Bolt-on to Built-in:
Putting Teachers in touch with Engineering and Practical Science

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Enrolments in high school maths and science subjects have been steadily decreasing over the past two decades. The modern science curriculum was developed and is thought to be one approach to try to address this downward trend. This change has involved the move of senior science curricula, beginning with Physics and very soon Chemistry and Biology, towards being "context based" systems. This involves the use of themes to teach science concepts. For example, physics concepts such as forces and motion are taught under the theme of 'Moving About', 'Electricity in the Home' looks at electrical principles, and 'The World Communicates' helps to teach the students about waves. The problem though that many teachers and more generally schools have to work out how specifically how to teach their students under these themes. The Engineering Link Group (TELG) offers a solution to this problem.

TELG has been running the Engineering Link Project (ELP) successfully throughout Queensland since 1994. It is a four day, residential course for Year 11 and 12 students whose major goal is to allow the students to become engineers, not just watch engineers. Each day, they undertake a day long engineering activity where the students:

- Are presented with a problem
- Learning some enabling background theory, including maths and science
- Design a solution to the proposed problem
- Build and test their solution
- Evaluate how they went and what they could have done better

While the course is managed by teachers, the activities are developed and delivered by volunteer engineers from universities and industries in the local area. Further details of the ELP can be found in the paper "The Engineering Link Project: Learning about Engineering by becoming an Engineer", being presented at this conference.

Many schools in Queensland so far have realised the learning and assessment potential in the Engineering Link Groups' activities within their curricula through a 'bolt on' approach. The complex level of senior school mathematics and science contained within each course module has allowed schools to follow at least two different paths:-

- Smaller schools send their entire physics class to the ELP and assess various items on the students return as a project, or use the module as the basis for a context in their term's work.
- Larger schools arrange for their students to select one of the completed modules as an assessable option.

The Engineering Link Group proposes their Engineering Link Project as an instrument for putting teachers in touch with practicing engineers to develop and work through real engineering modules, discussing their application and expansion and experience engineering first hand. We foresee these modules being used routinely in schools as integral parts of the physics (and chemistry) curriculum, through a 'build in' approach. TELG's future direction is then one of the facilitator of this endeavour.

The Teacher Engineering Link Project would be operated in a similar manner to the present student Project, with each teacher able to choose modules to attend, depending on their own interest and the needs of their school. Eventually teachers and students will attend our Projects, possibly even the same Projects, and where the teachers can learn other ways to teach science and mathematics in interesting ways and will leave with expectations of excitement for their teaching and learning.

This presentation will discuss this “bolt on to built in” future and will encourages discussion and debate on the best ways to impress upon schools the importance of having their teachers knowledgeable about applying theoretical maths and science to real world situations and problems. It will also discuss ways that engineers can assist schools to make better informed and better prepared students, without too great an impact on their already busy schedules. Creative ideas and suggestions will be welcomed.