



EDUCATION AND INNOVATION COMMITTEE

Members present:

Mrs RN Menkens MP (Chair)
Mr SA Bennett MP
Mr MA Boothman MP
Mr RG Hopper MP
Mr MR Latter MP
Mrs DC Scott MP
Mr NA Symes MP

Staff present:

Ms B Watson (Research Director)
Mr G Thomson (Principal Research Officer)

PUBLIC HEARING—INQUIRY INTO ASSESSMENT OF SENIOR MATHS, CHEMISTRY AND PHYSICS IN QUEENSLAND SCHOOLS

TRANSCRIPT OF PROCEEDINGS

WEDNESDAY, 10 JULY 2013

Twin Waters

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Committee met at 10.30 am

CHAIR: Before we start, I would ask members of the media who might be recording any proceedings that they adhere to the committee's endorsed media guidelines. Committee staff can provide a copy of the guidelines to you if you require them. Of course, I also ask that all mobile phones be switched off or set to silent. Good morning and welcome to the third public hearing for our inquiry into the assessment methods used in senior mathematics, chemistry and physics in Queensland schools. I want to introduce the members of the Queensland parliament's Education and Innovation Committee. I am Rosemary Menkens, the member for Burdekin and the chair of this committee. Committee members are Ray Hopper, the member for Condamine; Michael Latter, the member for Waterford; Desley Scott, the member for Woodridge; Steve Bennett, the member for Burnett; Neil Symes, the member for Lytton; and Mark Boothman, the member for Albert. Next to me is Bernice Watson, our research director.

We are particularly pleased to be at the Sunshine Coast today. It is a shame it is raining, but we have come to the Sunshine Coast today because we have received a significant number of written submissions to this inquiry. Thank you for the interest that has been shown. We had hoped to speak with some students here as well, but unfortunately that has not been successful. We are now looking at plan B in that regard. However, I am sure those students have a lot of other things that they are focusing on at the moment. Today's hearing is being recorded and will be transcribed by Hansard for future publication on the committee's webpage.

On 14 February 2013 the Queensland parliament directed its Education and Innovation Committee to inquire into and report on the assessment methods used in senior mathematics, chemistry and physics in Queensland schools. The terms of reference for the inquiry are available today at the registration desk and on the committee's inquiry webpage. This inquiry has generated a high level of interest. We have received almost 300 written submissions which contain strong and often very differing views on a range of aspects of the current assessment system. Stakeholder submissions are an important source of information for the committee's inquiry. Indeed, providing a forum for broad public input to the democratic process is a key benefit of this issue being considered in a parliamentary rather than another form of inquiry. However, the information we read and hear from written and oral submissions during this inquiry is not the only information that will inform recommendations the committee will make back to the parliament. The committee is assessing information from a range of sources.

Importantly, I must advise you that parliamentary privilege applies to all committee operations, including this hearing today. On the other hand, to mislead the parliament, including this committee proceeding, is a serious offence. If a witness is unable or unwilling to provide an answer to any question the committee might ask, he or she should advise accordingly, giving reasons, and we will certainly consider the reason and provide ample opportunity for a witness to seek any advice or assistance needed. Witnesses might also wish to take questions on notice if you do not have that information to hand. As well, you may request that any information you provide be kept private and, again, the committee will certainly consider that request. Some witnesses might wish to table further material for the committee to consider. If you wish to do so, you will need to seek leave of the committee and we will determine whether it is accepted. We are on a very strict timetable today, so I aim to hold us all firmly to the allotted times.

GRENFELL, Professor Al, Science Discipline Leader, Faculty of Science, Education and Engineering, University of the Sunshine Coast

MEYERS, Professor Noel, Head of School, Faculty of Science, Education and Engineering, University of the Sunshine Coast

CHAIR: First of all, I particularly welcome representatives from the University of the Sunshine Coast—Professor Al Grenfell and Professor Noel Meyers. Thank you most sincerely both for coming this morning. Would one of you like to make a brief three-minute opening statement?

Prof. Grenfell: My background in education includes 16 years in total in Queensland secondary schools as a science teacher, head of science and deputy principal and almost 30 years in tertiary education, including 25 years at QUT and time at the University of the Sunshine Coast. My most recent direct involvement with secondary school science was in my role as chair of the Earth Science Subcommittee of what is now the Queensland Studies Authority during the development of the earth science syllabus that was published in 2000. The process left me with a strong, positive impression of the assessment, knowledge and skills of colleagues in the subcommittee and the science advisory committee.

In relation to assessment practices, with a somewhat protracted involvement in the education sectors, I have seen some significant changes in assessment, particularly the removal of external examinations, the introduction of school based assessment and a shift to standards based assessment. I would view the reversal of those steps as retrograde. My specific experience with universities is that the assessment approaches reflect quite strongly those that I am conscious of in secondary schools. USC, for example, mandates criterion referenced assessment with the standards that are to be applied required to be communicated to students. Likewise, QUT has adopted a criterion referenced approach to assessment with predetermined and clearly articulated criterion standards.

