TRIATHLON

Research Project
For Teachers **p2&3**, for Students **p4**

HEALTH AND SAFETY

Students should be encouraged to make their own risk assessment before they carry out any activity, including surveys. In all circumstances this must be checked by a competent person.

For surveys and other activities on open water, the PE department or local water sports clubs may be able to help with risk assessments and ways to avoid risks. Students using specialised equipment should be supervised at all times.

Students may want to set up unorthodox experiments and you may need to seek specialist advice. In particular:

- Any investigations into the actual effect on real people of immersion in cool or cold water must only be done with medical supervision and appropriate medical resources on hand in case of emergency
- Any activity associated with open water will require specialised risk assessment.

Organisations such as CLEAPSS are able to help.

TRIATHLON:
Silver **Research** Project - For Teachers

On your bike

A triathlon consists of a 1500m swim in open water, followed by a 40km cycle ride, then a 10km run. World class athletes complete it in less than two hours.

Obviously, triathletes have to be super fit. **But what difference does their kit make?**

Take the cycling stage: Bikes vary in many ways, and cyclists ride their bikes differently – using gears to turn the pedals fast or slow. **So, why do bikes vary so much in style and price, and how does a triathlete choose the right one?**

HAVE YOU EVER WONDERED?

...if the shape of a bike, or the materials it's made from, really matter?

You might like to imagine yourself in a situation such as...

You're a Youth Club Leader. Your local community has raised enough money to buy several bikes for the club so that you can all use the local off-road cycling centre.

It's up to you to decide which bikes to buy.

You decide to **research information** to:

- understand how a bike's design affects performance on different terrains
- evaluate bikes to decide it they're good value for money.

Prompts

The **Student Brief** gives some triggers to start students thinking. They should realise that each trigger implies several items to research and compare. Encourage students to identify these themselves. However, if necessary, prompts such as those below might be given, to point students in suitable directions.

- The forces that a bike must be able to withstand when ridden on different terrains, or by different riders
  - What forces act on a bike when it is stationary, or moving in a straight line on smooth ground?
  - How do uneven ground/tight corners change these forces, or cause extra forces?
- The advantages and disadvantages of different materials that can be used to make the frame
  - What are the main materials used?
  - What are their properties?
  - What advantages do some materials have over others? What about how easy they are to use, or their cost?
- Why features such as wheels, tyres, brakes, frame shape vary from bike to bike; which features are necessary for your bikes. Analyse the advantages and disadvantages of different designs.
  - How do strength, forces such as friction, or comfort for the rider affect the design?
  - Do particular features affect the safety of the bike, and if so, how?
- The cost of different types / models of bikes
  - Is 'cost' just the initial price?
  - How long will the bike last?
  - What are the environmental costs (environmental impact of raw materials, manufacturing, transport and eventual disposal of finished product)?
- How easy different bikes will be to maintain in a good, safe condition?
- Are some design features easier to take care of than others?

Suggestions for supporting students

Though primarily based on secondary data, the Research project is likely to provide a more meaningful experience if the student includes some practical work. One possibility is for two students to undertake their projects – one Research, the other Practical – working independently, but coming together, to share mutually useful information and activities.

It is recommended that, wherever possible, Silver Award students should have a scientist or engineer as Mentor for their project. Please contact your CREST Local Coordinator to discuss Mentoring.

In this case, someone with knowledge and/or experience of materials science or design engineering would be ideal. The mentor might be involved in…

- academic or industrial research into, for instance:
  - designing, developing or testing materials for a given purpose
  - vehicle design or development
  - cost analysis or analysis of environmental impact
- scientific publishing
- equipment purchasing with a technical consideration
- sports or leisure cycling

Discuss with students how they will manage their time (after school clubs, working during lunch hours, homework). Agree a completion date with your students.

POSSIBLE EQUIPMENT, MATERIALS AND RESOURCES

Though primarily a 'theoretical' research project, 1-2 hours could usefully be spent in the laboratory – to illustrate, and explain or clarify, aspects already investigated theoretically.

www.britishscienceassociation.org/projectideas

Internet search

Combine 'bicycle' with terms such as: design, materials, off-road, mountain, frame, carbon-fibre, wheels or gears. Or try:

- History of materials used for bicycle frames
  exploratorium.edu/cycling/frames1.html
- How mountain bikes work
  adventure.howstuffworks.com/mountain-bike.htm
- The science behind cycling and bike design
  www.exploratorium.edu/cycling/ and
  www.explainthatstuff.com/bicycles.html
- Bicycle maintenance www.bikewebsite.com
- Bikes: design factors (free DVD ROM)
  www.engineeringeverywhere.org.uk

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Some things to think about…

- The forces that a bike must be able to withstand when ridden on different terrains, or by different riders
- The advantages and disadvantages of different materials that can be used to make the frame
- Why features such as wheels, tyres, brakes, frame shape vary from bike to bike;
- The cost of different types/ models of bikes
- How easy different bikes will be to maintain in a good, safe condition

Health and Safety

Before you carry out any experiment:

(a) find out if any of the substances, equipment or procedures are hazardous

(b) assess the risks (think about what could go wrong and how serious it might be)

(c) decide what you need to do to reduce any risks (such as wearing personal protective equipment, knowing how to deal with emergencies and so on)

(d) make sure your teacher agrees with your plan and risk assessment

NOTE: Your teacher will check that you can carry out your project safely your risk assessment against that of your school. If no risk assessment exists for the activity, your teacher may need to obtain special advice. This may take some time.

(e) if special tools or machines are needed, arrange to use them in a properly supervised design & technology workshop

(f) if an experiment involves physical activity, you may need the support and supervision of a P.E. teacher.