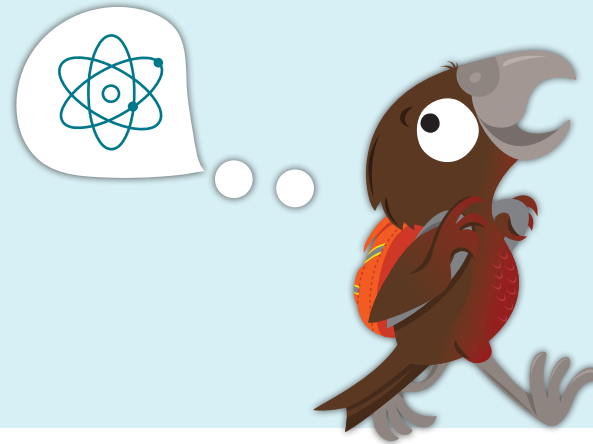


LEARNING AREA: SCIENCE (PHYSICAL WORLD)

Lesson Aim: To understand how gears on a bicycle work
New Zealand Curriculum Level 3

Lesson Overview



The gears of a bike make pedalling more efficient, and allow the cyclist to travel faster and handle steep grades and other obstacles with ease.

In this lesson, students should be encouraged and supported to make predictions and justifications, test predictions, record findings in an appropriate way, communicate findings using scientific vocabulary, and justify potential reasons.

1. Shift the gears so that the chain is on the smallest cog in the front, and on the largest cog in the back. If you have numbers on your gear changers (on the handlebars), this will be the lowest number.
2. Mark the top of the back tyre with chalk or piece of masking tape.
3. Note the position of the pedals. Have someone hold the bike upright as you turn the pedals forward in one full revolution, so that the pedals return to their original position. Make sure you have a friend or teacher stop the back tyre spinning freely with their hand when the pedal returns to its original position.
4. How many times did the tyre revolve? Write down the number of revolutions.
5. Now try the largest gear in the front combined with the smallest gear in the back. This is the highest number on your gear changers. How many times does the back wheel revolve for one turn of the pedals?
 - Which of these combinations would be better for climbing a hill?
 - Which would be better for a sprint on a flat road? (You can test your guesses later by riding the bike!)
 - Experiment with the intermediate gear ranges.
 - Make a chart of the number of rear wheel revolutions each combination of gears produces for one pedal revolution.
 - Why do you think bikes have evolved to have more and more gears?
 - Put on your helmet and hop on your bike. Experiment with what different combinations of gears feel like and describe the difference.

When you change gears:

- Always make sure you are pedalling
- Make sure you pedal a couple of times in between each gear change. In other words, don't go from your lowest gear to your highest gear in one change.

NB. Children do not need to be able to ride a bike to be able to participate in this lesson. If you would like to arrange for an instructor to teach your students to ride, contact Pedal Ready: www.pedalready.org.nz

Specific Achievement Objective Indicators

Physical World

- Explore, describe and represent patterns and trends for everyday examples of physical phenomena such as movement, forces, electricity and magnetism, light, sound, waves and heat.

Key Competencies

- **Thinking:** students need to make predictions and hypothesis, attempt justifications, and challenge and question findings
- **Using language, symbols and text:** record and communicate findings in a scientifically appropriate way

Science Capabilities for Citizenship

- Gathering and interpreting data
- Use evidence
- Interpret representations

<http://scienceonline.tki.org.nz/Science-capabilities-for-citizenship>

Possible applications or extensions of this activity

- Explore bike mechanics, how to care for and maintain the function of a bike.
- Create a prototype for gear function, or design an alternative (technology).
- Organise an out of school cycling excursion which require students to use gears.

Contextual Te Reo

- Haere = Journey, trip, travel
- Pahikara = bicycle
- Ete Pahikara = to bike (verb)
- Pūtaiao = science
- Mātai ahupūngao = physics
- Whakamātau = experiment
- Hurahura = to research / Kairangahau = researcher
- Kauwhata = graph

[Māori Dictionary](#)

Opportunities for cross-curricular links

- **Statistics** – Data collection methods; communicating findings by selecting appropriate graphs and making ascertations
- **Health and Physical Activity (movement concepts and motor skills)** – Explore what muscles are used to ride a bike and how different selected gears effect the body.

Adaptations for different year levels

Level 2:

- Keep gear content knowledge simple; focus on “high gears” being “hard gears” and “low gears”, being “easy gears”.
- Focus on how to use and change gears and the basics of why, in relation to care for the bike.
- Potential to go more in depth with braking function; follow cables between brake levers and see how they work.

Level 3-4:

- Compare how gears on different types of bikes work (e.g. road versus mountain bikes) – what are the similarities and differences.
- Explore how an internal hub works.
- Explore how to care for gears and why certain actions are important – e.g. how is rust caused and prevented? How would a rusty chain impact the function of the bike?