



LESSON PLAN

Lessons 7 & 8: Egg crash (design, build, test)

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UNIT TITLE: Safer by Design - Investigating Forces, Motion and Road Safety



LEVEL

Years 9-10



LESSON NUMBER

7&8 of 9



LESSON LENGTH

60 minutes



VICTORIAN CURRICULUM 2.0 CONTENT DESCRIPTIONS

- **Creating designed solutions:** apply innovation and enterprise skills to generate, test, iterate and communicate design ideas, processes and solutions, using technical terms and graphical representation techniques and appropriate attributions using manual and digital tools. (VC2TDE10D02).
- **Science inquiry:** arguments based on a variety of evidence can be constructed to support conclusions or evaluate claims, including consideration of any ethical issues and cultural protocols associated with accessing, using or citing secondary data or information. (VC2SI0I07).
- **Physical sciences:** Newton's laws of motion can be used to quantitatively analyse the relationship between force, mass and acceleration of objects. (VC2SI0U17).



VICTORIAN CURRICULUM 2.0 ACHIEVEMENT STANDARDS

- **Design and Technologies:** Students critique and communicate design ideas, processes and solutions to a range of audiences using technical terms, graphical representation techniques and appropriate attributions. (Level 9 & 10).
- **Science inquiry:** Students provide evidence-based explanations for findings and construct logical arguments based on the evaluation of multiple sources of evidence to justify conclusions and assess claims. (Level 9 & 10).
- **Physical sciences:** Students use Newton's laws to describe and predict the motion of objects in a system. (Level 9 & 10).

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KEY VOCABULARY

- **design** – to plan a solution that meets a specific set of requirements
- **build** – to physically construct a design using selected materials and methods
- **test** – to trial a design under controlled conditions to see how well it performs against the requirements
- **evaluate** – to assess how well a design met the requirements and identify how it could be improved



MATERIALS REQUIRED FOR THE LESSON

Student

- Egg Crash: Design, Build, Test Worksheet (Resource 7.1)
- Permitted materials per the worksheet
- Testing equipment per the worksheet

Teacher

- Supporting Slide Deck – as needed, display on screen or use a document camera or write on whiteboard
- Teacher Workbook – as needed for reference, including for display on screen or with a document camera



LEARNING OBJECTIVE

- We will apply our knowledge of safety features to design, build and test a 'mini vehicle'.

SUCCESS CRITERIA

- I can create a design that meets all requirements of the brief.
- I can build and test the design.
- I can reflect on the process and evaluate the design.



TEACHING CONSIDERATIONS

- This can be completed across two lessons or during a double lesson.
 - Further resources: The following may be useful to supplement the material in this lesson:
 - [Tech Schools and STEM Education Centres](#)
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Structure of lesson:

1

INTRODUCTION



TIMING: 5 mins

Activate prior knowledge

- **Show** students Slide 39 of the Supporting Slide Deck.
- **Ask** students to work in pairs to answer the questions on the slide.
- **Check for understanding** by sampling all student responses. Use questioning to support students to elaborate on their thinking and make connections. **Respond** by addressing errors, clarifying any misconceptions and reteaching if necessary.

Introduce learning objective

- **Show** the learning objective.
 - **Explain** how students can achieve this through the success criteria.
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DESIGN



TIMING: 25 mins

Explanation and modelling

- **Distribute** the Egg Crash: Design, Build, Test Worksheet (Resource 7.1) to students (or if using the Workbook, direct students to page 50).
- **Explain** that they are going to design, build, test and evaluate a 'mini vehicle' intended to protect its 'occupant' in a collision.
- **Ask** students to read over the entire design brief independently, annotating anything that is unclear with a question mark.
- **Model** the process of working through unpacking the entire brief with students using a think aloud. **Instruct** students to follow along and annotate their worksheet with additional information that may assist them. **Check for understanding** by asking students to summarise key aspects of the brief in their own words. Support students to ask any clarifying questions they may have or to identify anything that is unclear.
- **Organise** students into groups of 2 to 3.

Guided and independent practice

- **Instruct** students to work through the design process using the worksheet. Explain that they may spend some time discussion and brainstorming ideas, but they then must document the key features and provide a sketch of their design in the time allocated.
 - **Monitor** student progress by circulating as they complete the design documentation. Use questioning to support students to elaborate on their thinking. **Respond** to any errors or misconceptions that arise.
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BUILD



TIMING: 30 mins

Explanation and modelling

- **Ask** students to start building their design. Emphasise that they can revise their design along the way, and it is likely that this will be necessary. **Explain** that they must ensure that the design meets the requirements in the brief.
- **Distribute** the permitted materials to students.

Guided and independent practice

- **Monitor** student progress by circulating as they complete the build.

Reflection on learning

- **Instruct** students to record the details of the three most significant design changes that they made during the build in the table Part 2 of the worksheet.
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TEST



TIMING: 40 mins

Explanation and modelling

- **Ask** students to re-read over the test setup section in part 1 of the worksheet. **Check for understanding** by asking students to summarise key aspects of the test set up in their own words. Support students to ask any clarifying questions they may have or to identify anything that is unclear.
- **Instruct** students to read over part 3 of the worksheet. **Model** the process of working through unpacking what they need to record during testing with students using a think aloud. **Ask** students to follow along and annotate their worksheet with additional information that may assist them. **Check for understanding** by asking students to summarise key aspects of the testing process in their own words. Support students to ask any clarifying questions they may have or to identify anything that is unclear.
- **Model** the testing process using a sample set up with either a test vehicle you have built for this purpose or some other suitable wheeled object. Ensure that you emphasise correct set up, the testing process, and recording suitable observations.
- **Distribute** the testing equipment to students.

Guided and independent practice

- **Monitor** student progress by circulating as they complete the testing process.
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EVALUATE



TIMING: 15 mins

Explanation and modelling

- **Ask** students to re-read over the evaluate section in part 4 of the worksheet.
- **Instruct** students to use their formal and informal observations to respond to each of the evaluation questions in the worksheet.

Guided and independent practice

- **Monitor** student progress by circulating as they complete the evaluate section. Use questioning to support students to elaborate on their thinking. Clarify what is required as necessary.
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CONCLUSION



TIMING: 5 mins

Reflection on learning

- **Instruct** students to respond to the prompts on slide 40 in the Supporting Slide Deck.
 - Were the safety features in your 'mini vehicle' design active or passive? Explain why.
 - How might the results have changed if you used an uncooked egg?
 - The tests did not explore the effect of the vehicle mass in detail, how do you predict having a heavier or lighter vehicle would affect the results? Explain using appropriate physics.
 - **Check for understanding** by sampling all student responses using mini whiteboards or another suitable mode of response. **Respond** by prompting students to make connections and extend their thinking. Address any errors and misconceptions.
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