



# School-based Activities

## Sport Technology

### High tech clothing

#### Background

Sports stores are full of equipment and clothing that allege all kinds of improvement. Sometimes it is difficult to decide if the extra money for a product is worth it. It is often a good idea to construct a table of the benefits and drawbacks. What is the evidence for the claims? Strong evidence for claims is always based upon actual research. Is personal recommendation strong or weak evidence?



#### What you need

- Access to the internet
- Go to the Skins website to find out what claims are made for this new fabric and style of sports apparel:  
<http://www.skins.com.au/ns/howskinswork.cfm>

#### What to do

1. Read the claims made for the Skins product and fill in the table below:

Claim	Apparent benefit	Evidence provided	Your verdict
Surface pressure	Correct fitting	Sizing system based on BMI	Probably right
Engineered gradient compression			
Less vibration			
Thermoregulation			
Other			



Photo credit: Paul Rovere

**Try, think and explain**

Read the scientific reviews of new types of swimwear by Speedo, Adidas, Tyr & Nike. Fill in the table below to summarise the benefits of the new swimwear.

Claim	Apparent benefit	Evidence provided	Your verdict
Freestyle or crawl swimming	faster		
breaststroke			
backstroke			
butterfly			

**Useful websites**

For Australian scientists' research findings on the new swimsuits:  
<http://www-rohan.sdsu.edu/dept/coachsci/swimming/bodysuit/science.htm>

A copy of the scientific review of the benefits of wearing bodysuits:  
<http://www-rohan.sdsu.edu/dept/coachsci/swimming/bodysuit/fiveauth.htm>

For broad discussion of high tech. swimwear go to Wikipedia website:  
[http://en.wikipedia.org/wiki/Hi-tech\\_swimwear\\_fabrics](http://en.wikipedia.org/wiki/Hi-tech_swimwear_fabrics)



## Stored energy

### Sportsworks



#### What you need

- Photographs of pole vaulters

#### Background

The fibreglass/ carbon fibre pole shown in the photograph stores energy for later use e.g: When the pole is placed in the slot it is bent by the athlete's forward motion. The natural elasticity of the fibreglass/carbon fibre then straightens the pole and helps transfer the forward motion of the athlete into vertical motion.

#### Try, think and explain

1. Find out what kinds of materials the pole has been made from in the past.
2. Does the pole ever break?
3. Which types of athletes make the best pole vaulters?
4. In what other sports does the athlete store energy in the equipment?

#### Useful websites

How pole vaulting works:

<http://science.howstuffworks.com/pole-vault.htm>



## Sportsworks



Above: Vaulter walks past the competition supplied poles. Only some vaulter bring their own.



Above: Although the pole helps the vaulter to reach heights of between 4 and 6 metres, the athlete still needs much skill and strength to sail over the bar.

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# Technology design progressions

## Background

The surfboard has come a long way since a long solid plank of wood was used in the early 20th century. In fact the modern surfboard is an ideal case study in design changes. As new materials like fibreglass became available, designers and manufacturers quickly seized the opportunity to make desirable changes. The market is very sensitive to improvements. Can you predict where the future lies for surfboard design?

Sportsworks



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## What you need

- images of surfboards
- access to the internet

## What to do

1. Can you identify the correct decade of a surfboard's origin?
2. What has happened to the surfboard over the 80 years that they have been used in Australia?
3. What are some of the materials that have been used to enable surfers to stand up and take a wave?



### Try, think and explain

1. Create a blueprint for a surfboard.
2. Shape some polystyrene foam or balsa into the design you created.
3. Research other examples of technology progression such as the golf ball.

### Useful websites

<http://www.surfworld.org.au/>

<http://en.wikipedia.org/wiki/Surfboard#Design>

Here are the surfboards illustrating technology progression in the Sportsworks exhibition.





# Bicycles as efficient machines

## Background

Efficiency is the term used to describe the comparative amount of energy needed to move something a certain distance. From the diagram below, it can be seen that the bicycle is a more efficient user of energy than other vehicles that people use to move over medium or long distances. Also, some bicycles are more efficient than others.

