

## Vicphysics Teachers' Network

The Vicphysics Teachers' Network is a committee of physics teachers, both current and retired, teacher educators and academics. The committee sees its role as supporting physics teachers and physics teaching, and it also seeks to encourage student participation in physics.

The committee meets monthly after school to work for physics in the following areas:-

- Liaising with VCAA on curriculum matters,
- Distributing an email newsletter to physics teachers several times each term,
- Preparing a detailed written review of the VCE Physics Exam,
- Planning the annual Physics Teachers Conference in association with STAV,
- Planning and managing professional development activities on Medical Physics, Beginning Physics teaching, Practical Activities and Skills for laboratory technicians,
- Liaising with the Science Teacher Association of Victoria (STAV) on professional development matters,
- Organising physics activities for secondary school students, such as the VCE Physics Days at Luna Park, the Victorian Young Physicists' Tournament, Photo and Video Contests and the Practical Investigation Poster Competition,
- Administering a website of resources for teachers: [www.vicphysics.org](http://www.vicphysics.org),
- Surveying physics teachers on their qualifications, teaching experience and retirement plans,
- Undertaking research on student participation in VCE Physics, tertiary course selection by VCE Physics students and subject selection of science and maths subjects at the secondary VCE level,

See below for details of each of these.

- **Liaising with VCAA on curriculum matters,**

Members of the committee have been on most of the Physics Course Review panels over the last several years. Indeed committee members have been centrally involved in Physics curriculum in Victoria for almost 30 years. This has given the committee a substantial 'corporate memory' on the changes that have occurred over that time.

Members have been called on to develop support material and organise professional development programs for the introduction of new courses. The committee is also able to inform VCAA of teachers' concerns on various matters.

In the recent review to finetune the Physics course the committee was able to supply an extensive list of possible changes that would assist teachers in identifying the specific intent of statements on content.

With the Australian Curriculum initiative, the committee sent briefing papers on the Physics curriculum to ACARA and the committee was approached by VCAA and ACARA to be involved in consultations on the K - 10 science draft.

- **Distributing an email newsletter to physics teachers several times each term,**

The email newsletter has a mailing list of over 1000 addresses. It has been distributed since 2002. It has been an effective means of keeping teachers informed about professional development activities, new resources for teaching physics and stories from current physics research that teachers could use to encourage their students to consider the value of physics research and the opportunities it offers.

Many of the news items on resources, etc are still of value. A file of still current items is on our website, it now has over 300 items.

The extracts on physics research don't lose their relevance. There are now over 300 of them and are also available on our website, sorted by topic to allow teachers to find items of particular interest, e.g. cosmology.

- **Preparing a detailed written review of the VCE Physics Exam,**

For several years now the committee has provided a detailed question by question critique of the Physics exam. Our purpose is to improve the standard of the exam. Our concern is not with the academic standard, but rather with aspects such as clarity of intent, wording, layout and design of questions which will enhance the fairness of the paper and enable all students, regardless of language background to show what they know. We are also concerned about aspects that can create complications for the panel of markers.

It is our perception that VCAA sees our contribution as well intended and valuable.

- **Planning the annual Physics Teachers Conference in association with STAV,**

For over 30 years the Committee has planned the annual Physics Teachers Conference. The committee has decided the purpose of each conference, sought keynote speakers, planned the program and prepared workshop notes for participants when needed for sessions on course change. STAV's role has been to administer the conference, processing applications forms and managing the financial aspects.

The conferences, held in February for the last 15 years, have attracted between 300 and 350 physics teachers. They have always found the conferences a very valuable professional development experience. The committee has established a culture whereby many teachers are

comfortable with presenting to their colleagues. As a result the conferences have very full programs with numerous sessions on offer.

