

# **Deep Blue:**

## **innovations for the**

### **future of our oceans**



**stat.**  
Science Teachers  
Association of Tasmania Inc.

**Tasmanian Science Talent Search  
Information Booklet 2020**



## Acknowledging our **Generous Sponsors**

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### The Peter Smith Memorial Trust



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## About the Tasmanian Science Talent Search

The **Tasmanian Science Talent Search** (TSTS) is an initiative of the Science Teachers Association of Tasmania Inc (STAT). It has been operating continuously since 1960 (though not always by the same name) and has involved an estimated 60,000 students since its inception.

Through the TSTS, STAT aims to:

1. **Inspire a lifelong interest in science** by:
  - encouraging students to undertake project work in the sciences which is current and personally relevant;
  - giving students the opportunity to communicate their learning and discoveries to an audience in the wider community;
  - acknowledging student effort and celebrating high achievement in the sciences.
2. **Promote high quality teaching and learning** in all Tasmanian schools through the provision of a broad range of relevant learning opportunities.
3. Highlight a **Pathway to Excellence** so that Tasmania's best young scientists can have their achievements recognised on the national and international stage.

### Operation of the TSTS

The over-arching operation and administration of the TSTS is the responsibility of the Director. This role is currently held by Dr Deborah Beswick and previously by Doug Grubert.

The TSTS relies on the STAT Council and a passionate group of Members and other interested persons who volunteer their time and expertise to help organise the judging of entries, deliver professional development, support schools and host an Exhibition and Presentation Day.

None of STAT's efforts would be possible without the ongoing support of an enthusiastic and committed group of sponsors.

### Facts & Figures

In 2019, the TSTS involved:

- 1470 Tasmanian students
- 1027 separate entries
- 51 schools
- 10 separate age divisions
- 8 different sections
- over 130 teachers/mentors
- more than 20 tireless judges
- four school prizes
- three teacher awards
- over \$15,000 in student prizes

STAT's mission:

**'Promoting Scientific Literacy through Education'**



## Information for Students, Teachers & Schools

### Essential information TSTS 2020

Whether you have been involved in the TSTS for many years, or are considering involvement for the first time, the following information should prove helpful:

- ☐ it's open to **all** Tasmanian students K-12
- ☐ there are ten (10) **Sections** to appeal to different learners and learning styles
- ☐ sections fall into two categories:
  - **Themed** – which relate to the annual [National Science Week](#) topic; &
  - **Open** – which allow students to choose any topic of interest
- ☐ **Themed** sections include:
  - Picture Story Books (*new*)
  - Creative Writing
  - Posters
  - Photographic Essays
  - Videos
  - Scientific Essays
  - STEM Challenge
- ☐ **Open** sections include:
  - Research Investigations
  - Natural Sciences Project (*new*)
  - Invention/Engineering
- ☐ judging occurs in **Divisions**:
  - ECE (K-2)
  - LP - Lower Primary (3-4)
  - UP - Upper Primary (5-6)
  - JS - Junior Secondary (7-8)
  - IS - Intermediate Secondary (9-10)
  - SS - Senior Secondary (11-12)
- ☐ not **all sections are open to all divisions**
- ☐ if a division has many entries it will be sub-divided and judged by year level
- ☐ each section has Entry Guidelines and Judging Criteria. **Submissions than do not adhere will not be judged.**
- ☐ entry is free for all participants in 2020.
- ☐ all entries must be submitted electronically.

### Judging of Entries

Entries will be judged by members of STAT and other interested parties. Teachers and schools will be notified of results throughout the year via email and <http://stat.org.au/tsts/>.

### Becoming a Judge

Judging the TSTS is an enormous task. In 2019, there were 1027 entries. Judging a Division, or a sub-set of a Division, is a valuable professional learning experience and demonstrates [Standard 7](#) of the AITSL Standards. If you, or a team of teachers from your school, are interested in judging contact the Director: [tsts.director@gmail.com](mailto:tsts.director@gmail.com)

## Information for **Students, Teachers & Schools**

### **What recognition do students receive?**

All students receive a participation certificate which can be printed at school and presented at an appropriate assembly.

### **What do winners receive?**

Awards for **1<sup>st</sup>**, **2<sup>nd</sup>**, **3<sup>rd</sup>** and **Merit** are allocated for every Division in every Section. Recipients are invited to the Presentation Ceremony in November to receive their Award.

