The *NIWA* Auckland City
Science and Technology Fair

Student Information Booklet

What's in this Booklet

This book contains a lot of important information about;

- ➡ the way you need to proceed with your project
- ➡ issues of safety while carrying out as well as presenting your project
- ➡ guidelines for size and display of your work
- ➡ measures required to complete your project correctly
- ➡ the prizes that may be awarded at the Fair (based on previous years awards)

Getting Started

Please Read Carefully!

Working Alone or with a Partner (Maximum of two people per project)

Your first decision is - are you going to work alone or with a partner. If you are working by yourself then you can continue working through this page. If you choose to work with a partner (**and you may only work with one other person**) then you will need to work through most of these instructions together.

Start Your Log Book Next

Get a small exercise book and record **everything** you do on your project. This is your Log Book.
You may use a digital log book provided by your teacher - but this must be printed out if your project goes to the fair.
Full details on Log Books are on Page 4

Choose a Project:

Get an idea of what you want to investigate. Your ideas might come from your hobbies, or something you have learnt at school, or from something you may have seen in the media.
Try to avoid consumer testing type projects and try to choose something unique.
Make a list of possible topics and choose the one that you like the best.

Research the Topic:

Gather information on the topic from many sources including: libraries, companies, experts, the media, the Internet, etc.
Establish contacts to assist you and critique your work. These may be family friends, experts from educational or scientific institutions or may be someone from the local chemist, garden etc.

Organise the Information and Your Time:

Refine your idea so that you define an achievable project. Set deadline dates for each step of your project. Check with your teacher for the date your project is due and any other deadlines relevant to your work.

Plan Your Practical Work:

Write a plan detailing how you will undertake your practical work. Your approach may differ depending on whether you are undertaking a Science, or a Technology project. Check further on in this book to assist you in deciding this.

Fill out your Entry Form

This form can be collected from your teacher, filling it in before you start your practical work is a good idea. This will help you to determine if you need to obtain ethics approval. Return this form to your teacher so it can be sent in with your school entries before the close of entry date.

Fill out your Safety & Certification Form

This form should be collected from your teacher, fill it in. You should also complete this before you start your project. It must then be attached to the **back** of your project for it to be accepted into the Auckland Fair.

You will need to know the following:

What is Your Category of Entry?

Firstly is your project Science or Technology?

Then into which category does it fit? If you are not sure, check with your teacher.

Do You Need Ethics Approval?

To determine if you require ethics approval you should read the information in the Ethics Book. Check with your teacher if you are not sure.

- If you require ethics approval, fill out the appropriate form and send away as soon as possible
- If you are using animals (that don't require ethics approval) or micro-organisms then you will need to fill out a Care & Safety form which you should get from your teacher

Does Your Project Have Any Safety Concerns? If your project has fungi or bacterial culture plates, dangerous chemicals, produces electromagnetic emissions or uses mains electricity there are safety issues involved. See Page 11

Undertake Your Practical Work:

Keep detailed records of what you do at all times in your Log Book.

Do not rely on your memory.

Examine Your Results:

Record your observations and measurements accurately in your Log Book. Science and Technology require different approaches to how results are presented.

Draw Conclusions - Process and Interpret the Information You Gathered:

The conclusions you draw depend on the type of project you have undertaken. What do your results show? Do you need to conduct more experiments? Has your hypothesis been proved or disproved? What should you do next? You may need to consider returning to the planning stage and to repeat some of the project steps again, but with a modified approach.

Present Your Work

It is recommended that you a purchase a cardboard display board or make one of corrflute with fabric hinged panels, or similar. It must be freestanding and easily transported. It should not be larger than the following: 1.2 m wide, 1.0 m high and 75 cm depth. *(See Page 5 for full details*).

Check Your Display:

-has your Safety and Certification form attached to the back of the project

-has no hazards or dangerous parts, no dangerous or flammable chemicals, safe electrical wiring.

-has an Ethics Approval Form if it involves animals or other humans. (This may be in your log book or attached to the back of your project)

-has no bacterial or fungal plates on it as part of the display.

Attend the Fair - if Your School has Chosen Your Project

You must bring in and set up your projects at the venue on the Thursday before the Fair making sure you have it checked before you leave. Your teacher may take your project to the fair for you. If this is the case you can add any extras to your project on Judging day.

