NZASE article

Encouraging students in science fairs

Science and Technology Fairs are a good way for students to show what they have learnt about investigating science in the world around them. The words can strike fear into the hearts of some teachers and parents, but with good guidance, developing a science fair project needn't be onerous. And for some students, science fair is the only thing about primary science that they remember as adults. NZASE Science Communicator Mike Stone, a sometime Science Fair judge, focusses on what teachers can do to prepare their students for science fair success.

Although each region's requirements are a little different, generally projects must be practical science investigations where students collect data. (Beware websites from other countries with different requirements.)

While seniors can enter any science project, years 1-10 have specific categories: Earth & Space, Biology, Chemistry, Physics, Human Behaviour. Most regional science fairs are held in the middle of term three. Three regions have cancelled their 2020 fair and four are going digital.

Building skills

To be ready in term two to investigate their own question, students need plenty of experience of the building blocks and this makes a good focus for science learning in term one:

- Stimulating images or practical experiences that will generate questions (e.g., Science Learning Hub).
- Developing one idea into a testable question and setting a purpose (it helps if teachers model this)
- Designing an investigation
  - Fair test with controlled variables, changing one (independent) variable, measuring one (dependent) variable, repetition
  - Pattern-seeking where variables cannot be controlled; eg measuring Vitamin C in fruit, do people with longer legs run faster, how does a break in the canopy affect plants beneath?
- Measuring and collecting data into tables
- Processing averages and drawing graphs [in Excel use XY scatter charts]
- Stating a conclusion that answers the question in the purpose.
- Relating findings to the real world.

The more investigations students do in the term and years before they enter, the better prepared they are for Science Fair. Students will also do better if they have been working on some of the key literacy and numeracy skills inherent in investigations – e.g. the language of methods/conclusions and averaging.

Developing skills in investigations can be helped by using examples of student investigations; e.g. Connected L2 2015 Heat It Up, Connected L3 2015 The Science of Rongoā, and Connected L4 2016, Winning Ways: Presenting Scientific Data.

Teachers can make science fair more like real world science by shifting the focus to the Science Capabilities, and making it more about process than product. This means helping students develop and practise skills to gather and interpret data, use and critique evidence, and represent ideas.

However, this approach takes time – "time for critique and multiple iterations of the design of the investigation, time for collecting sufficient data (and making sense of it), time to make mistakes and go down blind alleys, as well as for group discussions and feedback" (Bull, 2016).

Waikato Science & Technology Fair, 2019.

Canterbury Science Fair, 2019

Choosing a topic

The hardest part for many students is choosing a topic. Sandy Jackson of Kings School suggests starting with students' hobbies and interests, using mind-maps and focussing questions as needed.

Students could think about something they learned at school, or something they may have seen in the media. Students can also get ideas from finding out about past winners at the regional Science and Technology Fairs: "what were their projects about, what ideas do those inspire for you?"

Senior students, whose time is constrained, are wise to focus on practical work they are already doing for their science fair project. The Royal Society's guide to developing CREST projects may also be useful.

Jessie McKenzie of the Royal Society, reminds us that programmes like CREST can strengthen the inquiry process of a Science Fair entry. CREST projects encourage students to find innovative and creative solutions to problems in science and technology, working with an expert in the relevant field.

Planning

It is wise to encourage students to start a log book once they have decided their focus, and to write in it every day. This is what scientists do, not just about their method and results, but also about thoughts and questions, summarising discussions with teachers or parents, noting websites, books, and possible solutions to problems [including "arrrggggh, the slaters escaped and were all over the study… mum was mad! Grandpa lent me a lid], and drafts of the final report.

Students will also need help planning – it is unwise to leave it all to them. Teachers can help by setting several milestones; eg. "you need to check your XXX with me by YYY".

Ethics

If working with humans or animals, students are required to consider ethics – largely this is about safety and respect. Animal ethics concern the care and treatment of animal subjects. It is a legal requirement for students to seek approval if the animal's normal needs are being changed. Human ethics include confidentiality, consent, and privacy. See guidance about ethics on the pages of CREST, and Auckland Science Fair, but go to NZASE to get the approval.

Ethics rules seem to vary by region so it is wise to confirm local Science Fair requirements well before starting the projects. Then check each investigation to see if it meets the criteria for requiring ethics approval and help students follow the process if it does.

Helping students

How much help can you (and parents) give? Students must drive the project but they will need help with lots of things along the way, and the younger the students, the more help they need. Just remember to work alongside students, and keep asking them questions: "I have set up the axes for you on Excel, so what numbers and title are you going to put on this one?" and "Here is a bit of guttering, how long do you need it? – and please hold it while I saw." Sandy Jackson says: "The test comes at the interview - if the students cannot really explain what they did and why, maybe it is not really their project."