### **Encouragement Awards**

These are sent to schools to recognise student work that did not meet the standard of Merit but which was worthy of recognition at school level.

### **What standard of work is expected?**

STAT expects that work submitted to the TSTS is of a high standard. On rare occasions, where entries do not meet that standard, the judging committee reserves the right not to award prizes in a division.

STAT also understands that 'success' means different things in different schools. Aspiration is an important value and in some settings, having students participate in the TSTS is a symbol of success.

### **How much help can students receive?**

STAT encourages conversation, communication and mentoring in all entries, with the proviso that **any contribution from those other than the student be acknowledged**.

In the **Research Investigation** and **Invention/Engineering** sections, it is common for scientists or industry contacts to mentor older students whilst a teacher oversees the project.

Younger students might be supported by an enthusiastic family members. Students will frequently have a great idea but need support to present it in a quality way. Adult and peer guidance enables this to happen and is **encouraged** - it mirrors what happens in the scientific community.

Tap into the expertise within your school and local community. Guidance, support and discussion of an idea will support learning in all curriculum areas and builds a quality learning experience for your students. Just remember, students must **Acknowledge** who helped with projects and what assistance was provided.

**Would staff at your school benefit from Professional Learning to help implement the Tasmanian Science Talent Search?**

**Contact: [tsts.director@gmail.com](mailto:tsts.director@gmail.com)**

**Does your school have a plan in place for National Science Week 15 – 23 August?**

The [Teacher Resource Handbook](#) is amazing and will provide ideas for the TSTS.



## Information for Students, Teachers & Schools

### Submission Requirements

Themed Sections	Eligible Divisions	Entry Types	Submission Type	Submissions Due
Picture Story Books (PSB)	ECE - UP	Individual or small group* (ECE - UP), ECE & LP may submit whole class entries	PDF	Fri 3 July: 5pm
Creative Writing (CW)	All Divisions	Individual entries only	PDF	Fri 3 July: 5pm
Posters (P)	ECE - IS	Individual entries only	Hardcopy	Fri 3 July: 5pm
Photographic Essays (PE)	LP - SS	Individual entries only	PDF	Fri 3 July: 5pm
Videos	All Divisions	Individual or small group* (All Divisions), ECE & LP may submit whole class entries	Weblink	Fri 3 July: 5pm
Scientific Essays (SE)	JS - SS	Individual entries only	PDF	Fri 3 July: 5pm
STEM Challenge	<i>Details of the STEM Challenge are on the website. Due Fri 25 Sep: 5pm</i>			

Open Sections	Eligible Divisions	Entry Types	Submission Type	Submissions Due
Research Investigations (RI)	All Divisions	Individual or small group* (All Divisions), ECE & LP may submit whole class entries	PDF	Fri 25 Sep: 5pm
Natural Sciences Project (NSP)	JS - SS	Individual or small group* entries	PDF	Fri 25 Sep: 5pm
Invention/Engineering (E)	UP - SS	Individual or small group* entries	PDF (with Weblink for video)	Fri 25 Sep: 5pm

\* Small Group entries **must not include more than three students.**

**Electronic submissions must follow this file naming protocol:**  
**School Name\_Student First Name\_Student Last Name\_Section Code\_Year Level**  
*Eg. Marvel PS\_Peter\_Parker\_PSW\_Year 5*

**Register entries online. Themed sections open Friday 1 May [www.stat.org.au](http://www.stat.org.au)**

New in 2020

## Picture Story Books

### ECE to Upper Primary

Picture Story Books must relate to the theme:  
*Deep Blue: innovations for the future of our oceans.*

### Topics for 2020

These are the ONLY topics that will be judged.

1. **Amazing creatures beyond our beaches**
2. **Kid Cousteau: Ocean Explorer!**
3. **Where have all the big fish gone?**
4. **Fifty Years From Now...**

✓ *Tick that you have satisfied each of the entry guidelines and judging criteria below:*

### Entry Guidelines

- ☐ Your book must use one of the above topics and be a work of **fictional narrative**.
- ☐ Incorporate **science concepts/information** into the story. This must be done through pictures supported by **minimal text**.
- ☐ Briefly explain **5 key science ideas** used to develop your story in an **Appendix**.
- ☐ Include a **Bibliography** listing all the different sources used to develop your idea.
- ☐ Typed or printed text is best but not essential. Ensure hand-writing is clear.
- ☐ Pictures can be created using **any medium**. Downloaded images/Clip Art cannot exceed 25% of total artwork and must be **cited**.
- ☐ All artwork done by hand must be **scanned or photographed** for inclusion in the Book.