There are many strengths of criterion referenced standards based assessment in the context in which I work, but some key ones are that the assessment ably supports student learning and favours authentic learning; it provides valid evidence of the achievement of learning outcomes; it provides meaningful feedback to students and teachers; and for us it reflects rigorous academic standards in science through predetermined and clearly articulated criteria and standards. I would like to pass across to Noel.

Prof. Meyers: I draw the committee's attention to a fundamental point and that is the notion of extended investigation. Extended investigation provides students with the opportunity to learn science by doing science. There is no more powerful way in which to create the next generation of innovators and practitioners of science, engineering and in the health disciplines than this particular strategy. I would suggest also that the current standards based criteria reference assessment provides guidance and intellectual scaffolding for the students as they progress through completing these extended investigations. So they kind of have an expert in their pocket in order to make their understandings real and meaningful to them.

I guess the counter argument to this is the use of marks. It is tantalising and alluring to suggest that we should use marks instead of standards based criteria reference assessment. The majority of experts throughout the world would disagree with that notion and they would suggest that it is kind of like trying to do heart surgery with a shovel: you will get the job done, but it will not necessarily be the prettiest job or even the most accurate job. More than anything else, though, I would ask the committee to think about the broad question and that is how do we maintain our pre-eminence in science and engineering and our place in the world if not by going down what is recognised as world's best practice?

There are also elements in the committee's portfolio review which I find quite interesting and they really focus very much on the declining numbers of students in the sciences, the chemistry, the mathematics and the physics. I put it to the committee that this is a function of two factors: one, the greater level of choice in the secondary sector, which is unprecedented in history, from which students are able to choose; and the second, broader element, is the lower aspiration of those students to pursue a career in science. I and my university colleagues take seriously our responsibility to raise the aspiration of those students and that is what we are working towards. We would welcome and wish to contribute any other answers to your questions.

CHAIR: Thank you. Thank you both Professors. Do I have any questions from the committee?

Mr BENNETT: Good morning. Picking up on standards based criteria, obviously, we have been around this inquiry for several months. With the standards based criteria referenced in the assessment for Queensland schools, is it comparable with the use of numbers and percentages? Can I get you to expand on that a little more for me? You mentioned the assessment.

Prof. Meyers: Sure. What we are in essence arguing is for repeatability of the judgements of individual teachers across teachers. If we ascribe marks to a particular piece of work, I think that does two things. The first one is that it gives away in most cases the benefits of the standards based reference system. The second one is that it makes a heroic assumption about the level and the discernment of the judgement of individual teachers. The question that I would ask, and knowing a little bit about this having a school in which we teach educators for the next generation, is that the likelihood and the repeatability of a judgement to half a mark is unlikely. So what is likely to

happen if we start ascribing marks is that there will be greater variation between markers and across the state than there would be if we worked to broad bands of achievement as outlined in the current standards criteria reference schema.

CHAIR: Thank you. Mark?

Mr BOOTHMAN: We certainly understand the reasons for this extended investigation and we are certainly considering some of the important assessment tools, but we have received a lot of evidence which suggests that there may be some room for improvement in elements of how these tasks are delivered. For example, with regard to communication about expectations and enforcement of word limits, do you have any views on how extended investigations could be done to improve this?

Prof. Meyers: There is no question that any system can stand to be improved. By more thoroughly articulating and guiding the principles and the underpinning cognitive challenges that we are providing for students, it is my view that we could significantly enhance the quality of their learning and also the quality of the standards that could be communicated to the public. This all gets back fundamentally to how effectively our teachers are trained and how effectively our teachers are able to deliver the materials which they are working with. I should emphasise one fact: teachers are doing the very best with what they have; teachers are doing the very best with the training they have. If there is one thing that I think we could do better it would be to invest more significantly in our teachers in professional development in an ongoing fashion. I cannot speak for the other universities, but we last year worked with about 900 or 1,000 teachers—in that range—in professional development not only on curriculum knowledge but also in assessment strategies. So I would see that there would be an enormous opportunity between the legislative arm and the academic arm of our state to work more closely together in order to enrich the capabilities of our teachers to deliver and communicate those notions to students and to the broader public.

Prof. Grenfell: Can I add that, while I am aware that there have been some concerns about EEs and other extended investigations, we see those as being absolutely critical, because they emulate the processes of science. While there might be improvements that need to be made in terms of workload for teachers, the skills of teachers in developing those extended investigations, it is an element of assessment that we think models what real science is like and can model what real science is like and, therefore, should not be lost. They may be improved. There may be strategies put in place to look at how they might be more focused, how they might be more efficient and perhaps the skills of teachers in developing them, but I would think it would be an unfortunate part of the assessment tasks to be lost.

CHAIR: Thank you. Ray?

