

Innovation

RESOURCE PACK

This Innovation resource pack aims to help students increase the quality and quantity of their ideas through simple, hands-on activities that draw on the practices of contemporary design consultancies and manufacturers. The pack is suitable for teaching students at Key Stage 3 and above. It is part of a series comprising resource packs on the following subjects:

Innovation
Verner Panton
Chairs
Memphis

Packs are supplied in photocopiable loose-leaf format and are designed to be interchangeable, so that common elements of each may be combined. In this way it is possible to assemble packs on:

Designing
Innovation
Manufacturing & materials
Ergonomics
Handling collection
– creating your own Design Museum
Activities

To enhance student creativity the Innovation pack may be augmented by adding Innovation sections from each of the other three packs in this series.



The Design Museum is the world's leading museum of 20th and 21st century design, and the UK's largest provider of design education resources. Its network of contacts in the corporate sector and the design world make it a bridge between the design community, industry and education.

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Designed by Pencil
Cover: Foam model of Dyson DC07

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for teachers' notes

Using this Resource Pack

During the last decade of the twentieth century, global communications and rapid changes in technology transformed our working practices, replacing stability and routine with risk and uncertainty. The ability to be flexible and creative will be more important for the future than traditional academic learning.

This Design Museum Resource Pack is for teachers and students at Key Stage 3 and above. It aims to help students increase the quality and quantity of their ideas through simple, hands-on activities that draw on the practices of contemporary design consultancies and manufacturers.

Aims and contents

The pack introduces the strategies central to creative thinking and provides practical guidance on putting them into effect. The information sheets and activities are designed to help students keep an open mind, work in teams and understand the importance of user evaluation. The main message should be that designers and manufacturers define their customers' needs and the concept clearly before they design.

Other triggers for innovation, including the study of ergonomics, new materials and manufacturing methods, inspiration, reconfiguring and technical expertise are discussed. Suggestions for assembling a handling collection for use in the classroom complete the pack.

The different sheets directly relate to each other and the information and ideas on them sometimes overlap. The Innovation sections from other resource packs in this series can also be combined with the contents of this pack to form a comprehensive resource.

Technical terms are explained in the 'buzz words' box at the end of each section.

Guide to using activity sheets

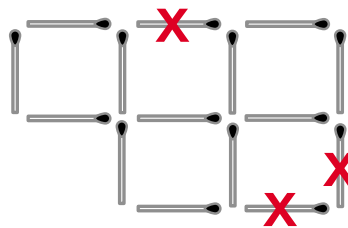
Activity 1 – Keeping an open mind

These riddles and puzzles help students defer judgement. They can be used individually as interim activities for students to do between other projects, or together as a preparation to put them in the right frame of mind for creative thinking.

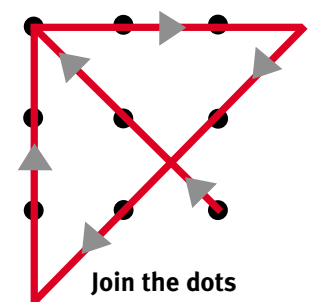
Solutions

Brain teasers:

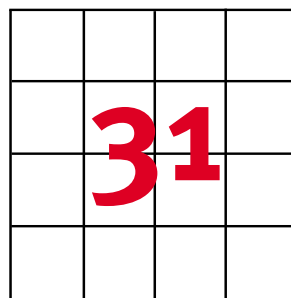
1. His parachute has failed to open.
2. They are goldfish whose bowl fell off the window sill.
3. Four seconds. If the time between the clapper striking the bell for the first peal and the second peal is two seconds, then it will be a further two seconds before it strikes for the third peal.



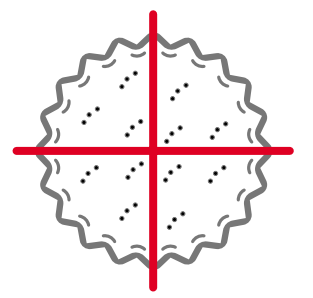
Matchless



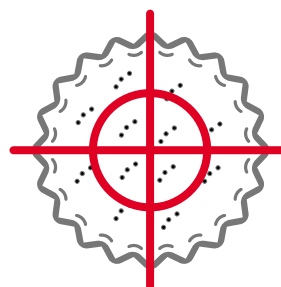
Join the dots



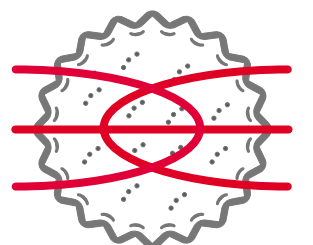
Square bashing



Clean cut (i)



Clean cut (ii)



Clean cut (iii)

Feedback

Using the evaluation sheets, point out to the students the ways in which they have jumped to conclusions and made assumptions. Ask them to assume the 'lateral thinking' mind set when tackling the next activity.

A Activity 2 – Working together

These activities will help acclimatise students to working in a group. You can use them as 'warm-ups' for group tasks or as discrete activities to support other areas of the curriculum (e.g. structures). Allow 20 minutes for each exercise.

The main point of the task is to get the students to work together to solve a problem. You will be able to see an obvious solution to these familiar exercises – indeed, you may prefer to substitute your own – but the purpose here is to bond the students as a team, not to find the optimum structural solution. Resist the temptation to make suggestions!

Feedback

Ask the students to consider their working methods, using the evaluation sheets. Did they divide up the tasks efficiently? Did they spend too much time planning and not enough making? The lessons to be learned here are the value of teamwork and the advantages of rapid prototyping (see also Activity 7).

A Activities 3 and 4 – Understanding the user

These introduce user evaluation and show students that the most effective way to research is to assess the needs of the user.

A Activity 3 – Whose life is it?

This proves to students how much information they can glean by careful observation and analysis.

For this exercise you need to ask people of different ages and lifestyles to take a roll of film of a day in their lives, leaving themselves out of the pictures. You will need to provide a set of photos (minimum a dozen pictures in each) for each group of four students. Allow 20–30 minutes for the exercise.