- ☐ Submit your Book as an **A4 or A3 PDF**. (Easily achieved in Word or PowerPoint).
- ☐ Include **Acknowledgements** listing any people who helped and what they did.
- ☐ **Word Limits:** ECE up to 200; others 300.

### Judging Criteria

Scientific concepts:

- ☐ Identification of science concepts
- ☐ Accurate portrayal of science concepts

Composing multimodal texts:

- ☐ Grammar, spelling and punctuation
- ☐ Creativity of story line
- ☐ Clarity of expression
- ☐ Visual impact of the Picture Story Book
- ☐ Integration of visual and text elements

Adherence to Entry Guidelines

- ☐ Inclusion of the Appendix, Bibliography, Acknowledgements and Word Count

Some helpful Australian resources:

[Exploring Picture Story Books](#)

[Writing Your Picture Story Book](#)

**STAT acknowledges the work of the Science Teachers Association of Victoria (STAV) on which this task is based.**

**Submit entries electronically in PDF format  
by: Fri 3 July: 5pm**



Updated

## Creative Writing

### Open to All Divisions

Creative Writing must relate to the theme:  
*Deep Blue: innovations for the future of our oceans.*

Choose **any topic relevant to the theme.**

✓ *Tick that you have satisfied each of the entry guidelines and judging criteria below:*

#### Entry Guidelines

- ☐ An entry must be an imaginative piece using any one of a range of styles including: diary, letter, speech, comic, cartoon, narrative, fable, parable, poetry, script etc.
- ☐ You must incorporate **science concepts/ information** into your Creative Writing.
- ☐ List **at least 5 key science ideas** you used to develop your work. Include this in an **Appendix** (ECE and Lower Primary)
- ☐ Students in Upper Primary & above must do the above and provide a brief, 1-3 sentence explanation of **each** point. Judges will look for concepts incorporated into your writing.
- ☐ Typed or printed text is best but not essential. Ensure hand-writing is clear.
- ☐ Illustrations can be used to complement your writing or as an integral part of the text style. **Any medium** can be used. Downloaded images/Clip Art cannot exceed 25% of total artwork and must be **cited**.
- ☐ Artwork done by hand must be **scanned or photographed** for inclusion in the Writing.
- ☐ Submissions must be **A4 PDFs** in either portrait or landscape orientation.

- ☐ Unlike previous years, in 2020 Creative Writing is not restricted to a single A4 page. Instead, the following **Word Limits** apply:
  - ECE: 50-300
  - Lower Primary: 100-500
  - Upper Primary & above: 250–1000
- ☐ Include a **Bibliography** listing all the different sources used to develop your idea.
- ☐ Include **Acknowledgements** listing any people who helped and what they did.

#### Judging Criteria

Scientific concepts:

- ☐ Identification of relevant science concepts
- ☐ Accurate portrayal of science concepts

Creating imaginative texts:

- ☐ Grammar, spelling and punctuation
- ☐ Creativity (choice of topic, text style, ideas)
- ☐ Clarity of expression (cohesion, vocabulary, sentence structure)
- ☐ Development of the story line (topic)
- ☐ Integration of visual elements (if applicable)

Adherence to Entry Guidelines

- ☐ Inclusion of the Appendix, Bibliography, Acknowledgements and Word Count

**Judges may divide work into sub-sections depending on the number and variety of text styles received.**

**Submit entries electronically in PDF format by: Fri 3 July: 5pm**



## Posters

### ECE to Intermediate Secondary

Posters must relate to the theme: *Deep Blue: innovations for the future of our oceans.*

Choose **any topic relevant to the theme.**

✓ *Tick that you have satisfied each of the entry guidelines and judging criteria below:*

#### Entry Guidelines

- ☐ Posters **should** be informed by personal research or part of a learning sequence.
- ☐ Entries must integrate **science** understanding and **artistic** skill (think **STEAM**)
- ☐ In this context, a Poster is a visual artwork used to **advertise a science concept**, issue or idea in a way that is **eye-catching, informative and/or evocative.**
- ☐ Information posters, diagrams, scientific charts, and pictorial essays are **ineligible.**
- ☐ Posters usually combine graphic and text elements. **No more than 20 words** can be used in this section.
- ☐ Students can use **any art medium.**
- ☐ Posters should be submitted in a digital format to [tsts.director@gmail.com](mailto:tsts.director@gmail.com).