Mr HOPPER: In your submission I note that you generally support the current assessment practices. You also acknowledge that refinements to assessment strategies could be made. Could you please elaborate on any of those recommendations that you believe are important for us to consider as a committee?

Prof. Grenfell: Can you be specific with the recommendations?

Prof. Meyers: May I begin to answer that question. I think it gets back to the way in which we construct the standards for the particular task at hand. The model that we were referring to—and thank you for the question—looks at an increasing cognitive complexity of each of the performance standards. There are various opportunities and various models that we could use. The one that I would suggest is based on Biggs' and Tang's SOLO taxonomy, which is a structured observation of the learning outcome. It works in increasing complexity of the way in which students are thinking and acting. So at the lowest level—and I know no Queensland students would exhibit this—they have no idea of the task, which would be equivalent to a very low achievement, up to the other end of the spectrum in which we write standards to provide that scaffolding and that guidance of learners that would say, 'Here's an answer to the problem. These are the sorts of elements that would be contained within that answer. Here's the sort of process that you would go through in order to get that answer and here's how you have taken that problem and turned it on its head and applied it in a completely different way.' That would exhibit creativity, innovation and also, and more importantly, the capacity to solve really complex problems and to develop new ideas and new knowledge from them.

So that is the first point of the discussion. There are models in which I think we can provide better guidance to students through improved ways in which we roll out the standards. When that has been done elsewhere, my understanding from the literature is that it significantly enhanced the quality of student understanding and student performance.

Prof. Grenfell: I also have questions about the recommendations, because we have not been all that explicit. Some implicit recommendations really related to professional development for teachers who may be having difficulty or facing challenges with criterion referenced assessment. The other area is communication with the public. We think sometimes better selling the strengths and advantages and the way that criterion referenced assessment works to parents, families and others in the community would be helpful in firming up the commitment to criterion referenced assessment.

Mrs SCOTT: With reference to the formulation of the national curriculum, we have heard a lot regarding the tension between the various states and the fact that something is removed because New South Wales objects to it and so on and the Victorian system and so on. I wonder if you could elaborate a little more on the various states' requirements.

Prof. Meyers: I thank the member for the question. I suspect I would be shot by my vice-chancellor if I were to venture into that particular ground. However, risking the firing squad, I would say that, in my view, the Queensland system has been very robust for a very long period of time. In my view, many of the innovations that have been brought in the Queensland curriculum are to be commended. I am not sure that student performance, as measured in standardised testing, is reflecting the quality of the Queensland curriculum.

In terms of the broader national agenda for curriculum, that is a question I think that this committee would be best able to answer. I can answer only very generally.

Prof. Grenfell: And I could answer only generally in terms of the senior subjects that have been proposed in the ACARA curricula and some of those are still not finalised at this stage. That is my understanding.

CHAIR: Members of the committee, do you have any further questions? No. Thank you. I really do thank you both, Professor Grenfell and Professor Meyers, for your input this morning and also your excellent submission that you have given us. We appreciate your time. Thank you very, very much.

SOORYA DHAS, Mr Jeevan, physics teacher

EVANS, Mr Paul, physics teacher

HILL, Mr Robert, physics teacher

CHAIR: Welcome, gentlemen. I particularly welcome here this morning Mr Jeevan Soorya Dhas, Mr Paul Evans and Mr Robert Hill. Thank you so much for coming along this morning. Would you each like to make a three-minute opening statement?

Mr Soorya Dhas: Thank you. I am Jeevan Soorya Dhas, a physics teacher from the Sunshine Coast. Madam Chair and members of the committee, thank you for giving me this opportunity. I am humbled to be part of this inquiry. Please excuse my nervousness as I feel totally out of place here, but I also feel strongly about the need for a change and hence I have agreed to appear before you. I do want to make use of the few minutes you have allocated to me, but I am not planning to go over the points people have already made in their submissions. Instead, I would like to use an extremely simple physics problem to highlight an important difference between Queensland's way of assessing and the rest of the world's.

Here is a simple physics problem: a rock is dropped from the top of a 100-metre building. Find how long it takes to reach the ground and find the speed as it strikes the ground. This is a problem Year 11 students will be familiar with. It can be solved quite easily using Newton's equation of motion. A competent student will take two or three minutes to solve this, and the correct solution will attract three or four marks out of a 100-mark exam paper. This is what students in New South Wales, Victoria, China, Europe and everywhere else do.

Now to the Queensland way of assessing. In physics, we have three criteria, namely, knowledge, investigation and communication. Problem solving forms one-third of the knowledge criterion. The question as it stands only tests their problem-solving skill. I need to give the students the opportunity to demonstrate their skills in investigation and communication. Here the students do not do any calculation or problem solving, but they write descriptive paragraphs. So I need to change the question to read: a student decides to study the motion of a rock dropped from a 100-metre building; discuss. The criteria sheet will indicate this is a B-level question. In the investigation criterion, students discuss hypothesis, risk assessment and equipment selection relating to the experiment. In the communication criterion, they write about the relationships between variables, explain the scenario and present their ideas all in a narrative way. This may take about 15 or 20 minutes.