A Activity 4 – Understanding the user

This can be used to focus pupils directly on a product they will be designing, or it can be a general user-evaluation exercise. Allow an hour for this.

D for designing 1 offers real-life examples of creative thinking and teamwork from industry.

A Activity 5 – Brainstorming

Once the ground rules have been set out and students are in the right frame of mind, it is time to move on to brainstorming ideas.

You may already have asked students to consider the general theme of a project in Activity 4. Activity 5 follows on directly from it, identifying and logging ideas which will have arisen during user evaluation. Allow 30 minutes for the exercise.

The most important features of a successful brainstorm are that ideas are not filtered or evaluated in any way; and that every idea is worthy of consideration and is recorded. It is very important that each group has a fair-minded scribe who ensures that this happens.

A Activity 6 – Developing ideas

Ask the students to put all their brainstorming sheets on the wall. Give them five Post-it notes each to vote for the best ideas.

Activity 6 is intended to get students to think in the same creative way about development. They may find this difficult; encourage them to try unusual combinations and modifications rather than simple styling changes. Allow 35 minutes for the exercise.

A Activity 7 – Rapid prototyping

Allow about 45 minutes for Activity 7. The time limit is most important: allowing a long time will make students too particular about the appearance of the outcome. Remind them of the lessons about teamwork learned in Activity 2 and get them working in 3D as soon as possible. It may be a good idea to have the rules for rapid prototyping on display. It is very important to have the widest possible range of materials available.

Working in groups helps students with difficult parts of the design process such as the design brief and generating and developing ideas. Once familiar with creative thinking strategies they will be able to apply them when working individually.

D for designing 2 describes professional strategies for developing design concepts.



for designing 1

Defining the concept

The concept, or initial brief for a product, is carefully worked out before any design work is done. Designers and manufacturers work in teams, thoroughly researching the target market and considering all possible solutions.

Keeping an open mind

When designing, we sometimes filter our ideas before drawing them. Creative people consider a broad range of possibilities. In doing so they are able to link unrelated subject areas to produce new ideas. This is also called lateral thinking or 'technology transfer'.

A Activity 1 will help you avoid jumping to conclusions.

Case study: VELCRO® brand fasteners

A Swiss engineer called George de Mestral was out walking his dog when he became intrigued by the way burs (prickly seed pods) clung tightly to his clothing and his dog's fur. He immediately thought that hooks and loops might provide an alternative to the awkward and expensive zip fastener. He worked with a weaver for eight years to develop it.

The loop tape required only a loosely woven fabric; the hooks, however, were more difficult to produce. Finally, by trial and error, de Mestral found that nylon forms tough hooks when sewn under ultraviolet light. He patented the design in 1955 and was soon selling 60 million metres



of VELCRO® brand fasteners a year.

VELCRO® is a registered trademark of Velcro Industries B.V.

Case study: Maclaren Buggy

Owen Finlay Maclaren MBE, a retired test pilot and aeronautical designer, was inspired to redesign the pushchair after the birth of his grandchild. He used the technology and materials familiar to him from the aeronautics industry – lightweight aluminium tube and resilient balloon-foam tyres.

Another example of 'technology transfer' was the use of the umbrella-folding mechanism to condense the Buggy into a neat tubular shape. The Maclaren Buggy weighed less than 3kg and could be slung over one arm when folded. It was first sold in 1967.



A multi-disciplinary team from international design consultancy IDEO working on the concept for a product

A How much of a team player are you? Find out in Activity 2.

Working together

Student projects differ in many ways from industrial practice. In industry, creating and developing a concept for a product is carried out by multi-disciplinary teams including experts in design, marketing, finance, procurement and production engineering. Then each department works independently on the development of the product, coming together regularly for progress up-dates.

“Stepping into the shoes of others means never forgetting we are designing for people other than ourselves”

Bill Moggridge and Tim Brown, IDEO

Case study: Shopping Cart by IDEO

International design consultancy IDEO always begin with total immersion in the world of the user. For their shopping trolley they used current models in supermarkets themselves and talked to shoppers, cashiers, managers and trolley collectors. They photographed and filmed users at every stage, including the way children rode on trolleys and how people carried their shopping away. They looked at the problem of trolley theft and incorporated a solution into their design.



Understanding the user

Having a clear picture of a problem is halfway to solving it. In industry much time, money and effort is spent on understanding the user, establishing what his/her needs are and looking at how he/she behaves, thinks and feels.

- Ⓐ Activity 3 tests how much you can find out about someone from very little evidence.
- Ⓐ Activity 4 makes you think about how you do things, and how other people do them quite differently!

Links ...

Websites:

Alessi: www.alessi.com

Ford: www.designmuseum.org
Go to 'Education'. Select 'Resources', then 'Primary/ Secondary' and download 'The Design Process at Ford Motor Company' resource pack

IDEO: www.ideo.com

Maclaren Buggy:
www.maclarenstrollers.com

2pm: www.2pm.co.uk

Velcro: www.velcro.com

Another example of technology transfer:
www.flymo.com

Books:

Alberto Alessi, *The Dream Factory: Alessi since 1921*, Electra/Alessi, 2001

Tom Kelley with Jonathan Littman, *The Art of Innovation, Lessons in Creativity from IDEO*, Doubleday, 2001

Fay Sweet, *Alessi: Art and Poetry*, Thames and Hudson, 1998



for designing 2

Making ideas happen

It is possible to find interesting and creative solutions to even the most mundane problems, as the examples on this sheet demonstrate. You can avoid the obvious and find an original solution if you do not make assumptions at the start about how the product should look.

Case study: Eco Bin by 2pm

How often do you see a stylish waste bin whose appearance is spoiled by the use of a plastic bag to keep it clean? Stewart Robbins' design is in two parts; the lower part has lugs on the side over which you hook the plastic bag handles. Then the top half slips over to hide the unsightly bag.

