# C O R R E C T E D  V E R S I O N

**EDUCATION AND TRAINING COMMITTEE**

**Inquiry into promotion of maths and science education**

Melbourne — 8 August 2005

Members

Mrs H. E. Buckingham
Ms A. L. Eckstein
Mr P. R. Hall
Mr S. R. Herbert
Mr N. Kotsiras
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Witness

Dr N. Webb, manager, Think Time Tutoring.

**The CHAIR** — I declare this hearing of the Education and Training Committee open. The Education and Training Committee is an all-party joint investigative committee of the Parliament of Victoria. It is hearing evidence today in relation to the inquiry into the promotion of maths and science education. I wish to advise all present at this hearing that all evidence taken by the committee, including submissions, is subject to parliamentary privilege and is granted immunity from judicial review pursuant to the Constitution Act and the Parliamentary Committees Act. The committee is hearing evidence today from Dr Norman Webb. Welcome. We have your submission. We will ask you to make a short statement and then we will open it up to questions.

**Dr WEBB** — I manage a small private tutoring company called Think Time Tutoring in Geelong. We tutor students from grade 2 to university on a range of subjects including literacy, numeracy, English, maths and science. We have had students from all private, Catholic and state secondary schools in our region and many of the primary schools. I have also taught maths and basic skills to unemployed students at Geelong Adult Training and Education Inc., which is a registered training organisation. I have taught at 16 secondary schools in the last five years and have been teaching full time at a particular secondary school over the last four or five weeks. I have been requested not to name particular schools because, firstly, current practice is to say only positive things about schools, perhaps due to concerns about morale or maintaining enrolments. I would like to note the program for international student assessment (PISA) report that Australian school principals agree that students: enjoy being at school — 90 per cent; value academic achievement — 90 per cent; value the education they receive at this school — 94 per cent; and students are cooperative and respectful — 98 per cent. I feel that principals would not like to give a negative slant on the performance of people in their schools, but I believe the teachers who feel they are muzzled in this debate are unable to make their particular views known. The second reason is primary feeder schools are perceived to be extremely sensitive to perceived criticism and the concern is they may direct their students to other, non-critical secondary schools, and the thing that is rewarded in secondary schools is to maintain enrolments and staff levels and things like that.

The views I am presenting are my own. However, I have encountered no disagreement when discussing them with perhaps 15 or 20 other teachers. I would like to not appear critical of either principals or teachers or anyone in the system because I have a genuine high regard for the innovation and commitment they show in what I believe is a difficult work situation.

I wish to particularly address the first term of reference 'determine which factors will support high-quality teaching'. I believe the quality of education of students entering secondary school appears to be lower today in all aspects. Without addressing this general problem, improvement in maths and science teaching will meet with limited success. There are several key things I wish to mention. Students of all ages seem to have difficulty reading for meaning. I teach students from grade 2 to age 18 with the Neale reading test, which is standardised to a reading age of up to 13. I almost always find reading comprehension ages lower than the student's reading accuracy age; this would not be picked up by a general teacher who is just listening for a degree of fluency. When teaching in the school setting students regularly ask not how do I solve this problem, but what is it about, what do I do now, even when it is in front of them. In a particular school that I know of there are six 18-year-old students who have regularly failed their driving tests because at that age they have difficulty comprehending and reading the manual, according to the teacher who is trying to rescue them. This is not an atypical or extremely disadvantaged school by any means.

Too many students today also exhibit poor behaviour and attitude to school and learning. The most important daily issue discussed by teachers is classroom management. One school, in sharing their classroom management program, which is aimed at reducing anxiety among teachers and students, with six other schools in the region, may have been relieved to find that in all those other schools, 'They all experience the things that happen here'. Forty-two per cent of year 8 students in Australian schools claim that in most or all of their maths lessons there is noise and disorder and that work does not start for a long time — in 27 per cent of cases, according to PISA.

In a paper entitled 'Changes in students' mathematics achievement in Australian lower secondary schools over time' — Andrew has some copies; I do not think they have been generally distributed — Affrassa and Keeves analyse the testing of the International Association for the Evaluation of Educational Achievement in 1964, 1978 and 1994, and statistically make comparisons. They conclude that, 'The mathematics achievement level of Australian students at the lower secondary school level has declined over the last three decades'. The factors they suggest to address the problem are centred around home background, motivation, attitudes, time devoted to learning maths and quality of instruction.

My belief is that the problems start early. Young primary teachers I have employed casually have all been dedicated and enthusiastic about teaching. They are popular with the kids. However, when I watch them with children who need help, they pass the time reading stories or playing maths games, and they recognise over time that the children do not improve their level of performance. I have other teachers who are not primary teachers, including myself, who can in this situation make a dramatic improvement in the achievement and self-esteem of children who are worried about their schooling. There are times when direct teaching, testing and persistence work for children.

The areas that need addressing must include the whole language method for reading instruction; mathematical and problem-solving skills — I mean right at the very early level; and the importance of early diagnosis, testing and remediation — it is not being kind to a child to leave him to realise for himself that he is limited in his reading understanding and problem-solving skills. There is a window of opportunity for teaching the skills which starts to close after the age of nine. Also, the sense of urgency of the situation — Australians must be convinced that education is important. I note that Steve Bracks is making comments about water usage and I am sure this has changed the perception of the problem in the community. I think maybe somebody should be saying the same things about our education system and trying to raise the level of importance of this area. Popular culture gives status today to fashion, services, money-making and freedom of choice. There is no effort to argue that if no-one chooses mathematical skills and science innovation the gloss of popular culture will not be achievable. The other question is how to balance putting a positive view of schools and telling the truth to parents who should be concerned about the lack of education their children are receiving, and who should instead be recruited as willing participants in their child's education?

Towards a solution: the benefits of undertaking a major change in the direction of education cannot be overestimated and in the long run will be more important than the war on terror or a number of new freeways. They include an innovative expanding economy and less need for expensive and inefficient programs such as VCAL and the RTOs that have been spawned since the Finn and Meyer reports of the early 1990s listed the competencies not evident in the unemployed and unemployable casualties of our current system. The Institute of Family Studies, in its recent report 'Growing up in Australia' — which has not been generally released; I am only going by newspaper reports — claims that 50 per cent of Australia's 20-year-olds have been adversely affected by drugs, depression and mental illness. Our happy, non-testing, game-playing primary schools have not solved the anxiety that children grow up with.

These problems are not unique to Australia. I have enclosed a photocopy of the ideas of Michael Barnard, who was at Melbourne University. I have time only to highlight the comments of this man who has obviously spent a lot more time researching the problem than have I. Solution 1 — schools need evidence-based solutions with modifications and additions to be made over time. This is the scientific approach, not the ad hoc accumulation of new programs and things to just worry teachers with. Solution 5 — the need for parent-teacher collaboration. Solution 7 — students need to be taught the foundations for learning. Solution 8 — the community and state are stakeholders in education. The outcomes are too important to be solely entrusted to people defending entrenched positions.

I have also included a press release from the US Department of Education from the Internet; America has similar problems to us. It notes with concern the lack of improvement in K-12 education in America over the past 30 years and notes that unlike education, randomised trials in medicine, employment and welfare and other fields have produced extraordinary advances.

There is a huge and expanding body of sound evidence-based knowledge about educational practice, supported by knowledge derived from other fields such as psychology, brain scanning and child development, which students in the current system will never be able to access or practice due to lack of time and the hostile environment in which they work.

Proposal: because I know that you cannot dismantle things and the costs involved in halving student enrolments and paying teachers exorbitant amounts is not what we are on about, I am suggesting perhaps schools of inquiry could be established, perhaps one per network area of region. These schools should comprise a total K-12 unit under one leadership team to review the entire sequence of learning. The schools should have freedom to be different and trial different procedures. One might trial different reading teaching methods, another more regular testing or streaming — large classes where other teachers are preparing or doing other things in a compliant school environment. The schools would have to be privileged with a generous staff-to-student ratio to allow the staff to

master and trial new practices and ideas. The outcomes of investigations of new practices would have to be independently assessed and open to scrutiny. Some of the staff should be given longer tenure and be regarded as senior investigators. The other teaching positions should be rotated with other network schools, allowing them a period in a learning environment to invigorate their teaching and a place to acquire new skills to take back to the home school. Inquiries into professional development in teachers suggest they may learn new ideas and programs and things but when they go back to their school environment they just do what they can do in that situation — they do not experiment or take risks because it does not work. These schools would need access to students of all ability levels. The students and their parents would need a level of commitment to stay and students who impede the learning of the school should be sent elsewhere. There might be room for special programs for high achievers or special lessons for visiting students from neighbouring schools.

Such a system would allow us to move forward and find solutions to many of the questions we cannot immediately answer, in an environment which would nurture the current staff and provide the excellence and interest needed to provide interest and a career path to high-quality entrants to the teaching profession.

**Mr HALL** — Thank you for your presentation. On the last initiative you are proposing, schools of inquiry, is there any overseas evidence? Has anybody else you are aware of set up such a model?

**Dr WEBB** — First of all, when we compare ourselves to overseas — I talked about America, my son has been in Japan and I have a daughter-in-law from Taiwan — and think of where the high-performing schools are, they all share our particular problems. In America there are some individual groups of teachers who, on a private basis among themselves, form a community of sharing different innovations, but they do it on their own time. There is one school my wife saw in a TV presentation on Jim Lehrer's program in which science is highlighted from a very young age — even at school age kids are producing scientific papers. However, to my knowledge, this would be very dramatic. I am trying to say the game is worth the candle. Someone has to find the way forward. There are indications that great improvements can be made.

**Mr HALL** — I just wondered whether you knew of any similar establishment.

**Dr WEBB** — No.

**Mr HALL** — In one of your summary proposals you suggested the need for people with training in maths and science and those with a talent in these disciplines to be encouraged by whatever methods are deemed effective — and that is something we have grappled with as a committee. How do you encourage people who do well in maths and science to move to the profession of teaching? Do you have any suggestions?

**Dr WEBB** — I noted there is a high turnover of teachers within five years of entering the profession. In my teaching career I remember a couple of lessons when I have held students captivated and interested and I have enjoyed teaching on those occasions. The rest of the time it is not science or maths; it is student management and trying to control the situation and get something through. The strategy we have is nursing them through. By year 10 or 11 they gain a bit of maturity and without any basic learning skills or good reading habits they turn around and think suddenly they need to do a bit of study. It is not a career path that a person who is interested in maths and science would enjoy. In the Kennett era there was a recognition of the lack of career path for teachers and unfortunately the solution seemed to be to reward senior teachers who could fill out job applications, remember more acronyms than anyone else, chair committees and things like that. My proposal is to try to direct people to get some satisfaction out of teaching and getting the learning process moving.

**Mr HALL** — In your comments you have suggested we need to capture kids by the age of nine and get them interested in some of the thought processes required to become good maths and science students. Given the fact that it has been put to this committee in some of our other inquiries that it is hard to attract primary teachers with sound science backgrounds generally, would you therefore employ specialists to build on the fine work that primary teachers do in student management, et cetera, and lend support to specialist science and maths?

**Dr WEBB** — In my proposal I think there is a big problem with the division between primary and secondary and the one side not knowing the other side. Within the total school situation the senior teachers who are concerned about the education of their students should be going down and interacting with people. I teach very young children. I can see the problem when I am tutoring secondary school students. I go back to the fundamentals they should have mastered in primary school which they have not got.

At a professional development day a colleague proposed changes to certain teachers. They said they were 45 years old and they could not change now. In a proper environment where there senior people, academics or tertiary educated, or even senior teachers within their own school system lending support, feedback and acquiring new skills through the program I am suggesting, teachers in the system could educate themselves a great deal. I also suggesting in my system that there is at least one centre of excellence where good science teaching at any level could be demonstrated. Even though you might not be able to find that many teachers competent in those disciplines, you will find some. If it is a satisfying situation, you will find more.

**Mr KOTSIRAS** — In your submission you have said all teachers should have access to the latest published research and open their minds to new developments. Teachers currently undertake PD days. How is your recommendation different to what teachers are already doing; or are you saying the current structure is not working?