Then return on Friday, at the time given by your teacher, for judging. You must be prepared to discuss your project with the judges. Ask your teacher for the specific dates and times.

Log Books

Log Books are an essential part of every project.
They should accompany your project when it is displayed.

They are:

A Diary	-to keep your thoughts and ideas in
	-to plan how you will use your time
	-to keep a record of what you did and when
A Workbook	-to record your method, the mistakes you made, your improvements, the things you need to do and the things you could do
A Notebook	-to record notes from conversations with teachers, interviews with experts and ideas from family and friends
A Research book	-to record the information you gained from textbooks, the Internet, libraries, businesses
	-to record the names and addresses of where your research came from
A Record book	-to write down your raw results, from all your trials and your final experiments and tests
A Draft book	-to write out drafts of all your final notes and to change and revise them to make them better

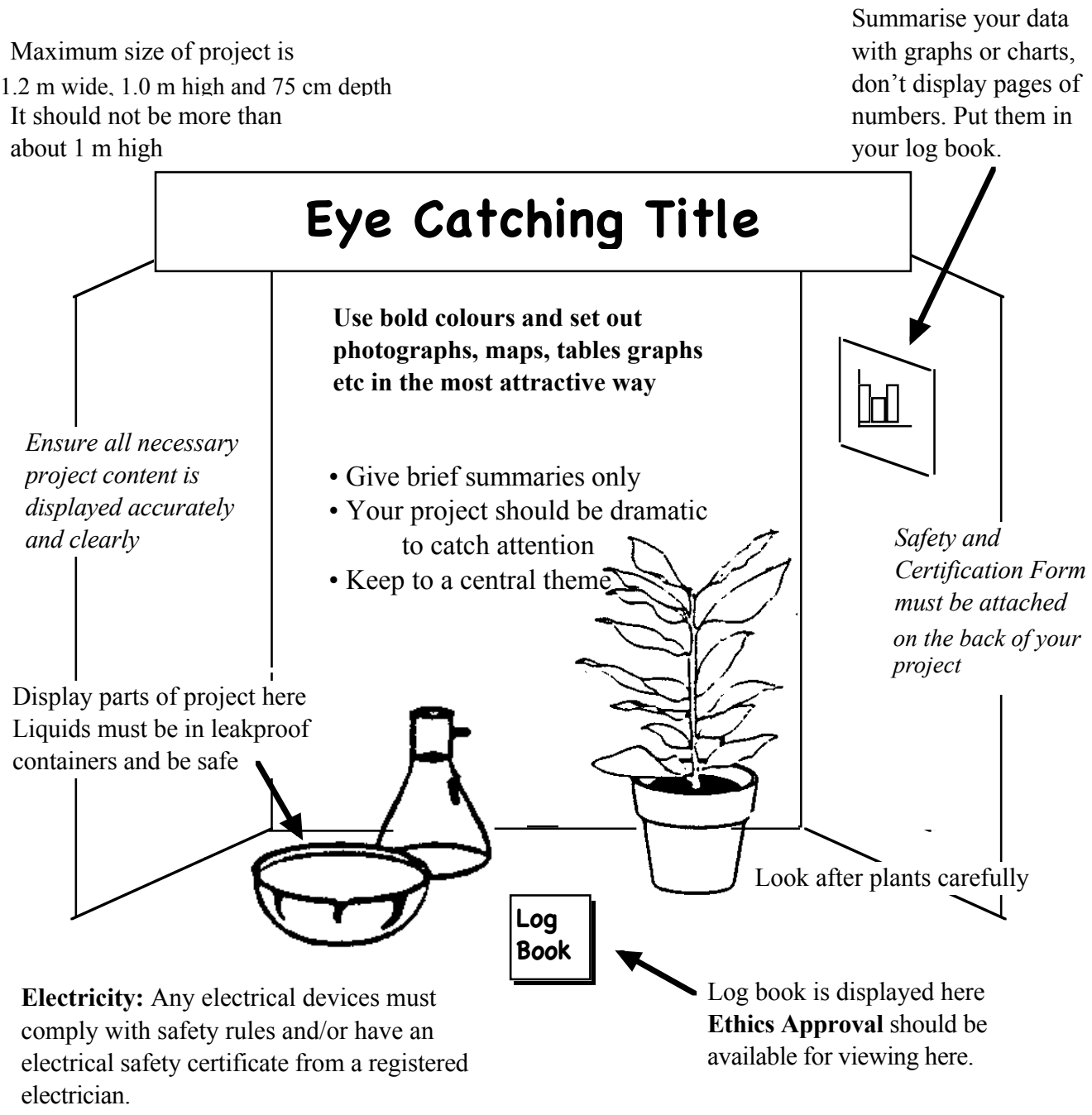
Your log book can be hand-written, it should show how much work you have done and it indicates the way you have thought through your project
If you keep a digital log book remember to keep all versions of your work - and any comments you may have added. It should show the progression of your work and the changes you have made.
You will need to print a copy of your digital log book, to be viewed by the judges at the fair