The starting point for the design idea was not appearance, however, but the material and the manufacturing process. Product designers 2pm specialise in flatpack designs in polypropylene sheet. All their products are, in effect, nets or developments which the customer folds and joins using integral slots and flaps. The two parts of the bin are supplied flat and are fixed into cylindrical shapes by finger joints

along the edges. Other examples from 2pm's range are a bird house and a lamp.



Brainstorming

Brainstorming can produce an amazing variety of innovative ideas: the most interesting and radical products can originate from a well-conducted brainstorm. The aim is to produce the widest possible range of new ideas in the least time. There is no place here for painstaking drawings on ordered sheets: instead you are making 'mind maps'.

A Activity 5 includes rules for successful brainstorming.

A After brainstorming certain strong ideas or themes emerge. Activity 6 will help you choose the best to take to the next stage.



The CDs fit snugly between the pegs

Soundtrack CD Holder by Alessi

CD storage is often the subject of student projects and some of the results can be a little predictable, to say the least. Designed by Ron Arad, this Alessi CD holder is sold rolled up in a CD case. It can be unrolled and stuck down to a surface with double-sided tape.

Data FILE: Polypropylene

- **What is it?** A tough and flexible thermoplastic.
- **Characteristics** Strong and resilient and will bend without splitting.
- **Best-known application** Stackable chairs, based on an original design by Robin Day (1962–3), now found in every school and college around the country.
- **Manufacturing processes** Usually injection-moulded, but also used in sheet form for ring binders and covers. 2pm products are die-cut (stamped out with a shaped tool like a biscuit cutter).

Case study: CAD/CAM at Ford

Designers and engineers at Ford use computer-aided design and manufacture (CAD/CAM) to model their ideas, not sketches or hand-made prototypes.

Design ideas are drawn on-screen and can be rotated in any direction. All the necessary measurements can be fed into the computer, even the space to allow a spanner to get in and tighten a bolt. At any point a designer in any part of the world can command a clay model to be produced on computer-aided mills in Britain and Germany. This is rapid prototyping on a worldwide scale.



A designer using a CAD program. The image can be rotated on the screen.



A computer-aided milling machine cutting a clay model.

Buzz words

Flatpack – a product sold as a kit of parts to be assembled by the customer. The parts are sometimes, but not always, flat.

Injection moulding – a manufacturing process used to make complex shapes from thermoplastics. Plastic powder is heated until it becomes liquid and is squeezed under pressure into a mould, which may be in several parts to allow the moulding to be removed when set. Injection moulding is very quick and many thousands of items an hour may be produced.

Integral – included in the main structure of the item; not added afterwards

Lateral thinking – using intuition or instinct to produce original and unusual ideas.

Lug – a part of an object which sticks out and by which it can be connected, supported or lifted.

Mill – a machine used to carve 3D models.

Modelling – trying out an idea on paper, computer or in 3D.

Net or development – a 3D shape which is flattened by opening it out along its seams. It may show fold lines and joining flaps or slots.

Plotter – a machine which draws an image from a computer screen.

Procurement – arranging for the right parts and materials to be supplied to the factory.

Production engineering – designing and adapting machinery and systems to manufacture a product.

Prototyping – making a model to develop an idea.

Resilient – able to regain an original shape or position after being pressed, stretched or bent.

Technology transfer – using knowledge about one subject to solve a problem in another.

Thermoplastic – a group of commonly used plastics which soften when heated. Thermoplastics are used for a wide variety of products such as household containers (polyethylene, or polythene for short), plastic packaging (polystyrene), toys and household appliances (ABS) and double glazing (PVC).

Developing ideas

When you have chosen the best ideas from your brainstorm, you may need to sketch to combine or modify them. When you have one or two good ideas to develop, you can start to model them.

“Engineers ... only ever make **ONE** change at a time ... It is the only way of knowing if the change has made an improvement.” James Dyson

Rapid prototyping

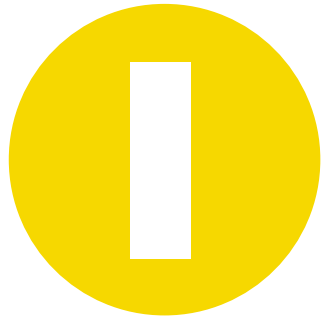
Once the strongest idea has been chosen it must be developed in sketch or model form. Stewart Robbins of 2pm prototypes flatpack designs using a CAD program and cuts the shape on a plotter fitted with a scalpel instead of a pen.

Foam model of DC07



A design and technology teacher prototypes a 'waking-up device' at a Design Museum workshop with IDEO, world leaders in innovation.

A Activity 7 guides you through the process of rapid prototyping.



I for innovation

How else do new ideas come about?

Innovative companies share certain characteristics: they see user evaluation as central to their success; they work in multi-disciplinary teams; they move almost immediately into prototyping.

More and more manufacturers are rethinking how they use their workforce to encourage innovation. James Dyson, for example, makes engineers and designers central to his company.

“Why should companies be led by accountants, lawyers and salesmen? Empowering engineers means that team leaders provide inspiration, not just balance sheets.”

James Dyson

D For the ways in which innovative companies originate and develop their ideas, see D for designing.

Case study: Dyson Dual Cyclone vacuum cleaner

James Dyson thought that the cyclone filter in his factory might work better than the filter bag in his ineffective vacuum cleaner. The way he went about exploring his idea is similar to how his engineers develop products today.

1. Establish exactly what the user wants

Dyson engineers are involved with customer care and listen to what customers say.

2. Define the concept

They write a brief which combines their suggestions with those of users.

3. Brainstorm it

They then produce a large number of sketches in order to select the ideas they are going to develop.

4. Clarify ...

A detailed design specification sets out the key features. Function, safety, materials, production processes, ergonomics, aesthetics and cost are all important.

5. Prototype it

Dyson engineers only make one change at a time as they prototype. They model in card and foam and test circuits using 'breadboards'.



Working 'breadboard' prototype of DC02

6. Test at every stage

When the stairhugging version of the DC02 was being developed, engineers built a staircase in the factory to test it.



Blue foam prototype of DC02

7. Use other people's know-how

Dyson engineers develop products with scientists, make financial decisions and get involved with every step of design and manufacture.

