STAWA
SCIENCE TEACHERS' ASSOCIATION OF WESTERN AUSTRALIA

# Category 1: Science Investigation

## What is a research investigation?

An investigation is an attempt to find, in a scientific way, the answer to an original question. The scientific way may involve careful recording of organised observations such as watching the behaviour of wild birds or the movement of planets. It may use an experimental procedure that involves designing an experiment, controlling variables, interpreting your data and making a conclusion. Investigations always look for reliable results that can be used to explain or predict events.

Entry requirements for this category are different for each of the four sections below. Please make sure you read the requirements for the section you are entering.

The different sections for this category are:

- Research Investigation – Early Childhood (Years K-2)
- Research Investigation – Middle/Upper Primary* (Years 3-6)
- Research Investigation – Junior * (Years 7-8)
- Research Investigation – Intermediate * (Years 9-10)
- Research Investigation – Senior * (Years 11-12)

* Entries in these sections may be eligible for selection into the **BHP Foundation Science and Engineering Awards.**

*Note:*
*It is acceptable for students in Year 3-6 to be given assistance in generating questions for research, however, they should be able to design their investigation to answer the question. From Years 7-12 it is expected that students generate their own research questions.*

## Some Winning Science Talent Search Project Titles

### Primary

- Which day is the busiest in a school zone?
- How do different amounts of water absorbed effect the rolling distance of a ball?
- What food do possums like best?
- Brand X or Y
- Fruit and Veg
- What materials keep things the warmest?
- Will the thickness of a copper wire affect the strength of an electromagnet
- Solar cells and my plane
- How Long can Shadows be?
- Fit Bit Fiasco
- Is Guinea Poo Better than Chook, Cow or Sheep Poo?
- Does age and gender affect reaction times?
- Does temperature affect an electrical circuit?
- Using pit traps to find out where insects and animals live in different habitats
- Different colours, different memory
- The paper project
- Experiment of surfaces
- Fast Rust
- Can freezing water cause pipes to burst in winter?
- Can we clone a cabbage?
- Stopping fumes in onions
- Children v's Adults - Sugar Sensitivity
- Science is a dragster
- Which is the best insulator?

### Secondary

- Dolphin streamlining
- Foaming at the mouth
- Are Childproof Containers Really Childproof?
- The analysis of graphology techniques against different personality traits
- Does different concentrations of disinfectant induce bacterial resistance?
- SouthPaw Galactica
- Cow Yellow Bone Marrow: A Promising Biodiesel Source
- How skyglow effects the night sky
- Thermoregulation in Siberian Huskies
- Does age negativity affect memory?
- Effects of Salinity on Plant Germination
- Cricket fantastic
- Making a cheap oxygen sensor
- Estimation of VO2 max and Lactate Fitness
- Is there anything growing in Boyanup's waters?
- Scientific Cleaning- To heat or not to heat
- Flight of a hoop glider
- Does packaging affect the ripening of bananas?
- A new tilt on spiral galaxies
- Positive Reinforcement and Memory Tests
- Acetone content of nail polish remover
- Egg production and quality
- Insulin mimetic
- Effect of temperature on shrimp growth
- Effect of divided attention on reaction time

The Science Teachers Association of New South Wales has kindly offered to share examples of student work with interstate students. Go to: http://www.youngscientist.com.au/?page_id=1885 for examples of student work submitted to the STANSW Young Scientists Awards. If you use any of these ideas as a starting point be sure to give due acknowledgement.

# Category 1: Science Investigation (Years 7-12)

An investigation in secondary school can relate to conducting a fair test, testing materials, solving a problem, carrying out a survey or fieldwork, sourcing data to explain phenomenon or conducting chemical analyses (see Table 3). It is expected that students in Years 7-12 generate their own research questions.

**A successful secondary science investigation entry will:**

- follow the scientific method of investigation.
- communicate your ideas clearly using appropriate scientific language.
- be your own original idea, not just something copied from the internet.
- include evidence of your background reading on the idea you have chosen.
- present a clear and accurate recording and appropriate representation of your data and observations.