Remember

Write it down as you go.

Don't leave it to your memory

The Display The way your work is presented is an important part of your project.



After you have spent your time making sure your work is completed to the best of your ability, you need to make sure it is displayed to show its full potential.

The Display Board

Remember this must be easily transportable and **freestanding**.

It may be made of cardboard (suitable boards are available from some stationery shops) corrflutte, with fabric hinges, or other lightweight material.

Check carefully that it falls within the correct dimensions: maximum of 1 m wide, 1.0 m high and 0.3 m deep.

You should check you have followed all the safety regulations. *See Page 11*
and ethics regulations *(see Ethics Booklet)*
and your Safety & Certification Form is attached to the **back of your project**

Categories

Category No.	Description	
1	Years 7 & 8	Living World
2	Years 7 & 8	Physical World
3	Years 7 & 8	Material World
4	Years 7 & 8	Planet Earth and Beyond
5	Years 7 & 8	Technology
6	Years 9 & 10	Living World
7	Years 9 & 10	Physical World
8	Years 9 & 10	Material World
9	Years 9 & 10	Planet Earth and Beyond
10	Years 9 & 10	Technology
11	Years 11,12 & 13	Science
12	Years 11,12 & 13	Technology

The Living World
Projects involving living things
(If this involves animals you may need ethics approval)

The Physical World
Projects involving physical phenomena – forms of energy, motion, forces etc

The Material World
Projects involving chemicals and their properties and reactions

Planet Earth and Beyond
Projects related to the earth and its processes or space

Technology
Projects involving the design and creation of a solution to a problem producing a product, process or environment that serves a real need. (If you have people or animals testing your product you may need ethical approval)

Can't decide which category your project fits into?

Check with your teacher first, and they should be able to help
Sometimes it is difficult to know which category it should be in, as it seems to fit well into two.
You should make your decision, place in that category and then check with the judges when you bring it into the Fair.

Prizes

Kindly Donated by our Sponsors (2016)

Category Awards
1st, 2nd and 3rd in each category

Bronze Sponsors' Awards

NZ Soil Science Society Award
New Zealand Statistical Association Awards
Clare Butcher Award for Natural History - Entomological Society
Ornithological Society Award
Baking Industry Research Trust Award
NZIFST - Award for Food Technology (New Zealand Institute of Food Science and Technology)
SAANZ Prize for Social Science Focus (The Sociological Association of Aotearoa (NZ))
Delta Education Supplies Award for Best Inquiry Into our Changing World
Stardome Award

Silver Sponsors

ASTA Award for Experimental Design
Auckland Dental Association Award for Human Biology
Bob Briggs Memorial Award
RIMU, Auckland Council Award
Transport Auckland Council Awards
A Day in the Life of Auckland Transport

Gold Sponsor
University of Auckland

University of Auckland Physics Department
University of Auckland Junior Scientist
Photon Factory Award for Technology Years 7 - 8
Dodd-Walls Centre Prize for best exhibit(s) involving optics or similar
University of Auckland - Dean of Science Creativity Prize