There are other methods and starting points for innovation.

Reconfiguring

Major manufacturers cannot take risks too often and may modify successful products to meet new requirements or a different market. This is called 'reconfiguring' or 'incremental innovation'.

The **Russell Hobbs K1 kettle** (1956) was the first automatic electric kettle. Its popular and radical design remained almost the same for 20 years, apart from the replacement of the chrome-plated copper body with a stainless-steel one. The K2 'Country Style' version of the 1970s reflected public taste for natural materials and rustic images in the wake of the hippy movement. The K2 continues to be produced today.

Inspiration

The 'Eureka' moment is rare. It usually comes about after a period of concentrated work when the mind is relaxed and thinking about something else.

In a restaurant on the Isle of Capri, designer Philippe Starck was about to tuck into a plate of squid garnished with lemon slices when he suddenly had an idea that combined these elements with a suggestion of alien life forms. He drew it on his napkin and the **Juicy Salif** lemon squeezer was put into production by Italian manufacturers Alessi shortly afterwards.



Technical expertise

Sometimes people with specialist knowledge work with designers to produce original solutions.

Designer Jonathan Savitt and dentist Dr Charles Taylor set out to stop the accumulation of debris at the base of toothbrush bristles, which encourages the growth of bacteria. Their **O-zone toothbrush** has a hole in the middle, removing the troublesome area to allow thorough rinsing of the bristles. The shape also encourages the user to brush at the correct 45-degree angle.



Links ...

Websites:

Alessi: www.alessi.com

Apple: www.apple.com

Dyson: www.dyson.com

Exploring Innovation: www.brunel.ac.uk/research/exploring

O-zone toothbrush: www.ozonetoothbrush.com

Books:

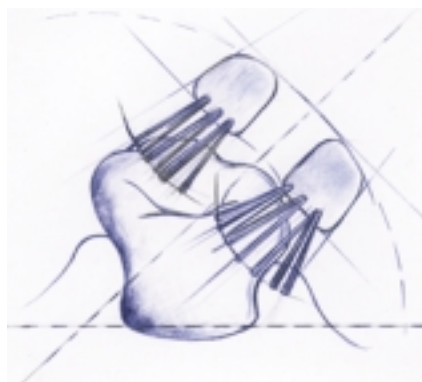
Brunel University and The Design Council, *Exploring Design and Innovation*, Brunel University, 2000

Judith Camel-Arthur, *Philippe Starck*, Carlton, 1999

Edward de Bono, *Serious Creativity*, HarperCollins, 1996

Simone Philippi and Philippe Starck, *Starck*, Taschen, 2000

Fay Sweet, Philippe Starck, *Subversive Design*, Thames & Hudson, 1999



Biography:

PHILIPPE STARCK

Born 1949 in Paris.

Interests Designs interiors, furniture and products.

Well-known designs Hot Bertaa kettle, Juicy Salif lemon juicer (both 1990–91), Dr Skud fly swat (1998).

Strengths Playful attitude to design. Original, creative, strong sense of form, adventurous use of materials and innovative manufacturing processes.

Weaknesses Some products do not work. The juice runs down the legs of Juicy Salif and the citric acid in it corrodes the chrome finish. Hot Bertaa is issued with a warning 'Not to be used when hot!' It is hard to fill, splutters when pouring, and steam comes out of the handle.

Buzz words

Aesthetics – a set of principles of good taste and the appreciation of beauty.

Breadboard – a rough working prototype used to get technical aspects right.

Cyclone filter – a machine that spins air at the speed of sound to remove particles from it by centrifugal force.

Eureka! – Ancient Greek for 'I've found it!'. What Archimedes is rumoured to have said in his bath on discovering the theory of displacement.

Function – the intended purpose of a thing or person.

Incremental – a little at a time.

Modify – to make changes.

Multi-disciplinary – involving many different branches of learning.

Radical – concerning the most basic aspects of a design.

Specification – a detailed description of the required performance, appearance, materials and other components of a design.

User evaluation – a study of the target user's lifestyle and requirements, or a test asking the user to try a product out (sometimes called a user trip).



for manufacturing & materials

Innovation is not just about novel ways of styling

Advances in materials and manufacturing technology often bring about changes in design.

Metals

Research and development in the aircraft industry during the Second World War produced a number of innovative metal products in the late 1940s and 1950s, such as the stainless-steel Russell Hobbs K1 kettle. The extreme strength of high-tensile steel enabled



designers to use smaller sections of steel rod than previously, producing many elegant and radical new designs, including Isamu Noguchi's Rudder Stool and Rudder Dinette table (1944, below).

Plastics

Leo Baekeland, an early twentieth-century radio pioneer, tried casting more complex shapes with the resin he was using to make insulating backs for wireless sets. This cheap lightweight material, called Bakelite after its inventor, allowed designers to use curves in casings for household appliances.

Bakelite was a thermosetting plastic, used for products which were batch produced. Thermoplastics, which were to have far greater mass-manufacturing potential, were largely developed during and after the Second World

War. Polystyrene, the first thermoplastic, was introduced just before the war: it is a component of synthetic rubber. Polyethylene, which followed it in 1942, might never have been utilised but for the intervention of Earl C. Tupper (see the case study below).

Data FILE: Polyethylene

→ **What is it?** A flexible translucent thermoplastic.

→ **Characteristics** Bends without splitting, easily moulded, cheap, unscented, non-toxic, has smooth and waxy feel, available transparent, translucent and in many colours.

→ **Best-known applications** Food containers and packaging, buckets and bins, carrier bags, plastic bottles.

→ **Manufacturing process** Injection moulding, blow moulding.

Case study: Tupperware

Earl Tupper, a chemist at the North American chemical company DuPont, was certain a use could be found for the plastic polymer polyethylene, a waste product of the oil-refining process. He developed a way of moulding it – the first use of injection moulding – and after some false starts developed a container which exploited the flexible characteristics of the material. When the lid was pressed onto the rim air was expelled from the container, creating a perfect seal. Once closed with the famous Tupperware 'burp' it became airtight.



