Submission to the Inquiry into
Effective Strategies for Teacher Professional Learning
by
The Australian Institute of Physics (Victorian Branch) Education Committee

The Education Committee is a committee of physics teachers, both current and retired, teacher educators and academics. It role is to support 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 June and November VCE Physics Exams,
- Planning the annual Physics Teachers Conference in association with STAV,
- Planning and managing professional development activities on Medical Physics and the Synchrotron,
- Liaising with the Science Teacher Association of Victoria (STAV) on professional development matters,
- Offering workshops on Physics and Middle School Science topics at conferences organised by STAV and University of Melbourne,
- Organising physics promotional activities for secondary school students, such as the Switch On To Physics program and the VCE Physics Days at Luna Park,
- Distributing Physics material such as the Transistor kit, the Bragg Diffraction kit, the Synchrotron CDROM and Physics Careers DVD “Physics as a Life Skill”,
- Administering a website of resources for teachers: 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,
- Advising the Victorian Branch and the Federal Branch of the AIP on educational matters.

These activities conducted over a couple of decades have given the committee an accumulated understanding of the professional development needs of physics teachers.

Inquiry into Effective Strategies for Teacher Professional Learning

Submission from the Australian Institute of Physics (Victorian Branch) Education Committee

Terms of Reference

a) the relationship between ongoing professional learning for teachers and teaching expertise;

Professional learning for teachers, at least from our perspective for that of physics and science teachers, has four features:

- Enhancing the context of content. Teachers need to be able to link the content that they are teaching to real world applications in the local community. Industry in its broadest definition has a role to play in this area. Two current examples are described in comments under terms of reference e),
- The learning of new content. Scientific and technological developments impact on science curricula, for example VCE Physics now includes topics such as the Synchrotron, Photonics and Electronics, while topics such as Cosmology and Alternative Energy Sources require regular updating. Similar topics can be found in the Middle School Science curriculum: Genetics, for example. This task of learning new content can be effectively implemented in a formal environment. An expert in the area delivering a well prepared lecture at a conference, with supporting material available to the participants, is adequate to inform and enthuse teachers.
- The development of teaching strategies for the new content. This is most effectively done in a collaborative environment where good ideas are shared. This can be achieved in small group discussions that are built into a conference program or through network meetings. However to be fully effective there needs to be a capacity for follow up to share their evaluations of the implementation of the ideas. This is where current implementation strategies fail. There are no mechanisms or resources to assist groups of teachers to maintain occasional face to face contact.
- The improvement of existing teaching practice. Changing teaching practice is the more difficult task. Telling people about a new strategy is likely to result in a small percentage of them taking it up. Showing a group of people the new strategy will increase this percentage slightly. Having them practice the strategy shows a significant, but temporary improvement in the percentage. However, to achieve long term change, there has to be practice with support in the following weeks back at school. Most professional development programs operate on the first two models and some attempt the third model. However there are insufficient funds and personnel to effectively implement the fourth and most effective strategy.

b) which factors will support high quality professional learning for teachers, including learning methods and environments for the development of professional knowledge, and the pedagogy relevant to professional development of teachers;

The factors that support high quality professional learning for physics teachers are:

i) **Cost**: Schools, in particularly Government schools, do not have sufficient funds for professional development of their teachers. This was made clear to our Committee when we analysed the participant data from our recent Physics Teachers Conferences. For the last few decades between 360 and 400 teachers from about 480 – 500 schools offering VCE physics in Victoria have attended our conferences. We had thought this was a reasonable attendance. Analysis of the schools of the participants revealed that they came from between 260 to 280 schools. The Committee surveyed the physics teachers in the schools that were not represented to identify their reasons. whilst some did not want to lose class time with their Year 12 students, the reason given by most was that the limited school PD budget meant that the cost of attending the conference was too high.

To address the first reason, the program for the 2007 Conference in February was extended to offer a separate evening program of repeats of the more important workshops and sessions from the day program. This was popular, but nearly all of the evening participants were day participants who chose to stay on, particularly the country teachers, as the conference was held on a Friday. The insignificant number of evening only participants suggests that cost is the dominant reason for non-participation.

To also assist teachers who could not attend the conference, key sessions and workshops were videotaped or audiotaped and made available on our website either as video streaming or audio streaming.

ii) Networking: The opportunity to follow up new ideas gained at a conference is essential if those new ideas are going to become established, rather than wither. Networking with teachers from nearby schools is an effective means of consolidating any new experiences. Unfortunately networking is seen by the school system as a peripheral matter of little consequence. Rather it should be given status and a priority, both by the school system and the school itself. It is recommended that

- after school network meetings should be regarded as a legitimate PD activity,
- time at such meetings should be counted as part of a teacher's after class activities, along with staff meetings, faculty meetings, coaching sessions and recognised as such,
- the responsibility of organising local network meetings is an important responsibility and should be recognised as such, financially or with time or both. Two models exist for this. In 2000 Balwyn High School, with the aid of Federal funds, established a program to support isolated teachers and students in country Victoria. A smaller version of this program is now run from Trafalgar Secondary College. The American Association of Physics Teachers (AAPT) has a very successful program called the Physics Teaching Resource Agents (PTRA) program (http://www.aapt.org/PTRA/index.cfm).

iii) Mentoring: A new teacher can be assisted by having a more experienced teacher available to discuss teaching and curriculum matters. Network meetings can accomplish this in part, but intense one on one discussion requires more time. Interested, experienced teachers could be given a small time release to spend time with new colleagues in nearby schools. Similarly there are, and there will be increasing numbers of, experienced and retired teachers who would be willing to take on this role as a volunteers. For the role to be respected, it needs to be paid.

c) national and international trends regarding ongoing professional learning for teachers and report on innovative initiatives;

The professional development literature indicates that the quality of a PD program depends on i) what the program covers, ii) how the program is planned, organised, implemented and followed up, and iii) how the program is regarded by the school and the education system.

