NIWA
Taihoro Nukurangi

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI
VICTORIA
UNIVERSITY OF WELLINGTON

NIWA Wellington Regional Science & Technology Fair

A Student's Guide to the Science Fair

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winner Victoria University Prize 2009

the ROYAL SOCIETY of NEW ZEALAND
TE APĀRANGI

UNIVERSITY OF OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND

IPENZ
ENGINEERS NEW ZEALAND

QUICK FACTS

- Every year, the NIWA Wellington Regional Science & Technology Fair is held in August.
- The Fair is open to year 7 to 13 students. Exhibits are divided into five classes:
  - Year 7
  - Year 8
  - Year 9
  - Year 10
  - Year 11-13
- Each school in the Wellington Region may enter up to 20 projects
- Projects can be in any area of science: Biological Sciences, Physics, Electronics, Chemistry, Astronomy, Meteorology, Geology, Geography, Geophysics, Computing or Mathematics.
- Projects should contain an element of original research.

MAJOR PRIZES (2009)

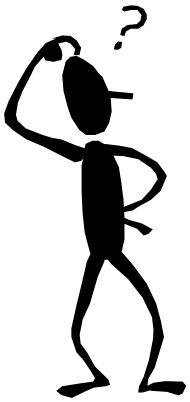
First in Class	**$300**
Second in Class	**$150**
Third in Class	**$100**
Fourth in Class	**$50**
Royal Society of NZ Wellington Branch Prize for best overall exhibit	**$700**
Victoria University Faculty of Science Prize for an outstanding Class 5 exhibit	**$4,500 (scholarship)**
OR Victoria University Faculty of Science Prize for an outstanding Class 1-4 exhibit	**Scientific Journal Subscription**
VUW Faculty of Science Excellence Scholarship for the best Year 12/13 project showing innovation	**$4,500 (scholarship)**

There are also a large number of special prizes that are awarded to projects on specific science fields, such as Microbiology, Chemistry and Earth Science.

REALISE THE DREAM

Up to five best projects at the Regional Science Fair are nominated each year for the 'Realise the Dream' Camp. This is a five-day national sciences and technology event held in December. The event is organised by the Royal Society of New Zealand, and the programme includes a wide range of activities like hand-on workshops, media training and lectures on communication and science-related topics. The finale is marked by a formal celebration dinner, where many big prizes like study grants of up to $7,000 and travel awards are handed out. From 2010 only year 9-13 students may be nominated.