Let us assume that the student solves the problem incorrectly and gets a C for knowledge, but gets the investigative and communication parts right and gets Bs in both. Just based on this question, this student will be judged a B-level student. Thus we have a high-achieving physics student who cannot solve a simple three-mark physics problem, but is very good at assessing risks and explaining scenarios.

At the other end, we may have a student who has excellent problem-solving skills, but does not like writing narratives or has limited language skills—perhaps an NESB student. This student gets the right answers in the knowledge section, but because of his limited language skills he is not able to articulate what is required in the investigative and communication sections. He gets either Cs or Ds in both, depending on how bad his language skills are. With one B and two Ds, he will be judged a limited achieving student.

The irony is that physics is all about solving problems to find answers, not about writing essays. This is the reason why many students choose physics in the first place. My students love the challenge of problem solving. There is a buzz in the classroom to see who finishes first. There is a sense of exuberance when they realise they can solve complex real-world problems using simple physics laws and mathematics. They absolutely hate having to write narratives, justifications and explanations. They do not see any point in it and it is a big turn off for them. As a teacher, I am saddened to watch their enthusiasm in physics being slowly eroded away because of the emphasis on writing skills.

Coming back to our rock problem, the current way of assessing gives high achievement to a student who is bad at physics and limited achievement to a student who is good at physics. I trust this example is of some help to you. I am now ready to answer your questions.

CHAIR: Thank you. Mr Evans?

Mr Evans: I am Paul Evans and I have 30 years' experience teaching senior physics. My submission is No. 253. Thank you, Madam Chair and committee members, for giving me this opportunity. Statements from 21 Sunshine Coast senior physics teachers that were collected as part of my Master of Education indicated they are unanimous in their condemnation of the criterion based assessment model of the 2007 physics syllabus. They dislike its subjectiveness and difficulty to implement in a consistent manner. That is 21 out of 21 were not supportive of the system, so assessment processes are definitely not supported by teachers.

For the second term of reference, please refer to the graphs in my submission. The main highlights are that despite the population increase in Queensland and the number of schools increasing from 290 in 1992 to 386 in 2012, the enrolment numbers in senior physics have stayed constant for the last 20 years. They were 7,281 in 1992 and 7,154 in 2012. There is no reasonable change. However, the participation rate displays a decline from a peak of 21.8 per cent in 1993 to 14.8 per cent in 2012. The drop-out rate, which you can work out, from senior physics has increased from 13.2 per cent that dropped out in 1992 to 18.9 per cent that dropped out in 2012. The introduction of the 2007 senior physics syllabus has not addressed the decline in the participation rate or the increasing drop-out rate.

The assessment process is fraught with shortcomings and opportunities to flaunt the system. EEs are assignments which are completed outside of the classroom, therefore, students can achieve a lot of external help from older students, siblings, parents, private tutors or even buy someone to do the assignment for them. This external help is available to some students but not all students. The authenticity of a student's assessment item is questionable. Assessment is inequitable and the education assessment playing field is not level. It is very much biased in favour of students who are from high socioeconomic backgrounds.

Even with all the professional development that we have had, two teachers looking at the same assessment item and using the subjective criterion based assessment model can end up with awarding different marks. Therefore, it is not reliable. The actual argument earlier on was that criterion based makes it reliable. It does not make it reliable. In fact, it makes it less reliable, so it is not repeatable. In fact, the same teacher on two different days could possibly get different results.

The external moderation process is unreliable. Standards vary from school to school, district to district, and year to year. An assessment item that was approved by panel one year gets refused the next year, yet you have made no changes. Frustration reigns. Validity and reliable judgements of student outcomes cannot be made. The only reason the system is deemed to work is because of the enormous time and commitment put in by the thousands of dedicated and conscientious Queensland teachers. It is certainly not because of the QSA's assessment model; it is despite it.

However, teachers' patience is wearing thin and the frustrations are increasing as clearly demonstrated by the 96 per cent of frontline practising teachers who submitted a submission wanting change. There are many experienced teachers, myself included, who are anxiously awaiting the outcome of your parliamentary inquiry and its recommendations. For many, the outcome will decide whether they take early retirement or they go to part-time work to deal with time commitments and pressures of the assessment model. Others may decide just to change to international baccalaureate, junior science or move abroad to avoid the system. I personally know of teachers in every one of those circumstances who are waiting on your decision. It is a reality of the stresses that the assessment model places upon teachers that we are considering this. The average age of a Sunshine Coast teacher is 45.6—that was three years ago—which is close to retirement. They can be taking retirement to get out of the system. Can Queensland afford to lose this valuable resource base if the QSA and the assessment model remains?