Our current concern is that the large number of participants has hidden the fact that a number of schools sent more than one teacher, which has meant that over 150 schools were not represented at each conference, with most not present at consecutive conferences. The Committee surveyed these schools to identify possible reasons and to seek solutions. As a result of this exercise, the committee decided to include an evening program of two sessions in the 2007 program to attract teachers whose schools did not have the funds to release them and those that did not want to miss their classes. The strategy was not that successful. There were very few evening only registrations, rather the country teachers took the opportunity to stay on and go back the next day. The Committee persisted with the evening program in 2008 with only slightly improved results. In 2009 a new strategy of an earlier start to the evening sessions significantly improved the numbers, which was also the case in 2010.

In 2014 the evening workshops were moved forward to the late afternoon. In 2015 a session of short 'Karaoke' workshops was introduced with some success and repeated in 2016, but is now discontinued. On the Saturday after the conference, Excursion tasters has been offered for the last several years with participants able to check out up a few excursion venues in the one day.

- **Planning and managing professional development activities on Medical Physics, etc**  
The previous VCE physics course introduced a number of options that linked to technological initiatives, including the Synchrotron, Medical Physics and Photonics. The committee addressed professional development needs of teachers in these and other areas at its annual Physics Teachers Conference. In addition to that, it organised events on specific topics. With support from the Australian Synchrotron Project from the Department of Industry, Innovation and Regional Development (DIIRD) it produced support materials and ran several in-services for the Synchrotron as it was being built and commissioned.

In association with the Peter MacCallum Cancer Centre, the Committee has run Saturday morning in-services for the last several years. These are now held as part of the Excursion taster program, see above.

A one day Beginning Physics Teachers In-Service is held each year during the Term 1 school holidays.

Workshops on Practical Activities for topic across the breadth of the Physics Study Design were held for a couple of years, but are currently suspended until a less labour intensive model of running the event is devised. Instead Workshops for Laboratory Technicians, focussing on physics aspects for Years 7 - 10, have run successfully.

- **Liaising with the Science Teacher Association of Victoria (STAV) on professional development matters,**  
Science Teacher Association of Victoria (STAV) has a large membership base and through registration fees it is able to operate an office with several full-time administrative personnel and produce and distribute journals and newsletters. The Vicphysics Teachers' Network is a group of volunteers and the committee has a limited cash base. Most of the activities are done on a voluntary basis and the distribution of information is largely by electronics means.

As a result STAV is an essential partner for the organisation of large events or the distribution of material in a hard copy format.

- **Organising physics activities for secondary school students such as VCE Physics Days at Luna Park, the Victorian Young Physicists' Tournament, Photo and Video Contests and the Practical Investigation Poster Competition**

The **VCE Physics Days at Luna Park** have been running since 2005. In 2004 The committee was approached by Luna Park management to explore the potential of Luna Park as a Physics excursion. Amusement Park Physics is a popular topic in America and Queensland where the weather allows the amusement parks to run seven days a week. Luna Park currently only runs on weekend and school holidays.

The committee was keen to be involved and contracted to prepare worksheets for each of the rides and advise Luna Park of advertising and management of the excursion.

The worksheets were designed for the Motion section of Year 12 Physics, which most teachers in the first part of the year. Also most of the rides involve circular motion. The committee in association with Luna Park currently offers four consecutive days about mid term 1 for schools to book. Over the four days, about 2600 Year 12 Physics students attend the VCE Physics Days.

All the worksheets, excursion advice and planning information is available on our website for schools to download and customise for their students. To ensure the days run smoothly for all concerned, the committee organises a ride sequence for each school so that all students get an equal chance for each ride.

Dataloggers are also made available to the schools to enable their students to collect data from each of the rides for analysis back at school. A logger is worn by a student and it records their acceleration in the three directions: up - down, forward - back and left - right, as well as altitude. This data can then be downloaded to a computer later in the day.

In the Victorian Young Physicists' Tournament (VYPT) students from Years 10 and 11 in teams of 3 experimentally research a common set of three topics and then in a day of contests report on their findings and also question the reports of other teams. The VYPT ran for several years and was suspended in 2018

The Photo and Video Contests are open to students with several entries each year. The Practical Investigation Poster Competition was established in 2016. It is for Year 11 students and is related to the assessment task for Unit 2 of the Study Design.