It is important that PD programs give teachers the opportunity to increase their understanding not only of content, but also of teaching strategies.

Teachers should also be regarded as learners in the sense that professional development is an on-going process. This means that not only should teachers be followed up to support their professional learning, but their experiences should provide feedback on the design of the professional development activities themselves. This support can be provided in a number of ways as outlined under terms of reference b).

The school and the education system can enhance the effectiveness of a PD program by acknowledging that it is every teacher's right to have access to professional development on an on-going basis. This can also be achieved in the manner described in b) above.

d) determining how best practice in ongoing professional learning for teachers can be delivered into schools and learning communities;
Given all the comments made in b) and c) above, successful professional learning, as with all learning, regardless of age, is mostly a function of 'time on task'. The more time that is devoted to learning a task the better an individual will be at performing that task, whether it is a child learning to read or a teacher learning the best way to teach relativity. Quick fixes don't work. Time costs money, whether it is smaller classes in the primary school or regular network meetings after school.

e) examining the potential for greater cross-sectoral links between industry, training institutions and schools in the delivery of ongoing professional learning for teachers; and
The AIP Education Committee have organised successful professional development with other bodies. These include:

- A half day event on Medical Physics designed in collaboration with the Peter MacCallum Cancer Centre. This was held on a Saturday morning at the Centre when there are fewer patients. The Centre provided the venue, the presenters and material for the participants. The event was advertised through the Committee's regular email newsletter to teachers and volunteers from the Committee processed the applications and liaised with the Centre and with the applicants, while the Committee covered the administrative costs. The event was free to teachers, well attended (up to the Centre's capacity of 20 people) and much valued by both the teachers and the Centre personnel. It achieved the purpose of informing the teachers on the current technologies used in Medical Physics, allowing them to see the machines and talk to the medical physicists in charge of them, as well as learning about the possible careers in the Medical Physics area, their required training and the current demand. The event will be repeated later this year.

  This style of event is one possible model for professional development for science and physics teachers. It can be effective in delivering the first feature of professional development: "Enhancing the context of content" It makes use of an industry's resources and personnel at a time of the week when they are available and can be used at little or no cost. There are also minimal overheads in running such an event. The drawback is that only small numbers of teachers can attend at any one time, but over the years the coverage will increase. Also by holding the event on a Saturday morning it will attract the teachers who feel they need an update in the offered area. See Table 1 for possible activities.

- Half day or full day events on the Synchrotron over the last few years. These have been developed in association with the members of Australian Synchrotron Project, which is part of the Department of Industry, Innovation and Regional Development (DIIRD). This has been a successful partnership with each event attended by about 40 – 50 teachers. The events have been funded and supported by DIIRD. The support has included the releasing of Synchrotron staff to be presenters at the in-service and providing a tour of the synchrotron for participants. The funding covered the administration, advertising, hire of venue, catering, travel cost for participants and on some occasions, the coverage of teacher replacement. Once again the events were free to teachers and schools.

Events have been held during the school day, sometimes on the day of the General Achievement Test (GAT), which is completed by all Year 12 students and many Year 11 students obviating the need to cover teacher replacement costs. On such occasions the cost to DIIRD was about $150 per participant. When the event was held on days when teacher replacement costs needed to be covered, the cost was $300 per participant.

These costs for the professional development of teachers are remarkably low by industry standards and represent good value for money. An effective in-service for 50 teachers could be run for under $7,500. For companies and organisations that see public outreach as one of their key roles, this is an effective way of fulfilling that responsibility.

Area of Study	**Topics**	**Industry organisation**
Nuclear and radioactivity physics	Radiation Protection	Radiation safety program, Dept of Health
Investigations: Aerospace	Flight	Major industry participants such as BAE, Boeing, Thales, Tenix and GKN Engage
Investigations: Alternative energy sources	Photovoltaic Wind	Sustainability Victoria Auswind
Motion in one and two dimensions	Accident analysis, Car safety	Monash University Accident Research Centre
Electronics and photonics	Photonics	Victorian Photonics Network
Investigating materials and their use in structures	Materials Stability	Materials Australia Engineers Australia, Structural Branch
Electric power	Power generation	Engineers Australia, Electrical Engineering Group
Photonics	Photonics	Victorian Photonics Network
Sound	Microphones, Loudspeakers	Australian Acoustic Society

Table 1: Areas of Study and topics with possible industries

f) examining gender issues in the delivery of ongoing professional learning for teachers.
While there is an increasing feminisation of the teaching work force, physics teachers and physics students are still predominately male about, 70:30 in both instances, although there is a perception from observing the participants at recent Physics Teachers Conferences that there are a significant number of the female physics teachers are amongst the younger members of the profession.

In regard to professional development, the proportional of female workshop presenters at recent conferences has been about 40:60, which is also the proportion of females on the Education Committee, with two of the last four chairpersons being female.

Dan O'Keeffe
Secretary
Australian Institute of Physics (Victorian Branch) Education Committee,
PO Box 304, Glen Waverley 3150
Ph (03) 9561 7602
Email danok@bigpond.com