### Judging Criteria

Scientific concepts:

- ☐ Identification of a relevant science concept
- ☐ Demonstration of unique perspective or insight into the selected science concept

Creativity and Technical Skill

- ☐ Quality of composition
- ☐ Skilful use of chosen medium
- ☐ Application of time/effort, attention to detail

Adherence to Guidelines

- ☐ The entrant followed the Entry Guidelines

**Submit entries electronically by: Fri 3 July:  
5pm**

Updated

## Photographic Essays

### Lower Primary to Senior Secondary

Photographic Essays must relate to the theme:  
*Deep Blue: innovations for the future of our oceans.*

Choose **any topic relevant to the theme.**

✓ *Tick that you have satisfied each of the entry guidelines and judging criteria below:*

### Entry Guidelines

- ☐ A Photographic Essay is a series of **5-8 photographs**, taken by the entrant, which **tells a story or evokes an emotion.**
- ☐ All photos must have been taken with this competition in mind. Photos from personal archives must not be used.
- ☐ Photos may be edited or 'touched-up' by the photographer but must retain, at the judges' discretion, an essentially '**natural**' look.
- ☐ Each photo may include a caption of up to 20 words.
- ☐ Entries must be **multi-page PDFs.**
- ☐ Include an artist's statement (up to 200 words) on page 1 **or** the final page.
- ☐ Include your Project Title, Name, Division and School on Page 1 (Artist's statement is optional). **Do not put photos on Page 1.**
- ☐ Photographs must be arranged into a sequence in the order you want them to be viewed with **one photo per page.**
- ☐ No single photograph can exceed 1Mb and **no entry can exceed 8Mb.**

- ☐ The final page must include a numbered list of your photos, in the order they appear, stating the date each was taken and what editing (if any) was performed. It may also contain **Acknowledgements** and **Bibliography** (if either are applicable).

- ☐ The final page can include your Artist's statement if it wasn't on Page 1.

**Do not put photos on the final page.**

### Judging Criteria

Your entry will be judged using these criteria:

Scientific concepts:

- ☐ Photographs highlight a scientific concept or issue which is relevant to the theme
- ☐ The Artist's statement and captions convey scientific knowledge and awareness

Creativity and Technical Skill

- ☐ Consistently skilful technique and composition
- ☐ Selection and sequencing of photos tells a compelling story
- ☐ Artist's statement showcases the link between intention and outcomes

Adherence to Guidelines

- ☐ The entrant followed Entry Guidelines

**Submit entries electronically in PDF format  
by: Fri 3 July: 5pm**



## Videos

### Open to All Divisions

Videos must relate to the theme: *Deep Blue: innovations for the future of our oceans.*

Choose **any topic relevant to the theme** and **any genre** that conveys your scientific concept.

Check out [Sleek Geeks](#) for inspiration!

✓ *Tick that you have satisfied each of the entry guidelines and judging criteria below:*

### Entry Guidelines

- ☐ Videos should be informed by personal research or part of a learning sequence.
- ☐ Good video requires **good writing**. Choose an idea, develop your idea into a logical **structure** then write a detailed **script**.
- ☐ List information sources in a **Bibliography**
- ☐ Good video requires **technical skill**. Plan your use of sound, slow motion, subtitles, animation, close-ups, tripods, B/W, etc. Check out [MyState Filmmaking Guides](#)
- ☐ Videos must be the **work of the entrants**. Any footage/images from other sources should be incidental (<10%)
- ☐ You can use 'extras' as support actors, to hold a camera or for minor assistance. They should not make **major contributions**.
- ☐ **Only the entrants may work on the editing and post-production of the film**. Techniques taught by teachers/mentors must be done using unrelated footage.
- ☐ **Acknowledge** people who helped in your **Credits** and explain their contributions.

