in the Exhibition

Shape Shifter

A flexible mirror to make you look tall and thin or short and fat. Good fun, but what shape mirrors give these effects?

Head Stand

Two flat mirrors at right angles – a reflection of a reflection. See yourself upside down, and see things fall up!

Mirror Challenge

Try to carry out a task that you can only see in a mirror. Writing your name or following a maze becomes extremely difficult.

Corner Reflectors

Use the magnifying glass to look for the tiny mirrors that make up these reflectors.

In Your Eye

Three flat mirrors coming together at one point – you get a reflection of a reflection of a reflection. Light entering the exhibit comes back out parallel to the direction it went in, but moved over a bit. This is how bike reflectors and cateyes work – there are examples to view through a magnifier, see **Corner Reflectors** exhibit.

Seeing Round Corners!

Fit together tubes and mirrors to look around corners. Use the periscope to read the hidden answer to a riddle. Investigate how many mirrors you need to see yourself, or to see images the right way round.

Mirror, Mirror on the Wall

Explore the differences in images made by flat, convex, and concave mirrors.

Phantom Jellybeans

Try and pick up the jellybeans – this real image is frustrating when your fingers go right through it! The concave mirror in this exhibit produces a 'real' image in the space in front of the mirror. This is in contrast to flat mirrors, which produce a 'virtual' image, which looks as though it is behind the mirror.

Variangle

Investigate the relationship between the angle of two mirrors and the number of images that can be seen.

Kaleidomania

These continue to be popular toys. A number of large kaleidoscopes with different numbers of mirrors inside them allow you to explore how they work.

Shake Hands with Yourself

Another example of a concave mirror producing a 'real' image, this time so convincing that you try to 'shake hands with yourself'. The mirror is black and shiny, showing that mirrors do not have to be 'silvery'. Also check out the **Mirror, mirror on the wall** exhibit.

Bending and Bouncing

Explore how different substances (lenses, mirrors, and perspex) bend and bounce light beams.

Seeing Into Infinity

A reflection of a reflection of a reflection. See a tunnel of mirrors wind away to infinity.

Anamorphic Art

Use a cylindrical mirror to give a distorted picture its true shape. These anamorphic pictures were a popular form of entertainment 100 years ago.

Black Hole

Explore the fact that without light there would be no sight. To see something it has to have light reflected off it and to see light it has to reflect off something.

Shape Maker

Use 2-dimensional shapes and mirrors to produce 3-dimensional looking images. For example, you can get the image of a hollow box from a single rod. Also try out the **Variangle** exhibit.

Mirror Window

A sheet of plastic is made transparent if there is a light behind it – you can see Einstein the great scientist. With no light behind it, the sheet becomes reflective, and you see yourself! This phenomenon is common in many glass buildings.

Face Changer

This exhibit enables the viewer to look at facial symmetry – we often assume that our faces are exactly the same on each side. In fact we can look quite different when both sides of our face are mirror images of each other.

Bird's Eye View

Look up at a hemispherical convex mirror above you – like a shop mirror, this lets you see a 360˚ view, but everything is reduced in size.

Mirror Writing

You are provided with ½ letters to place in front of a mirror to make whole letters. This exhibit explores symmetry – not all letters are symmetrical. Can you decode the ½ writing on the information card?

Many Me's

A fun way to explore multiple images. Also try out the **Variangle** exhibit.

Shape Up

A cylindrical concave mirror on one side, convex on the other. Explore focal points – if you put an object outside the focal point, its image in the mirror is the right way round. For example, if you hold up your name you can read the reflection of it in the mirror. However, images change as you move towards the mirror.

Giant Kaleidoscope

Use the large-scale kaleidoscope to create your own images.

RESOURCES

BOOKS:

The Magic Mirror – An Antique Optical Toy
Dover Publications, New York, 1979.
This book contains 24 anamorphic pictures and comes with a 'magic mirror' enabling the viewer to see the pictures without distortion.

Magic in Art
Stirgis Alexander
Belith Press, Great Britain, 1994.
Includes anamorphic pictures using mirrors, tricks of perspective, illusions and do-it-yourself anamorphosis using grids.

The Kaleidoscope Book – A Spectrum of Spectacular Scopes to Make
Edited by Thom Boswell
Sterling Publishing Co, New York, 1992.
A gallery of kaleidoscopes, design, construction techniques and 11 different kaleidoscope projects.

Mirrors and Spheres

M.C. Escher
Escher was intrigued by reflections and the concept of a sphere acting as a mirror. Escher is also a good source of examples of translations and tessellations.
See artworks at: **http://www.worldofescher.com/gallery/**

WEBSITES:

http://www.geocities.com/SoHo/Museum/8716/anamorph.html
View some of the works of István Orosz from Hungary, born 1951. He likes to use visual paradox and illusionistic approaches while following traditional printing techniques such as woodcutting and etching. He has some good examples of anamorphic art.

http://library.thinkquest.org/28160/english/index.html
For students with a high level of reading. Good basic information on light and mirrors.

Fun interactive sites for students:

http://www.learner.org/teacherslab/science/light/lawslight/index.html
Play with the mirrors - see how concave/convex mirrors change body shapes.

http://www.optics4kids.org
Interactive educational activities for students including links to other websites.

http://mathforum.org/sum95/suzanne/colortess.html
An interactive program that directs you to creating your own tessellation.

http://www.mathsyear2000.org/explorer/
Lots of interactive Maths activities.

NATIONAL LIBRARY SCHOOLS' SERVICE
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Website: http://www.natlib.govt.nz
Telephone: 0800 171717 Fax: 0800 907000
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Monday - Friday 8.30am - 5.00pm
Thursday 8.30am - 6.00pm (during term)
Online request form: *http://www.natlib.govt.nz/cis-online-request*

DuraVision™ School Science Mirrors.

With the assistance of physics teachers in both New Zealand and Australia, we have developed a set of two Physics Mirrors. The set includes one Convex and Concave mirror and also an experiment book, those experiments include:

1. Basic measurement of light.
2. How to measure spherical aberration.
3. How to measure sound and show that it is directional
4. How to create an illusion.
5. The power of solar energy.

The mirrors allow physics teachers to demonstrate a range of experiments that show students about light refraction and light reflection.

The Set comprises of: 1x 600mm Convex & 1x 600mm Concave Acrylic Mirror with P.V.C edges, adjustable fittings, complete with experiment booklet and display stands.

Code	**Description**
20664	Set of 2x 600mm School Mirrors
20666	600mm Concave Mirror
20667	600mm Convex Mirror

Concave Mirror

Convex Mirror

For more information contact: BENNETT MirrorTechnologies

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