Cawthron Scitec Expo

Student Teacher Guide

CAWTHRON

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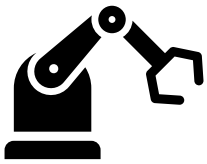
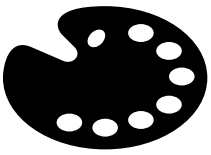
Contents

How to Enter

1. Choose a project type
2. Choose your topics
3. Fill out online entry form
4. Carry out your project, keep a logbook
5. Write up your project
6. Prepare your display (and presentation if applicable)

Choosing a Project Type

Choose a project type that will interest you and topics that you are passionate about.

	**Science Practical** You will need to ask a question that will become a hypothesis or prediction. You will gather data in experiments, in order to prove or disprove a hypothesis or confirm or not confirm a prediction or aim. Follow the scientific method and write the practical up using set guidelines. See pages 5-8
	**Technology** You will need to develop a product, device or process to serve a purpose, a human need, or a problem that needs solving. These projects involve following a set technology process and write up. See pages 9-10.
	**Research** When a practical experiment or a product is not possible, you can chose a topic or question and investigate it in-depth by researching information from which conclusions are drawn. You must show good understanding of your research. See pages 11-12.
	**Art in Science/Technology** Create art inspired by science or technology and display it using any type of media. These projects should be accompanied by a paragraph explaining the inspiration. They will be judged by artists and scientists. See page 13

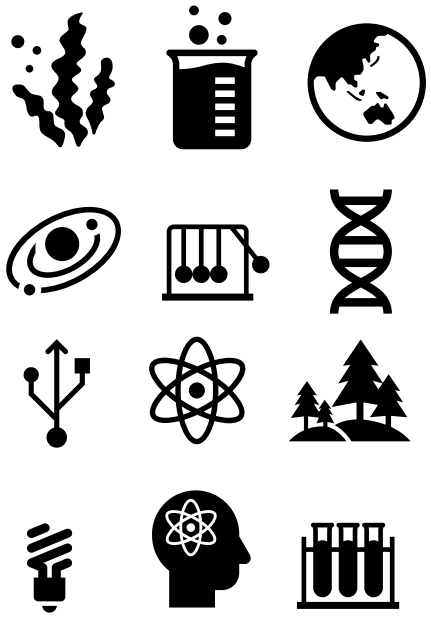
Regardless of what project type you are entering, you will have the option of also entering the **Science Communication** category where you will be asked to present your project to a panel of science communication judges. See page 14.

Choosing Project Topics

Choose topics that you really care about or are interested in. You can also look at what prizes are available for topics you are considering. Your chosen topics will help us decide what prizes you are eligible for and will also help us judge you.

Topics include (but are not limited to);

- Marine Biology
- Biology/Life sciences
- Chemistry/reactions
- Physics
- Conservation
- Sustainability/Environmental
- Electronics
- Astronomy
- Microbiology
- Wood/metal work
- Botany/horticulture/plants
- Social/memory
- Technology
- Earth science/Geology



Science Practical Project

Think of a question you would like to answer

Do some research, ask for advice

Create a hypothesis or prediction

Develop a method

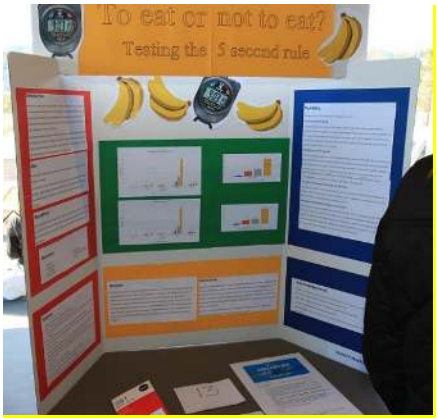
Carry out experiment or test, and collect results