**Dr WEBB** — There has been an inquiry of which I have read an account in the newspaper saying the current PD in fact does not work. Teachers I speak to and the research in America also suggest teachers can be presented with information about better teaching techniques and agree that the theory of it is much better than what they are doing. But when you are in a classroom situation you tend to fall back on conservative strategies giving people work and standing back and watching to see what is happening. The evidence is that professional development does not work. I really admire the initiatives and innovations people are proposing. I admire their commitment, but they do not work.

**Mr KOTSIRAS** — So how would you structure them?

**Dr WEBB** — If I go out tomorrow and find different methods for teaching maths to year 11s, then I will probably not be able to do it in the classroom. I am suggesting that a teacher should be able to be rotated through a school so he would be able to acquire positive experience in a new technique. I am hoping having schools in the system that actually show progress and genuine learning will also serve as some sort of catalyst to the wider school community to see it as possible. At the present time students say that private schools have wonderful teachers. The difference between Geelong Grammar and the school down the road is not the quality of the teachers to my mind, although the quality of teachers there is certainly excellent. It is the ethos of the parents who place a very high value on education. If a lot of the other kids could be transported into Geelong Grammar I personally believe they would respond to the total environment where education is seen to be important to the majority.

I actually did this for a while with my own son and the difference was very dramatic. I am not suggesting you spend that amount of money, but I am suggesting some money would need to be spent to establish something in the state system to provide an example which other schools believe they could emulate.

**Mr KOTSIRAS** — Could you also explain what you mean by the next sentence, 'However, politics and misconceptions among teachers are abstracting the education of our children'?

**Dr WEBB** — It is a while since I wrote this. Teachers I have spoken to did not know this committee, which I think is extremely important, was happening. I do not think I would like to extend that more widely apart from the marking out of territory, avoiding criticism and the level of petty politics.

**Ms MUNT** — It seems the crucial basis of your argument is classroom management. With the Chair I opened a maths conference for the universities a few weeks ago. They had some research on the teaching of maths in classroom. I found it fascinating because a lot of the success comes from the teacher method and the best method is where the teacher interacts with a student one-on-one throughout the classroom period, sets the work, interacts with students and if they have problems goes back and interacts with them again. Did you have any ideas on classroom management you would like to see? That is my first question. My second question is how would you choose the students for the centres of excellence?

**Dr WEBB** — They would be on a contract which was entered into on a yearly basis between students and teachers. In the first instance you would just choose a particular secondary school plus feeder schools. I am not talking about a University High School situation; where students were selected for high academic achievement. Students need to be representative of all ability levels.

Going back to the classroom management question, there is some very good work being done in universities — the little bit I am aware of. My own classroom management success, when I have it, is exactly what you are saying —

moving around the classroom and interacting on a personal level. When I make a positive interaction and try to build a relationship with a particular student, being a humble man I have trouble being aware of all the other things that are going on. Teachers say they think in any class they will get 5 per cent on-task behaviour; the rest of the time is the rest of it. Sometimes it is better than that. I would like to think I can beat that. Over a long time I can raise the class to where I have a positive relationship with them, but it is very hard work.

The history of the average child is something like this: they are born, we recognise they have certain aspects and they wish to acquire meaning from the world. This is early childhood development. They are interested in language acquisition, quantity and personal interaction. They have the means of particular learning they are receptive to. There are reading programs which should be directed to age four, and I have not had time to address that. This is the time when reading and language skills are being acquired. Children getting into the school situation at the age of four or five and finding they are not rewarded or recognised by the teacher pull back. At the age of six parents will come to me and says the teacher says he is going to be fine and do not worry. By the age of nine a sizeable proportion, particularly of boys, will have divorced the school system and be a future problem. I am not giving you the answers, but I am saying we have to find the answers and they will be at that early stage. With classroom management techniques we are just trying to pick up the pieces; we are not solving the problem.

**The CHAIR** — Thank you, Dr Webb. It is always good to have people come forward with views and one of the problems, as you were saying before, is that too many teachers do not come forward with positive viewpoints. I thank you very much for that. One of the things I am finding difficult to grasp with what you are saying as a broad picture is that when I go to the schools in my area I do not experience the same thing you are saying. I will just use a few examples which I would not mind you commenting on to see how you think they are working. Most of the schools in my area are in clusters. There is an $80 million program to foster primary and secondary interaction around areas of key learning. They seem to be working well in terms of the schools in it. We have leading schools funding, say, at St Helena and Diamond Creek secondary colleges which is about $4 million to $5 million. Every single teacher is going through an in service in terms of using technology across the teaching methods and improving outcomes. I have another secondary school which is part of a statewide trial evaluating outcomes. The teachers are quite positive. It is a big thing for teachers to sign up to being moderated against outcomes. That was your point I think in your submission — to have a look at outcomes against targets and even evaluate against student and parent feedback. I know they are early days, but are you seeing any indication that those programs are having any impact?

**Dr WEBB** — I have not seen them. I do not think I am the only person who has had these thoughts. I see a lot of concurrent thinking and initiatives which I appreciate. I have taught at Diamond Creek for a few weeks, but that was years ago and it was not relevant. I do not know just how effective they will be. I hope they are. If they work and are cheaper than my ideas I would not argue against them. I do not see they have to be exclusive.

**Witness withdrew.**

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Mr N. Champion, Oakleigh, head ofGreek Orthodox College.

**The CHAIR** — The committee welcomes Mr Neil Champion from Oakleigh Greek Orthodox College. I assume you are no relative to Greg Champion.

**Mr CHAMPION** — We are about the same height and physical characteristics, but no relation.

**The CHAIR** — So we will have a presentation not a song?

**Mr CHAMPION** — That may be a good thing given the way my voice is today. I am head of the Oakleigh Greek Orthodox College. However, I represent my own views rather than the views of the college. I want to make that clear. My expertise is as a long-term science teacher particularly in physics. I have authored VCE physics textbooks. I have contributed to numerous junior science text books including one which has just won a national award for publications for Nelson. I was the VCAA science manager for four and a half years, most of that time on my own developing the curriculum from prep to year 12. I signed off the CSF, but I did not actually have anything to do with it. I came in about two months beforehand. I was able to make a number of changes to the quality of science. I was appalled by the fact that at the very end all of the implied or actual methodology that was suggested in the CSF had been removed by the contractors as part of the process. I was responsible for physics, chemistry, biology, psychology and the development and implementation of environmental science. I am a physics teacher and I think that probably gave me a chance, but I do not know that everybody would have had the chance. So that is my background.

I gave you a very lengthy paper on numerous issues. It was written before the Victorian essential learning standards came in. At that time I expected them to be a framework, and some of my comments may have to be updated in relation to the VELS developments. VELS worries me a little bit because I still believe it is very generic and requires a significant content base. There is only one reference to a book about teaching and learning which I believe relies far too heavily on brain research and not enough on the social constructivist principles to which I have alluded. Those principles have been in place for 20 to 30 years. Going back to the 1930s there was the work of Vygotsky at Herzen University, and I mention that because I gave a paper at that university earlier this year on the VCAA implementation of the physics curriculum and its core and detailed studies, and I have a copy of that for the committee.

A lot of work is being done on the whole business of connecting kids to cultural conversation as you go about learning science. Clearly that is a very important component of the way we ought to do science, but it has some very serious issues in relation to the way you do assessment. There is a whole lot of difference between assessing for learning and assessing what you teach, and I have made a comment about assessing for what students have learnt or been taught for that very reason. In terms of *Alice in Wonderland* it is a question of 'I learnt them' not 'I taught them'. You can teach a dog physics, but you cannot learn them anything, and that is an important component of my thinking.

There are some programs around, particularly in the United Kingdom and at Melbourne and Monash universities where they run the Reason!Able program which is actually in the humanities department. It has demonstrated high level performance over and above equivalent students who are either at university or not at university in the first year — that is two standard deviation changes in their capacity. Similar work is being done at King's College in London through Jonathan Osborn and others. They would claim, although tentatively, that underperforming schools that used programs where they were deliberately teaching logic as part of their science courses become significantly above the line in all subjects not just science. So I recommend that to you.

I have talked about the school environment. I have just purchased four electroboards, which are interactive whiteboards where kids can log onto the Net and so on and so forth and do a lot of really interesting stuff. You can connect the boards publicly to the work of individual students and then workshop that with the whole class from time to time. I know that is done at Melbourne University. I cannot put one in my science room because there is nowhere to place it. I cannot put in computers because they are too close to water and a whole range of those sorts of things.

I have made a number of comments about that including the fact that laboratory technicians are very rarely trained in physics and never trained in education. So often you get a mismatch between the laboratory technician's view of the world in terms of occupational health and safety because the occupational health and safety rules are often

based on an industrial model, not a school teaching model. In some cases the label cannot fit on the reagent jar and then you are in trouble with the laws so far as I can see.

In paragraph 1.3 of my submission I made a comment that you ought take significant note of the fact that the biggest bucket drag on the introduction of new curriculum is the lack of teacher knowledge about new science. I had a significant argument, which I lost publicly, with the psychology teachers — they are mainly English teachers teaching psychology — who have no idea what is currently going on in psychology as a science. The debates I had were at least 40 to 60 years old and I went back to the literature to have a look at that. How can we run 16 000 kids through a science education at years 11 and 12 which purports to be scientific, but which is about fact, knowledge and recall? For example, we have examiners who put out flash cards. Kids can read and memorise them and get most of the answers in the examination. That is quite unsuitable as a science education, certainly at the end of the school years. The issue of the eye and the brain, both of which are done in year 7 or year 9 science but which are regarded as almost too difficult entirely for the VCE psychology students, is a worry; and the fact that there are no meaningful statistics in biology, environmental science of psychology is a disgrace to our curriculum, or students and to their development.

The comments I made on assessment relate to the Goodrum report which is a 2001 publication into the status and quality of teaching and learning of science in Australian schools. In assessment the really serious problem is that assessment practices are very limited. Currently in the VCE, as a public relations exercise really, the school-assessed course work program requires students to be tested in the same way as they are tested, generally speaking, in the examination. Strangely enough, the correlation between school-assessed course work and examinations is very high, which is what the VCAA is attempting to do. The fact that the kids are learning no other skills other than how to pass examinations seems to me to be something of a problem.

I refer you to the science teaching professional standards. I believe the maths association has referred you to those same standards. I notice that you are seeing the VIT later today. It is a really serious matter. We need to have highly accomplished teachers and an accreditation process which is not just bureaucratised but which has grunt and pays its way for people.

I made some comments about GTAC and VSSEC — Victorian Space Science Education Centre. I note you have seen GTAC, and that is important to me. I have a copy of a submission I made internally to the VCAA on the way in which we might build up the curriculum structure in order to find space for new science as it comes online rather than throwing something in every 5, 10, 15 or 20 years and saying that every kid in the state has to learn it. That was the purpose of constructing the VCE physics curriculum in the way that we did.

In that sense you asked about business, industry and research applications and how they can come online. My view is that unless you put it in your senior curriculum it will never go anywhere. If you put it into your senior curriculum as a mandated part, then you have the problem of the backlash from teachers who do not know how to deal with it and are too scared to deal with it. They have had long periods where they are not learning, and teachers coming back to learning have significant anxiety about that; it is quite difficult to do. I was the education convenor for the Victorian photonics network. They wanted me there because I was getting photonics into the physics course which meant that there was an interest in the industry in taking up the opportunities, and they did that by hiring post graduate students to write practical work. They gave us access to all sorts of people who were interested in education and so on, and one company, Senko Australia, took it on itself to produce materials for schools which it is now selling into schools. It is not a big money maker, but it is something that we got it involved in, and it meant that we had access to people to write materials for a CD-ROM which the VCAA produced after the Department of Innovation, Industry and Regional Development provided us with sufficient funds to do that job.