1ST STEP – COMING UP WITH IDEAS

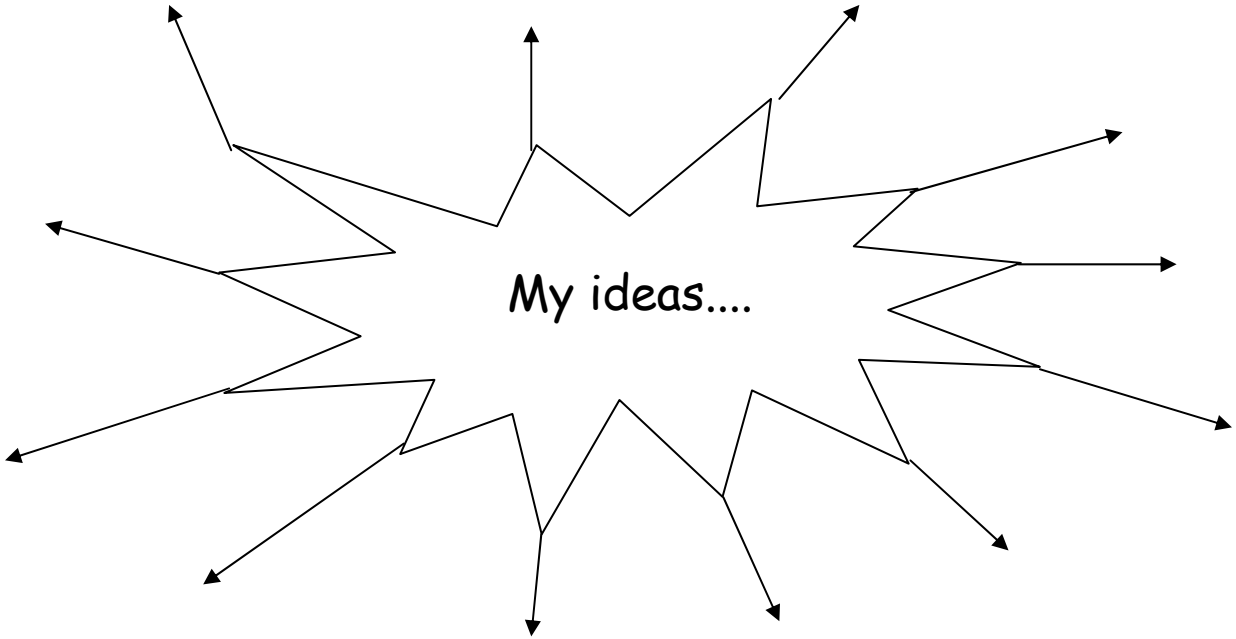


Knowing where to start is perhaps the most difficult step. Here are a few ideas:

1. Start with a real-life problem that you have. What do you find annoying in your daily life? For example:
    a. The supermarket doesn't have a tasty gluten-free ice cream. → You could make your own recipe of a tasty ice-cream.
    b. My mailbox is difficult to use. → You could design a new, more user-friendly mailbox.
    c. My sister always recalls the wrong thing. → You could start an experiment testing the reliability of people's memories and come up with ways to remember better.

2. Or start with a question that you want an answer, something that interests you, makes you wonder. The question can be about microbiology, maths, chemistry, etc. For example:
    a. Mum says *"practice makes perfect"* but is it true?
    b. Can I listen to music while revising for exams?
    c. Would I lose lots of vitamin C if I cooked my veggies?

Use the next page to brainstorm your own ideas and possible solutions.


My ideas....

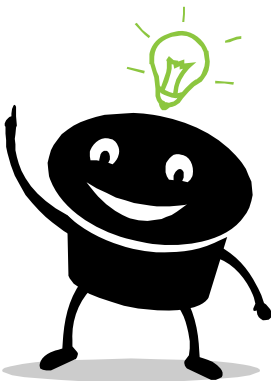
2ND STEP – CHOOSING A TOPIC

Before choosing an idea from your brainstorm, you need to be aware of three different categories - your idea should fall into one of these:

1. **Experimental Research**: a project that involves a controlled experiment
   e.g. which brand of battery lasts the longest
2. **Technology Development**: this is where your idea involves creating or designing something to help people or make life easier:
   e.g. inventing a new, more user-friendly mailbox
3. **Research to increase knowledge for environmental or social systems**: this is where your idea is tested by gathering and analysing data instead of using controlled experiments, such as doing a survey.

After you have brainstormed some ideas, look at each of them and ask yourself:

1. Does my idea fall into one of the three categories? Which one?
2. Can I design a method that is feasible?
3. Can I finish the project within a few months, in order to meet the deadline?
4. If I have to buy equipment to do the project, will it be cheap?
5. Is the project appropriate for my year level?
6. Will I really enjoy finding out the answer or the solution?

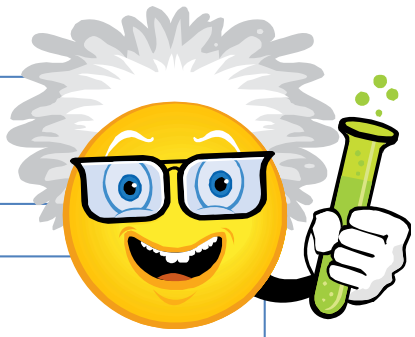


You can also browse the net, discuss with your teachers, parents and friends. Seek advice from experts. When you answer 'yes' to all six questions and are satisfied with the idea, then use that as the topic of your project.

The topic of my project is:

3RD STEP – THE DESIGN PROCESS

EXPERIMENTAL RESEARCH



LogBook
- Get a notebook - an ordinary exercise book will be fine
- Start making notes of everything you do, find out, think ...

Research
- Do some background research on the topic
- Find out what others have done
- Use the research as the basis of your questions

Aim
- What do want to find out?
- Why do you want to do the experiment?

Hypothesis
- What do you think will happen?
- Make an educated guess from the background research you have done

Equipment
- Find out and list all the equipment and resouces you need
- Also list all the independent, dependent and controlled variables

Method
- Give the instructions for your experiments clearly and consisely and in order, so that some-one else can repeat it
- Number each step, and begin each step with a verb, e.g. place, mix, cut

Results
- Record all the raw data in a table. Include samples, photos, diagrams, etc where appropriate
- Process the data - often a fully-labelled graph is an excellent ,visual way

Discussion
- Discuss the difficulties you've encoutered and how you can do better next time

Conclusion
- Was your hypothesis right? Why?
- Do you have any theories to explain the data and the hypothesis?
- Have you learnt anything?