Sportsworks



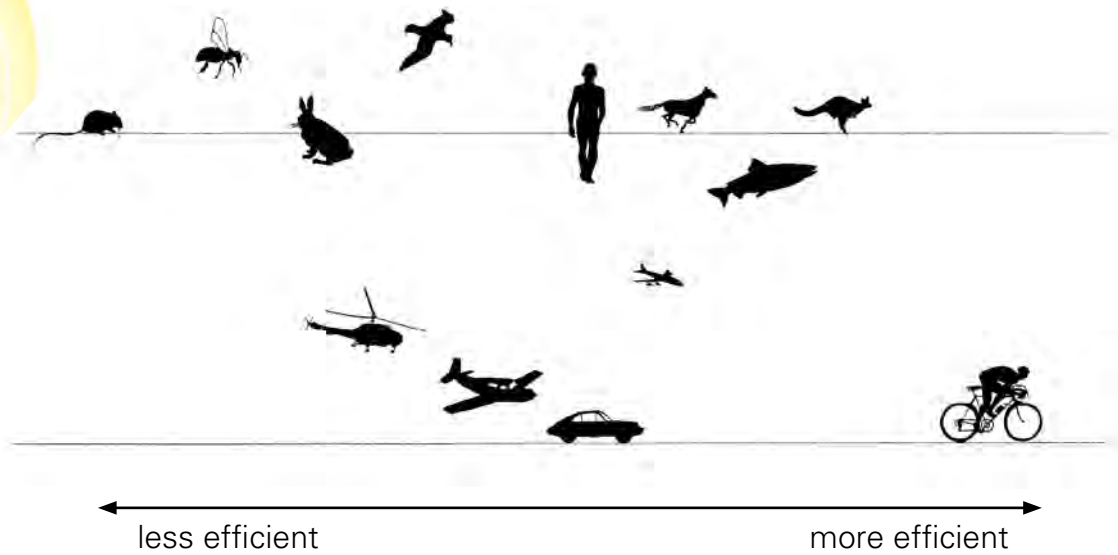
## What you need

- A collection of photos of the many different kinds of pedal powered vehicles

## What to do

1. Rank the vehicles in terms of perceived efficiency.  
Which vehicles would go further for less effort?  
Provide some reason for each of your choices.
2. What are the essential features of the most efficient vehicles?
3. What changes to a bicycle's equipment may make it more efficient?  
For example which types of tyres decrease the friction between rider/bike and road?

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Above: Diagram illustrating the relative energy efficiency of various vehicles and the bicycle, as well as the energy efficiency of locomotion in various animals versus a walking human.

### Useful website

<http://en.wikipedia.org/wiki/Bicycle>





# Clothing and sport

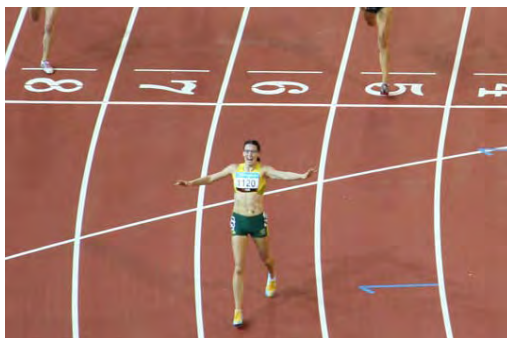
## Background

Track and Field athletes wear a wide range of clothing. The events themselves seem to dictate the garb; inevitably fashion also dictates style changes. However, there are a number of variables which an observer may find interesting or even puzzling—why are some athletic events best served by loose clothing and others dominated by tight costumes? Investigations into the properties of the various textiles used in athletic clothing can provide insights into other reasons for the changes in clothing styles.

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Above: These men are dressed in pre-competition clothing for pole vault.



Above: Two of Australia's top athletes, Jana Pittman & Craig Mottram wear different kinds of sporting attire for racing. Why? Is less always better?

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## What you need

- Photographs of athletes in a wide range of sports or track and field attire

## What to do

1. Investigate what sports require specialised or unique clothing.
2. Why do sprinters prefer tight fitting clothing?
3. At which running distance do athletes begin to prefer looser styles of clothing?
4. Which clothing is universal to all sports?
5. Apart from requirements for modesty, why does male and female clothing differ for the same sport?
6. What are some examples of unisex clothing?





## Sportsworks

Male and female distance runners often choose to wear different kinds of clothing. Is it more about appearance or is there a cooling advantage with the female tank top? Why do sprinters wear tight fitting clothing and distance runners prefer loose clothing?

### Useful website

<http://www.insport.com/>



# Racing and regular wheelchairs

## Background

Over the past thirty years wheelchairs have undergone some huge design changes. Wheelchair athletes are now finishing their races faster than able bodied athletes. What are the design features which have made all the difference to performance on the road and track?

Sportsworks



## What you need

- Two good photographs of the different styles of wheelchairs – the racing wheelchair and the everyday model.

