Tasmanian Science Talent Search 2008
49 years strong
(an initiative of the Science Teachers' Association of Tasmania)

P.O.Box 3053, Canning St., Launceston TAS 7250.
stsearch@bigpond.net.au *http://www.key.org.au/stat/* ABN – 97 660 939 433

Open-ended Science Research in the Classroom: Have a go! Help is at hand!

Have you ever thought that having your students do an open-ended science research project would just be the ultimate learning experience and your ultimate dream, but you fear the ultimate nightmare?
Maybe you feel uncertain as to your own experience, the organisation needed, and just "how to get started".
Well, there's no need to re-invent the wheel. Learn from others and the resources available!
Now could be the time to plan something for Term 3, maybe on a small scale first time, ready for a fresh full-on effort next year, in time for the 50th year of TSTS!

If you have never tackled open-ended research before, and your colleagues also feel uncertain to give you guidance, then probably the best $55 your school could ever spend would be the "one-off" registration to the CREST scheme, run by the CSIRO and staffed by trained support teachers to assist you in all areas (see the CREST brochure accompanying STATIC)

CREST, Creativity in Science and Technology, is a nationally-recognised and non-competitive award scheme with no due date for project submission. Projects started now could even be finished next year, though there is always the encouragement for students to also enter their local state Science Talent Search and thereby also enter the BHP Billiton national science awards. "From little things, big things grow". CREST can give teachers inexperienced in Open-Ended Research the supportive scaffolding to lead them through the early stages and keep students focused, thus avoiding possible pitfalls.
There are three Primary levels (Green, Orange and Blue) and three levels for Secondary students (Bronze, Silver and Gold), each involving progressively more hours of student commitment and more independence of approach.

For your registration fee you will receive:

1. an excellent Teachers Handbook -either Primary or Secondary- which is very user-friendly and direct (no pages of waffle), with suggestions as to how to get started, student profiles/ checklists for student achievement, and ideas for projects. The Primary Handbook outlines 7 units which could immediately be implemented in the classroom as a prelude to more independent work.
2. an Investigation Planner which helps your students do all the following: pin-point their aim, the variables and how to control these, plan the method, consider safety precautions, keep a logbook, record results appropriately, reflect on and analyze results, and discuss problems encountered and opportunities for further investigation.
3. For the secondary levels, (Bronze, Silver and Gold) the staff at CREST will give specific feedback to students after they have considered their aim and method, often making alternative suggestions if

appropriate so that their work will be more fruitful and rewarding (ie. suggestions on variables not considered by the student in their planning stage). Quick feedback is given by email, in itself giving credibility and an aura of importance to the students.

4. Progress charts for teacher evaluation and student self-appraisal as well as an assessment Rubric, help students remain focused on their investigation, an essential ingredient in a classroom where students may be doing vastly different projects.
5. For a continuing annual fee of $20, schools can remain registered and teachers can enter their students' projects online after teacher review, for a certificate or medal, depending on level achieved. The secondary Silver and Gold levels require a small entry fee before assessment by CREST staff. Achievement at this level is a highly regarded addition to any student's CV. Entry into the competitive TSTS and BHP Billiton awards will no doubt bring further acclaim and possible success.

Various starting points can be used by teachers: (all outlined in the Teachers' Handbook)

1. A teacher demonstration of an experiment, with subsequent brainstorming for suggested follow-up experiments manipulating different variables, with different groups within the class taking up one new aspect of the basic "recipe", i.e. a new hypothesis to test. This restricts the amount of differing equipment needed and laboratory organization is easiest.
2. Similarly, students might choose to develop further an experiment they enjoyed earlier in the year. Though opening up a wider range of topics and equipment needed, at least it is likely to be similar to that already used so probably on-hand.
3. Teachers could suggest "guided investigations" i.e. a list of topics from which students can choose
4. Students plan open-ended investigations on their own choice of topic. This needs direction to assist choosing a worthwhile project, achievable within the students' capability, time and equipment available. They might follow-up a personal interest e.g. sport, rocks, food, sight/hearing, solar power. There can be science found in everything, from roller-blades to horse-riding. The following website is excellent in helping students formulate an hypothesis to investigate from a given general interest area: http://www.sciencebuddies.org/mentoring/project_background_research_plan.shtml

To help students plan: again the Teachers Handbook and CREST support staff give much assistance in how to:

1. identify variables
2. control variables
3. safely carry out the experiment
4. present data, look for trends and explain these from known (or researched from the Net etc) science
5. specify the role of the teacher, mentor and parent. Even a suggested model for letters is included, as well as an outline for writing a media release to publicise your students' success !

Check out the CREST website www.csiro.au/crest
Freecall 1800 626 646
Email; crest@csiro.au

Another CSIRO initiative, "Scientists in Schools", links teachers and scientists to form partnerships to provide inspiration, fun and learning for students, teachers and scientists alike. If you would like to do a study on e.g. your local creek environment, or endangered species etc, but don't have the practical or theoretical background, you can register online with www.scientistsinschools.edu.au for a scientist to help you. Obviously, there won't necessarily be someone instantly at your fingertips, but this could be a real opportunity to plan for a special study next year, with maybe students doing some follow-up investigations of real substance as a result! This would also be a great vehicle for CREST. Wow! The stuff we teachers dream of!

In addition there is a new dedicated "Research" section on our website www.key.org.au/stat/. It would be good to encourage students to read this, along with the full details of the TSTS Booklet Research section, (with the outline of suggested procedure, report writing, and judging criteria) before even thinking of launching into their own project. In "Research" you can find:

1. 2007 TSTS results, showing winning topics from past students of different ages
2. 2006 Judges Comments. A good outline of suggestions to improve students entries
3. 2007 Judges Comments. Further ideas for improvements
4. An article from STATIC 2006: "…Where Do We Start?"
5. STATIC 2007 article "Don't let you students miss this opportunity"

It can be best to introduce the planned Research Unit a few weeks before actually starting, allowing students to formulate ideas, discussion to fine-tune the hypothesis to be investigated as well as accumulating the range of required equipment. Encourage students to bring in as much of this themselves if possible (household equivalents to scientific equipment are often just as good). Some schools will also concurrently run a theoretical assignment, so that students aren't left with "nothing to do" if their experiment is not full-on hands-on for the whole lesson. Obviously, time will be needed on the computers to research background information or to be writing up reports. Some schools might have a short written contractual arrangement signed by the students if there is uncertainty regarding the level of trust that this type of unit depends on.
Encourage students to keep a daily logbook, including photos of themselves carrying out the experiment. Anything that heightens their pride in their work is sure to encourage a top effort.

Good luck with your ventures. Students will gain a fuller appreciation of the joys and challenges of scientific research. This will also allow them to really stretch their abilities, often with wonderfully rewarding results.

To teach students the "process" of science, is to open their eyes to the scientific world…for life.

The BHP Billiton website may be of interest as well, with descriptions of past winning projects, judging criteria etc.
http://scienceawards.bhpbilliton.com

Margaret Hosford
Director TSTS 2008