Teachers do not need more training. They need a system of external examinations and a return to marks, not criterion based assessment, and to be able to focus on teaching. There needs to be a timetable of this action to give teachers confidence that a positive change is happening, otherwise they will leave.

Committee members, please listen to the frontline teachers and address their concerns. With due respect to the QSA and education theorists who actually have a vested interest in this assessment model, they are not on the front line seeing the stress that is being caused to students and teachers by this unworkable system. The Queensland education system could and should be much better for our students and teachers and, if this assessment system is so good and, as earlier mentioned, world practice, then why is not the rest of the world embracing it? Indeed, countries like the UK are moving away from the internal assessment and coursework because of the issues with authenticity, validity and being socially unjust.

Thank you once again for this opportunity. Before I finish, I am sad to see that you could not have any students able to come. I do actually have some examples of EEs from students who have agreed for me to show them if you would like to see the weight that they actually are and what we have to do. Madam Chair, if that is appropriate, I can table that so that you can have a quick look at the EEs to see the depth of the students' work. Thank you again and I look forward to answering any questions on my submission.

CHAIR: Thank you very much, Mr Evans. Do I have permission from the committee for Mr Evans to table these? Yes, definitely. Thank you very much, Mr Evans. I call on Mr Hill.

Mr Hill: Thank you. My name is Rob Hill and I am a physics teacher from the Sunshine Coast. I feel, at the moment, somewhat redundant because the gentlemen to my right have been saying exactly what I was planning to say about the acceptability of the assessment processes by teachers in Queensland. I think the numbers in the written submissions clearly indicate that there is a great level of dissatisfaction with how things are working: over 80 per cent—you quoted 90 per cent, Mr Evans, 92. Of those that are in favour of the assessment processes, it is noticeable that most of them are either academics or heads of departments or actually on panels already, so you would expect them to be supporting it.

I do not want to cover ground that has been covered already. I think the most useful thing that I could point out is about the repeatability, which is this issue which is supposed to be so important and is manifestly not so with the assessment criteria system. I would like to point out I have used these two documents here. Whether they can be tabled or not is moot. These are R6s, which we have to send in with our assessment pieces and the students' answers. We have to send them to the panel year by year. We put on here what we think are the grades the students should attain. The panel looks at them. They put on their grades, send them back with appropriate comments or what they consider appropriate comments to guide the schools.

These are two R6s of sequential years with exactly the same assessment items—no changes whatsoever. In one case we are told that the submission, that is all the papers we have sent in, demonstrated appropriate coverage of course topics and the general objectives as set out in the school's work program. Great. The year's hard work which we have been putting in has paid off. Everything is good. We have the balance right. The panel is happy with this.

In the subsequent year, the next year, exactly the same assessment pieces, no changes at all—I cannot emphasise that strongly enough—'The balance in the general objectives over the course of study is not evident.' What has changed? The assessment items have not changed, so where has the change happened? It has happened in the panel. There is no consistency. This happens over and over, repeated I am sure in schools across Queensland. One year everything is good, the next year not good, you have to change. It just leads to frustration and uncertainty. As a teacher I am left totally unsure of what I am doing. It is demoralising, it is frustrating. I am not the only one. This is repeated over and over again.

Also on this R6 I placed two of my top students at a level called VHA8 and 7. That is about as high as you can get. The panel knocked those students down 15 rungs—15 levels out of 50. 15. I was devastated. That is about as bad as it gets. That left me saying how have I got it so wrong? What have I done wrong? I do not understand what is happening here. As a teacher that knocked me solidly. My confidence was really solidly undermined.

I went back to the panel chair. After looking at my submission and after spending it seemed like hours saying, 'Look, here's the criteria, here's the student's work, here's the criteria, here's the student's work.', they were reinstated. Now, what is going on here? This is not good. This is appalling, in fact. One of those students finished up as a dux of the school and the other one, who actually came second to the dux, finished up with a Dean's scholarship in one of the universities in Brisbane. So they were good students. The comment from my principal when I showed him this: 'The system is broken.'

You will find one of the written submissions actually, interestingly, picked up on this very incident and said how wonderful the system is because it put it right—put the mistake right. That was the comment. I was appalled. That is like a car manufacturer producing a brand new car, saying how wonderful the car is, having adequate airbags but shonky brakes. The inevitable smash happens, the poor old driver staggers away battered and bruised and the manufacturer says, 'Look at how wonderful the air bags are.' Sadly, this is the attitude of QSA. They seem to miss the point. They miss what teachers are saying over and over and over again. They are not taking the teaching fraternity with them.

My final point would be, if you look at the written submissions, over 25 per cent have asked for their names to be withdrawn or not put on there. In contacting some of those people, the reason why is that they are afraid of some kind of retribution or persecution when they send in their next set of submissions to the panel. Now, you may say, 'Well, that's ridiculous, that's not going to happen', and I would personally I say that's probably right, but the fact is that you do have 25 per cent of people not wanting their names out there because they are afraid or apprehensive of what is going to happen. They have obviously lost confidence in the QSA. This is the biggest issue. There is no trust, there is no confidence, and QSA have failed to take teachers with them. The system is broken.