- ☐ Videos must be **90 seconds to 3 minutes** of content (excluding **Credits** – see below)
- ☐ **Credits** (up to an extra **30 seconds**) are required. Include: the roles of entrants, **Bibliography, Acknowledgements** and a **list of the equipment/software used**.
- ☐ Submit videos in a common format using a **weblink**. Check it works before submission!

### Judging Criteria

Your entry will be judged using these criteria:

Scientific concepts:

- ☐ Identification of relevant science concepts
- ☐ Appropriate amount of science content
- ☐ Accurate portrayal of science concepts

Composing a digital multimedia text

- ☐ Video conveys a coherent message
- ☐ Appropriateness of expression/language for the selected genre
- ☐ Inclusion of relevant scientific vocabulary and/or explanations
- ☐ Use of persuasive devices

Presentation and Technical skill:

- ☐ Quality of footage (shots, lighting, stable)
- ☐ Editing (transitions, effects, pace, mood)
- ☐ Sound (dialogue, effects, music)
- ☐ Adherence to the Entry Guidelines

**Submit entries electronically as weblinks  
by: Fri 3 July: 5pm**

## Scientific Essays (Persuasive Writing)

### Junior, Intermediate & Senior Secondary

Your Scientific Essay must relate to the theme:  
*Deep Blue: innovations for the future of our oceans.*

*This task combines the **Sustainability** cross-curriculum priority, **Literacy** general capability, **Science as a Human Endeavour** and **Science Understanding** strands. Use it incorporate contemporary science into Literacy classes! Integrate assessment for science and English.*

### Topics for 2020

These are the ONLY topics that will be judged.

1. **Overfishing – what is the future of wild-caught fisheries?**
2. **Plastic pollution: our oceans are in crisis but is there a solution?**
3. **30cm by 2050: is sea-level rise so bad?**
4. **Aquaculture: risk versus reward**

✓ *Tick that you have satisfied each of the entry guidelines and judging criteria below*

### Entry Guidelines

- ☐ Your Essay must follow one of the above topics. Please indicate the topic as a **header or footer on your entry**.
- ☐ Your essay must incorporate **scientific information and evidence**.
- ☐ Essay must follow **conventions for Persuasive Writing**. See [examples](#).
- ☐ **Acknowledge** any people who gave you assistance and how they helped. (include this at the end of your writing)

- ☐ Include a **Bibliography** outlining all sources used. Specific information must be **cited**. See: [Plagiarism & Referencing](#)
- ☐ Use images, tables, graphs etc **sparingly** and only if they support your argument.
- ☐ **Word limits:** JS - 1200, IS - 1500, SS - 2000 (excluding Bibliography)
- ☐ **Formatting:** use a clear font, 12pt, 1.5 line spacing, 2.5cm margins, **PDF docs only**

### Judging Criteria

Your entry will be judged using these criteria:

Scientific concepts:

- ☐ Identification of the main science concepts
- ☐ Appropriate amount of scientific content
- ☐ Accurate use of scientific evidence

Composing written texts:

- ☐ Grammar, spelling and punctuation
- ☐ Clarity of expression
- ☐ Accurate use of specialised vocabulary
- ☐ Use of persuasive devices

Presentation and format:

- ☐ Engaging and informative introduction
- ☐ Variety and veracity of resources used
- ☐ Quality of conclusion
- ☐ Adherence to Entry Guidelines (including the word count)

**Submit entries electronically in PDF format  
by: Fri 3 July: 5pm**



## Research Investigations/Experiments

### Tips for Students and Teachers Embarking on Research Investigations

Undertaking a Research Investigation for the first time can be daunting for students and teachers. Identifying ways for students to improve their work is import for all students as they progress through schooling. Many teachers seek advice to help them provide better support for their students and to encourage better outcomes.

Students and teachers alike are encouraged to reflect on the points. These are neither **Guidelines** nor **Judging Criteria**. They are observations distilled from viewing many hundreds of entries from around Tasmania and across all year levels. Some observations will apply to your context and others won't.

