Embedding career education in the Victorian Curriculum F–10

Mathematics, Level 9

An existing learning activity linked to a particular learning area or capability in the Victorian Curriculum F–10 can be easily adapted to incorporate career education, enriching students’ career-related learning and skill development.

1. Identify an existing learning activity

**Curriculum area and level:** Mathematics, Level 9

**Relevant content description:** Express numbers in scientific notation [(VCMNA303)](https://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA303)

**Existing activity:** Representing extremely large and small numbers in scientific notation and numbers expressed in scientific notation as whole numbers or decimals.

**Summary of adaptation, change, addition:** Investigating the use of very large and very small numbers in a range of occupations.

2. Adapt the learning activity to include a career education focus

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| Existing learning activity | Adaptations, changes or extensions that can be made |
| Teacher discusses the need for a notation to express very large or very small numbers and provides examples of large and small numbers that would be inconvenient to express in whole number format (‘Ten billion’ or ‘10 000 000 000’; and, ‘One-trillionth’ or ‘ $\frac{1}{1 000 000 000 000}$’ ). Teacher provides examples of large and small numbers written both as whole numbers and expressed in their ‘powers of ten’ or in index form, (13 billion = 13 000 000 000 *or* 13 × 109). Teacher introduces scientific notation as an index-form number notation system involving a unit whole plus decimal proportions, multiplied (or divided by) by the requisite powers of ten. For example, 13 billion (13 × 109) is ‘**1.3 × 1010**’ and trillionths (125 × 10-12) is ‘**1.25 × 10-10**’ in scientific notation.Students enter and read large and small numbers using scientific notation on a calculator, and then use index laws to make ‘order of magnitude checks’ for numbers in scientific notation, For example, (3.26 × 104) × (18.65 x 107) $≈$ 60.799 × 1011 $≈$ **6.0799 × 1012** | Teacher opens class brainstorming session on the focus question: ‘What jobs involve the use of really large and really small numbers?’. Students brainstorm as many jobs and careers they can think of that might need very large (> 10 000) and very small (< 0.001) numbers.With lists on board, teacher circles the occupations and careers that involve maths and science. Examples are likely to include chemists, astronomers, engineers, microbiologists, computer programmers, financial analysts, nuclear physicists. Teacher presents the following range of ‘very large’ and ‘very small’ things that need measuring in the real world:**Very large:** Financial measures in the economy, e.g. the value of a country’s production or the amount of government spending; distances between planets, stars or star systems; weights or volumes of large structures such as buildings or bridges; the number of cells in an organism; the speed of light.**Very small:** The size of a viral influenza cell or bacterium; the size of atomic and sub-atomic matter; the length of a blood cell; the electrical charge in a single electron; the time it takes light to travel one kilometre. |
| Teacher sets a range of exercises and problems involving the interpretation and application of large and small (fractional) numbers using scientific notation.Students solve problems involving scientific notation and express final answers in scientific notation. | Teacher asks students to select one large and one small thing from the list and investigate whose job is it to measure this, and how is it measured?Students select two items and investigate the above inquiry questions, recording their findings then sharing with the class.  |
| Teachers work through solutions in class and discuss student responses.Students share responses and mark own work, making corrections and addressing misunderstanding. | Teacher poses the following questions: ‘Why might there be a need for a notation to express very large or very small numbers in these occupational contexts? How could this help?’ After discussion, teacher introduces standardised scientific notation. |
| Teacher collects students’ work for checking and marking.  | Students investigate further to find an example of a specific measurement in their selected focus (‘The number of cells in an average human body is …’), and record this in scientific notation along with an occupation associated with measuring this thing. They record a brief description of the role, including how the measurement is taken and used, and study pathways to the role.Students publish their investigation results onto large posters of butcher’s paper and display around the classroom. They discuss any similarities and differences in the use of scientific notation across the occupations identified. |

Considerations when adapting the learning activity

* Teachers will need to assist students with the names and natures of some of the scientific professions.
* Presenting students’ investigative findings around the room will further reinforce the value of an understanding of scientific notation across a broad range of careers and occupations.

Additional resources to help when adapting the learning activity

* [Introduction to scientific notation](https://prezi.com/chb0eqdsbes6/scientific-notation/)
* Extension opportunity: AMSI: Maths in Context, ‘[Mission to Mars](http://calc.amsi.org.au/wp-content/uploads/sites/15/2016/04/Mission-to-Mars-Teacher-booklet.pdf)’

Benefits for students

Know yourself – self-development:

* By researching the ways in which specific occupations might make use of scientific notation, students understand how people communicate in different settings and for different purposes.
* As they investigate a range of occupations, students develop self-knowledge by building on their awareness of personal interests and potential pathways.

Know your world – career exploration:

* By researching how people use scientific notation in a variety of contexts, students better understand the importance of science and maths to society and thus better understand work.
* Recognising links between maths at school and its application in real contexts encourages students to value current learning opportunities and lifelong learning.

Manage your future – be proactive:

* By researching real-world scientific measurement scenarios and providing examples of how these would be communicated, students engage in opportunities to learn and explore career options.