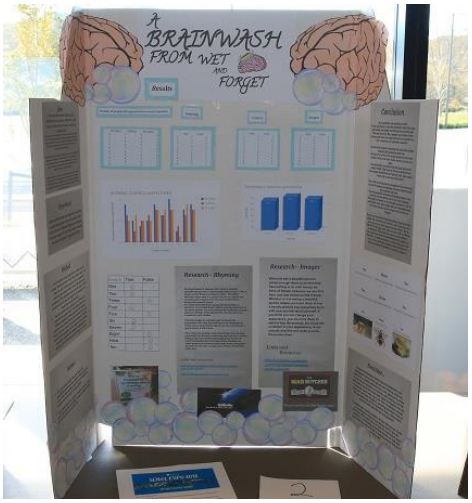
Analyse results

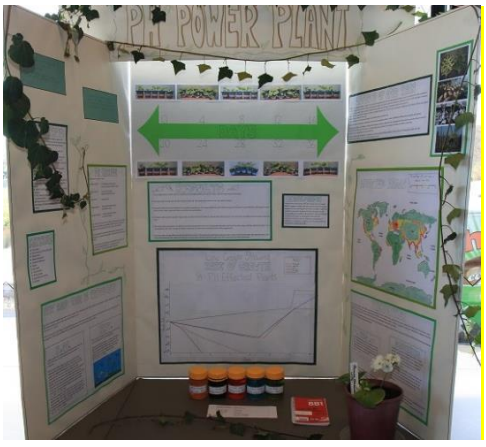
Draw conclusions and discuss your findings

Evaluate your experiment or test, what would you change next time?

Write up project and create display







Types of Science Practical project

Fair test:
Set up a controlled experiment.

Pattern seeking:
Controlled experiments are not always possible, but you can still make study of things you can't control.

EXAMPLE: Chloe's *Fair Test* Science Practical project

Chloe is interested in the outdoors and the garden. She is aware of climate change and global warming. She wonders how rising temperatures will affect plants growing.

Topics: Botany, Biology, Environmental, Earth Sciences

Chloe's question: 'How well do seeds germinate at different temperatures?'

Hypothesis: 'More seeds will germinate the higher the temperature gets'.

Independent Variable (the thing you change): Changing temperature between 5, 10, 15, 20, 25, 30 degrees Celsius.

Dependent variable (the thing you measure): Measuring how many seeds germinate.

Conditions staying the same: same type of seeds, number of seeds, growing conditions, amount of time allowed in each condition, germination stage when counted, water

Method: Chloe makes mini green houses and heats them to set temperatures, she plants seeds in trays, with identical growing conditions. After a set time she counts how many seedlings have emerged. She repeats this with method at different temperatures, being careful to keep all other conditions the same. Chloe records all stages of her work in her logbook.

Analysis: When the experiments are complete Chloe compiles all her data. She makes graphs to display the results. She sees that at certain temperatures many seed germinate but at other temperatures few do.

Discussion: Chloe researches other science and uses information to come up with possible explanations of her results.

Evaluation: Chloe thinks that she controlled her growing conditions well, but next time she could use another type of seed to see if that would react differently to temperature.

EXAMPLE Simon's *Pattern Seeking* Science Practical project

Simon lives by a river and notices the colour of the water changes when it rains. After researching he wonders if the amount of coloured sediment in the water is related to the rain.

Topics: Environmental, Other

Question: Is the amount of sediment in a stream affected by rainfall?

Prediction: The amount of sediment in a stream will increase with rainfall.

Two key variables:

- The amount of sediment: measured by taking samples of stream water over time.
- The amount of rainfall: measured by a rain gauge.

Conditions staying the same: Same amount of water sampled, same equipment, same way of determining amount of sediment, same rain gauge.

Method: Simon measures the rainfall at his house and takes water samples at set times and measures the sediment

Analysis: After compiling his results, Simon analyses them to see if there are any patterns.

Discussion: Simon uses the knowledge he has gained from research to suggest explanations for his results

Evaluation: In future Simon would like to gather more data from different places along the river.

Writing Up: Science Practical Project

Your write-up needs to make sense to anyone reading it who has no background knowledge of your project. Your logbook will be looked at by the judges. These are the main stages of a science investigation write-up:

Background/observation:
What did you observe or find out about your topic that made you think of your question? What science does your observations or research relate to? Hypothesis/prediction/aim: This 'sets the scene'.