#### The best **Research Investigations**:

- ☐ Start the process early – this allows students the time to consider different options, start and then change focus if they need.
- ☐ Use a pilot test to help develop more advanced experimental designs. (Year 5-12)
- ☐ Are planned to enable teachers to assess various areas (science, maths, literacy) (K-10)
- ☐ Optimise the time and learning of students and teachers by entering the same work in the UTAS Awards and the TSTS (Year 5-12)
- ☐ Encourage students to investigate something of personal interest or community relevance.
- ☐ Encourage students to investigate something with real-world application.
- ☐ Use Whole Class Investigations to connect several small experiments or tests together as part of a rich Unit of Inquiry. (K-4)
- ☐ Undertake relevant research to help understand the main concepts associated with the topic.
- ☐ Seek expert knowledge from within the school, family, community or industry to develop a topic
- ☐ Uses [Project-Based Learning](#) or [Depth Study](#) to go beyond a normal 'Science Report'. (7-12)
- ☐ Identify a problem and try to find a solution or find something that is not understood and suggest a plausible explanation.
- ☐ Take time to understand different types of data, their strengths, weaknesses and validity for certain purpose and age groups.
- ☐ Consider importance of sample size, blind trials, confounding variables, randomization etc.
- ☐ Perform [Controlled Experiments](#) or adopt the principles of a Fair Test.
- ☐ Understand the important difference between correlation and causation.
- ☐ Maximise the duration of data collection.
- ☐ Maximise the amount of data collected so that more meaningful conclusions can be made.
- ☐ Understand that a hypothesis and a prediction are fundamentally different. A **hypothesis** is a proposed explanation whereas a **prediction** is an expected result. A hypothesis should be **testable** and **falsifiable**.
- ☐ Don't use standard school experiments. If based on a school experiment, it should offer a novel application, have some change or use the method across a wider range of conditions.
- ☐ Don't forget they should promote curiosity.

**Guidelines appear on pages 14-15.**  
**STAT is developing judging rubrics which will be available online early in Term 2.**

**Submit entries electronically in PDF format by: Fri 25 at 5:00pm**

# Research Investigations/Experiments

## Writing a Primary Research Investigation

A **Research Investigation** showcases the entire process of planning, conducting and reporting on a scientific experiment or inquiry.

These **Guidelines** are for primary school entries:

*Note: these are Aspirational and represent the Gold Standard for Tasmanian Year 6s. Students and teachers should not be put off. STAT recognises that the development of high quality science inquiry is a journey. **STAT wants to receive and celebrate entries from students wherever they are on that pathway.***

**Cover page** – include a title, name or names (if it's a group entry), school, year level and a relevant picture. The best pictures show students in action.

**Abstract** – most students don't use these until high school. Year 5 & 6s who enter the same work in the [UTAS SEI Awards](#) should have written one. It is an 80-100 word overview of your project (see [Tips](#)). Other students can opt to omit this.

**Introduction/Background Information** – this is where you explain why the topic was chosen. It could be a problem to solve or a question to answer. State what you already know and have discovered through research. Introduce terminology or vocabulary relevant to your topic, process or the equipment you used.

**Aim** – state the purpose of your experiment, what you hope to learn, discover or find out. Younger students can benefit from the use of a 'stem':

*'The aim of the experiment was to...'*

*'The aim was to examine the effect of ... on ...'*

Consider rephrasing an ['Investigable Question'](#).

**Prediction and/or Hypothesis** – students must include one, the other or both. (See the previous page for differences). Students can have multiple predictions/hypotheses if more than one simple test is conducted as part of an investigation

**Variables** – these are the factors you change, control or measure/observe to determine if a **causal relationship** exists. See [Variables](#)

**Materials** – make a detailed list of all equipment (eg. 6 x 1L plastic tubs; 15g salt). Diagrams/photos can help show how you set up the equipment.

**Method** – a clear, [step-by-step](#) description of what you did (**past tense**) written so that another person could repeat your method precisely. Diagrams or photos can help illustrate certain details.

**Risk Assessment** – a [focus on safety](#) is important. Untrained teachers/parents might not model safe practices. Include a section on risk/safety. [This](#) from UTAS may help guide your thinking.

**Results** – include **clearly labelled** tables, graphs, charts, photos, diagrams, maps, observations etc. Effective **Qualitative methods** can prove very difficult for his age-group and are discouraged.

**Discussion** – judges pay most attention to this part because it is where **higher order thinking** is demonstrated. **Analysis, synthesis and evaluation** are skills that can be learnt from a young age (see [Tables 1 & 2](#)). As a **minimum**, this section should:

- Describe patterns in the results
- Explain patterns by suggesting the cause
- Explain any errors/problems that occurred and what you did to fix them
- Identify what could be done to discover more about the topic (ie the next point of learning)

**Conclusion** – summarise what you did, the reason you did it and state the main outcomes/findings. Was the aim fulfilled? Was the prediction accurate? Was the hypothesis supported? Can you relate your findings to the real world?