So there are ways that you can get industry involved. With the synchrotron project the Australian Synchrotron Project* wrote to us saying that it was keen to have us onboard. It has been significant in continuing its support

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*Mr Champion wrote to the Committee on 30 September 2005 informing it of a minor factual error that had not been corrected prior to publishing of a final hearing transcript. The original transcript appearing on the Committee's website stated that Monash University had written 'that it was keen to have us on board'. Following Mr Champion's advice that it was in fact the Australian Synchrotron Project that made this statement, this factual error was corrected. Thus, the version of this transcript appearing after 4 October 2005 (and to be tabled in Parliament at completion of the inquiry) refers to the Australian Synchrotron Project making this statement. The prior published version attributes this comment to Monash University.

during the implementation phase of the current VCE physics course. It has just run a professional development activity for teachers who are teaching about the synchrotron, and it has produced materials on its web site which is up-to-date and relevant to the course. Both of those are highly successful efforts, and were done through a core and option process in the VCE rather than saying that we should shoehorn it into an already enlarged curriculum. We produced the core and it then ran out to other things and that is a very useful way.

I have made some negative comments about the VCAA in the past. That is simply a pragmatic matter. It does not have the staff. It is run with pocket money from the education department. How would you expect it to do a reasonable job of curriculum design, development, proactive work in getting the field ready and then supporting the field when changes are made? It is not possible without curriculum expertise.

I hope the education department has provided the committee with a copy of the *Science in Schools* report. I have a number of documents which I will mention.

**The CHAIR** — Will you table those documents?

**Mr CHAMPION** — I will table those documents. It is just a question of how I manage them for your benefit.

**The CHAIR** — If you like you can table them when you finish.

**Mr CHAMPION** — Terrific. It is just a bit of a pain. I will just make one other comment before I close and give you a chance to recover from me going at 100 miles an hour. It seems to me that science graduates these days have HECS debts that are higher than those of arts graduates. Why would they come into teaching if they are not going to get the equivalent take-home pay of their colleagues? How do you fix that? Obviously one way of doing it is to subsidise the difference. I think that is a very simple way of making sure that they come out with a take-home pay that is the same as every other person. That is quite different from then saying that science teachers are the greatest thing since sliced bread and ought to get more. I noticed that the maths association regards maths teachers as needing higher pay than others. We would be in for that chop as well! I think there are some simple ways that you can support teachers.

I have also commented on the need for a sabbatical approach. I think a sabbatical can be taken after seven years. I have called for it after five years. There needs to be a time when teachers can update their skills because if the bucket drag is on knowledge, what are you going to do? We submitted three detailed studies and projects proposals for VCE and the third was one that was already in the curriculum prior to the updated course, so that all those teachers who did not feel comfortable still had something to feel comfortable about, and that is the way we got it through politically. But, of course, it means that probably two-thirds of the state is not doing anything new to what they were doing 10 or 12 years ago. So there are some issues there.

**The CHAIR** — Thank you. Congratulations on your presentation and for the very practical ideas which you put in your submission. To start off I want to explore the issue of laboratory technicians. You said that many of them do not have specific physics qualifications, and virtually none of them have education qualifications. We have not heard much about that before. Could you start by outlining the qualifications of a laboratory technician in a secondary school. What are the requirements?

**Mr CHAMPION** — There is a TAFE qualification; I think it is at diploma level. The work they are required to undertake is basically preparing practical work for teachers, and then maintaining things like livestock, plants and the chemical store. The chemical store is probably their biggest nightmare because they have to keep things in working order. They often work alongside teachers. They are often called into classes to assist students. In some schools they become mentors for students doing specific projects and so on. So it is a relatively straightforward job, although it is also very much a coordination job because the teachers are talking to laboratory technicians all the time. If the laboratory technician decides that you can only have five groups in your classroom, you will probably only get five groups in your classroom even if you have 30 kids.

**The CHAIR** — How are they taught the curriculum? Does the laboratory technician know the scope of the curriculum from A to B? Is that part of the training process?

**Mr CHAMPION** — It is certainly not part of the training process because they would be trained in a more generic sense than just school laboratories. So they are very often doing animal technician work as well. I am

not clear now. I had some input into the diploma for laboratory technicians 10 or 12 years ago, but things have changed since then.

**The CHAIR** — But is that what you mean by education? That they have some understanding of the curriculum and the outcomes that are expected, and how the practical versus the theory interacts?

**Mr CHAMPION** — It is the interaction between the practical and the theory. Let me give you an example from a school that I was in. I wanted my students to learn the difficulties of making their own personal judgments in planning a research project and asking for the right equipment, and then getting on and doing the thing. We discussed the matter and they put out their proposals. I gave them to the laboratory technician who said, 'I cannot do that because I cannot put down exactly the equipment that they want'. I said, 'Do what they ask for, throw a few other things on the trolley and see what happens'. I had an enormous problem because the laboratory technician always provided everything neatly and in order. I was tough enough to brace myself and deal with it, but teachers lower down the school, particularly young teachers, simply went along with the fact that the laboratory technician decreed that every practical group would have exactly the equipment it needed in exactly the right place with exactly the right chances of getting exactly the right result, which is exactly the wrong way to do that sort of practical work. It may be just a management issue in the school, but it would be nice if they had some idea before they turn up.

**The CHAIR** — So you would look at an in-service, professional development-kind program. Are there any in place?

**Mr CHAMPION** — There is a laboratory technicians branch of the Science Teachers' Association of Victoria. Generally the technicians' interests are in sharing ideas about what to do, about resources and about safety. The other issues are of secondary importance.

**Mr KOTSIRAS** — Would you say a bit more about BISEC?

**Mr CHAMPION** — I am sorry, I forgot that in my presentation.

**Mr KOTSIRAS** — The link between industry and schools.

**Mr CHAMPION** — I always worry about creating another bureaucracy or another bureaucratically designed organisation. My concern is that unless you create something with a bit of grunt that actually has its eye on the ball all the time in terms of new science coming into the curriculum, you are never going to get it. You will not get it through the VCAA because it is undermanned and in my view its vision is not particularly broad. The education department provides advice to education department schools, and that is about 50 to 60 per cent of total schooling. So the idea of putting together an organisation including government, business, industry and universities into some sort of coalition at a management level which then creates a small but active unit that could make those connections directly to industry, to business and to new technology is a role that I identified in a number of ways.

**Mr KOTSIRAS** — Who will pay for this?

**Mr CHAMPION** — Obviously government has a role because it is interested. I note the federal government's policies are almost equivalent to those of the state government in terms of innovation — and Queensland has the same sort of policy. I do not think this is a party-political issue; it is a government issue. I think you have had a submission from VECCI. I am disappointed in the industry's desire to engage in education per se. I think VECCI's view would be that the education system provides a product which is then picked up by industry. I know there has been a lot of concern about the way in which interactions occur in the local learning and employment networks because industry says, 'Stop fooling about talking education and nonsense. Let's get down to brass tacks so we know how much it is going to cost us and we can get in and out of the issue'.

I think industry has to take far more responsibility for what happens in our schools, but I think it has to be a partnership. That was OST's complaint in the letter that it sent to the VCAA offering further support to the education system. When we had a science expert studies committee we had nobody on it from industry simply because one science manager chasing around his networks did not get hold of anybody who said, 'Yes'. It was done on, 'Who do I know in the system who might come around to do it and who do I know well enough to sweet-talk into sitting on a committee for a day and several hours for nothing but a few sandwiches and an orange juice?'.

**The CHAIR** — Are you familiar with the new federal government fund to have interaction between industry and science teachers?

**Mr CHAMPION** — I am not.

**The CHAIR** — Is it a practical thing to pay scientists to go in there, or is it a management kind of thing?

**Mr CHAMPION** — What I am concerned about is that those people who are already in the know will remain in the know and those who are not will continue to remain deadwood on the tree. You have got to take a proactive view about who is your target, and your target is people who are working their backsides off in the schools doing a damn fine job with young people, and failing to keep up with anything like the curriculum needs that they have to if we are going to take an innovative approach to science and engage kids in understanding the science that is on the doorstep today.

**The CHAIR** — Presumably there would have been consultation on a fund of that size.

**Mr CHAMPION** — Yes. I looked at it a little while ago but I have not actually pursued it. My interest at that time was that there are some very good things. As I think I have mentioned, Macquarie University has a master's of science education, which I am doing online. I got onto that because I advised them about how to do that. It is interesting that there is some infrastructure in New South Wales that we do not seem to have in Victoria — certainly it did not come over my desk — to do online learning. It seems to me that in one of the areas — for example, in environmental science — there is excellent work being done in New South Wales. We have got quite a good course in Victoria that is not getting much traction. If we could provide an online environment, it would be much better, and if we then connected up the practising scientists into that cohort we would do a lot better I think.

**Mr HALL** — First of all, thank you for an excellent submission. I was going to ask about the subject knowledge area of your submission where you talk about the biggest bucket drag being the lack of teacher knowledge about new science. In particular your recommendations 11 and 12 actually suggest that teachers should be required to have their skills assessed by a formal process every five years and an annual accumulation of points. Is that special to science or should it be applied to other disciplines as well?

**Mr CHAMPION** — Undoubtedly that is something that ought to be across all disciplines, in my view. Science is particularly acute because it is changing rapidly, and in Victoria where government initiatives have put in place a synchrotron and you have the $100 million in neuroscience, the Victorian Institute for Chemical Sciences, the brown coal CRC, and they are producing stuff that we need to have kids connected to straightaway, then it is crucial. I think things move a little slower in the history areas, but there is a significant development in the post-modernist and the post-structuralist debates in history that are just not on the radar in the schools.

**Mr HALL** — Could that assessment be incorporated into the annual assessment of teachers?

**Mr CHAMPION** — That would be a very good structural way to begin the process. My concern and why I made those comments is that when you do that all you get is people signing off things that are not all that satisfactory. Attendance at a professional learning activity is of no consequence in my view. You have just got woken up perhaps and then you go back to sleep. It is when you are actually engaging with content, engaging in some way with pedagogy and its relationship to content, that you start to get traction on the sorts of things I am talking about.

**Mr HALL** — How well in your opinion is that new science being delivered as part of tertiary qualifications in terms of physics lectures?

**Mr CHAMPION** — Do not get me started. What we are trying to do in secondary and what they are trying to do in tertiary are very different, and that is where the mismatch occurs at the VCE accreditation process. My feeling is that the tertiary institutions know what they want and they are prepared to just go for it.

**Mr HALL** — Do they adopt the new science in their courses?

**Mr CHAMPION** — My son just recently completed a physics degree at Melbourne University. I would say that some of the stuff he was reading I read. I do not think there was a lot of engagement with new science, but

even so he was up with the synchrotron as a tool, so in that sense I presume that he had done some work in that area but he just did not bother to tell me about it because he knew I would not understand it well enough.

**Mr HALL** — I was interested in your comment about the college in London that was teaching logic.

**Mr CHAMPION** — King's College London does a lot of work on argumentation. That is the technical term. Jonathan Osborn is the person there. When I went to St Petersburg I made numerous attempts to contact him and he did not reply, so I was not able to see him on my way through. He was in Australia 12 months prior engaged in lectures at the association of science teachers conference, and there is an exponent of the work in a primary school in WA who I am keeping in touch with. I am hoping to have some involvement in that. It was her lecture on this work that she had done that alerted me. She showed a graph showing average schools and looking at the intervention of below-average schools over time, and she was not prepared to say that there was statistical evidence but all the schools that were involved in that intervention had jumped over the average, so she thought it was a pointer in the right direction.

**Mr HALL** — We might follow that up as a committee too because that is an interesting initiative. You have spoken extremely well about senior science in schools. How important in your opinion is the grounding that children in primary school get in science towards their success, their interest and their engagement in future years?

**Mr CHAMPION** — I actually think that where schools are having a go in science and are not being too fussed about explanations but are interested in how things go and what happens in science, schools like that get an enormous amount of activity from kids. They get a lot of language activity. I think it is very powerful. We turn them off pretty quickly when we get our Bunsen burner licence, a microscope licence and a safety poster in the first six frigging weeks, and that is the end of the matter. It is as boring as bat shit, and that is they way the kids experience it.

**Mr HALL** — In your opinion is it important to engage them?

**Mr CHAMPION** — Absolutely, but always it is the next level on. The secondary level I do not believe is, generally speaking, really hitting their straps in relation to what is happening in kids and science. The Science in Schools project certainly showed that. It also showed that there was a significant problem in secondary schools and there was a serious doubt as to whether after year 10 what the kids expected was ever going to be delivered at the VCE. That is my concern, that the VCE is a dinosaur attached to a mammal or something, that sort of notion. It is really important to keep the thing going. What I notice in the VELS stuff is they are actually saying let's reduce the science demands early, let's do something in the middle up to year 10, and then talk about pathways to whatever is already there in place in years 11 and 12. These are kids that are now all going through to 18 years old. Why do we stop suddenly and give them a whole lot of traditional backward kind of pedagogy and backward kind of constructed curriculum at the last when they are at the most fecund years of their lives? We try to control their fecundity all the time. We do a pretty good job in some cases.