Tupper began the process of innovation by studying polyethylene's qualities and devised the perfect function to suit them, making containers for food. His colleague Brownie Wise suggested home parties as a means of marketing the products, and the 'Tupperization' of America began.

Injection moulding

The invention of injection moulding meant that for the first time plastics were chosen for their innate design and manufacturing potential and not just for their ability to imitate a more expensive material.

Products which had been manufactured in wood or metal were rethought and redesigned in plastic. Injection moulding made mass production in plastic a reality and inspired many innovative products, for example, Lego and milk carton caps.

The ballpoint pen

The ballpoint features a ball bearing to spread quick-drying ink over the paper. It was originally conceived in 1888 by an American, John Loud, for writing on leather and was developed by several people including the Biro brothers, who patented the idea. They had trouble producing a working version and it was Marcel Bich who came up with a reliable disposable pen in 1953.



Links ...

Websites:
 Bic: www.bicworldusa.com
 Innovation: www.ideafinders.com
 Smart materials: www.brunel.ac.uk/research/exploring
 Tupperware: www.tupperware.co.uk

Case study: Kettles

In the 1970s the electric jug kettle was launched. It featured a body injection-moulded in acetal with an integral spout and side handle, instead of the dangerously situated handle of traditional models. This development was a triumph of both materials technology and manufacturing; early thermoplastics could not contain boiling water without distorting or even melting. After the development of cordless kettles the only significant innovation in kettle technology was the limescale-resistant disc element, but materials technology continues to affect kettle design.

Tefal Freeline cordless kettle

Appliance manufacturers Tefal felt their product range looked too French. In 1986 they asked British design consultants Richard Seymour and Dick Powell to redesign their kettle to make it more international in appeal. Seymour Powell adapted the brief to include considerations of user and function. The result was the first cordless kettle (right).



Russell Hobbs Thermocolor kettle

The recent developments in smart materials have produced plastics which are temperature sensitive. The Russell Hobbs Thermocolor kettle (left) uses smart plastics technology to change colour when boiled.

Buzz words

Acetal – heat-resistant and injection-mouldable thermoplastic developed in the 1970s from polyacetal (developed in 1958), which enabled plastics to be used for items previously made from metal.

Batch production – the manufacture of a specific number of products, from as few as a dozen up to thousands of articles.

Casting – to shape a material such as liquid metal, glass or plastic by pouring or pressing it into a mould.

Component – a part of something more complicated.

Design consultant – someone hired by a company to design a product or system.

Injection moulding – a manufacturing process used to make complex shapes from thermoplastics by squeezing heated plastic powder into a mould.

Mass production – continuous production which may run into millions of items. The high initial cost of complicated tools and moulds is offset by the number of identical products which can be made.

Section – the shape of something when cut through. Often used when describing materials which come in long lengths, like wooden dowel or steel or aluminium rod.

Smart materials – materials that are 'intelligent' can sense changes in the environment, usually heat or light.

Stainless steel – a mixture of iron and carbon which also contains chromium that allows it to resist rust and discolouration.

Synthetic – made artificially.

Thermoplastic – a group of commonly used plastics which soften when heated and are used for a wide variety of products such as household containers (polyethylene, or polythene for short), plastic packaging (polystyrene), toys and household appliances (ABS) and double glazing (PVC).

Thermosetting plastic – plastics like phenol, urea and melamine formaldehyde, which are formed by heat and pressure (compression moulding) and cannot be re-formed. When overheated they burn. They are used for heat-resisting applications like worktop surfaces and saucepan handles.

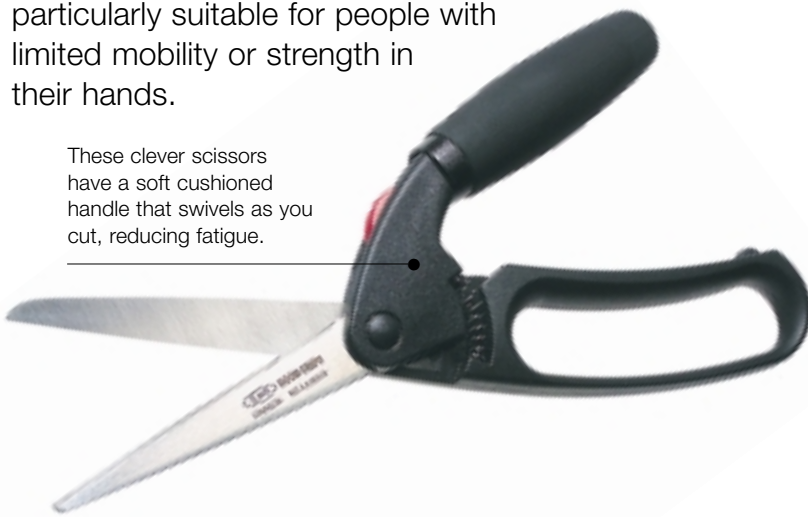
Timeline: KETTLES

19thc	1894	1920	1923	1956	1958	1978	1986	1999	2000
First mass-produced cast-iron kettle	First electric kettle made in USA	Electric saucepan in common use	Copper heating element invented	First automatic kettle – the Russell Hobbs K1	Polyacetal used for first plastic kettle	First injection-moulded acetal jug kettle	First cordless kettle	Disc element introduced	Smart kettle – changes colour when boiled

Case study: Good Grips

Sometimes the need for an ergonomically correct design can inspire a completely new product. Sam Farber ran a successful business in New York marketing and selling kitchen equipment. When his wife, a keen cook, developed arthritis and found difficulty using utensils, he felt he was ideally placed to help her and others like her. He collaborated with Smart Design and came up with a range of kitchen tools which are user-friendly for everyone but particularly suitable for people with limited mobility or strength in their hands.

These clever scissors have a soft cushioned handle that swivels as you cut, reducing fatigue.



This cheese slice features rubber fins on the handle which make it soft and comfortable to hold.

Good Grips now have over 100 items in their range, including knives, a whisk, a kettle, a sieve, brushes, gardening and bathroom equipment.

