
## Teaching notes

## How to use this resource

This resource, *Laptop wrap:* *Under the surface*, is designed to support student use of laptops in both online and offline classroom environments.

The resources and tasks promote student understanding of surface area and volume and build capacity in using a variety of information and communications technology.

Tasks 3 and 4 can be completed by students with either [SketchUp](https://www.sketchup.com/education/sketchup-for-schools) or [GeoGebra](https://www.geogebra.org/3d). Both require students to set up a (free) account in order to save work. It is recommended to get familiar with one of these programs so that you can help students with the tasks.

### Explore

In this section there are two puzzles to do with volume from nrich.org. Students will need to be confident about calculating the volume of rectangular prisms to attempt them.

### Your tasks

Students should click on either the icons or the hyperlinked text to view each particular task in a pop-up window. Links have been provided if additional resources are required to complete the task.

Tutorials offering additional assistance using different programs are also available online.

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| **Task 1: GeoGebra Investigations**OneNote or other note-taking software, GeoGebra | Students explore the difference between volume and surface area, examine the algebra in the formulae and use GeoGebra. 1. Open each link (note: The checkboxes reveal the solutions).
2. To capture graphics use the hotkey shortcut – *Home* + *S* on the DER-NSW laptop or within GeoGebra select *File* menu > *Export* > *Graphics View to Clipboard.*Paste graphics into notebook.
3. Utilise relevant tools: superscript, insert symbol etc.
4. Teachers could ask ‘backwards questions’ about what dimensions would give certain volumes or surface areas.
5. Completing a table with the dimensions for some similar solids may be helpful when considering the effect on volume and surface area,
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| **Task 2: Wasted space** GeoGebra, presentation software  | Students create a presentation outlining the solution to the problem: ‘Tennis balls are often packaged in cylindrical cans of three. What volume of space is NOT occupied by the tennis balls?’ |
| **Task 3: Calculating surface area** SketchUp or GeoGebra, OneNote | Students use SketchUp or GeoGebra to construct a solid shape and insert the image in a OneNote file to demonstrate their understanding of surface area. They look at the conversion factors required when converting between units2.1. Students could also investigate mm2 and mm3 conversions.
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| **Task 4: Scaling-up**SketchUp or GeoGebra | Students reduce/enlarge their solid shape and examine the effect on the surface area and volume. 1. Ensure that they scale each dimension equally*.*
2. Depending on how they have set up their shape, students can scale up by typing a scale factor and pressing return.
3. Challenge student conceptions on the change in area, surface area and volume if only one dimension is changed.
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### Quality Teaching Framework

This resource has been developed to support pedagogy and improve student outcomes based around the NSW Quality Teaching Framework, with particular focus on the following elements:

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| ***Intellectual quality*** | ***Quality Learning Environment*** | ***Significance*** |
| 1.1 | Deep knowledge | **[ ]**  | 2.1 | Explicit quality criteria | **[x]**  | 3.1 | Background knowledge | **[ ]**  |
| 1.2 | Deep understanding | **[ ]**  | 2.2 | Engagement | **[x]**  | 3.2 | Cultural knowledge | **[ ]**  |
| 1.3 | Problematic knowledge | **[x]**  | 2.3 | High expectations | **[ ]**  | 3.3 | Knowledge integration | **[x]**  |
| 1.4 | Higher-order thinking | **[ ]**  | 2.4 | Social support | **[ ]**  | 3.4 | Inclusivity | **[ ]**  |
| 1.5 | Metalanguage | **[x]**  | 2.5 | Students’ self-regulation | **[x]**  | 3.5 | Connectedness | **[x]**  |
| 1.6 | Substantive communication | **[ ]**  | 2.6 | Student direction | **[x]**  | 3.6 | Narrative | **[ ]**  |