Method:
Write your step-by-step method accurately describing what you did to collect data and what equipment you used. Make sure somebody else could redo your experiment by using your method.

Processing results:
Process your results and display them. Tables, graphs, photos, diagrams, statistics and videos can be used to show results.

Interpreting results and writing a conclusion:
What is the data telling you? Write a conclusion by relating what you found out back to your hypothesis/prediction/aim and the relevant science that you identified.

Discuss your results:
Have your results and conclusion made you think of more questions? If so, what experiment would you like to do to learn even more? Are you pleased with your results?

Evaluate:
Did your experiment work well? What would you do differently another time?

Bibliography/Acknowledgements:
What books and websites did you use to find out information? Who gave you valuable assistance?

Technology Project

Technology describes how we can make or adapt something to solve a problem or to allow us to do something new. It requires you to use critical and creative thinking and follow a development process.

You must show independent thinking and good understanding of your topic. Use a logbook to show the development of your ideas and research. Include this with your write-up.

Decide on a problem that needs a solution. Product? Process? Software?

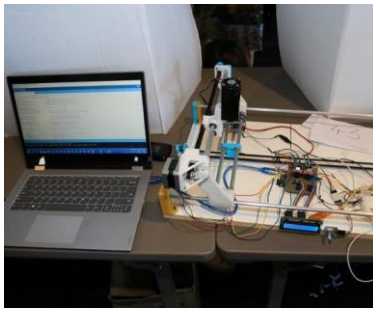
Background research. Consult stakeholders. Who will use it? Where? Research existing solutions to similar problems - check that a solution does not yet exist. Ask for advice.

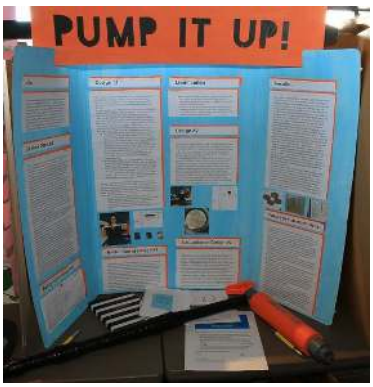
Write a brief to describe your solution - a conceptual statement (who, what, where, when, why) and list specifications to assess whether it is fit for purpose

Generate a range of design ideas. Select one that best meets your brief while being realistic and achievable.

Produce a prototype. Test it and seek feedback from stakeholders

Evaluate the results of your test against the brief - justify why your solution is fit for purpose





Writing Up: Technology

When undertaking your project, you use a logbook to record everything. Your logbook will be looked at by the judges. These are the main stages of writing up a technology project:

Background:
Explain why your project solves an opportunity or need that does not yet have a solution.

Aim:
Describe the problem. What will you aim to do to solve it and what is your criteria for your design? What inspired you to find a solution? Include your brief (conceptual statement and specifications)

Design:
Draw concept sketches or plans showing alternative design options. Show the option you've selected with clear justification of why it will meet the brief and will be a feasible option.

Evaluation:
Discuss how your design performed against your criteria and justify how it is fit for purpose.

Modification:
Show what you changed and why. You can "Design>Evaluate>Modify" several times as technology has a cyclic nature. Explain the role of stakeholder feedback in this process.

Future recommendations:
Show what you would do next. Where do you see this going in the future? If you have done any marketing research included it here.

Bibliography:
What books and websites did you use to find out information?

Log Book:
All projects must be accompanied by a log book, which will show your thought process, every modification and result/observation recorded

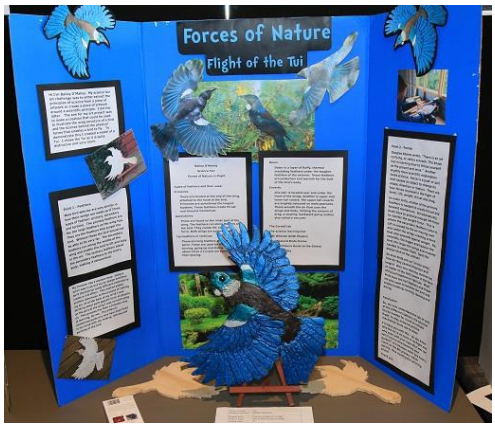
Research Project

Many fields of science can't easily be experimented on. Researching is a major part of scientific and technological work.