Special features include:

- the use of non-slip Santoprene rubber for handles
- large-diameter handles
- 'soft spot' grips which provide extra friction
- consideration of the position of handles on heavier items such as kettles to reduce wrist strain

“What meathead decided to put anti-arthritis pills in a childproof container?”

Richard Seymour

Links ...

Websites:

Exploring ergonomic design:
www.brunel.ac.uk/research/exploring
 Henry Dreyfuss: www.hda.net

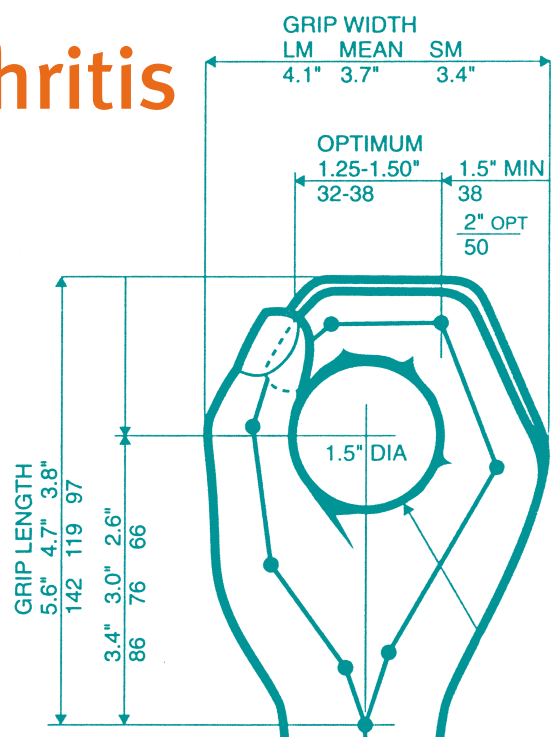
Henry Dreyfuss archive:
www.si.edu/ndm/exhib/hd/start.htm
 Innovative houseware: www.jwpltd.co.uk

Books:

Henry Dreyfuss Associates, *The Measure of Man and Woman*, Whitney Library of Design, 1993
 Russell Flinchum, Henry Dreyfuss, *Industrial Designer: The Man in the Brown Suit*, Rizzoli, 1997
 G Salvendy, *Handbook of Human Factors and Ergonomics*, Wiley, 1977

Getting a grip

This diagram of a grasping hand by Dreyfuss, intended to help calculate the diameter of hand rails, is used by companies like Good Grips to decide on the shape and size of handles.





for handling collection

Create your own Design Museum

The development of a variety of handling collections that enable product evaluation and stimulate inspiration is of enormous value. Product analysis can be a vehicle for the discussion of many issues in the classroom: the research and design of like products, inspiration and creativity, evaluation and the need for modification. It is also an excellent way of increasing knowledge of materials, manufacturing techniques and function.

Creating an Innovation handling collection

This should comprise cheap or easily obtainable products that can be used by students in the classroom. Some of the products seen in case studies on this sheet and in other sections of this resource pack may form the basis of the collection. Each product illustrates a different aspect of innovation and may be used as a starting point for a thematic handling collection, e.g. kettles.

Here are further examples of innovative and radical design solutions that are cheap or easily obtainable.

Printed materials

Design Museum posters
Branding, e.g. Go and Orange by Wolff Olins, RAC by North
Catalogues
Design magazines
Newspaper supplements

Products

Packaging
Small electronic items
Smart materials and textiles

Examples of these can be found in *Exploring Design and Innovation* (see Links)



Case study: Anywayup Tots Cup

Mandy Haberman was irritated by the way her daughter's drinking cup leaked. In 1990 she developed a childproof snap-on lid with a patented rubber valve which would not leak even when upside-down. Her design, which is for babies from the age of nine months, has won several awards and was picked as a Millennium Product. This is a perfect example of **user need** initiating a new concept.



Identity consultants Wolff Olins developed the strategy, name and brand for British Airways' new low-cost, no frills operator. The name needed to be understandable across Europe, using clear, unfussy typography. The brand had to be fresh, simple and direct but not crudely downmarket.

Using an Innovation handling collection Comparative evaluation

1. Choose a product from your Innovation handling collection. Collect information on another product with the same function. Now compare and contrast the products under the following headings:

Materials
 Manufacturing processes
 Ergonomics
 Sustainability
 Style and aesthetics
 Originality

Which product comes out best?
 State your reasons.

Product development

1. Look at the Soundtrack CD holder in D for Designing. The designer, Ron Arad, has thought of a totally new way of holding a CD.

2. Brainstorm all the different ways you can think of to hold a CD. Be as wild and outlandish as you like!

Case study: Flymo lawnmower

The Flymo hover mower was inspired by the invention of the hovercraft by British designer Sir Christopher Cockerell. This impressive piece of lateral thinking or **'technology transfer'** was the work of Swedish inventor Karl Dahlman in 1963. He spent many months experimenting and developing a mower with no wheels which floated on a cushion of air. The Flymo was light and easy to use. The catchphrase 'It's less bowver wiv an 'over' became popular as a result of the TV advertising campaign.

Flymo developed the hover mower design by including an integral grass box. This is another example of 'reconfiguring' or 'incremental innovation' - modifying a successful design to attract new markets.

1 See I for innovation for further examples



Flymo Turbo Compact

Case study: Sony Walkman

Akio Morita, the Chief Executive Officer (CEO) of Sony, often initiated new designs on the basis of his observation of everyday life. He noted the ingenious things people did in order to listen to music wherever they were; on the beach, in the park and whilst walking or jogging.

Sony had once before led the world in the development of the



An early model of the Sony Walkman

transistor radio. They replaced valves with transistors, thus enabling radios to be much smaller. This innovation and the Walkman are perfect examples of **advances in technology, materials and manufacturing** bringing about changes in design. The technology for the Walkman already existed with the development of the integrated circuit (known as ICs or chips) and small-scale electric motors. Morita persuaded the engineers at Sony to improve the quality of sound and to leave out the recording function to save space, and in 1979 the Sony Walkman was born.