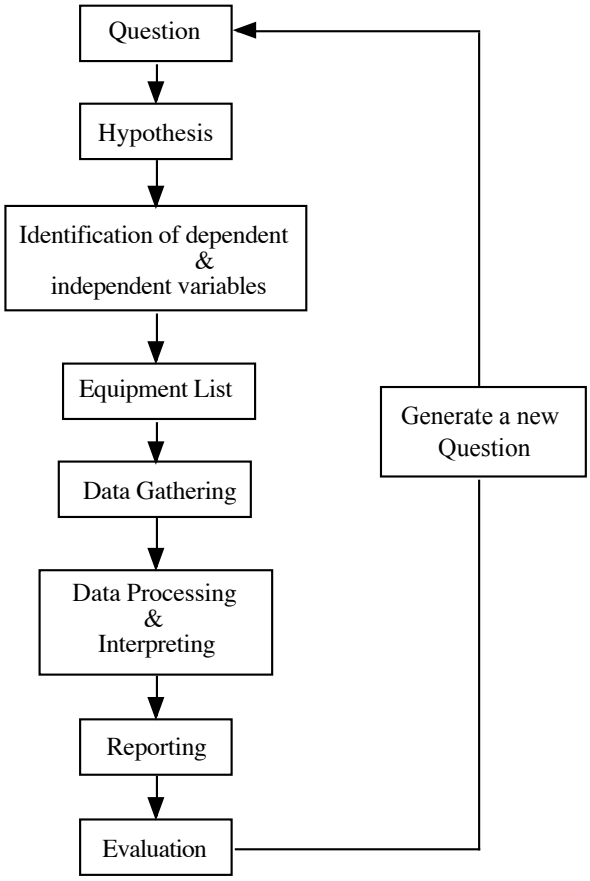
Platinum Sponsor
NIWA

- **NIWA Auckland Prize** -Best Exhibit in Atmospheric and Water Science
- **NIWA Platinum Award** -Runner Up to the Premier Award
- **NIWA Premier Platinum Award -** Best Overall Exhibit in the Fair

The Scientific Method

What is Good Science?

Good Science usually involves researching your topic to determine your background knowledge, development of an hypothesis, the testing of that hypothesis by controlled experimentation or observation ensuring at least three replications, the collection, processing and analysis of data mathematically and statistically, and the communication of valid conclusions based on those results.



What Should You Have On Your Science Project?

Title:
Make it big, bold and interesting.
Introduction:
State the problem to be investigated and why you chose it.
Aim:
State your aim clearly.
Hypothesis:
Write what you expect the results to be.
Method:
Explain what you did. Use diagrams and include photos if appropriate
Include equipment or models if possible.
Results:
Provide graphs of data if appropriate. Make these clear, accurate and visually appealing. Tables of numbers are important but may be best placed in your log book.
Conclusion:
Record what your results have shown.
State if they agree with your hypothesis.
Discussion:
Suggest what your results mean?
Do more questions need to be asked that could lead to further investigation?
Were there any errors that may have affected your results?

You Should Also Have:
Safety & Certification Form:
Fill it out correctly and attach it to the back of your project
Log Book:
You must include a log book which records everything you do on the project.
Appendix:
Any additional and useful information
Bibliography and Acknowledgements:
Include a bibliography of all texts and online resources. Include written acknowledgement of all people and organisations who have helped you. This may go in your log book.

Science Investigations Should Show the Best …

Focusing and Planning:

Focusing and Planning includes:

- Researching your topic and summarising your findings
- Focusing on a question to investigate and refining the question until a manageable question is developed which will allow **quantitative measurement of the relationship between two variables**
- Identifying appropriate variables - both dependent and independent variables
- Making testable predictions based on scientific concepts. The prediction should evolve from scientific experiences you may have had, or that you have previously gathered information about
- Selecting appropriate equipment
- It is essential that the following are clearly identified:
  - -the dependent variable
  - -the independent variable
  - -other factors that need to be controlled

Carrying Out A Plan

Carrying out a plan includes:

- Gathering information, as data, photographic evidence and supporting information using a systematic format e.g. table, diagram, graphic, etc.
- Using equipment with precision, using relevant number of significant figures to show the intended precision of data
- Recording all relevant information systematically in a logbook with dated milestones that you determine
- Choosing a range of variable values that is as wide as possible to most effectively identify the trends and patterns, and using equipment that will suitably enable this to happen
- Making sure that at least three sets of data are collected for each trial and that a variety of trials is used
- Making sure that each set of data is accurate and precise, but do not delete data that seems to be incorrect. Acknowledge data that does not fit in, using brackets and notes.