**Table 3. Different types of secondary investigations**

| Type of investigation | Description | Examples of suitable question formats |
|---|---|---|
| Investigating a relationship between the independent and dependent variable where repeat trials^ can be used. | A controlled experiment (**fair test**) with repeat trials.<br><br>^Repeat trials are conducted because tests are non-destructive. | • How does backspin on a basketball affect goal shots?<br><br>• What is the effect of tyre pressure on rolling resistance in bicycle tyres? |
| Investigating a relationship between the independent and dependent variable where replication^^ can be used. | A controlled experiment (**fair test**) with replication.<br><br>^^Replication is used because tests are destructive and cannot be repeated, or the population may not be uniform. | • Do moon phases affect the germination of radish seeds?<br><br>• What effect does temperature have on germination? |
| Testing types of materials | A controlled experiment (**fair test**) with a discrete independent variable using repeat trials or replication. | • Which poo makes the best fertiliser?<br><br>• Are childproof containers really childproof? |
| Investigating the effect of several independent variables on one dependent variable – often associated with a design problem | A number of independent variables are tested separately, or in combination, on one dependent variable to develop a design brief. | • Can the temperature above downlights start an insulation fire?<br><br>• How do the number of coils, length and thickness of wire affect the efficiency of a heating element? |
| Survey research, where populations are sampled to investigate the relationships between variables | The population being tested is non-uniform and samples are selected based on the parameters being investigated (e.g. gender).<br><br>Random sampling is used to control for interfering variables. | • How do height and weight vary with age in boys and girls?<br><br>• Does streaming affect student academic performance?<br><br>• Where do cockatoos prefer to nest? |
| Comparative or descriptive studies<br>(fieldwork) | Comparisons may be made between sets of data relating to different locations or time.<br><br>A range of data is collected to develop a description of a phenomenon or location. | • What is the abundance and distribution of Surf Clams<br><br>• Has the town jetty development affect surrounding cockle populations?<br><br>• How does the shape of the moon change over a month? |
| Researching, analysing and explaining data collected and reported by other scientists | Secondary data is sourced to identify patterns then explain them. | • How accurate are BOM predictions for my local area?<br><br>• How has land clearing affected stream quality over the last 10 years? |
| Chemical analysis | The use of quantitative analysis to identify chemicals present in substances | • What is the acetone content of different nail polish removers?<br><br>• Does cooking food affect its vitamin C content? |

Table adapted from Hackling M (1998) *Working Scientifically: Implementing and Assessing Open Investigation Work in Science*, Education Department of WA

# Science Investigation (Years 7-12)

**A Year 7-12 science investigation involves:**

- choosing a topic that you are interested in.
- developing a clear testable question around your topic.
- forming a hypothesis.
- planning your investigation.
- conducting a risk assessment*.
- conducting your investigation.
- collecting your data.
- analysing your results.
- writing your report.

* *It is important that a Risk Assessment is completed before starting your investigation. A Risk Assessment Form is required to be submitted with the entry or your entry will not be assessed. Make sure your teacher goes through your Risk Assessment form with you even if you are doing your project at home.*

## Entry guidelines

You are required to:

☐ Produce a written report using the following headings:
- **Title page and Table of contents**
- **Abstract** – A brief description of what you did and what you found out.
- **Introduction** – What gave you the idea? How did you get started? Include any background research you have done on the topic.
- **Aim** - What you were trying to find out? What you thought would happen.
- **Materials** – List or describe the materials used.
- **Method** – Describe the steps you took. Describe the safety requirements you followed in conducting this investigation. Photographs of your set up could be included.
- **Results** – Everything you discovered (or found out). To show this use tables, graphs, pie charts, photos etc.
- **Discussion** – Discuss your results describing the patterns and trends. Describe how you could improve your investigation.
- **Conclusion** – List the main things you have discovered or found out. Go back to your results - What do they tell you? Did your results support your hypothesis? Use your research/scientific knowledge to explain your results.
- **Acknowledgements and References** – Make sure you include a list of people who gave you help/advice and list any books or websites you used.

☐ Produce a video presenting your project to the judges.
- ensure your video is no longer than **THREE** minutes in length
- your video should
  - explain how you got the idea, the theory behind your project
  - describe how you did the experiment, explaining any relevant terms along the way
  - describe your results/findings
  - explain why your project is important in today's society

☐ Submit your video to your teacher in MP4 format for submission on your school's USB. If the video is presented in any other format there is a risk that it may not be able to be reviewed.

☐ Attach the required forms to the back of your report.
- *Risk Assessment Form* – required for all entries.
- *Informed Consent Form* – if human subjects are used in your investigation.
- *Supervising Scientist Form* – if your investigation method falls outside the ethics or safety guidelines for schools.

☐ Ask your teacher or parent(s) to check your report to make sure it follows the guidelines.

☐ Your report should be typed and printed on single sided A4 paper and staple in the top left corner. **DO NOT** bind or place your report in a presentation folder.