**References and/or Bibliography** – these record the sources used in your background research. By Upper Primary many students cite facts in-text.

**Acknowledgements** – of people who gave input, advice, help, equipment **and what they did**. Did a teacher suggest the idea? Did a parent do some of the typing?

**Appendix** – include logbooks, photo records, risk assessment and any other **relevant** information judges may need.



# Research Investigations/Experiments

## Writing a Secondary Research Investigation

A **Research Investigation** is an extended written task in which students showcase the entire process of planning, conducting and reporting on a scientific experiment/inquiry. In-class **science reports** and **prac write-ups**, don't exhibit the same effort as a **Research Investigation**. Top senior entries are really [Project-Based Learning](#) or [Depth Studies](#).

Many teachers and schools use slightly different styles. These updated **Guidelines** are intended to help define general expectations for the TSTS:

*Note: elements identified by an asterisk (\*) may appear under their own headings or be incorporated into other sections. Discuss this with your teacher. Some subjects use a less formulaic style (especially in some TASC 3 subjects). Such entries are acceptable just ensure judges can see where each element of the Guidelines has been incorporated into your work.*

**Cover page** – include title, name or names (if it's a group entry), school, year level & possibly a picture.

**Abstract** – a brief overview of your project comprising around 80-150 words (see [Tips](#))

**Introduction/Background Information** – explain why you chose the topic, define terminology and explain the research you've done (see [Planning research](#)). This should be detailed and directly relevant. **Cite** information from your sources.

**Aim\*** – state the purpose and relevance of your experiment. What you intend to discover or find out.

**Hypothesis\* (or Prediction)** – these are different! A **hypothesis** is a proposed explanation whereas a **prediction** is an expected result. Good hypotheses are **testable** and **falsifiable** (see [Khan Academy](#)).

**Variables\*** – these are factors you change, control or measure/observe to determine if a causal relationship exists. See [Variables](#)

**Materials** – list all the equipment used. Be specific: (eg. 4 x 250mL beakers; 20.0g sodium acetate). Consider a diagram or photo to show how they were assembled if using an unconventional set up or if using materials that have been improvised.

**Method** – a clear, [step-by-step](#) description of how your procedure was conducted (**past tense**) written so another person could repeat it precisely. If you made mistakes these should be reported honestly (the assumption being you adopted changes to address any errors).

**Risk Assessment\*** – entrants **must** [focus on safety](#). Do this **before** starting your experiment. Local & national competitions (UTAS, TSTS, BHP Awards) **ALL** require completion of a Risk Assessment. Many schools use software to assist. Alternatives exist such as [this from UTAS](#).

**Results** – include **clearly labelled** tables, graphs, photos, diagrams, maps, etc. **Qualitative data** have a place but it can be difficult (not impossible) to address a testable hypothesis with qualitative methods. Discuss your ideas with your teacher.

**Discussion** – up to here, much of a written report involves lower order thinking. Your discussion is where you engage **higher order thinking skills** such as **analysis**, **synthesis** and **evaluation** (see [Tables 1 & 2](#)). As a **minimum**, you should:

- Describe any patterns in your results
- Explain the cause of any patterns in your results
- Analyse the validity of your results by identifying any errors/problems in your experimental design
- Evaluate the relevance, importance or 'real-world' application of your findings
- Identify extensions or new hypotheses that require future investigation.

**Conclusion** – summarise what you did, the reason you did it and state the main outcomes/findings. Was the hypothesis supported? How does the study relate to the real world?

**References & Bibliography** – **References** are those sources you **cite**; a **Bibliography** records all sources used in research, experimental design etc.

**Acknowledgements** – identify people who gave advice, help or equipment **and state what they did**.

**Appendix** – include logbooks, risk assessment and any other **relevant** information judges may need.

New in 2020

## Natural Sciences Project

### Open to All Secondary Divisions

A **Natural Sciences Project** can be used to report on a 'grass-roots' initiative in agriculture, conservation, land management or related disciplines. Projects can be **Case Studies** of works **completed** by a school, local community citizen science group or partnership. Works currently **'in progress'** are also appropriate.