Links ...

Websites:
 Anywayup Tots Cup:
www.mandyhaberman.com
www.inventor.hu/
www.uknow.or.jp/uk_now/index.html

Go logo by Wolff Olins:
www.wolff-olins.com
www.go-fly.com

Sony Walkman:
www.sony.com
www.sheridanc.on.ca/~randy/design.dir/applian.dir/sony.htm

Flymo:
www.flymo.com
www.electrolux.com
www.artizan.demon.co.uk/olc/mowhist.htm

Books:
 Brunel University and the Design Council,
Exploring Design and Innovation, Brunel University, 2000
 (Interactive version at
www.brunel.ac.uk/research/exploring)



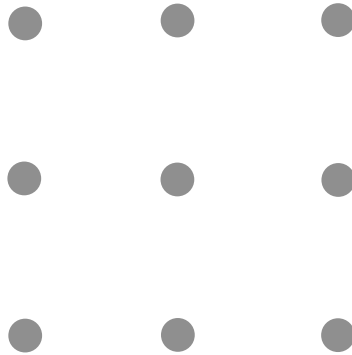
for activities 1-2

Free your minds and work together to define the concept

Activity 1 – Keeping an open mind

You can solve these brain teasers by asking the teacher questions but the answers will be yes or no only.

1. A man is approaching the centre of a field. He knows that when he gets there he will die. Why?
2. Romeo and Juliet are lying dead on the floor. The room is empty except for a pool of water and some broken glass. How did they die?
3. If a clock takes two seconds to strike 2 o'clock, how long will it take to strike 3 o'clock?

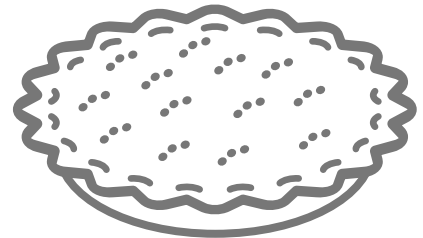
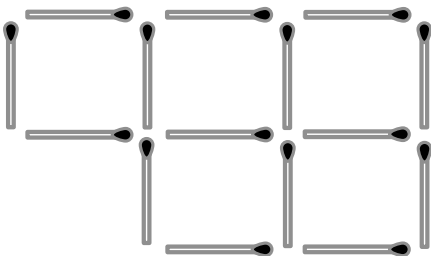


Join the dots

Connect all nine dots with four straight lines. Go through each dot only once. Do not lift your pencil from the paper.

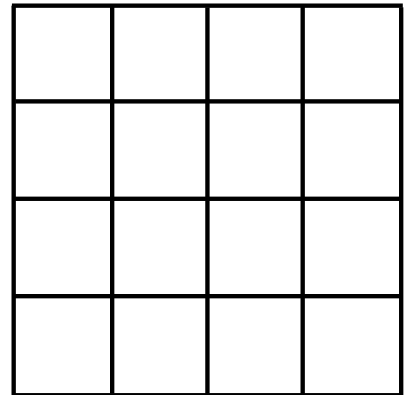
Matchless

Take away three matches to leave three squares.



Clean cut

Cut the pie into eight pieces using only three cuts.



Square bashing

How many squares do you see?



Activity 2 – Working together

Most of us have to work with others to solve problems. Like the previous activity, this is more about how you work than what you do. It works best in groups of three or four. Allow about 20 minutes for each task.

Problem 1

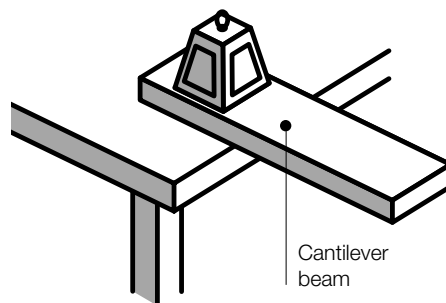
Using one piece of A4 thin card, build the tallest free-standing tower you can. It must stand up on its own!

You will need ...

Scissors, card, sketching paper and pencils. No sticky tape allowed!

Problem 2

Build the longest cantilever beam you can, using tape instead of the weight and spaghetti instead of wood.



You will need ...

Spaghetti, masking tape, sketching paper and pencils.

Problem 3

Make a structure to hold a house brick as high as possible above the table.

You will need ...

Four sheets of tabloid newspaper, four 100mm lengths of sticky tape, scissors, brick, sketching paper and pencils.

Problem 4

Make a container to protect an egg which will be dropped from a height of 6ft.

You will need ...

One sheet of A4 paper, one thin polythene sandwich bag, an egg, cotton thread, sticky tape, scissors, sketching paper and pencils.

Activity 1	Evaluation Now that you know the answers ...
-------------------	---

Which ones did you get right? _____

Looking at each puzzle you got wrong, what did you assume about the instructions which put you off the track? _____

Discuss the puzzles with a friend and list where you jumped to conclusions. Did you both make the same mistakes? _____

Now work out a strategy for future problem-solving and share it with the class. _____

Activity 2	Evaluation How successful was your outcome?
-------------------	--

How did you divide up the tasks amongst the group? _____

How much time did you spend planning and how much making? _____

How could you have improved the way you tackled the task? _____



for activities 3-4

Understanding the user

Activity 3 – Whose life is it?

You have in front of you a set of photographs representing a day in the life of someone you do not know. From the evidence in the pictures, put together a profile of the person. You may not know everything from the evidence in the photos; for example, you will have to guess a name which you think fits with his or her age, character and lifestyle.

Age _____ Male /Female _____



What is his/her relationship with others in the house?

Does he/she have a partner? If yes, what do you know about the partner? _____

Where does he/she live? (Can you narrow it down to a county, or even a town?) _____

Describe his/her home. Is it a house or flat? Is it owned or rented? Does it have a garden? _____

How does he/she get around? Does he/she have a car? What make is it? _____

What does the person do for a living? _____

What does he/she like to do in his/her spare time? _____

What is his/her attitude to new technology? _____

What kind of clothes would the person wear and where would he/she buy them? _____

What kind of music does the person like? _____

Where does he/she go on holiday? _____

What would be a perfect evening's entertainment for him/her? _____

What would be a typical evening meal? _____

What is his/her dream? _____

What is his/her name? _____

When you have answered all the questions, choose someone in the group to show your photos and describe your subject to the class.