**Mr KOTSIRAS** — Do you support what Minister Brumby is reported as saying in the newspaper today that science universally should be dumbed down to make it easier or more attractive for students to do science at university?

**Mr CHAMPION** — I would hate to hear the words 'dumbed down' put in place. I think there is a whole new way of thinking about doing university science which might be more engaging. Not every student goes on to do an honours or masters level or postgraduate. I had some conversation with a reader in physics many years ago when I was in the paper saying, 'We are doing a wonderful job in physics', and he said, 'You are not doing much good' or whatever. The end of the conversation was, 'We will always get our 25 honours students', so who cares about the other 400 who were sitting around in first year? The go-on rate from third year to fourth year is quite high because they have all dropped out by then. They drop out mainly because it is still seen to be a non-engaging regurgitation kind of approach where you put down on the exam paper stuff you have already learnt and that you have already seen somebody else solve. One of the books I have read in this area which has been studied in the US was called *They're not Dumb, They're Different*. The woman there showed that people moved out of science and into humanities because in humanities you could think your own thoughts, you could engage with lecturers, you could have a different opinion and you could get full marks in the process, because all you had to do was pull things together. In science it is all about repeating what is already well known. In the university they need to start

paying attention to those sorts of results and saying, 'Let's get everybody engaged in stuff that is meaningful, with a meaningful audience for the student'.

**Ms ECKSTEIN** — First I want to say I am pretty alarmed that lab techs seem to be directing the teaching and learning in the curriculum process in some places. That seems to be a case of the tail wagging the dog. I am alarmed if that is generally widespread. But I want to follow up on some of the stuff Peter asked about the primary area. What else do we need to do there? Do we need to bring more of that teaching of logic and thinking skills into the primary system? Do we need to rebuild the curriculum from the primary up rather than from the VCE down? And what do we need to do about the middle years, that bridge between primary and secondary where maybe we lose a lot of kids?

**Mr CHAMPION** — I think it is essential that there be good expertise in the primary area in sciences and we should continue to pursue them. But science is always done in a context. In one sense I come from that social constructivist thing which says that science is contextually bound within the culture. You will see that you get enormous traction with kids when you talk about environmental stuff and when you talk about forensics, when you put it all together and you get a balanced weight of argument rather than A then B then C. Primary kids are good at that and primary teachers are extremely good at doing that sort of thematic thing where they are bringing in literacy, the social and the science in the one place. We need to really encourage that.

In years 5 to 8, or 5 to 9, the middle years, it seems to me there are two things that came out mainly from the work that we did in Ballarat with the online learning community. When the kids have got new stuff to learn which is interesting, is in the paper and is topical, and they have got an audience that they value, then they will go for it big time. Who is the audience that they mostly produce it for? I am to saying this to my staff all the time. If the only audience that the kids are producing their work for is the teacher, who cares? They are not so engaged with teachers that they really want to do it. They are more engaged with marks, and what is the point of that? My view would be that we have to start to engage our 5 to 8s in some meaningful education which is actually connected to the community. That comes back to the BISEC notion, that unless you actually get that community up and running and starting to put some grunt into education, you are lost. You are going to be transmitting facts and maintaining kids in classrooms, and some teachers will do a good job and some will do a bad job. They will do a good job and a bad job anyway; why not do it in a more interesting way?

**Ms ECKSTEIN** — Do we need to upskill our primary teachers?

**Mr CHAMPION** — Yes, we do.

**Ms ECKSTEIN** — How do we go about it?

**Mr CHAMPION** — It will cost you money.

**Ms ECKSTEIN** — What does not cost you money?

**Mr CHAMPION** — Exactly. It is always a question of what your priorities are. Can I come back to your question about whether we build up the curriculum from primary to secondary or back the other way. One of the things I did at the VCAA when the CSF came in, I suggested that we actually fold back from the CSF into places that were interesting like the synchrotron, like photonics, like neuroscience, like biomolecular technology et cetera. You actually take your curriculum document and say let us fold back down there to areas that are important and not demand that every school in the state take it, but let us create some clusters of schools — whether they are geographically located or online communities — let us put them together and support them to actually do this stuff. If you fold back from your curriculum or fold forward from your curriculum you have still got to do that task, whichever way you do it. You have got to make some judgments. You have got to decide that what is valuable is interesting science that is worth telling kids about and getting kids involved in and getting them talking about new science.

We have had some success. Kate Crawford's work in New South Wales, for example, has had some success in some very difficult schools where kids have got new technology, new skills developing, new ideas in their heads, engagement with scientists and an outcome or audience that was worth dealing with. That is the sort of thing I want to push. I hope that helps.

**Ms MUNT** — I have a nuts and bolts question. It says teachers now teach elements of phototonics in core and option. How does that actually work? You are talking about bringing in all these interesting things.

**Mr CHAMPION** — This document is sort of an attempt to give you a sense of the structure I had in mind. If you take the synchrotron at the middle there, what we have done with physics — at the top of the page — we have said, 'We will teach you about electric power, we will teach you about some quantum physics and then you can choose the synchrotron applications, but if you do not want to do that, you can do sound or you can do photonics'. What we have said is electric power and the quantum area — those two units which every student takes — then lead out to three possible ways of going. One is the synchrotron, one is photonics and one is sound. I have drawn it this way because is if you start with the synchrotron you can actually go another way. You can say synchrotron science encompasses science. You can build it out to physics; you can build it out to biology; you can build it out to chemistry. You can put a detailed study process in place, then you can do what you need to do in biol. and chem. and physics for two-thirds of your course and throw some stuff together. The advantage of that is that you now have a unit where kids are actually getting some real grunt. You can move out in other ways to space science and nanotechnology, or proteomics.

**Ms MUNT** — And they are also things that kids might actually be interested in. If you say physics, it is, 'Oh no, physics'. If you say nanotechnology or space science it is, 'That sounds interesting'.

**Mr CHAMPION** — In that respect, if we want to talk about space science, I gave you a document which is a VCAA memorandum in which I discuss how this might unfold for adding in space science. If you go over to the last couple of pages you will see a detailed study space weather proposal from the Victorian space science education centre. I put that forward just as I left the VCAA and I have heard nothing more about that; I do not know what the extent of that is, but the detailed study could have been added to the physics course at any old time. It could have been added within a six-month timeframe — that is, if you said it had to be accredited by June for implementation the following January for schools that were interested in taking it up, there is no impediment actually, if you do the work; and the proposer has to do the work of getting the schools organised, getting the examiners organised, get the content organised. All the VCAA has to do is basically to identify that this is compliant with the standard and has an assessment program et cetera.

The VCAA's response to this is always that with these detailed studies any option is not comparable. You cannot compare the three detailed studies and therefore you do not have a fair result for your ENTER score. They have a very simple solution to that. They do it already. They moderate the school assessed course work against the exam score. It would take about half an hour to do the work. They told me it would take forever so they cannot do it, but that is just an excuse. The algorithm is already there. The marking is about 1 second for every marker for every paper; to tell you which detailed study the student did. Bureaucratically it is about a one-day maximum set-up and trial and proof. In terms of winding it up at the end of the year, it would take about 2 hours I believe. It is not going to be a problem.

If you want have detailed studies you actually have to solve that problem with the VCAA which is their 'fair, valid, reliable'. Is it fair? That means you have got to have the same questions for every kid. Is it valid? It has to go somewhere near the study design. Is it reliable? Do we always get the same answers to the same questions? There is another question there: does it do what we want to do as a society when we are teaching kids at years 11 and 12? My answer is basically we are not doing that.

**Ms MUNT** — On a different subject, I was wondering what you think about prerequisites for science courses, and how the universities have really phased them out. Do you think that is a good idea or a bad idea?

**Mr CHAMPION** — As a practicing physics teacher with a good connection with physics departments — I have actually taught at VUT in the physics department and so on — I think the physicists at the universities have sold the physics teachers down by not having prerequisites. They need the numbers in the courses. They were not going to get them by requiring every student to have physics because not every school has a physics teacher. So if your physics department falls down you lose your pay.

**Ms MUNT** — Does that do a disservice to the kids who go into physics?

**Mr CHAMPION** — Some years ago Monash had no prerequisite entry for engineering, but you cannot get into chemical engineering, which is the biggest employer, out of it, so, yes, it does do a disservice in that sense. On the other hand we know that mature-age students who come back to science and who did not get their VCE

actually do very well at university because they are motivated and they want to do it. My problem with the loss of prerequisites — and VUT was an example — is that kids who could not get into a course got into the science course because they thought they might like to do science, but they did not know that they should not have been there, and that is the problem I have with that.

**The CHAIR** — Thank you very much, Mr Champion. We may have further questions, if that is okay, and Andrew will follow them up.

**Witness withdrew.**

# C O R R E C T E D  V E R S I O N

**EDUCATION AND TRAINING COMMITTEE**

**Inquiry into promotion of maths and science education**

Melbourne— 8 August 2005

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Mr J. McDonald, program director, peer mentoring program coordinator, In2science, La Trobe University.

**The CHAIR** — We welcome John McDonald to talk to us about the in2science peer mentoring program. John, we have been to Murdoch and had a look at the STAR program earlier this year, so would you perhaps like to do a presentation and then we will open up to questions?

**Mr McDONALD** — I thought I would give you a little bit of an overview of what the program is for those people who might not be too clear about it. I want to literally go through your terms of reference and try to support how the program actually hits those things. The program is run between Melbourne University and La Trobe University. Basically the idea behind it is that we place volunteer university science students — second-year and up, right up the way through to PhD students — into local high schools. They work en bloc for about 10 to 14 weeks, roughly a semester placement. They go in for 2 or 3 hours a week. They work with the same classes each week and the same teachers each week.

The basic idea is about communication. It is about engaging with the students as a role model, and the students get involved in a wide range of different activities and different things. All students who get involved are police checked and trained before they go in, in terms of being prepared for going in. The only costs we cover are the students' travel costs et cetera. I find that science students have about 25 or 26 hours a week of contact time at uni, so I think the quality of commitment of the students is extremely high considering that they do not have a lot of spare time to go ahead, compared to some students doing arts who probably have 7 or 8 hours a week, and there is a large difference about how much time they can commit to these sorts of things.

We are evaluated internally and externally. We have got the Centre for the Study of Higher Education involved in it, and we had an evaluation last year. They are also just about to undertake another update evaluation this year to keep us going with what is happening. Currently we have about 38 mentors out in schools this semester. We only started last year. We have 17 schools, both metro and regional, and we get schools ringing up all the time saying, 'How can we have some involvement?' et cetera.

We see it as a cost-effective way that has positive outcomes. It does have win-win-win outcomes — that is, the students benefit, the university students benefit and the teachers benefit. I think that anything that is going into schools and offering that sort of support has definitely got to be a good way of trying to help and motivate students. We have done things like raising the profile of science within schools just by giving something different. I always find that the hardest thing that any teacher has got to compete with is the TV. Kids are so used to having things that are instant feedback, instant rewards. They have got PlayStations and TV, and teachers cannot compete with them in any way, shape or form. I was a teacher for 13 years in the UK, and you just cannot compete with that, but having something that is slightly different in the classroom — a different person who some students can talk to and try to relate to — has been really worthwhile.

In relation to how it supports teaching and learning, through the peer mentoring program teachers have been able to offer and try new and exciting things. Many teachers will say they just do not have the time to set up new experiments and to think about things. Quite a few of the teachers who have been involved with us have said things like, ' I have got on the backburner these things I have wanted to do for quite some time, but I just have not had the support'. I had a university science student go in there with a science specialism. It is more than just a classroom assistant who probably does not know the ins and outs of the subject. They have had many students go in, and the mentors will actually run an activity — for example, at Princes Hill they were doing some upper-atmospheric ozone testing, and the peer mentor was able to do that with a group of students. It is very much helping us get away from recipe science, which is going on in schools very much. The kids are seeing every experiment as a recipe and ticking things off in a list because of the time frame. Showing them what the university students learn is much more of an investigative approach.