- **Administering a website of resources for teachers: [www.vicphysics.org](http://www.vicphysics.org) ,**

The committee has managed a website for several years now. The website features an extensive range of resources for all the Areas of Study in the VCE Physics Course, as well as information on Careers, News and events for Students. The website also features a Forum in which teachers can contribute to discussions.

- **Surveying physics teachers on their qualifications, teaching experience and retirement plans,**

The committee has surveyed Physics teachers several times over the last fifteen years on these matters by a variety of means. The surveys have consistently showed that about 90% of the Victorian physics teachers are qualified to teach Year 12 physics. This contradicts the Australian Council of Deans of Science study which had three weaknesses. 1. The study did not, and was not allowed to, make interstate comparisons of teacher qualifications. 2. The study asked if teachers had a full degree in their teaching discipline, whereas only 2<sup>nd</sup> Year University is required to teach Year 12. 3. The study's sample size for all science teaching disciplines and all states was quiet

large and randomised, however, when narrowed down to Physics in Victoria, the number the study surveyed was a fifth of the Committee's survey size.

The other aspects of the Committee's surveys are also interesting; over half of the physics teachers also teach science in the Years 7 – 10; over half will retire within the best 5 – 10 years and many are willing to help out with some form of part time work in retirement. The Committee will continue to undertake the survey.

- **Undertaking research on student participation in VCE Physics, tertiary course selection by VCE Physics students and subject selection of science and maths subjects at the secondary VCE level,**

The committee has investigated a number of different statistical aspects of physics education. The key one is the participation in secondary physics.

The analysis of student participation in secondary physics and other subjects often either uses as a measure the raw enrolment numbers or the percentage of Year 12 students doing the subject. The latter measure is better than the first as it allows for the fact that the number of children born each year has varied over time, and consequently the number of students doing Year 12. This is a reasonable measure when comparing a few consecutive years, but it is unreliable beyond several years. The reason is that the proportion of students entering school who stay on to Year 12 has changed markedly over time. A more accurate measure compares the number doing a subject to the age cohort. This gives a more accurate measure of a subject intrinsic attractiveness.

Analysis of this measure of the data of the last 30 years indicates that while there was a phenomenal increase in the participation of physics in 1990 and 1991, as it was for other science subjects, the participation in physics since then has been significantly better than at any time in the last 30 years. The concern in the data is that in recent years there has been slight, but steady drop in the participation. The Committee suspects that this is due to the fact that there are no tertiary courses in Victoria that have physics as a specific prerequisite. The other factor affecting student selection of physics is, it is thought that students feel that the effort in doing physics is not adequately rewarded by the VTAC scaling system.

Another area of analysis has been what tertiary courses do VCE Physics students actually select. This data has been supplied by VTAC for the years 1996, 2000, 2004. The courses have been grouped into various categories and the course selections have been analysed by gender and study score. The analysis shows that there has been a decline on the percentage of Physics students being selected for Science and Engineering courses from 65% in 1996 to 54% in 2004, while the combined percentage for biomedical and commerce courses has risen from 24% to 34%. More of higher study score students choose biomedical courses than engineering and science courses. The mean study scores in physics of the students choosing each of the mainstream science courses range from the high 20's to the low 30's out of a maximum of 50, indicating that the average science degree student got a low or high C+ on the VCE physics exam.

The Committee is currently analysing VCAA cross subject enrolment data for the VCE Maths, Sciences and English as a Second Language (ESL). The analysis so far has revealed that there are a significant number of female students who are doing Chemistry and Specialist Maths, but not doing Physics. There is an opportunity to promote physics to this market.

- **Making submissions to government inquiries on education.**

The committee has made submissions to the following State Government inquiries:

- Inquiry into Effective Strategies for Teacher Professional Learning,
- Inquiry into the Promotion of Maths and Science Education.