Selection and presentation

Once your students have completed their projects then they need to be judged, and only the best from the school put forward for regional judging. Within a large school some projects may need to be selected for

each class. Some teachers ask students to submit their report on paper; then only students with the best investigations make their board.

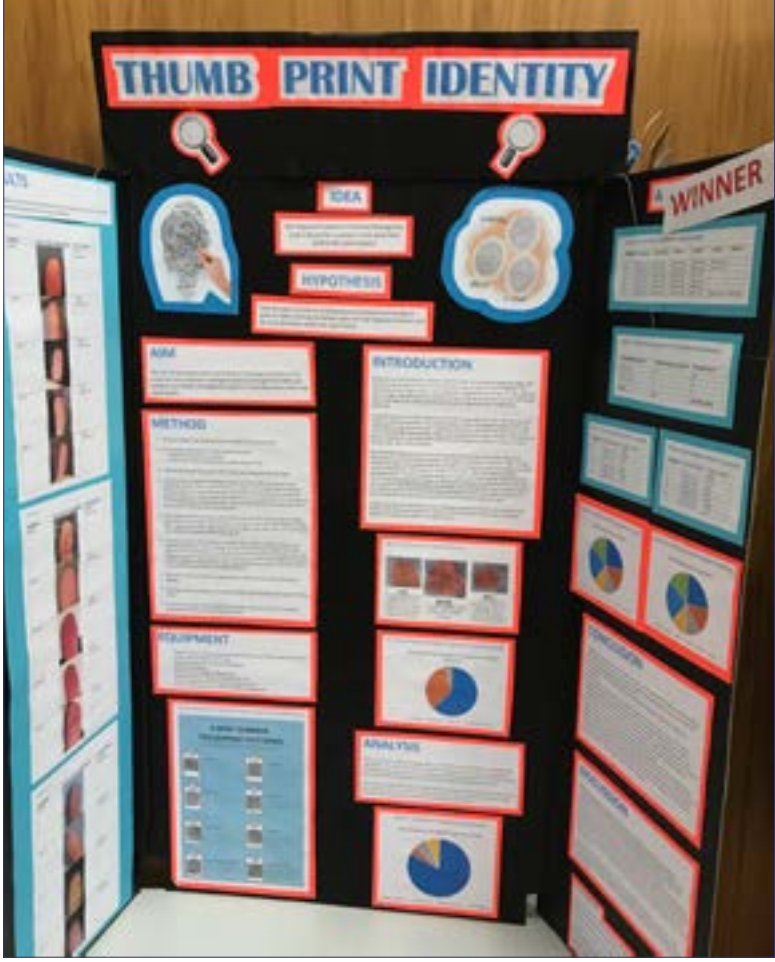
Teachers can use colleagues, science teachers from a nearby school, retired teachers and local scientists to help with judging. If you have not run a school competition before, talk to someone who has, such as a teacher on the regional Science Fair committee.

Science Fair boards are easily available from local retailers like Warehouse, Warehouse Stationery and Paper Plus. As a judge, I remind teachers that boards will be displayed in a hall where lighting is high above the tables, so reading is difficult.

To make text readable for judges, it is best set at 16pt or bigger, with line-and-a-half spacing, and a pale background. If students can't fit their summary using this font size, then they have too much information. Part of the skill in presenting a report is distilling information down to the essence – less is more. Teachers can help with this.

At the fair, students work will be judged and judges will ask students about their investigation. This interview is crucial, as students need to show they understand their investigation well; a good interview will make a difference in their final grade. It helps if students have practised this skill with family and in front of the class, so they become used to answering unexpected questions.

Helping your class enter a science fair can be messy and chaotic, but also very rewarding. For some students investigating a topic and making their board will be the primary science they remember, full of fun and learning. Consider giving it a go.



A Hawkes Bay Science Fair winner, 2019

Ngā Kupu

Kaiwhakawā - Judge
Matatika - Ethics, ethical
Pukapuka rātaka - Journal
Raraunga ine - Measurement data
Taurangi wehe kē - Independent variable
Taurangi whakamauru - Dependent variable
Tūhuratanga – Investigation
Whakamātau - Trial, experiment

From Te Aka Maori Dictionary & Paekupu

Reference

Ally Bull, 2016. Science Fairs, NZCER

Links

Auckland Science & Technology Fair teachers' timeline
Kerikeri High School Science & Technology Fairs booklet (a useful flowchart of investigation steps)
NIWA Science & Technology Fair page includes websites for fairs in ten regions.
Other regions:
Science Fair Far North
Cawthron SciTec Expo, Nelson region
Central Northland Science & Techology Fair
Eastland Network Science & Technology Fair,
Te Tairāwhiti

The Hawkes Bay Regional Science & Technology Fair, Southland Science & Technology Fair and Manawatu Science & Technology Fair have been cancelled for 2020.

2020 Fair dates are on the NZASE events page.