Information is to be gathered, discussed and presented on your display board.

You must show your independent thought and understanding of your topic.

Use a logbook to show the development of your ideas and research and include this with your write-up.



Think of a research question.

Research to find information relevant to your initial question.

Ask more questions to show your curiosity.

Research information to answer these questions.

Write up your answers to show your curiosity and understanding.

Draw conclusions from your research.

Evaluate your research, thinking about what else you could have asked.

Write up your project.

Research Project Steps

1. Develop a question or idea for your topics and search for information from books, the internet and asking experts (text, data, images and diagrams). Make sure that you record where you have gained your information from.

2. Select the information that answers your question. Develop more resulting questions and find answers to those questions. This should show a logical progression, curiosity and understanding of your original question.

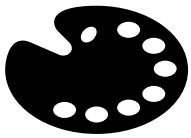
3. Process your information by:
   - Acknowledging any information that you understand and put information into your own words in a way that shows your understanding
   - Relating any diagrams, data or images to the relevant text
   - Annotating relevant diagrams, data or images to explain what they are showing.

4. Show that you understand your research, discuss and link information, evaluate your research and draw conclusions. Conclusions may include your opinion. Indicate possible future investigations that could be done.

Writing-up Research

- Your research may be presented digitally or on a board. See page 15.
- Make sure that your display includes your logbook so that the judges can see a logical development in your thinking.
- Use a larger font and increase the gap size between lines. This makes the text easier to read on a board.
- Don't present your information in big blocks of text. Break up blocks with relevant sub-titles, annotated diagrams, data or photos. A good annotated diagram can easily replace a big block of writing.
- Showing understanding is crucial for this research project. You must show how all ideas relate to each other.

Art in Science / Technology project



Science/Technology and Art seem like totally different type of subjects, but they are connected. Scientists and technologists regularly observe nature for inspiration to solve problems and art can also be inspired by nature, science or technology.

Projects can use any type of media (painting, photography, sculpture, video etc.) including creative technology which allows students to produce a product that demonstrates their *craft skills* in wood, metal, engineering or textiles.

Art projects must be accompanied by a sentence/paragraph explaining the inspiration. The Art section will be judged by artists and craftspeople.

Please refer to the exhibit size restrictions. See page 15.

Communication Presentation

If you have also entered a Science Practical, Technology, Research or Art in Science-or-Technology project, you may also deliver a communication presentation and be eligible for the Communication Award.

The Presentation

You will be required to give a 10 minute presentation to a small audience. This presentation will consist of a speech, and ideally a PowerPoint or props to talk to.

- A PowerPoint, if used, should have 6 - 8 slides presenting key information/diagrams/photos/data showing your understanding and the development of your thinking.
- The slides should contain only 3 – 4 bullet points per slide and mustn't contain too much information.
- Props may include equipment used in you project, something that shows your results, or a model that you developed in your project.

Your Communication

The judges will be wanting you to show how well you understand your project. They will be looking for:

- An explanation of what your project was about and why you chose it
- A discussion of your methods in developing your project
- An excellent understanding of the underlying science
- The ability to evaluate your project
- The impact of your communication.

You will be told the exact time and location of your presentation closer to the time.

Making an Exhibit

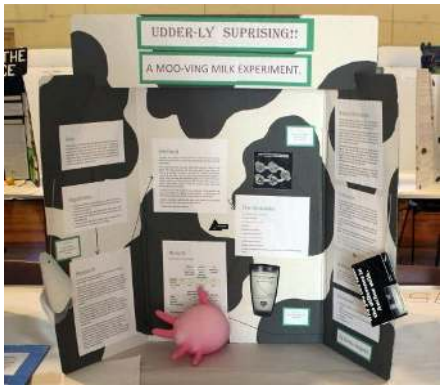
The classical way of displaying your project is shown below. However, you may choose to have a flat poster or use digital technology. Get creative!