Processing and Interpreting:

Processing and Interpreting includes:

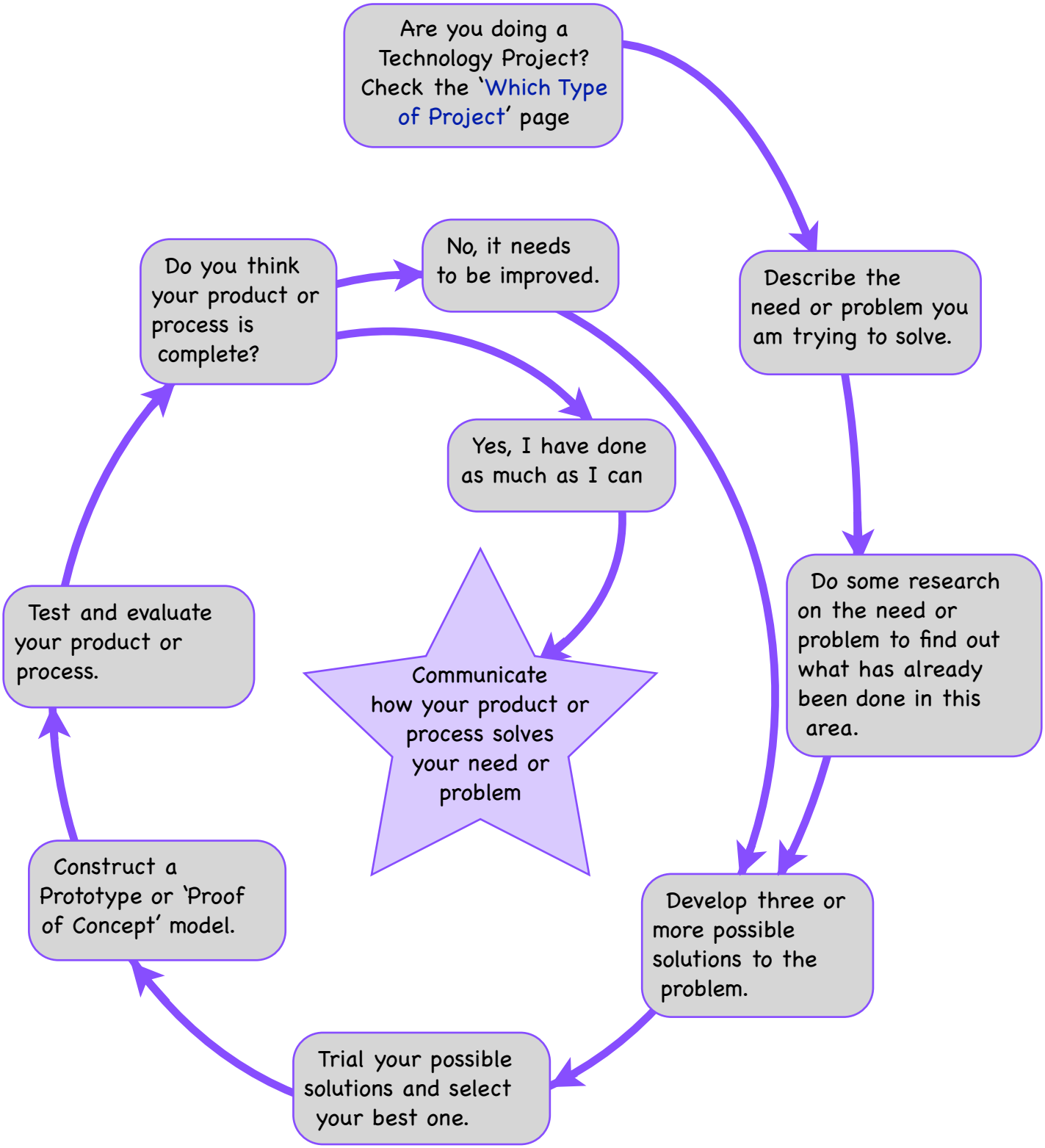
- Determining which items of data may be irrelevant because of mistakes and eliminating them or repeating the measurements to check them
- Carrying out statistical, mathematical and graphical strategies to identify trends, patterns, and relationships where appropriate. This may be done using graphs, spreadsheets, equation etc.
- Using reasoning to draw and justify conclusions on the basis of evidence
- Evaluating the investigation to determine how you might have improved the reliability by describing the systematic and random uncertainties that might have been present and discussing how to reduce these uncertainties where possible. Also describing difficulties and how you overcame each one

Communicating and Reporting:

- Communicating and Reporting includes:
- Writing text and symbols
- Drawing diagrams
- Tabulating data
- Identifying sources of information in a Bibliography
- Presenting a high quality display preferably using light weight material

NIWA Auckland City Science and Technology Fair
Technology Process

Follow the arrows around the chart to complete your project.