A **Natural Sciences Project** gives students the opportunity to **showcase applied science**. It differs from a Research Investigation because it is not focused on generating a hypothesis or controlling experimental variables:

✓ *Tick that you have satisfied each of the entry guidelines and judging criteria below*

### Entry Guidelines

- ☐ Entries must showcase (a) results of an initiative completed in the last 3 years; **or** (b) the status of an initiative 'in progress'.
- ☐ Projects must be **directly relevant** to the entrant's school or local community.
- ☐ Entries should address a clearly identified problem or challenge.
- ☐ Your Project must incorporate **scientific information and evidence** from research.
- ☐ Comprehensive **Background information** must be presented to provide context.
- ☐ Describe the **Method, Intervention or Strategy** used to address the problem.
- ☐ Present **Observations & Results** as tables, graphs, photos, interviews, maps, etc. Use measurements where possible.

- ☐ The **Discussion** is where you describe the outcomes of the work, analyse what was successful and what was not, identify errors/problems and suggest possible future improvements.
- ☐ A **Conclusion** must summarise whether the problem/challenge has been resolved or, if not, what future effort is required.
- ☐ Include a **Bibliography** outlining all sources used. Specific information must be **cited**. See: [Plagiarism & Referencing](#)
- ☐ Include an **Acknowledgements** page identifying people who worked on the initiative or who helped with your entry.
- ☐ Word Limit: 1500 – 3000 words

### Judging Criteria

Your entry will be judged using these criteria:

- ☐ Identifies a locally relevant problem.
- ☐ Explains how science informs the decisions and actions of land managers.
- ☐ Collects and records information and data
- ☐ Draws conclusions and communicates findings
- ☐ Uses appropriate grammar, spelling and punctuation
- ☐ Uses referencing and a bibliography
- ☐ Acknowledges key collaborations

**Submit entries electronically in PDF format  
by: Fri 25 September at 5:00pm**



## Invention/Engineering Projects

### Upper Primary to Senior Secondary

Using an **Engineering Design Process**, students identify a problem then create, test and refine a working **invention**.

An invention may be a completely **new idea** or a **significant refinement** of an existing device. A **method** or **process** can be an invention.

Invention/Engineering Projects rarely occur in science classrooms. They are more suited to **Project Based Learning**. Students should discuss ideas widely with teachers of Science, Mathematics, MDT, Digital Technology, Home Economics, PE & Agriculture – fact ideas can come from anywhere! Specialist mentors can be found in the wider community.

Usually, the hardest thing is identifying an **authentic need**. So ask around...

Visit the [UTAS SEIA](#) and [BHP Awards](#) sites. They offer tips, ideas and provide a pathway for your **Invention/Engineering Project**.

### Entry Guidelines

- ☐ An entry must be a **working** invention that solves a **real problem**.
- ☐ ICT-based projects in an Engineering or Science context are also eligible.
- ☐ It must **apply scientific principles**.
- ☐ It must be **safe**. Do a **risk assessment**.
- ☐ It must be **well manufactured**.
- ☐ You must show evidence of research into similar and rival inventions or devices.
- ☐ You must have followed an **Engineering Design Process** and keep a **logbook**.

### Written Report

You must submit a report 800 - 3000 words.

- ☐ **Aim** – the goal of your invention
- ☐ **Introduction** – explains the problem you identified, limitations of existing solutions and what is new about your invention.
- ☐ **Design Brief** – how you built, tested & refined your invention.
- ☐ **Discussion** – explains scientific principles that apply to your invention. Analyses the results of tests. Describes limitations and proposes further improvements.
- ☐ **References & Bibliography** – provides a record of your background research.
- ☐ **Acknowledgements** – of people who gave advice, help, equipment **and** what they did.
- ☐ **Appendix** - Logbook, risk management, link to video of your invention in operation etc.

### Video

Video the invention in operation. Video quality is not assessed, but judges need to see and hear the invention working to judge it.

### Judging Criteria

Judges will use your written report, logbook and video to assign marks. The criteria are those used at the [BHP Awards](#):

- ☐ Design Approach (including risk) 30%
- ☐ Design Ingenuity 30%
- ☐ Value 20%

**Submit entries electronically in PDF format  
by: Fri 25 September at 5:00pm**