SCIENCE

SSEP EXAMPLE // ELECTRICITY & FENCING
DEVELOPED BY // FRASER HIGH SCHOOL AND GALLAGHER

ACTIVITY EXAMPLE

KEY WORDS

Electricity | electronics | energy | solar energy | circuits | research and development | pricing | animal health | agriculture | voltage | current | resistance |

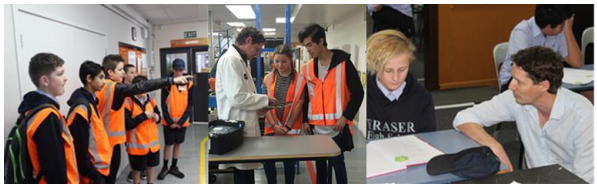
ALSO USEFUL FOR

Agriculture | Horticulture | Maths | Agribusiness | Economics | Business Studies | Digital Technology |

PROGRAMME OUTLINE

3 POINTS OF CONTACT

- Gallagher staff come into classroom (x2)
- Workplace visit (x1)



EXAMPLE

1. Gallagher come into classroom, introduce themselves, background to the organisation, their careers and the how science is used in the industry. **Employer tips:** This session is about getting the students comfortable with the visitors. Ask the students what they know, and let the students direct the conversation. Some topics that students are interest in are, how much money do you make? Education after school? Tax? What an engineer actually does vs what people think they do? Link electricity science curriculum with electric fences. **Student Activity:** Have a product to demonstrate, this engages the students.
2. Workplace visit includes tour of the business, meeting staff and hearing about different careers. Seeing manufacturing, engineering and research & development 'behind the scenes'.
3. Return classroom visit. **Student Activity:** Electric fencing activities. **Employer notes:** Gallagher usually have 2 people in the class with the teacher, so each group has an adult taking them through the activity. These activities have elements that are well beyond some students, in reality only the first half of each activity is usually achieved. With the short time available, the students get more out of actively discussing the activity with each other and the adult, many students don't actually get to writing much down.

ACTIVITY EXAMPLE

Intro Gallagher group

- Overall company, 80 years, 500 in Hamilton, 1000 round world, we design, build and sell
- Farm fences, Animal weighing
- Security, people fences
- Fuel pumps
- R&D Engineering
    - Idea - Free
    - Test $
    - Research and test $$
    - Build $$$$
    - Sell

Intro into electric fencing, demo of a couple of products (2 min)

- Turn on demo products

General intro R&D design process, and describe what the groups are going to be doing (5min)

- Try and find out what the customer wants
- Try and find out what we can give the customer that they don't not know about
- Research and learn about the difficult bits
- Build something and test it
- Sell it
- Continuous improvement

Describe what the groups are going to be doing (5min)

- Split into 3 groups and rotate through 3 activities that relate to the R&D process. About 15min per activity to make up the hour.

Activities, 3 groups

S10 fence tolerance (get a shock), related to how long the battery will last *

Check no-one has a pacemaker or heart condition

Draw the "shock" circuit

Measure everyone in the group, how far can they go and keep their hand on it, record the number from the stick. (Can do individuals, or groups holding hands)

Calculate average, best/worst

Describe why the shock increases along the rod

Calculate the current and power flowing using

Voltage = Current x Resistance

Power = Voltage x Current

Average power = Peak Power x Time

Time = 0.00001 seconds

Position	Resistance Ω
11	100,000
10	133,000
9	166,000
8	200,000
7	233,000
6	283,000
5	317,000
4	350,000
3	384,000
2	417,000
1	451,000

Inside an electric fence (how does it work?)

- Disassemble a solar electric fence unit
- Identify major parts/components
- Draw a diagram of the energy conversion and storage through the entire system from sun to shock
- Show where the energy flows
- What are the types of energy?
- Advanced, work out how much energy flows
    - Solar = 1000W/m^2
    - Measure the panel size and work out the max power in W
    - Assume 8 hours sunlight a day
- Draw the electrical circuit
    - Show where the current flows
- Advanced, calculate the current and power
    - V=IxR
    - V=8,000 V
    - R=200,000 Ohm
    - I=?
    - P=VxI

Electric fence uses and features (customer research)

- Make a list of ways an electric fence could be used (real or crazy)
    - e.g. fence in farm animals or pets, fence in people, fence in fish, light fires.....
- Make a list of cool features it could have (real or crazy)
    - e.g. Bluetooth, Nuclear powered, make it fly.....
- For each item in the lists, think about what that would mean for the product design
- Create a product proposal
    - Features?
    - Cost estimate?
    - How would you sell it?