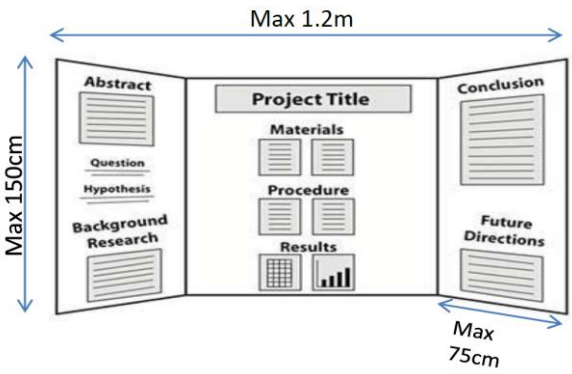
Size restrictions

Every project, regardless of the type, is allocated an equal amount of space (1.2m wide, 1.5m tall and 0.75m deep). Please do not exceed these dimensions or it may be difficult to display your project at the venue.

Recommendations

- Free standing and robust
- Use colour and photos, make it attractive
- Writing no smaller than 1 cm anywhere on your project
- Font larger than you would normally use. Also, increase the gap size between lines. This makes the text easier to read on a board.
- Clearly set out and with a logical flow
- Space in front of board can be used for equipment, product or logbook





Digital presentation requirements

If you choose to display your project digitally, you will need to do the following;

- Identify your project as a digital entry in your online registration
- Use Powerpoint to display your project with no more than eight slides and up to two minutes of video (if desired)
- Save your entry on a cloud-based service. Include the link for this in your online registration
- Complete your project two weeks prior to the Scitec Expo
- Bring your digital presentation to the Expo on a fully-charged laptop

Preparing for an Interview

Every student will be asked questions by the judges so be prepared and give feedback on everything. Be confident - you are the expert on your own project.

Things you may get asked:

- Why did you do this project?
- Did you enjoy it?
- Do you understand the ideas and concepts of the project?
- What was the process you took to complete the project?
- What were the challenges you overcame?
- What would you do differently if you had the chance?

Judging Criteria

It is important to know what you will be judged on, that way you can make sure you score highly. There are separate judging criteria for each different type of project.

Science Practical Project

	Outstanding	Good	Average	Poor	Minimal	Absent
Understanding of background research	**5**	**4**	**3**	**2**	**1**	**0**
Scientifically rigorous	**5**	**4**	**3**	**2**	**1**	**0**
Ability to explain project clearly	**5**	**4**	**3**	**2**	**1**	**0**
Understands results	**5**	**4**	**3**	**2**	**1**	**0**
Logical conclusions from results	**5**	**4**	**3**	**2**	**1**	**0**
Can discuss problems/limitations	**5**	**4**	**3**	**2**	**1**	**0**
Exhibit is well designed and attractive	**5**	**4**	**3**	**2**	**1**	**0**
COLUMN SCORE						
TOTAL SCORE						

Technology project

	Outstanding	Good	Average	Poor	Minimal	Absent
Understanding of background research	**5**	**4**	**3**	**2**	**1**	**0**
Quality of brief and design ideas	**5**	**4**	**3**	**2**	**1**	**0**
Chosen design is innovative and a clear solution to the problem	**5**	**4**	**3**	**2**	**1**	**0**
Stakeholder and end-user considerations are evident in the development	**5**	**4**	**3**	**2**	**1**	**0**
Shows and can discuss skills learned during the development process	**5**	**4**	**3**	**2**	**1**	**0**
Can justify how the prototype or outcome is fit for purpose and meets the brief	**5**	**4**	**3**	**2**	**1**	**0**
Is able to discuss future development of the concept and/or limitations	**5**	**4**	**3**	**2**	**1**	**0**
COLUMN SCORE						
TOTAL SCORE						