One of my PhD students is doing some malaria research, and she went in and said to a class, 'I have just done an experiment and it has lasted three months'. The students just could not believe that somebody had done something that lasted three months, and she said, 'It did not work'. They are so set in their way. There is a success culture within schools, so the determination to succeed in the longer term is not there. By exposing them to some of these students they actually have the opportunity to see that science is an investigative thing, that it is forward looking and out there, rather than this mundane looking at the textbook and looking at the next thing.

Teachers very often have limited specialism in some of the subject areas that they are teaching. What we can always try to do is match up a student mentor with a specialism subject that the teacher requires. A good example of that I had last year was a teacher who requested some different genetics for a year 10 class. She did not have a lot

of knowledge of it. She kept telling me that when she went to university, genetics was not even invented. She felt that she was very much teaching from the textbook. She was literally bound by what knowledge was in the school textbook. I put a third-year genetics student in with her and she totally changed. To have a teacher come running up to you saying, 'This is the work I did last week with my class', was just amazing. That was literally through talking to the mentor and the mentor saying, 'We could try this, we could do this and if they get stuck I could answer the questions'. That really helped get some discussion about science going on et cetera.

Teachers do work with the mentors in a lot of cases, trying to plan activities. I have got one student planning some activities at the minute. We are trying to get some of the academics involved as well. A lot of the activities that have been done have been instigated by the student off their own bat. The role literally that we put on the students is that they go in and the teacher facilitates the opportunity for the mentor and the students to talk to each other, and that is literally all we ask. Anything above and beyond that is literally down to the teacher and the mentor.

Teachers are able to use different classroom strategies. Quite a few teachers have said they have been able to implement alternative ways of managing the class — for example, up at Mill Park one of the teachers had a low-ability year 8 class which was very difficult to teach as a whole unit. She split them up into three groups. A little group was working on some written work, the mentor took one group and the teacher took the other group, and they rotated. The kids were amazed at how much work they actually got done, and the teachers were amazed at how easy it was just having someone they could use in that sort of way. What that meant was that the classes were much more enjoyable, there was less shouting going on and more learning going on, which is the purpose for them being there.

I have also seen teachers increase their interest in science. For a lot of the time everybody used to say to me, 'After five years your degree is pretty much redundant'. Science is definitely the one where there is so much change coming on. To hear teachers say, 'I am actually looking forward to teaching this class, and I am looking forward to the mentor coming in and working with me on this', it is re-sparking an interest'. When you have been doing the job for quite a lot of time it can become fairly repetitive in relation to the actual process — not the content but the process side.

Part of what we are trying to do is also establish links between the universities and the schools, and that is really getting going. A lot of teachers say to me, ' I know universities are there, but I do not know anybody'. This has provided a pathway so they can try to get hold of guest speakers, and try to get people to come in and run activities for them to get into the university, so it is bridging that gap quite well for them.

In relation to national trends and things, I suppose we would not be here if there was not an issue in relation to science and maths teaching. The Australian Council of Deans of Science has run a few studies in relation to who is actually studying science and the reasons behind that. I was interested to listen to the gentleman before speak about trying to get some more motivation for students to actually study science and dumbing down ideas. It is quite interesting that we have a higher HECS fee for science students. From talking to quite a few students I know they will say, 'I will take another subject even though science is really interesting, because I am probably going to walk out and get the same pay for doing my degree but it is going to cost me more to do. My time is 28 hours compared to 12 hours. I can get a part-time job; in fact I can get a full-time job'. Those sorts of factors are really being thought about in relation to the students.

We provide a sort of role model, which I think is really good. I think the role model of being a good citizen is extremely important. I find that because my mentors are volunteers and are not getting paid the quality is extremely high.

I suppose the schemes are quite new. Australia has probably had them going for about 10 years over in the WA. New South Wales does not have any. Tasmania is starting to get programs going et cetera. The UK has had them going for about 30 years, and Israel about the same time. The UK has now moved over to a national mentoring scheme. If these things were not seen as being useful, then people would not be investing this sort of money into them. With the likes of Perach in Israel, 30 000 students are giving up their time, but they get half their HECS fees back at the end of the year if they are involved in that sort of program. To me that sort of incentive is pretty good. When I am actually doing the training session I talk to the students and say, 'Guess what they do in other countries?', and they say, 'Oh, wow! Really good'.

I refer next to best teaching practice and how it helps in sharing ideas. We run a newsletter that I do every month. Literally I go around to the schools to see how the mentors are being used and actually share that amongst the schools. My aim with that is purely for the teachers to look at what other people are doing and say, 'Hang on a minute, we could be doing that'. They could be doing that, and that helps. The mentors find out what other schools are doing and that spurs them on to do a little bit more as well. I have put articles in teaching magazines, in STAV magazines and in the education magazine that has gone to New South Wales, Victoria, Queensland, SA and WA. So we are trying to get ourselves out there in relation to how it works and how effective it can be.

We have just got ASISTM funding to bring Monash into a sort of separate program. Our aim there is again to grow that program in that geographical direction. Having the three universities involved there is quite a good thing. Being in a regional location definitely helps. We were really limited where we had the university campuses initially, so places in Bendigo and Wodonga have been useful, and they have been well received and well supported.

I tend to find that because the mentors are keen to stay with the program that so far I have had very few who have said, 'No, I do not want to do it ever again'. I think I have had 2 out of 70 in total. Most of them want to go to a different school. They take with them the skills and expertise that they have learnt in one place to another place, so I find that quite useful. The feedback from the kids to the teachers is that they are getting more value out of the lessons. A lot of the feedback is, 'Somebody can answer my questions. I am not sitting around with my hand up all the time. I have got somebody who can help me out. My lessons are more enjoyable. I am getting more out of it'. The teacher is more engaged in the lesson, and it is raising the profile of the subject within. Because they are doing slightly different activities the kids are walking away and saying, 'I am doing this in science', and hopefully the other teachers in the schools are saying, 'That is really good'. Initially other teachers in the school did not even know it was there, but what we are finding now is that other teachers are coming up to us and saying, 'Can we get somebody to come in and do history? Can we get somebody to do English?', so the profile is getting raised and hopefully there is a sharing of ideas.

Industry research applications: I suppose most often research applications are from the point of view of what the program can offer. The curriculum is changing so much in science — in nanotechnology, biotechnology and genetics — that teachers are very scared of a lot of those topics coming in. They do not really know a lot about them and they are totally reliant on the books. I had one teacher say to me, 'We do not know what we are teaching next semester because the book is changing'. I found it scary that that was the level of support they were being given. With the program, as I said earlier, if we can we match up a teacher with a school that has a requirement for physics, maths, chemistry or whatever. Genetics and biotechnology have been extremely popular at the minute. A lot of schools are running things like forensic science classes, which are very popular for some reason. Being able to put in people who can talk about the ins and outs of these things has been really worthwhile. Things like robotics are definitely taking off, so the schools are seeking that support and help. Where we can we try to put that student in the school to give that support — it is not as free labour — and to be able to talk and engage a bit further than what the teacher can on the subject. We can also offer presentations about topics as well. What I am finding is that as I am getting a bit more known at the two universities, the academics are more willing to get involved and offer support for activities as well, so it is growing that way.

The next reference concerns links between the schools. I suppose the initial idea from the two deans of science from the two universities was really about trying to increase that engagement. The link between the schools is definitely growing. Our aim is that once we get a school on board in the program we keep them, which is slightly different to some other programs that operate. Some programs allow the university student to pick the school that they go to. Our aim is to say, 'Okay, we have got a student in a school, and that school then gains students over a period of time'. Kids get used to being exposed to them over a longer period of time rather than somebody going in and saying, 'Okay, you have had a mentor two years ago; there is another one who wants to come'. There is no continuity or real benefit in the program working that way.

As I said, we have also seen the universities collaborating and working well together. It is working really well. I find that I am backwards and forwards between the two unis. Because I am solely orientated to doing this program, it is fantastic that I can spend the time. I get to go into the schools and I can act as the link between what is going on, which has worked really well.

The reference to gender issues is not one that I had overtly thought about when we set up the program. Probably about 60 per cent of the mentors are female, but then again the numbers of students going to university are

increasingly female. That is another issue along the way. What I tend to find is that putting female science role models in is very good. A lot of the teachers have said, 'Forget that they are doing science; it is just having this younger person come into my class. I am in my mid-50s and I am not the role model. They see me as the teacher'. I do not think any kids ever sees a teacher as a scientist, whereas they do view these students going in as scientists. That sort of role model of a person going in and saying that you can achieve and do a little bit more has really worked.

Male role models — my regional campuses all have male mentors for some strange reason. I do not know why, but that has tended to happen. They are extremely influential. Again one of the things that has come out is that we have found that students are more willing to engage with them rather than their own teacher because they see the teacher as the person assessing them. A lot of kids have been frightened of asking the teachers questions about what they are doing if they are unsure and want a bit of clarity. They say, 'The mentor does not actually assess me. They are not judging me; they are just helping me'. They also like the idea of getting a different viewpoint, a different explanation from a different viewpoint, so it has worked quite well in supporting the different genders.

Different learning styles is something that we are targeting with our ASISTM of funding, so hopefully some of the schools involved in the program are going to try to look at different ways in which we can engage students on that sort of level.

Another big thing is more individual attention. As with anything, teachers will spend more time with the less able in any class. They will learn those names much quicker. What we also find is that a teacher says to us, 'I can spend more time with each student. I can explain things. I can target what the student needs to learn'. Also the mentor can go in and provide that sort of help as well.

The final thing was in relation to getting more people to undertake the teaching of science. This is a fantastic way for students at university to have the opportunity to go into a school to see if they can communicate with kids, which is their biggest fear, an opportunity they would not get as a trainee teacher. I had one mentor in a school where there was a trainee teacher on placement. The class started an activity and the mentor jumped up and started going, and the trainee teacher just sat there. Afterwards she said to my mentor, 'How can you just get up and interact with them?' She said, 'That is what we do. But you want to be a teacher, don't you?' Trainee teachers are thinking about classroom management, classroom issues and curriculum. Forget about all that. It is just going in and talking science with the students which really helps.

Probably about 50 per cent of the students who get involved have been thinking about teaching as a way forward for them. I have had nobody come back and say, 'Definitely not'. I tell all the teachers that it is an opportunity for them to engage uni students to actually think about taking up teaching. I think the way they go in and what they get to do and actually talk purely about the subject, is why teachers end up teaching 90 per cent of the time; they have a love of that subject. I do tend to find that the students really have the opportunity to engage and say, ' I can actually engage with students. It does work'. I found a couple of students who went into the program for other reasons. They have turned around to me and said, 'I am going to apply for a grad. dip. at the end of the year', which to me is just fantastic. I had two go on and do that. That was within the first placement that we had, which really showed them there was an opportunity for them to get involved.

I also put in my submission some statistics in relation to some feedback we have had, and also some quotes from some of the schools and the students in relation to what we are trying to do. I suppose the reason for my being here is just to raise our profile really. We are about trying to raise our profile. We are currently funded by the William Buckland Foundation. Obviously, as always, money is the thing that comes into it. I would hate to add up what the cost would be of me putting my mentors in schools and how many hours they have been in for in just 18 months. I hate to think what that would work out at if I was paying them. I do think In2science is a cost-effective way. The support has been fantastic. Schools have taken it up very quickly. They have embraced it really well. Teachers have embraced it really well as an opportunity for them to actually be a bit different and a bit more innovative in what they are trying to achieve.

**Ms MUNT** — How long will the William Buckland Foundation funding last?

**Mr McDONALD** — We had three years of funding for that initially. That was from April last year. We are now looking at alternative sources of funding. We are going to investigate both state government and industry as well.