Which Type of Project am I Doing?

If I am doing a Technology project I will be designing a solution to an identified problem or need that serves a real purpose.

e.g. The problem is my schoolbag straps keep breaking. I have designed and made a super strong strap to help with this

The problem is Auckland traffic congestion. I have designed a process to help with the traffic at peak hours

Safety Requirements

Exhibit Safety is of Extreme Importance

The following must be considered

1. The use of animals **may** need approval from the Ethics Committee. If you require approval you must apply for this before you start your experiment. *(See Ethics Booklet for full details).*
While there is no specific humans ethics committee to apply to, there are certain factors that should be considered. You should read the ethics information book or check the Royal Society website which gives ethics information for students who carry out similar investigations for Crest Awards.
https://royalsociety.org.nz/what-we-do/funds-and-opportunities/crest-awards/

2. Projects must not include fungi or bacterial culture plates as part of the exhibit. Photos must be used. Any exhibit, which is, in the opinion of the Chief Judge, unsafe, will be rejected. From where samples may be taken, can be found on Page 34 of this Ministry of Education document
http://www.nzase.org.nz/files/stanz-resources_4_1277119556.pdf

3. Chemicals that may spontaneously combust, explode or emit toxic fumes are prohibited unless permitted by the organising committee. Ask your Science Fair Teacher to discuss this with the committee.

4. Equipment that produces electromagnetic emissions must comply with accepted safety standards. These can be obtained from Occupational Safety and Health, at the Department Of Labour.

5. Any exhibit requiring mains electricity must be constructed to comply with electrical safety laws. Exhibits using in excess of 12 V AC or DC and currents exceeding 50 mA **must be certified as safe by a registered electrician or electrical engineer**. Contact the Ministry Of Commerce for advice in this area.

6. All exhibits must be transportable with moving parts firmly attached and safe.

All projects will be inspected before they are placed on display on the Set-Up Day. It is the exhibitor's responsibility to ensure this check is made and they receive an **Acceptance Sticker** which is attached to their offical name tag. If any of the above requirements are not met, or if the exhibit is not checked on Set -Up Day then the exhibit **will not** be considered for judging.

Criteria for Judging Science Projects

Judges will evaluate your strengths and weaknesses in these areas

Scientific approach: (scientific thought and understanding)

- Evidence of links to curriculum area / scientific knowledge
- Statements of purpose / predictions / questions
- Data collection / observation record
  uses a range of scientific symbols, conventions, and vocabulary.
- Thoroughness / statistics / replication
- Awareness of a bigger picture / links to other elements of scientific research

Originality

- Evidence of own work / ownership
- Development of interpretation / conclusions
- Acknowledgement of sources / support
- Standout features evident

Skill (*technical skill)*

- Expertise appropriate for year level
- Evidence of progression of learning / value of outcome
- Appropriate use of equipment
- Safety issues considered and adhered to

Organisation

- Relevance identified / link made to learning
- logic / creativity apparent in presentation of material
- evidence in report / log book of direction / development / time
- evidence of care /ethics / environmental awareness
- evaluate the suitability of the investigative methods chosen.

Criteria for Judging Technology Projects

Brief Development:

- What is to be done?
- Why should it be done?
- The specifications are defined.
- The end users are described and their needs identified.
- Ideas to meet the need are described

Planning for Practice

- Planning stages are identified.
- Milestones are described.
- Evidence of reflection and forward planning is presented.

Possible Solutions

- Mock-ups, models or prototypes are shown.
- Is it fit for the purpose?
- Does it meet the brief?
- Does it meet the needs of the end users?
- Does it meet the specifications?
- Any future opportunities are identified.

Innovation and Originality

- Evidence of originality or innovation is shown.

Technical Skills

- It is well designed and constructed.
- It is reliable in operation.
- It shows skilful use of tools and instruments.
- It is well planned and neatly finished.

Presentation

- Steps are recorded with detail.
- The text and diagrams are clear.
- Assistance is acknowledged