## What to do

1. Make up a table identifying the similarities and differences between the two styles.
2. Discuss the reasons for the similarities and differences.

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Characteristic	Racing Wheelchair	Regular wheelchair	Similar	Difference
No. of wheels				
Size of wheels				
Centre of gravity				
Method of steering				
Type of tyre				
Braking				
Size of outer wheel				
Speed				
Type of seat				

**Useful websites**

<http://www.sportaid.com/racingwheelchair.shtml>

<http://www.usedwheelchairs.com/>

[http://sportsillustrated.cnn.com/paralympics/2000/paralympic\\_records/](http://sportsillustrated.cnn.com/paralympics/2000/paralympic_records/)





## These boots are made for kicking



Above: Fifty years of football boot evolution.  
 From left to right: The modern boot, the first low-cut boot and the older style boot.

### What you need

- Find some more sporting equipment which has changed significantly over the years. See image below of golf balls through the ages. (Photo credit: Paul Rovere)

### What to do

1. Draw up a table in order to make a list of the changes which have occurred.

Example: A comparison between the older football boot & the modern football boot

	Older boot	Transition boot	Modern boot
Upper	leather	leather	plastic
Sole	leather	rubber	plastic
Stops	nailed	moulded	moulded
Ankle protection	yes	no	no
weight	420gms	260gms	240gms
Suitable for orthotics	no	some	yes

2. What are the likely benefits of these changes?
3. What are the possible disadvantages of these changes?

### Try, think and explain

1. Investigate the wide variety of stops, spikes, sprigs, blades and other devices used to provide extra grip in sports shoes. What is the general design trend in these devices?



Above: The development of the golf ball

### Useful websites

<http://www.prodirectsoccer.com/home.asp>

<http://www.asics.com.au/technology11.asp>

[http://en.wikipedia.org/wiki/Football\\_boots](http://en.wikipedia.org/wiki/Football_boots)



## Tracking changes in swimwear



Above left: The modern half length and full length swimsuit (Photographer Paul Rovere)

Above centre: Three swimming costumes from the Museum Victoria collection.

Above right: Swimming briefs worn by Australia's Murray Rose, gold medallist at 1956 & 1960 Olympics (Photographer Paul Rovere)

### What you need

- Photographs of swimwear used in past Olympic competitions

### What to do

1. Find out when swimming trunks were first made from nylon.
2. Prior to the introduction of nylon costumes, what other materials were used to make costumes?

### Try, think and explain

1. Weigh some swimming costumes before and after immersion in water.
2. Compare the buoyancy of a cotton T-shirt and a nylon swimming costume.
3. How long does it take for swimming trunks to sink in a bucket of water?
4. How do the modern skin tight swimsuits help swimmers go faster?
5. Find out what sort of finishing treatment is applied to the modern swimming trunks.
6. Why would woollen fabrics be unacceptable for swimming fast?

### Useful websites

<http://www.4swimwear.com/femhignecbod.html>

for information about the Speedo fastskin

[http://www.olympic.org/uk/passion/studies/photographic/index\\_uk.asp](http://www.olympic.org/uk/passion/studies/photographic/index_uk.asp)

for full Olympic image archives



# Making a cricket bat

## Background

Cricket bats are one of the most familiar pieces of sporting equipment. Most cricket bats are machine made. A few bats are still hand made and each one has a fascinating history.

## What you need

- A few cricket bats from different manufacturers, enough to have a basis of comparison.

## What to do

1. Look at the bats and make a list of the different materials used to make a cricket bat.
2. Use the internet to find out where all the materials are sourced from.
3. Compare the look and feel of different bats. Are all bats the same? How do they differ?

## Try, think and explain

1. Lay two bats face down and lined up against each other to see how their profiles compare. Which bat has a narrower profile? Which feels heavier?
2. In the case of the two bats pictured above, which bat would be easier to use against fast bowling where one wants to be able to lift a bat quickly? (More of the bat's mass needs to be closer to the handle).
3. Which bat would be better for a power hitter, where more mass is behind the point of impact?
4. Create a table of the differences between different cricket bats\* comparing such properties as weight, height, width, profile and sweet spot.

## Useful websites

[www.fisherbats.com.au](http://www.fisherbats.com.au)

[http://en.wikipedia.org/wiki/Cricket\\_bat](http://en.wikipedia.org/wiki/Cricket_bat)

\*Maximum dimensions for a cricket bat are as follows:

The blade has a maximum width of 108 millimetres (4.25 inches) and the whole bat has a maximum length of 965 millimetres (38 inches).