Research Project

	Outstanding	Good	Average	Poor	Minimal	Absent
Preliminary development of ideas for the topic or questions	**5**	**4**	**3**	**2**	**1**	**0**
Selected and processed a wide range of valid resources	**5**	**4**	**3**	**2**	**1**	**0**
Shows logistical progression of thought throughout the presentation	**5**	**4**	**3**	**2**	**1**	**0**
Has drawn relevant conclusions	**5**	**4**	**3**	**2**	**1**	**0**
Shows understanding of the underlying science	**5**	**4**	**3**	**2**	**1**	**0**
Acknowledgement of all sources of information	**5**	**4**	**3**	**2**	**1**	**0**
Exhibit is well designed and attractive	**5**	**4**	**3**	**2**	**1**	**0**
COLUMN SCORE						
TOTAL SCORE						

Art in Science or Technology Project

	Outstanding	Good	Average	Poor	Minimal	Absent
Log book demonstrated process, sketches, problems met, learnings etc	**5**	**4**	**3**	**2**	**1**	**0**
Originality in concept or approach	**5**	**4**	**3**	**2**	**1**	**0**
Balanced composition (design and construction)	**5**	**4**	**3**	**2**	**1**	**0**
Technically competent with medium	**5**	**4**	**3**	**2**	**1**	**0**
Understanding the art genre	**5**	**4**	**3**	**2**	**1**	**0**
Exhibit is well designed and ‘works’ as an art piece	**5**	**4**	**3**	**2**	**1**	**0**
COLUMN SCORE						
TOTAL SCORE						

Communications Presentation

	Outstanding	Good	Average	Poor	Minimal	Absent
Effectively explained what their project is about and why they choose it	**5**	**4**	**3**	**2**	**1**	**0**
Discussed the investigative, technological or research methods they've used	**5**	**4**	**3**	**2**	**1**	**0**
Showed excellent understanding of the underlying science	**5**	**4**	**3**	**2**	**1**	**0**
Exhibited the ability to evaluate their investigation	**5**	**4**	**3**	**2**	**1**	**0**
Method(s) of communication chosen had impact	**5**	**4**	**3**	**2**	**1**	**0**
COLUMN SCORE						
TOTAL SCORE						