**Ms MUNT** — How much per year is required?

**Mr McDONALD** — It depends how big the program gets really. We are working on roughly $100 000 a year. I would like to be paid a lot more, but — —

**Ms MUNT** — So it will be $200 000 a year!

**Mr McDONALD** — That will be fine, thanks.

As with anything, the administration costs a bit. When they did the 12-university trial a couple of years ago with an admin person trying to run it, they found it extremely difficult to do their other job and manage this. The advantage I have is that I get to go into the schools and interact a lot more with the students and offer them my support. When I went to the conference for peer mentors in Australia last year I had been going for about six months and other programs had been going for about five or six years. They were asking me for a lot more information, because I had actually been in the classrooms with the teachers and actually seen it in action. Most of them just organise a placement.

**Ms MUNT** — How many mentors do you actually have? You say you have them at 17 schools. There must be some extra ones.

**Mr McDONALD** — There are 38 mentors out there at the minute. Last year we started with 10 schools and 14 mentors. In the first semester this year we were at 13 schools with 25 mentors, and now we are at 17 schools for the semester coming up. Our aim is to just keep growing. I do not know what the boundary limit is of students getting involved. That will always be the critical thing. At the minute I am not really having to advertise; a lot of it is going back by word of mouth now. They are actually going out there and talking to their friends. I am turning them away. I have probably had 40 or 50 apply.

The difficulty is always trying to match up a student's availability. If university students think they are free from 2 o'clock they might be able to get into a school, so where they live can sometimes be an issue. We have tended to take on schools that are near the campuses, where we know the students are commuting around and where we know there are large pools of students. Being near universities gives us good coverage in relation to this sort of Melbourne part of the metropolitan area. Getting the universities involved would be good. RMIT already runs a similar program, but it mainly does things going into primary.

**Ms MUNT** — And Monash University?

**Mr McDONALD** — Again, Monash does a lot more primary-orientated stuff. What it will do with the ASISTM funding is turn over the mentors to secondary in this aspect of their program. We are limited initially through the William Buckland Foundation to state schools and to years 7 to 10. We have put it down to schools to target which year level they think will be most appropriate. Last year it was very much years 7 and 8. The first semester this year has been very much years 9 and 10, and again for the second semester this year.

**The CHAIR** — Notwithstanding what you have just said, are there no schools on your list from the western suburbs, where most of our industry is? Also there are no schools on this list from the outer south-eastern or southern areas. I just make the point here. What I am really asking is how you could expand and what are the factors for expansion. If you look at this list of schools where you have mentors, large numbers are at some of best schools in the state. They are state public schools. I think virtually all of them have pretty good representation in terms of both academic and other outcomes, whereas there are probably a heap of other schools where science issues in particular are not working that well that you are not hitting on that could desperately use your input.

**Mr McDONALD** — The factors in relation to the way we selected schools included the fact that because we were starting off we wanted it to work. So our first aim was to look at schools which we knew were interested in science and were actually looking forward. It is absolutely pointless just putting a mentor into a school where the teachers are not interested. The teachers have to wish to be involved; it is a voluntary process from everybody's point of view. So even though we are in a school, if any teacher says to me, 'I have been coerced into doing this', I do not want my students going in there. So we have to have that sort of idea behind it.

Some of the schools have become involved through the northern metropolitan region of the education department. They have been doing some of the science promotion work, and we have followed on in some of the schools that

have gone through that process. That is one way: they are getting funding to get themselves up and running, and this is a way to support them for a bit in the longer term. I would love to expand it much more. Monash is getting into that south-eastern corner.

If I had a sort of image of what I would like to see longer term, what Western Australia has done is very good. It has been state funded for all its universities to run the programs. That allows the universities to operate uniquely. I do not see them all taking it on or universally having to run it the same way, because every school is different. What happens in a low-achieving school in the western suburbs might be totally different from what happens at MacRobertson Girls High School, so we cannot dictate to them what actually goes on.

Getting the funding for all the universities to operate these programs or to allow the schools to approach the universities is going to be quite crucial. Controlling factors for me always include the geographical location of students. Students have to be able to get back to their university studies. They are very limited with time. I get some 2 or 3-hour windows from some of these students and they will go in there for the 8.30 a.m. class start for some of the schools and be at their lecture at 10.00 a.m. So their commitment is really high. It is just being able to commit to them for a long period of time.

The program works because students get that extended exposure to mentors. Some places run things like the science shows, which are a fantastic way of getting things started and getting an interest and sparking enthusiasm. It is like a TV show — you are sparking that enthusiasm. What we allow with this is for the students to get that interaction. If they can sit and work with a PhD, an honours student or even a common undergrad student, it is pretty useful in that way. So I would love it to grow bigger.

**Mr HALL** — In regard to timetabling, do schools actually make a commitment to timetable classes to facilitate the ability for some of these peers to go into schools, or could they do so?

**Mr McDONALD** — The original idea was for schools to try to identify where they wanted to target somebody coming and then we would try to match them. When we started last year, quite small, we just literally said, 'This is when the students are free. Can you accommodate them?'. And across the curriculum they have pretty much done so. The schools have pretty much tended to find classes that fit with the mentors. We initially said to any new school coming in to just take one mentor to see how it goes, trial it and see what they can do rather than opening its doors up for a lot of them. And then what we are tending to find is schools making particular requests. For example, one school said to me, 'We want a mentor with every year 7 class'. That is great if I can do it, but I cannot if I do not have enough students available.

What has tended to happen is that schools have put in requests for subject areas. For example, if they want a physicist, a chemist, a biochemist, and so on, where that has been a priority I have tried to match that up for them, and then they have very often tried to pair it up with some of their classes. What I do is initially get the timetables from the university students. I pass them on to the schools saying, 'These are some students that are in the field you are looking for. They live reasonably locally, or they are at the university close to you', and I will let them match them. My aim for the longer term is to grow the number of students so that four or five students go to each school.

**Mr HALL** — You say your contract funding limits you to years 7 to 10 under the current arrangement. Is there any impediment to going to years 11 and 12 in future years?

**Mr McDONALD** — I would not have thought so in relation to the funding. I suppose the idea of it being in years 7 to 10 is that they are very much the most impressionable group that we want to try to target. Probably by year 11 they have already made that conscious decision to study the sciences. Quite a few schools have asked us if the mentor students can go in and talk to year 11 classes; that is not a problem. Some schools work on a two-week timetable, which is a nightmare, so there is some difficulty trying to get the mentors into schools. They might do a couple hours in one week of classes and they might have years 7 and 8, and the following week they might have a year 11 and a year 8, just because of the timetabling. So I would rather that than the mentors going in lots of times during the week.

A lot of the mentors have gone in and done a general talk to year 11 and 12 students about studying at university and how science at university is different to what they are doing. One group of mentors from LaTrobe University went up to Heron Island for one of their pracs over Easter. A lot of them came back and did some fantastic presentations. I did not generate that: it was purely off the university students' bat to actually do that extra work.

Timetabling can be an issue. As the program grows I will get more mentors, and that will give me more flexibility. That is always going to be the controlling factor in anything like this.

**Mr HALL** — Is the experience from other universities in other parts of the world and Australia that have been running this program for a while that you get more science teachers out of the program than you would otherwise?

**Mr McDONALD** — Personally I do not see it as being overtly quantitative in its outcomes. I do not believe that somebody going in for a couple of hours a week is going to totally be the driving force for change in everything they are going to do. But in regard to uptake quite a few of the students have definitely said to me, 'I was not thinking of teaching before. Now it is on my list. Now it is one of the possibilities. I have really turned on to it now'. Going on to train for it is the initial idea. I suppose the gratification of being a teacher and the pay, the training and everything else are the things I will not have any control over.

In the United Kingdom the government offered additional funding for students to go in and teach sciences. They were being given £6000, or $15 000, initially to study and train to be a maths teacher. At end of it if they were still there they received another lump sum; and if they were still teaching after two years they got another lump sum. They definitely saw an increase in the number of students taking that up. Offering some equity between the amount people pay in HECS fees is another possibility. That definitely undermines things. We are being overrun by students applying for some courses. Everybody is crying that people cannot get into university, but there are courses that do not have people in the places that are available because these other things turn them off a bit. There is definitely interest. We are still fairly new. We are probably looking at five years before we see those sorts of trends. I know Russell over in WA is looking at longitudinal research now on his mentors, so we will see what sorts of things they can throw up.

**Mrs BUCKINGHAM** — I want to follow up something Mr Hall just asked you. I understand your funding is for years 7 to 10, but in this inquiry the committee has been made aware that primary school teachers often do not feel comfortable teaching science because of a lack of science in their own background. Do you envisage the program could be expanded in some way so that mentors could go into a primary school?

**Mr McDONALD** — Absolutely. There is no problem with going into there as well. The University of Queensland is doing something called Bright Minds, and again there is definitely no problem going in there. It offers that scientific knowledge for the teacher which the teacher may not have because of their background. The RMIT and Monash programs are very much more orientated towards primary schools, so it definitely works. I suppose a lot of university students are frightened to go into secondary schools. When you talk to them and ask whether they would prefer to go into a primary school to volunteer or into a secondary school, you tend to find that that fear factor initially makes them choose to go into primary schools. But I do not see a problem with it. You can definitely do something. The level of stuff is coming down. I tend to find most of the mentors panic when they go in and do stuff that is away from their specialist field. For example, if they are going in for 14 weeks the school is not going to be teaching genetics for 14 weeks. If some of them are going in and doing magnetism to start off with, initially they tell me that they find it easier to communicate with the kids about subjects that they do not know than their own. I do not see a problem with it at all.

I have had one school ask me whether it was possible to actually get high school student mentoring for primary schools, so that was an idea — whether we could replicate the pattern and have that cross-phase from secondary down to primary. I'm not sure.

**The CHAIR** — I have one final question. Back to the schools, you obviously do very personal mixing and matching, as you say. If you are looking at a broader system, how does Israel handle 30 000 students? They must have a different system.

**Mr McDONALD** — They have a huge system. They have very much a pyramid process. They have a lot of coordinators down in different areas. The system is different from ours in that basically students sign up to the program, they commit to so many hours a week, often working with an individual in a school; they are then allocated to a counsellor or trainer/manager for them, and each manager would have a portfolio of mentors they are looking after in schools.

Often it will be the case that a mentor will go to a school and the headmaster will say, 'I would like you to work with students X, Y and Z in this class', or 'I would like you to work with students X, Y and Z at their home'. In

many cases, because of that — Australia's issues are nowhere near the sorts of issues they have — a lot of the students that go in and mentor by spending time with the students, just talking with them. Sometimes they are told not even to talk about academic things. They are told just to go and play games with them, take them to the museum, take them to the park and that sort of thing. Their role is slightly different, and what they have definitely found is that two or three students being mentored within any class can totally change the dynamics of that class. It really varies. It is at the discretion of the principal of the school to allocate the mentors and how they work within it. The structure is a lot of tier-down stuff, so within each university there would be a group of people who would manage and counsel them going through.

**The CHAIR** — Thank you John. We wish you well with more funding.

**Witness withdrew.**

# C O R R E C T E D  V E R S I O N

**EDUCATION AND TRAINING COMMITTEE**

**Inquiry into promotion of maths and science education**

Melbourne — 8 August 2005

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Witnesses

Ms S. Halliday, chairperson;

Mr A. Ius; chief executive officer; and

Ms R. Newton, manager accreditation, Victorian Institute of Teaching.

**The CHAIR** — We welcome the Victorian Institute of Teaching to the hearing to enlighten us a bit on maths-science education and what the institute is up to now.

**Ms HALLIDAY** — I chair the council of 20 people for the Victorian Institute of Teaching. As you are well aware, the act was introduced and we took up premises in 2002. We have now been active for almost three years, although we came into being at the beginning of 2003 with respect to the full registration of all teachers in Victoria, which now adds up to a grand total of about 98 000. We deemed about 80 000 as fully registered, and the rest we have registered through our processes since we have been in operation, from January 2003.

Today we will take the opportunity to give you a bit of an understanding about how the Victorian Institute of Teaching Act 2001 is relevant to your inquiry. As you are aware, we register teachers; we have a responsibility to keep a public register; and we have a responsibility to develop that public register so it identifies the full qualifications of teachers. At this point in time we just have registered teachers names and numbers, because collecting the qualifications of 80 000 teachers who were deemed was a little hard — dare I say impossible — because they did not know where their records were. That said, with the renewal of registration, which takes place in five years — which becomes 2007 — they will be requested to give us a full understanding of the extent of their qualifications, so we will actually be able to tell you per se how many are specifically trained in physics, for example, in a few years to come.

