**teachers guide**

**Forces 4:**

**Forces in the human body**

# Components

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|  | NAME | DESCRIPTION | AUDIENCE |
|  | *Forces in the human body*teachers guide | This guide contains strategies that provide opportunities for students to apply their understandings of unbalanced forces to situations that affect the human body. | teachers |
|  | *Forces in the human body*video | A video shows how an understanding of forces can be used to diagnose and provide solutions to medical issues. | students |

Purpose

This resource provides students with opportunities to **Elaborate** on their understandings of balanced and unbalanced forces, by applying their knowledge to new contexts.

# Activity summary

Outcomes

Students:

* understand that multiple forces on an object can be combined into a single force that has the same effect;
* develop an understanding that forces can be used to protect us from damaging effects of large unbalanced forces; and
* appreciate regulations about wearing seatbelts or safety helmets are based on scientific understandings of forces and motion.



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| ACTIVITY | POSSIBLE STRATEGY |
| Review students’ knowledge of forces and motion, including:* balanced and unbalanced forces, and
* effects of forces on motion.
 | whole class discussion |
| Students watch the video, *Forces in the human body*, and answer questions, in the ‘Information for teachers’ section below.This may take the form of a research project or a class/group discussion. | working individually, small groups or whole class |
| Teacher allocates a follow-up task to each group:* design and construct a capsule to protect an egg in a 2 m fall; or
* plan and conduct your own investigation into how bicycle helmets, car seat belts, air bags or baby capsules protect occupants in the event of a collision.
 | small groups |
| Students present to the class features of their egg capsule and why it was successful/unsuccessful.Or, students explain to class how bicycle helmets, car seat belts, air bags or baby capsules protect occupants from effects of large forces in a collision. | whole class |



In small groups, students undertake either a design exercise or an investigation.

## Design exercise

Students design a capsule to protect an egg in a 2 metre fall. To complete the task, students:

* design and construct a capsule from commonly available materials, such as: paper, cardboard, bubble wrap, drinking straws, adhesive tape …;
* test and modify their capsule design, as required, to ensure it meets its purpose;
* demonstrate to the class the success (or otherwise) of their design;
* describe (verbally, orally or visually) design features of their capsule; and
* apply their knowledge of forces to evaluate and explain the effectiveness of their design.

## Investigation

Students plan and conduct an investigation into how bicycle helmets, car seat belts, air bags or baby capsules protect people from effects of large forces in a collision. To complete the task, students:

* select one of the above safety devices and research how it protects users from effects of large forces;
* explain (verbally, orally or visually) how the device minimises force on users;
* design and construct a model of the safety device, from commonly available materials, such as: paper, cardboard, bubble wrap, drinking straws, adhesive tape …;
* plan and conduct an investigation of their design; and
* evaluate the effectiveness of their design.

# Technical requirements

The teachers guide requires Adobe Reader (version 5 or later), which is a free download from [www.](http://www/) adobe.com.

QuickTime version 7 or later is required to view the video. This is a free download from [www.apple.com/](http://www.apple.com/) quicktime. A high quality MP4 version with subtitles is available on CD-ROM or download from the SPICE website.

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Web: spice.wa.edu.au Email: spice@uwa.edu.au Phone: (08) 6488 3917

Centre for Learning Technology (M016) The University of Western Australia

35 Stirling Highway

Crawley WA 6009

# Associated SPICE resources

*Forces 4: Forces in the human body* may be used in conjunction with related SPICE resources to address the broader topic of forces and motion.

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| DESCRIPTION | LEARNING PURPOSE |
| *Forces (overview)*This learning pathway shows how a number of SPICE resources can be used to teach concepts of balanced forces, unbalanced forces and motion. |  |
| *Forces 1: Introduction to force*A video stimulates students’ interest in learning about forces and motion, and elicits prior knowledge and misconceptions. | **Engage** |
| *Forces 2: Investigating forces*Practical activities provide opportunities for students to explore effects of forces on the motion of objects, including those falling in Earth’s gravity. | **Explore** |
| *Forces 3: Balanced and unbalanced forces*An interactive learning object enables students to explain and predict effects of balanced and unbalanced forces on objects. | **Explain** |
| *Forces 4: Forces in the human body*Students apply their understanding of forces and motion to new contexts, such as: forces in the human body or designing and testing the effectiveness of a safety capsule to protect passengers in motor vehicle collisions. | **Elaborate** |