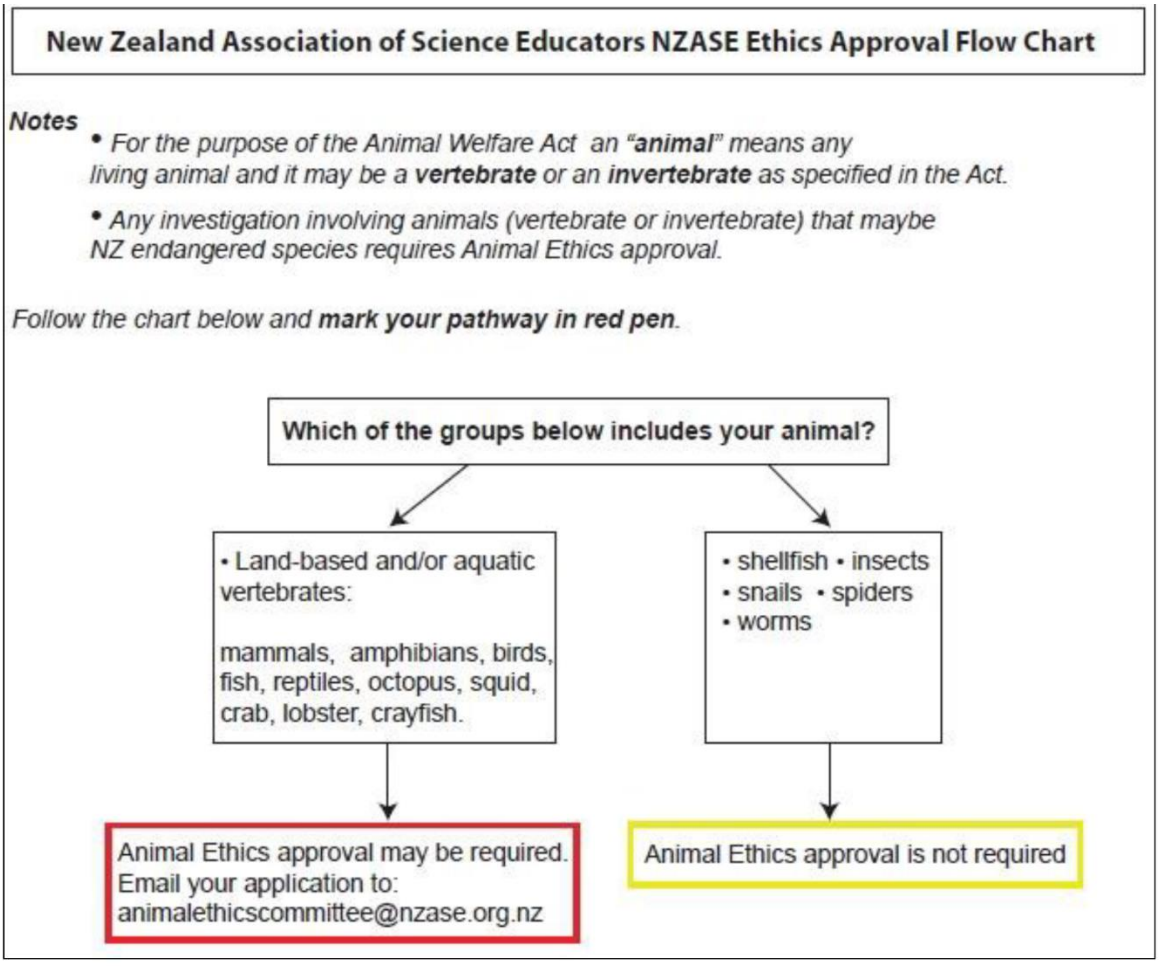
Appendix: Ethics Approvals

Human Ethics

If your project involves adults and children as subjects (eg taste testing) then you need to get the informed consent of all participants. There are no human ethics committees but information and guidelines are available on the Royal Society of NZ website at this location here.

Animal Ethics

If your investigation involves animals, including humans you may need animal/human ethics approval **prior** to beginning your project. Refer to the flowchart below to determine whether or not you require ethics approval. Online application forms, information and ethics approval be obtained from www.nzase.org.nz.



Appendix: Health and Safety

The following safety rules for construction of projects are necessary to prevent electrical fires and prevent injury to exhibitors and visitors.

NOTE: No power supply is available at the venue.

1. Construction must be durable and stable when on display

2. Dangerous chemicals and explosives must not be exhibited.

3. Naked flames cannot be used in any type of display – they are a fire risk.

4. Animals must be fed and their containers kept clean. A certificate of approval from the NZASE Animal Ethics Committee is needed for projects that involve manipulation of animals. See page 20.

5. Human participants in projects must be fully informed and give approval – see your teacher for information and before carrying out your investigation, get approval. See page 20

ALL PROJECTS WILL BE INSPECTED BY THE SCIENCE FAIR COMMITTEE AND THOSE THAT DO NOT COMPLY WITH THESE RULES WILL BE DISQUALIFIED.

Responsibilities: The Science Fair Committee will take due care of equipment and exhibits on display, but it does not take responsibility for loss or damage. Exhibitors are to remove any valuables after judging.

Checklist

- [ ] Read the Student/Teacher guide to understand entry requirements
- [ ] Decide what type of project you wish to enter, and whether you wish to enter the science communication award
- [ ] Complete your online entry registration
- [ ] Check if you need Ethics Approval for your project
- [ ] Do background research and get help from an expert
- [ ] Carry out your project (remember to keep a logbook)
- [ ] Design and create your exhibit
- [ ] Advise Scitec Expo organisers of changes to your original online entry registration
- [ ] Check your exhibit follows all the safety rules
- [ ] Arrange to get your exhibit to the Scitec Expo on time
- [ ] Be present for judging interviews as advised
- [ ] Tell your family and friends to come and see your entry displayed
- [ ] Arrange for your exhibit to be removed from the Scitec Expo as advised once judging is complete