That said, we have a range of other data that we think would be of interest to you. We are in a position where we can demonstrate that there has been an increase in the number of science and maths teachers, and people studying to do teaching. We also have some details around the way in which we are interacting with the universities, because under our act we have the responsibility to accredit all university pre-teacher service degrees. All of those degrees come before our accreditation committee and we have an input as to whether or not they are altered — or the profession does — or improved in various ways. Certainly we have had some interaction with them around maths and science as well.

We can give you some specifics around supply and demand, and some of the general information we have collected, because obviously we are in contact with a lot of people on the way through. I will hand over to Andrew Ius, who is our CEO, and Ruth Newton, who is our accreditation manager. Ruth is the secretariat member who looks after the 25-person accreditation committee which approves the university pre-service teacher education courses.

**Mr IUS** — We have documented our presentation for you today, so you will have full copies of this I hope. I do not intend to read it, but I will take you through what I think are the salient features and then maybe engage in any questions, comments or issues you may want to raise.

As Susan said, we have given you a bit of a background to the institute and identified for you, apart from the documented functions under the legislation, what we believe might be more particularly relevant to your considerations with your current terms of reference. We have responsibility for a register of teachers, which is publicly available. Anyone can come and inspect that on site at our premises during office hours. Within that public register we are required to maintain six elements of information — the name of a teacher, their registration status, their qualifications, their professional expertise, the date of registration, and their registration number. In addition to that we are also required to accredit pre-service teacher education programs — as you would be aware from your previous inquiry — and we initiated a project back in 2004 to look at reviewing the Standards Council of the Teaching Profession's requirements. That project was called our Future Teachers Project. We are currently awaiting the government response to this committee's previous inquiry report before we release our consultation document on what we propose to do in relation to putting in place new accreditation arrangements for pre-service teacher education programs.

In the specific area of pre-service teacher education, we have outlined for you the current general requirements for people seeking to enter pre-service teacher education programs. You can see there that the current stipulation — that is, that which has moved across from the standards council — is that there be a standard equivalent to a C in VCE English units 3 and 4 and at least a satisfactory completion of VCE mathematics 1 and 2. For postgraduates, however, we look to a more detailed understanding of their courses of study. What I have referred to previously is in relation to undergraduates. It is in this context that we have attached a relevant document for your consideration as appendix 1 — our subject area guidelines. That is a fairly critical document because it is a reference point for a series of key activities that we engage in.

Firstly, it is important to note that those guidelines have been recently reviewed. In 2002 the Department of Education and Training did a fairly substantive review of its then subject area guideline requirements. They have in fact come across to the institute, and we have now adopted those, with some minor modifications — tweaking around the edges, essentially.

The important way we use those guidelines is, firstly, in the evaluation of the proposed prerequisites for teaching methodology courses in postgraduate pre-service programs. We use that, universities use that, and VTAC uses that as a way of assisting people to be aware of what the requirements might be, and also for evaluating discipline studies and teaching methodology units offered in undergraduate and postgraduate pre-service education programs. Those guidelines also constitute an advisory service; they are the backbone, if you like, to an advisory service that both we and the universities offer when people are seeking to enrol in teacher education programs, particularly at the postgraduate level.

It is important to note that those guidelines establish what we believe is a minimum level — so it is not the maximum. A clear example would be that for people who are seeking to be able to teach higher levels — for example, VCE subjects — in maths and science, we would suggest that there needs to be a higher level than that which is documented in those subject area guidelines. That is how those subject area guidelines are currently being used by universities and ourselves.

To give you a bit of an understanding of what we mean by those subject area guidelines, we have clarified some terminology as to what we mean by a part study and a sub-major. You can see from those guidelines that for someone to be seen as qualified for mathematics teaching in Victoria, the requirement would be a sub-major in mathematics. We understand a sub-major to be a sequence of discipline study taken over two years and certainly involving second year level studies. We have gone through and documented the situation for science, and when we come to science there are certain categories of recognised sciences that we look at in terms of what is commonly taught in schools. We have some requirements there that we will point to.

When it comes to preparing teachers in primary schools the information and requirements are not as detailed, because clearly in teaching science, or in preparing people to teach science, you are actually preparing people to be teachers across the broad range of subject areas and not just science. We look at what the requirements are for those courses that prepare teachers, asking questions about their literacy, their numeracy, their science preparation, and how in particular they look to prepare people in those areas. When we conduct those inquiries or review those courses we receive a wide range of responses back. Some universities put in place hurdle tests where they require people to be able to demonstrate that they have a degree of proficiency at a certain standard. Others have a more thematic approach to what they are doing. The response varies across universities.

In terms of preparation for people who will be teachers in secondary schools, we look more specifically at the degree of subject discipline knowledge and the depth of knowledge that they will be expected to have in those different areas. That is particularly where the subject area guidelines come into play.

Our responsibility, as Susan mentioned, is to register teachers. Unlike many other registration authorities across Australia, we still interrogate quite closely the academic transcripts of individual teachers who seek registration. We do not accept at face value that because a teacher has a teaching qualification, that will necessarily be sufficient to prepare them to be registered here in Victoria. We look at their academic transcript to ensure that the discipline study content is relevant to their claims to having been trained as a teacher to teach in particular areas. We look for that evidence, and that is used in our judgment of whether or not a teacher will be registered. While we look for that degree of detail, it is not formally used in our registration process. In fact when you are registered here in Victoria you are simply registered as a teacher — you are not registered as a secondary teacher or a primary teacher or a maths teacher or a science teacher; you are simply registered as a teacher. The allocation of teaching duties is a matter that is left within the employment domain of a particular teacher.

In terms of the supply and demand situation, as Susan alluded to, we have information going back to 1994 on final year students exiting from universities. We have been collecting that information, looking in particular at the subject methodologies that people have been undertaking. We have looked at that for both primary and secondary, graduate and postgraduate. You have before you an appendix which provides the numbers and a graph illustrating the trend over recent years for the numbers of people who have been coming out of universities with methodologies in particular areas.

I suppose the relevant feature to note there is that there has been a growth since the late 1990s, and there has been a modest growth overall. We have provided you with an understanding of what that growth looks like so you can see it as a proportion of the overall cohort who are graduating. If you want to look at it a bit further in terms of how that comes across as numbers of people prepared by schools, you can see that somewhere in the order of two to three graduates are exiting — that is, two to three per registered Victorian secondary school — with methodologies in science and maths. It is very difficult to give you exact information because clearly some people are doing two or three methods, not just one, and so you cannot break it down as clearly as that. But that gives you a ballpark sense of what is currently happening in terms of people graduating from Victorian universities.

I suppose the important issues for us that we would seek to highlight are that the effective teaching of maths and science, both from international research and our own research, suggests that a prerequisite for that would have to be a deep knowledge of what students are expected to know and be able to do. The discipline content is critical, and the extent of that discipline content is a key factor in preparing people to teach effectively in maths and science. That is certainly something that we will be seeking to develop further when we put in place some new accreditation arrangements. Those accreditation arrangements will be based on some standards that we have drafted for graduate teachers. While they are not specific standards for each particular area, they are generic standards. We have identified the current draft version of those for you in another appendix. We will be looking to develop those standards to the level of understanding for the universities so that they can understand what we are expecting by way of graduate qualities.

Another important issue for us to put on the table for you is that, as we mentioned, in the public register we are required to identify not just teachers' qualifications, but also their area of professional expertise. There has been some consideration by our council as to what that might mean. Our council has given some consideration to the possible application of the subject area guidelines as a way of identifying a teacher's professional expertise for the purposes of putting it on the public register.

The concern our council has identified with that approach is that, as Susan has mentioned, there are about 80 000 or so teachers who were deemed registered when the institute was initially established, and there are no records available for those people's qualifications, so there is quite a massive job in terms of collecting that information. As Susan mentioned, we propose to do that as part of the renewal process. Moreover, there is the broader issue of the fact that a number of people have now been teaching for quite a considerable period of time — and clearly with some success — in areas of maths and science that they may not have been originally trained in. To apply that policy or those guidelines to this activity, without some capacity to give some recognition for prior practise, would be a key issue that would limit its applicability. We are currently looking at how we might develop that policy if we are to move down the track of putting in place a statement of professional expertise.

The other significant feature for you to possibly consider in terms of our functions is the renewal of registration. We have been currently conducting a series of workshops across the state with teachers looking at the issues and the concerns that they have around their professional learning, because one of the requirements of the renewal of registration, as we understand it, will be the issue of the application or demonstration of professional learning as a way of maintaining the currency of professional practice. The key features that have been identified from the discussions so far, and therefore that we are looking to build our policy around, are that teachers have indicated to us that they believe it is important that they see professional development as an intrinsic part of their ongoing professional learning, and that currently they believe much of that professional development is system and school-driven, and they would like to see greater recognition given to their personal professional requirements. They see that there is an urgent need for them to be made aware of the breadth of professional development opportunities that are available and moreover the quality of some of those professional development programs that are available. They would see us fulfilling a major element of service to them, as well as our regulatory responsibility, if we were able to do that.

They have also asked us to look at the issue in particular of how people are supported in the areas of casual relief and emergency teaching where there is concern that not a great deal of professional development is targeted and directed towards those people who comprise quite a significant proportion of our profession and without whom our profession would not actually be able to operate. That is another issue we are currently working on.

Finally, the council has asked us to suggest that if this committee saw fit to recommend any issues or activities that were seen as being applicable across the profession overall — that is, across the three sectors — then being an

agency that has that capacity to work across those three sectors, we would be happy to receive any recommendations that relate to our responsibilities.

**Mr KOTSIRAS** — Regarding the renewal of registration, hypothetically, if I have not been teaching for six years but I am registered with VIT, I have paid my membership, currently I can — next week — apply to a school and get employed by a school even though I have not been teaching for five years, is that correct?

**Mr IUS** — If you are currently registered, that is correct.

**Mr KOTSIRAS** — Then in 2007 my registration will come up for renewal. If I have not been teaching for seven years, what type of questions would I be asked to see if I am able to be registered again? Would you ask me if I had done some PD or whether I have done some teaching?

**Ms HALLIDAY** — We would start with a criminal records check.

**Mr KOTSIRAS** — Assume that is okay.

**Ms HALLIDAY** — Then we would look at some understanding of the institute and our new documents such as a code of ethics and a code of conduct, which our act requires us to produce. The code of ethics will be launched soon and the code of conduct next year. The council itself is starting to unpack through the consultations with the profession that Andrew is talking about as to what else it would be reasonable to ask of people within this first period.

The second period of re-registration is in 2012. Obviously if you are going to ask people to do a range of things, you need to give them some time.

**Mr KOTSIRAS** — That was my next question.

**Ms HALLIDAY** — Yes. This is an interim or an entry point where we are not envisaging that longer term what would be required for registration will all be required at this point in time. If you look at the nurses, for example, their re-registration requires some form of new recognised course or qualification in each renewal period.

It has been very clear, I think, that one of the core things that council knew and the profession continued to tell us, is that you can get a lot of new pieces of paper, but it does not necessarily mean you are a better teacher. We are very mindful of the range of things that could be falling within the basket of things to show us for re-registration. That said, the first period is interim and this is about a cultural change with the profession and we are mindful of how we need to do it in a progressive way so that we take the people with us and we are inclusive in our approach. So I cannot give you the list of things.

**The CHAIR** — But you will ask for subject qualifications?

**Ms HALLIDAY** — Yes. This is the first time we get to seek information of the other 80 000 who simply just got rolled over — they called it grandfathered but I will call it rolled-over. But from the others who we have brought on board, the other 20 000 in the last two years, we have collected all of that information and we have that stored.

**Mr HALL** — In respect of that, if I could just follow on, it was suggested to us this morning that science in particular is somewhat different in that the acceleration of new science is far greater than probably other subject areas. History does not change quite as quickly as perhaps some of this does — contemporary history maybe. In terms of developing a process — which you indicated you are doing — in your discussion with the profession at the moment in terms of how you recognise professional development, do you envisage that there will be a uniform system for recognising professional development across all discipline areas or will they be different?