TECHNOLOGY DEVELOPMENT

LogBook
- Get a logbook and record everything you do

Problem
- Start with a need or opportunity
- Are you improving existing technology or designing a technological innovation? Think about how it would benefit certain groups of people

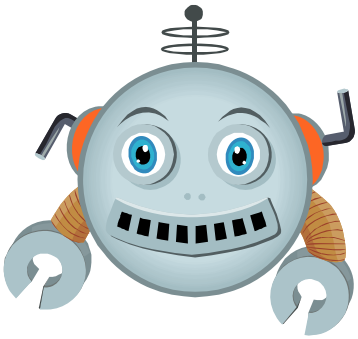
Research
- Find out what others have done about the identified problem
- Find out about the cost of equipment and resources

Solution
- Start with a drawing/model, then build a series of prototypes
- Carry out appropriate tests, performance measurements, etc.

Testing
- Try your solution with a sample of people
- Ask for feedback and keep making improvements until you're satisfied
- Again keep a record of all the testing

Discussion
- Has your development been successful?
- Discuss the application of your solution. Will others find it useful?

Market
- Come up with creative ideas for production, packaging and marketing



RESEARCH

LogBook
- Keep a logbook of everything you do, find out, think ...

Research
- Give the reader some background information to your topic and reasons why you choose this area of research

Plan
- List key questions
- Identify possible resources

Collect
- Collect relevant information from a range of sources, e.g. books, multimedia, surveys
- Think about the science ideas and technology involved in the research

Process
- Organise and evaluate selected information on the topic
- Summarise your research findings
- Select relevant and useful illustration, diagrams and graphs

Interpret
- Think about what the selected information means in terms of your research topic
- Link to the science ideas and technology principles

Discussion
- Did you encouter any problems during your research?
- If so, how can you improve next time

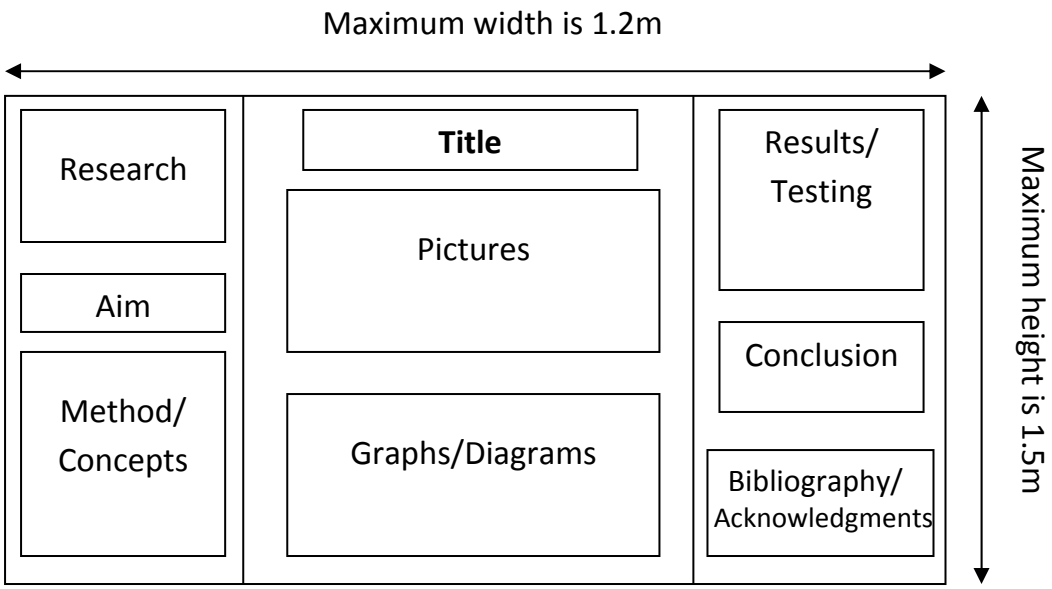
Report
- Write the final draft of the report
- The final report can include illustrations, graphs, models, etc.
- Include a full list of references of resources used

Conclusion
- Make generalisations and form judgments
- Have you answered all the key questions in your plans?

4TH STEP – PRESENTATION

At the Wellington Regional Science Fair, you will need to display your project on a board. Most stationery shops sell this. Be as creative as you can when putting the information on the board. Include pictures, charts, diagrams, and you can even put your model or a small demonstration in front of the board.