Activity 4 – Observation exercise

We generally assume that everyone is the same as us. In fact we all do things very differently, as is proved by this simple observation of everyday activities. Designers use in-depth interviewing and role-playing exercises like these to establish what users really want from a product.

My life

In groups of four, choose an everyday activity that everyone does. It could be waking up, getting up, having breakfast, making a hot drink, preparing or clearing away a meal, having a bath/shower, using the phone, getting to school or college, studying at home, getting ready to go out, getting ready for bed.

When you have chosen an activity, everyone in the group should take five minutes to write down exactly what he or she does.

Then make yourselves a set using furniture and props you have to hand. It may be useful in some cases to plan in advance and bring in some of the items you might use, like alarm clocks, mobile phones, toothbrushes, make-up, a kettle and crockery.

Now each person takes a turn to act out the activity. The others then question them in detail about what they do. Make them explain everything! Think of this as an interrogation!

Appoint someone to record everything on a white board or large sheet of paper. This will form the basis for discussion of a concept or a starting point for a new product.

D For the benefits of user evaluation, look at the case study and picture of the IDEO shopping cart on D for designing 1.

Example: Getting ready for bed

What time do you go to bed? **Do you kiss anyone goodnight?** Do you have a bath or shower before bed? **Do you wash and/or clean your teeth?** Do you undress in the bedroom or bathroom? **Do you share your room?** Is the person you share with still up/in bed already/going to bed too? **When you take off your clothes, do you hang them up/put them in a drawer/hang them over a chair/drop them on the floor/put them in the wash?** If you don't put them away, who does, and when? Where and how do you store dirty clothes? **Do you take food or drink to bed?** Do you have the radio/TV/music on? **Will your noise disturb anyone?** Do you read in bed? Do you like going to bed? **Is your bed comfortable?** Is it made? **Do you like your bedroom?** Do you spend time in your room other than to sleep? Do you study in your room? **Do you keep all your belongings there?** Do you have slippers? **What are they like?** What do you wear in bed? **Do you have a teddy bear?...**



for activities 5–7

Making your ideas happen

Activity 5 – Brainstorming

The best ideas happen when you forget your assumptions about what a product should look like and go back to basics, thinking about its function. Follow these rules as you develop your own product ideas.

Each group will need ...

Lots of big sheets of paper and a pencil or pen, or a whiteboard and marker.

One person to write it all down.

Someone to chair the discussion to make sure everyone gets a say.

Do not use a computer, ruler, colours or anything else that might slow you down.

BRAINSTORMING – THE RULES

Encourage wild ideas

Think 'out of the box'. Do not assume that a CD holder will be some kind of wooden shelf unit – the CDs could be stuck to the wall with rubber suckers or hung on a line with bulldog clips! An egg holder could just as easily be made of elastic bands or paper.

D For how ideas are generated in practice, look at the case studies and pictures of the Alessi CD holder and the 2pm Eco bin on D for designing 2.

Forget ...

- Cut-out pictures of existing products
 - Commonly used materials
 - Construction techniques
- Put the catalogue in the bin!*

Anything goes

Write down anything that comes into your head, as fast as possible. Be clear but do not try to be neat. Use words and pictures. Put everything down, no matter how silly it seems.

Work together

Do not aim to make your idea 'win'. Build on the ideas of others.

One at a time

Listen to each other. Write down or sketch every idea.

Stay focused

Stick to the problem. Do not be tempted to follow 'blind alleys'.

Define the concept

Summarise the main ideas and present them to the rest of the class.

Activity 6 – Developing ideas

Now you need to pick the best ideas to take further. At this stage the best ideas are the most interesting ones rather than the most practical!

Each group will need ...

Post-it notes, sketching paper, pencils and pens.

Ask each member of the group to use their Post-its to vote for the five best ideas. Identify the ideas with the most votes and give a three-minute presentation to the other groups outlining the ideas you have chosen.

Now you are ready to clarify your ideas and decide which ones to develop further. The following rules may help you:

DEVELOPING IDEAS – THE RULES

Modify

What can be changed to make the product work/look better?

Magnify

Would all or part of the product be improved by being larger?

Minify

Would all or part of the product be improved by being smaller?

Merge

Can two ideas be combined to improve the product?

Activity 7 Rapid prototyping

Once you have decided on an idea to develop, it is time to start prototyping! This means making a quick model, a 3D sketch, to illustrate your idea.

Allow about 45 minutes to produce a prototype. You may need to draw it roughly first to agree between you how you are going to make it, but get your idea into 3D form as soon as possible.

Use paper, card, foamboard, wood, clay, plasticine, fabric, string, wire, elastic bands, balloons, foil, spaghetti, straws, tape, mapping pins and anything else that seems useful.

Then choose someone to present your solution to the other groups.

Pin up the rules printed here to keep you on track.

D For examples of the development of ideas in practice, look at the case studies and pictures of CAD/CAM at Ford and the Dyson vacuum cleaner on D for designing 2.

Buzz words

Assumption – a belief taken for granted, sometimes without good reason.

Cantilever – a beam or girder fixed at only one end.

Chair – the person who guides a discussion and makes sure everybody has a say.

Concept – a mental picture of a product; an idea.

Evaluation – a judgement on the good and bad points of the design or performance of a product.

'Out of the box' – original and unconventional.

Presentation – a spoken or written report, often using visual material.

Profile – a description of a product or person.

Prototyping – making a model to develop an idea.

Role-play – pretending, acting a part.

Strategy – a plan for tackling a task.

Summarise – bring together the main points of a discussion.

RAPID PROTOTYPING

THE RULES

GET SOLID
QUICKLY

Start
simple

Work
rapidly

Make it
rough