**Mr IUS** — The broad response we have received from teachers is that some sort of reference point for their professional development would be useful and that they potentially see the fact that we have a standards framework now as the way in which we could reference that. In other words, if we can identify professional development activities that correlate back to the domain. In the professional standards framework, for example professional development activities, that will build on the content knowledge that teachers will need to know, or professional development activities will enhance the range of professional practices that teachers need to apply —

if we can find a way of systemising or identifying professional development activities around that standards framework and helping them to be guided in their choices, then that would be an extremely useful activity.

That is what we are currently looking at — finding a way in which we can reference PD activities back against that standards framework. What they have also said to us is that given that many teachers undertake quite a lot of professional development, it is not unreasonable to stipulate the quantum of professional development that teachers might be able to undertake over the course of the year and therefore build that into their professional renewal requirements. Whether we go down to the level of saying that a science teacher needs to do X number of hours in science, I do not think we are at that point.

**Mr HALL** — Do you hope to have a lot of that preliminary work completed by 2007?

**Mr IUS** — We certainly would hope to be in a position by early next year to release a major discussion paper for the profession to be aware of what the requirements will be in terms of signing up, as Susan said, full renewal, so that they understand the conditions under which they will be signing up and under which they will be asked to renew then when the next renewal phase comes around.

**Ms HALLIDAY** — By the time the discussion paper goes out there will be another year, pretty much, before the first renewal period. Within that people can obviously look at what they have done during the five years but they will have that year to pull together what we would be seeing as an entry point. Clearly it will not have the same requirements as it will for the next period because this is the first and this is a large shift.

**Mr HALL** — A culture change?

**Ms HALLIDAY** — I was being gentle!

**The CHAIR** — I refer to the graph on page 10. There has been quite an increase, as you referred to, Andrew. Do you have any qualitative analysis about what is going on? We see in all the disciplines that there has been a lift in the number of people doing maths and science. Is that to do with the increasing number of students doing education, or is there any qualitative analysis of what has happened there?

**Mr IUS** — It does parallel somewhat the growth in numbers overall that have come through in teacher education, though I suspect the proportion in growth of numbers is not as great. We can certainly give you some validation of that information if you like. We can do some comparison because we do have the overall cohort analysis as well, but the proportionate shift here, I think, would turn out to be a bit bigger than otherwise and my guess at that is because we have not done any survey analysis here. I think it is a response by the universities to the quite regular now, and repeated emphasis in the public domain, about the need for more maths and science teachers where there has been an argument about the shortage of maths and science teachers. By and large I think this has been in response to that.

**The CHAIR** — It would be interesting to see whether they were mature students, or ex schools — there is a whole heap of facts in there. I wonder if we could perhaps get that information from the faculties themselves, perhaps that is a possibility?

**Mr IUS** — We may be able to get that information because they do provide quite comprehensive reports to DEST, the commonwealth department, as part of their accountability requirements. Some of that information comes to us by way of comparability that we ask for, but I am not fully across all the levels of information that they collect.

**Ms HALLIDAY** — Anecdotally there would probably be two other things I would add. The first is that when people are interested in maths and science, the market for employment out there is a bit sparse, so the other alluring factor is that the first, second and third year entry teaching salaries are very high compared to the other professions — they are right up the top. If you have got an interest in maths and science then this is a job, at least in your entry point into a full time career, where you are going to get a significant or reasonable salary for somebody in their early 20s.

The other proportion of people we are seeing coming into teaching are, of course, those who are looking for a second career, be they police, nurses, architects, artists, re-entering 35 to 40-year-olds. We have got no indication as to how many of those are maths-science, but as a group of people we need to be really mindful of the potential in

that area of those re-entrants, which is making up about one-third — I think mature-aged is about one-third — of entrants. There are others who just cannot get in because people want to teach, and there are probably some opportunities to utilise those people who have a range of experiences, if they do have an original maths-science base. We have not done any work on that, but we should not be forgetting that group.

**Mr IUS** — The other salient point is that behind this data there is at least anecdotal evidence that universities in responding to the increasing demand levels for these subject areas by trying to make more spaces available, it has given them some concerns about the quality for entry into those courses. Whilst the numbers of places are going up because they are making more spaces available, the anecdotal evidence we are hearing suggests that the student demand for those places is not growing to the same extent at which they are making places available.

**The CHAIR** — Earlier today we heard that a typical science student studying science at university will do 20 to 25 hours of student contact time but a humanities student may do 7 to 12 hours. There appears to be quite a discrepancy at the university level of the number of contact hours you have in your degree. Do you take that into account when you are looking at the first degree side of secondary-teacher qualifications? Do you look at the number of hours they do or just whether they have passed or failed?

**Mr IUS** — I will just confer with Ruth here about whether we have that level currently required in our documentation. I do not know that we do.

**Ms NEWTON** — No. We require that they have successfully completed their degree, but usually what the universities look for is a grade point average in their first degree.

**The CHAIR** — There is quite a staggering difference in some cases. The issue is whether it is good or bad. Science graduates pay more HECS. Perhaps they are paying less per student contact hour than others. The last question I have is to do with your comments, Andrew, about degrees of proficiency in primary schools and how you monitor that. I understand that next year some universities — Monash, for instance — in their undergraduate primary education are going to do away with exams in terms of content knowledge. Are you aware of that? I may be wrong so I would not want it to be on public record, but how do you monitor the content knowledge of primary school teachers in terms of their degrees?

**Mr IUS** — For primary school teachers?

**Ms HALLIDAY** — If you remember I talked about the accreditation committee. Ruth is the manager at present who looks after the accreditation committee. We have every university represented on that committee with a majority of members from the teaching profession. There is quite some input in looking at all of those degrees before they are accredited.

**Mr IUS** — I do not know that we have received any formal advice yet about the change in any courses at Monash. Are they talking about Monash science or Monash teacher education?

**The CHAIR** — I think it is primary education and maybe just maths and science. It is an issue of, as we referred to in our last report, how you assess competency. In England, as you know, they have written exams in IT, English, maths. Here it is how you assess those levels of competency within a more generalist primary education course. I was wondering what were your thoughts on that.

**Ms HALLIDAY** — Ruth, have you looked at the Monash primary?

**Ms NEWTON** — No, I have not. We always have a proviso on our approvals, of course, and the proviso is that if there is any significant change in the course we are to be advised, so the universities will contact me. When they get to that stage where they are ready to do something that is different, it has to go back through the accreditation committee. I would think that one of the strategies that we are going to use with the new Future Teachers Project and the new guidelines will actually be the benchmarking. I would imagine that benchmarking — of course, it is against expectations of the education community and against each other — would bring out any deficits that there might be in a particular course that might be caused because of a particular approach to teaching and learning within the pre-service course.

**The CHAIR** — I do not have a viewpoint as to how you assess it. I was just wondering what sort of rigour goes into the assessment of competency across a range of subjects at the primary level, that is all.

**Ms HALLIDAY** — Certainly we would see that as a significant change and we would expect them to talk to us about it.

**The CHAIR** — It was just referred to me; whether it is true or not I am not sure on the details.

**Mr KOTSIRAS** — We have heard witnesses say that primary school teachers are not prepared, or avoid teaching maths and science in primary schools, and this has been going on for years now because they have not got the content knowledge to teach maths or science. They will do anything to get out of teaching maths and science, and if they have to teach maths and science they might do it for one period a week. Have you thought about how you can ensure that teachers going into primary teaching have got sufficient content knowledge in maths and science to be able to teach the subject at primary school? I can understand for the 70 000 who are already there, or whatever the percentage is of primary teachers, but what about from now on as teachers come out?

**Mr IUS** — I suppose it is important to differentiate between their position as to what they prefer to do versus what they are prepared to do. I can imagine that quite a number of people might prefer not to teach things that they do not feel comfortable teaching, but that does not mean they are not appropriately prepared to teach in those areas. Our expectation is that primary school teacher education programs prepare teachers at an appropriate level across seven of the eight KLA areas as they are currently defined. That means having a capacity to teach maths and science. We know that a number of teacher education programs provide bridging courses for students to ensure that there is a sufficient discipline content if they have not studied maths and science at the senior school level, particularly if they are undergraduates, which is the predominant way in which people come into primary teacher education. In terms of the Institute's requirements, we certainly expect that teachers are prepared to teach maths and science if they are primary school teachers. We do not have any strong background information or knowledge on whether it is as a result of that preparation or their own personal preferences that they would prefer to teach areas other than maths and science. We have not done any survey work in that area.

**Mr KOTSIRAS** — Witnesses have told us that teachers out there are not teaching maths and science to the level they should be teaching. It is a big problem in primary schools. I am not saying all schools; I am not saying all teachers. We have had student teachers tell us that teachers themselves are not teaching maths and science, so there is a problem. I am not sure what VIT can do about it; I am not sure what we can recommend — but the problem is there.

**Ms NEWTON** — In pre-service education, and I think you are right about ensuring that people have the strength in those areas before they go out there, there has been a strong emphasis on numeracy in particular and on teaching maths.

**Ms HALLIDAY** — If in primary schools teachers are choosing not to teach maths and science, whether the person is or is not capable — obviously somebody who is not capable but is trying to teach it is equally as bad — the reality is without the employer or an overarching directive from the curriculum scenario that so many hours can be taught, it is really up to the individual if they want to teach maths and science. It is expected, it is in the curriculum if you are delivering the curriculum, but there is no mandated number of hours that they have to teach it in the primary school. We cannot do anything about that, but you never know, you could suggest someone else mandates a number of hours.

**Mr KOTSIRAS** — But you are comfortable with the accreditation of the courses as they presently are?

**Mr IUS** — We believe that our demands currently of pre-service teacher education programs where they are required to prepare people across those areas, and what a number of universities do to try to build the discipline knowledge of those people to teach in those areas, is reasonable. I will not say that there is not room for improvement — there is always room for improvement — but certainly the requirements are there that they prepare teachers capable of teaching across the seven KLA areas, which therefore includes maths and science. We know universities have these bridging courses in place to prepare people where there appears to be a lack of discipline knowledge.

**Mrs BUCKINGHAM** — I would like to ask a question about this appendix. As psychology is one of the fastest-growing sciences or quasi sciences, I am interested that it does not appear here.

**Mr IUS** — We have taken it off because it is right off the scale. The numbers of people doing psychology are quite large.

**Mrs BUCKINGHAM** — The other thing is as these statistics have been collected over an 11-year period, as well as the number of teachers who have been prepared to go out into these areas, I am wondering what the result would be if you looked a little further, like two years down the track, and find out what they are teaching. Five years down the track, are they still teaching? If their major or sub-major was physics, are they teaching physics? Is it the institute's role to track that? You are telling me that there are 98 who in 2005 will be qualified to teach physics, but do we know that they will be teaching physics when they get out into the schools. Are they also teaching chemistry and biology? I am not quite sure how I use this. It looks like there are enough out there, but I am not sure whether in the big wide world of teaching at Wycheproof secondary where you might be qualified in physics but they need a biology teacher, whether this means we are producing enough in the areas that we need to.

**Ms HALLIDAY** — The reality is many schools do not teach physics anymore. They have teachers who can teach physics, or the odd one might pass through, but they do not run physics classes anymore. There are lots of schools that fall into that category.

**Mr IUS** — We do not currently do any survey work around what teachers are actually doing in terms of their teaching practice. We do not do any of that survey work. We collect the data mainly around the supply side, not the demand side.

**The CHAIR** — I have one last question which is fairly simple. Lab technicians came up earlier; do you have any responsibility for the qualifications of lab technicians?

**Mr IUS** — Our jurisdiction relates only to teachers. Lab technicians would come under the category, I assume, of ancillary staff in schools, and they are not required to be registered with us under our legislation.

**The CHAIR** — So it is a school guideline thing.

**Mr IUS** — I believe the department, for example, as an employer would have guidelines around the requirements for lab technicians and other categories but they are not covered under our jurisdiction.

**The CHAIR** — Thank you very much. Once again you have provided a lot of information and we will follow up on some. We wish you well. We look forward to the government's response to our earlier inquiry. We will try to steer clear of extra work for you in the next one.

**Mr IUS** — We are always happy to receive more references.

**Committee adjourned.**