To give you an idea of how to start, have a look at the board below and see how different sections are typically arranged:



Maximum depth is 0.75m.

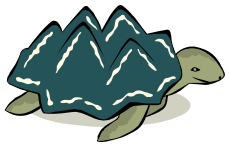
Class 4/5 students can be more creative in their presentation. You can make PowerPoint slides, build a web page, etc. Include heaps of pictures, animations, charts, etc. Let your imagination run wild! Note that if you choose to do a PowerPoint or web page, you will be given a 10-minute slot to present your work.

Once you're satisfied with your project, tell your teacher to have it sent away for judging.

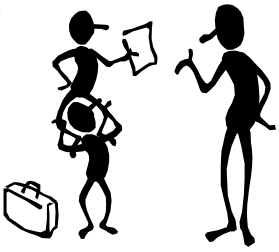
SOME EXTRA TIPS:

- Always keep a log book that records everything you do – all of your ideas and attempts, even failed ones. A simple school exercise book does the job fine. Remember to date every entry as well.

- If your project involves animals, you should be aware of the health and safety guidelines. You will need to apply for approval if you plan to use any vertebrate or endangered animals. Go to www.nzase.org.nz for more information.



- If your project involves people, you need to prepare an information sheet to give to the participants, so that they can be fully informed about the project and what is expected of them. For each participant, you also need to prepare two copies of the consent form (one for them and one for you) for the participant to sign. Parent's consent is also required if a participant is under 16.

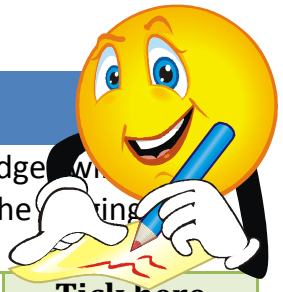


- Your project doesn't have to be complicated to win. Keep it simple. You should however be creative and original in your method/design.

- Always include a bibliography. Note that at NIWA Science Fair, Wellington City Libraries offer a special prize of a $50 book voucher for a project with the best bibliography.

- Acknowledgments are very important as well. You need to list and thank all the people or organisations who have helped you with your project. The judges need to know how much help you've received, in order to avoid any suggestions of unfairness or plagiarism.

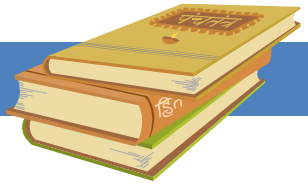
5TH STEP – SELF-EVALUATION



When you have finished check your project against the things the judge will be looking for at the Fair. Can you put ticks against them all? Here are the judging criteria:

Criteria	Tick here
Scientific Method and Understanding • clear scientific thought, the application of appropriate scientific methods, an appreciation of the need for accuracy in observation, measurement, data collection and reporting • an understanding of the underlying or related scientific principles embraced within the project • ethics approval or consent gained if necessary	
Technical & Graphic Skill • assembled with skill and dexterity, equipment, models and the frame of the project have been well constructed • graphic materials have been carefully prepared and presented • living plants and animals have been well cared for • working parts are reliable • the whole is well planned and neatly finished	
Originality • uniqueness of approach • resourcefulness in obtaining and interpreting data • ingenious use of illustrative objects, inventive apparatus • insight conclusions • inspired applications of the principles, process or product	
Thoroughness & Effort This is reflected in: • the scope of the topic • the scale of the investigation • the detail obtained • the extent of the results • the repetition of the experiments • the construction of the project and its illustrative items • written material and other displays	
Presentation • well designed and developed to be attractive, visually interesting, informative on all aspects of the investigation • well illustrated with photographs, models, specimens or samples • has wide public appeal	

RESOURCES



- http://www.sciencefair.org.nz/
  This is the official website of the NIWA Wellington Regional Science Fair. You can read about all the rules, guidelines and deadlines there.

- http://www.realisethedream.org.nz/
  Visit this website if you want to find out more about the national Realise the Dream Science camp. You can also read about past participants' projects there and perhaps use them as an inspiration for yours!

- http://www.projects.org.nz/
  This student-run website is designed to help you through the process of doing any science project. It also has information about similar science competitions in New Zealand.

- You can surf through the following websites to find a science fair idea:
  www.all-science-fair-projects.com
  www.super-science-fair-projects.com
  www.ipl.org/div/projectguide/

- www.nzase.org.nz/safety.html
  This website has all the safety guidelines you need to know when doing experiments in laboratories.

- And of course, when you're stuck or unsure, you can always ask your teachers or parents for help.

Good Luck ☺