CHAIR: Thank you, Mr Hill. Order, please. This is a parliamentary proceeding and orderly behaviour is expected even though I do appreciate your passion and interest in this area. Mr Hill, we would be happy for you to table those two documents if you so desire.

Mr Hill: I think it would be useful.

CHAIR: Do the committee give permission for them to be tabled? Thank you, Mr Hill, we would appreciate those.

CHAIR: To our three witnesses, as the committee do ask you questions please feel free, each and every one of you, to answer as you see fit or not answer as we throw general questions. I would like to throw a question to Mr Hill. I know I am playing devil's advocate when I ask this question, and I do understand what you said in the last part of your opening remarks, but do you think that the same discrepancies in marking could occur in an external examination with different examiners?

Mr Hill: I would suggest it is much less likely to happen because the probable cause of such discrimination is the confusion which most teachers find when they are trying to use these discriminators. I am still, after five years of using these, unsure how to mark. That is appalling. It would appear that the panels are also unsure how to mark or how to use them because of the sort of discrepancies that are happening. I suspect, having worked in the UK for 10 years and taught at A level and had no issues like this at all, that external examination, although it is not going to be perfect, obviously the chances of such huge discrimination is not going to happen and probably even smaller errors will be very rare.

CHAIR: Thank you. Questions from the panel?

Mr BENNETT: Mr Evans, evidence has been consistently presented to this inquiry from academics and perhaps from universities that we need more personal development and more training of teachers. I picked up on your point about retaining teachers which was quite prevalent in your presentation. Would you briefly perhaps clarify or add some more weight to your presentation about the real threat of losing teachers? Would personal development and more training allow us to get to something that is world's best practice ultimately?

Mr Evans: First of all, there has been lots of professional training already. It has not resulted in an understanding of the criterion assessment model. Some of the workshops that were done by the QSA originally, I think it was best described as the QSA being arrogant and unhelpful. The fact was that they just didn't understand it themselves. The QSA didn't understand it themselves. They couldn't communicate that to the actual teachers and then couldn't give examples of how to interpret the subjective criteria giving an example of a student's work. So they themselves couldn't do it consistently. They could not answer the questions for the teachers. The teachers felt very frustrated. So more training along interpreting the actual subjective criteria and its nuances will not be helpful. Was the piece of assessment complex and challenging, is it at an A plus or an A minus sort of level, that is not going to change, it is still going to be subjective and that is actually going to lead to more frustration. And consequently teachers who are getting closer to retirement or struggling with this will consider their options—last term, to take an example, there were nine weekends in the term, seven of the weekends I spent marking. Seven weekends, which were 15 hours a weekend, marking. So for every EEI you are basically bringing in 50 hours extra work for every class of approximately 16 students. That is one and a half hours for a draft, one and half hours for a final, moderation afterwards—meeting with other teachers to decide. So for every EEI for every class that you teach, and most physics or maths teachers will have two classes—a year 11 and a year 12—so it is an extra 50 hours for each EEI or ERT assessment and with a class of 16 students. Try and incorporate that on top of what you are normally doing as a teacher. And also there is the timeline. If you have got a draft, you have got to give that back by the next week. Teachers are fed up with that. The work-life balance does not exist. It does not exist for students because we are actually putting too much emphasis on these long EEIs. Even with a word limit, it

doesn't work. Even examples on the QSA website, their word limit that they had for an example wasn't within the actual word limit. The students who get an A for all nine criteria cannot stay within the word limit—unless you've got a university ability to review it, I would say a second-year university graduate or undergraduate who can actually synthesise and precis the work. Students haven't got the maturity.

So consequently two things in there: one is training isn't going to help. There has already been a lot of training and that hasn't been helpful. As was said by Robert, teachers have lost confidence in the QSA and their ability to be able to communicate and understand the actual criterion. Myself, when I went to the actual QSA workshops the person talking to me was not a physicist. They were telling me how to mark physics and they were not physicists. The credibility was gone straight away as soon as that occurred. The second thing in terms of retirement, people are looking at it. I can say five exact teachers, including myself, if this doesn't change I will not continue to teach—senior teaching of physics—because I do not want to lose my weekends marking. Yet, in order to do the job properly and to give critical feedback—as Hattie says, the feedback is the most important part you can do with the students to improve—if you do it thoroughly and properly it takes an hour and a half at least, and I am being generous, some of them take me two to three hours to do properly and to do that properly and as a conscientious teacher you get fed up spending your weekends doing that. Teachers are considering what are my other options.

Mr BENNETT: Moving forward then, how do we get, remembering the students are the focus, to world's best practice if we have done the training?

Mr Evans: First of all, the EEs themselves, it is wrong to say that prior to 2007 we did not have any rigorous scientific investigations. We did. My students, for example, built a solar barbecue. With that they did an investigation, they put together a hypothesis, they put together a rigorous scientific method, they actually collected data. That was done before EEs. It is not to say that all of a sudden EEs are the big thing that has just been introduced, but the assessment of them was not using this criterion based assessment model. That has become the issue, and the fact that they have to be a minimum four weeks up to 10 weeks. It does not have to be a minimum four weeks. That minimum four weeks generates a lot of data. That data generates a lot of actual analysis which generates a lot of conclusions which means you go beyond your word limit. It is not rocket science. That is what happens. It shouldn't be four weeks for a start. It shouldn't be criterion based. As a learning tool, brilliant, these are really good, but as an assessment tool on which final decisions are made on the student's level of achievement, no. Because there is no authenticity, validity and reliability of the student actually doing the work. Is it the student's work? They work in groups of two or three. Are they all doing the same amount? Some students have more opportunity to get more help therefore the actual piece of work that they submit isn't guaranteed to be their work. Yet you are making big decisions on what their level of achievement is on the EE and the EE can be up to 25 per cent. You need four to six pieces of assessment and if one of them has to be an EE that is 25 per cent. You could have an ERT as another one. That makes it 50 per cent. That is another written assignment. Fifty per cent of it could be on unreliable data that has been collected, because you cannot guarantee the authenticity of the work. That should not happen. What frustrates me more than anything is the unlevel playing field that exists out there for education, because some students have got lots of help, others haven't got lots of help. It depends if they have got an educated family, if they are in an independent school or a school that has an experienced physics teachers that offers support for drafts and tutorials, great. If you don't, you don't have that help. So it is unfair—back to the focus of students, it is unfair for students.

CHAIR: Thank you very much for those comments. I would just like to ask, would it be an improvement from your perspective if, rather than you and/or your school developing or own assessment tasks for students that you set tasks from a bank of external development assessment tasks that were explicitly linked to the criteria and standards for maths, chemistry and physics?

Mr Evans: Certainly the fact of having to reinvent the wheel, and you have got thousands of teachers around the state who are reinventing the wheel. So that, first of all, would benefit that. The international baccalaureate has a bank of assessments that teachers can pick from that have been already accredited and been approved, if you want. That certainly would help, but the interpretation using the subjective criteria would still be there. That would be the problem, the actual sort of subjective marking as a final assessment. The other thing is the authenticity of it. It is still external. You still have that authenticity that you cannot guarantee. So would it help from reinventing the wheel? Yes. But would it guarantee authenticity, validity and reliability? No, it wouldn't.

Mr LATTER: Mr Evans, I note previous comments of yours, and will refer to other submissions made to the committee—in fact, one today which you may have heard—that EEs have a great deal of weighting from the previous submitter's perspective in that it is learning through Brisbane

real and applied science. I want to go back to your comments. am I right in saying that you put some weight in having EEs or assignments, but you do not believe that they are an appropriate assessment tool? Was that right?

Mr Evans: That is correct. The idea of doing experiments for physics is great. That is what it is about. It is a tool to learn from—to do the collecting of data, to do the analysis. Whether it has the label EEI or an extended piece of work does not matter. It has to be a scientific investigation. First of all, they are important as a learning tool. But then to give it the final weight of 25 per cent—because if you only have four assessments that you submit to determine a level of achievement, because of the difficulty with the authenticity of that piece of work it becomes unreliable. As a teacher you are actually making judgements thinking, ‘They have signed a piece of paper that says it is my work. The parents signed it. I have to accept it.’ You cannot challenge it. As a learning tool, it is great. But as an assessment and final decision maker, no.

Mr LATTER: To be very clear on your position, is it fair to say that you are completely supportive of an external assessment method or do you think there is a place for both types of assessment?

Mr Evans: There is a place for both types. You need external examinations for auditing. With an internal examination, I teach the content, I set the examination and I also set the revision. I can set the revision to be exactly the same as the exam. That is fraud. That should not be the case. If you are a teacher who is under pressure from your head of department, from the fact that your school has to now publish OP results, from parents in terms of what are you doing to help my student to achieve, it is easy: make a good revision paper. Make the revision paper exactly the same as the exam paper and there is no problem. There is no auditing done. The revision paper does not go to the panel. I have been on panels and have seen that. In the old system I have seen supposedly complex questions answered that were meant to differentiate between A, B and C students. You had the exact same answer to a question from a C student as you did from an A student. They have been taught the method to regurgitate it and reproduce it. Those students who are A students have not had the benefit of showing they are an A student above a C student because the C student has learnt exactly the same process.

The fact is that you teach the content, you set the revision paper, the revision paper can be exactly the same as the exam paper and there is nobody to challenge that. There is no external auditing. That is where external examinations have a place in the system. But within that if it comes in teachers will be judged on their performance in classrooms. Well, great. Do the teaching, set the revision paper, do the exam paper that is very similar to the revision and the students get good results, the parents are happy with the results, the heads of departments are happy, everybody is happy. You get performance pay so brilliant. However, shifting the focus back on the students, is it good morally for the students? No, it is not. They then think they have an opportunity to maybe go to university to do a subject area that is challenging. They have a good grade in it because you have taught them how to jump through the hoops and regurgitate. They then drop out.

My position is that EEIs or science investigations, whatever you want to call them, are great as a learning tool. External examinations have a place because they can effectively audit the quality of the teaching that has been delivered, and the teacher can just get back to teaching rather than worrying about trying to jump through the assessment hoops of this criterion based assessment model.

CHAIR: Mr Soorya Dhas and Mr Hill, would you like to make comments on this area?

Mr Soorya Dhas: My preference is for 100 per cent external exam. QSA already holds this kind of assessment method. Hubbard's School follows that and universities are very happy with the outcome it produces. As Paul just mentioned, the problem with internal exams is that many schools teach to the exam. They give the students revision questions which are very similar to the exam questions, and that is not fair on the students at other schools. The only way we can have a level playing field is by having as much external examination as we can. My personal preference is for 100 per cent external exam where questions are not based on communication skills but on problem-solving physics skills.

Mr Evans: The UK system has just fallen back from course work and in maths it is all 100 per cent external examination. In science it is 80 per cent external examination. You can have up to 20 per cent internal but the actual internal assessment has to be done under exam conditions. So it cannot be done collectively in a group, and it cannot be taken out of the class. The assessment that is done in school is still under reliable, repeatable conditions and you do not have external help. You can still have the internal but it has to be very rigorous. It cannot be such that they can get external help from outside.

Mr Hill: Having taught for 10 years under a totally external exam system, I would suggest that the level of teaching has to be that much higher in order to meet the needs of the students because you have no idea what questions they are going to be facing on their exam. So you have to teach the breadth and the depth that they need to cover that. I totally endorse what Mr Evans has said about teaching to the exam with an internal exam. If you are under pressure, what are you going to do? If you are under time pressures, you are going to teach to the exam questions which you have set. I do not know how you could teach students subject matter which you knew they were not going to be assessed on and you were going to run out of time to teach the other stuff. I am a strong advocate of external exams. I know a lot of people would disagree with that, but I have seen it in operation and I think it produces a much better standard.

Mrs SCOTT: We are hearing so much about huge stress being placed on teachers, students and no doubt a lot of parents as well with perhaps the result of students entering university with deficient knowledge to undertake the course they are doing. I am just thinking back to when you were at university and probably did just an external examination. If you look at your preparedness entering tertiary education and so on, do you consider we have fallen back a great deal? How much has science advanced in the content that you have to teach at the moment? Is there a huge amount of additional content because of advances that needs to be taught? I am just wanting a little bit of knowledge on that area.

Mr Evans: From the content point of view, the content that we are teaching is limited because we are spending more time on EEIs.

Mrs SCOTT: Yes, I understand that.

Mr Evans: As a result we cannot cover as much content so equally—

Mrs SCOTT: But there is more to be covered?

Mr Evans: Well, you have a choice basically. When you write your work program you can choose which particular units you want. In writing the work program, you can use that to demonstrate your particular interests as a teacher if you want. So you could do cosmology or you could do electronics. So there is a bit of choice if you want within that, but the content that we can cover is definitely less because of the amount of time that is spent on doing either ERTs or EEIs—

Mrs SCOTT: It is robbing you of time.

Mr Evans: It is definitely robbing us of time. Thinking back to my experience, the external exam has prepared me very well for university. However, we did no investigations as part of it; it was all external. I would have liked to have done some investigations because I found that my ability to analyse data was not as good. That part—analysing data for scientific investigations—is good. You need to look at data, draw graphs and do a conclusion. That is part of science, definitely, as was mentioned earlier.

Mr Hill: May I add to that? My degree is in applied physics. From that you will gather that I am very keen on hands-on stuff. The previous syllabus gave plenty of opportunities, I found, for using experimentation. As you were saying, you can run investigations, whereas now with EEIs we have to use an enormous amount of time which, as has already been said, eats into the content area which we would normally be teaching. My feeling is that by the time my physics students get to the end of the course they are not as well prepared as they used to be as far as content is concerned and, to some extent, as far as practical abilities are concerned.

CHAIR: Can an exam, pen and paper test analysis, synthesis and research skills? These are goals of the syllabus now, not just content knowledge.

Mr Evans: Yes, they can. You can give a set of secondary data to students. So there is data that has already been collected. They then basically have to analyse data as if they were doing part of an EEI. Obviously they have not gathered that data but they are analysing that data. So they are actually doing the data analysis, drawing graphs, drawing conclusions and making recommendations. That can be done in an exam environment. You have to be creative in terms of thinking of the examination, but it can be done. You can put a scenario to students saying that you wish to investigate momentum. You have two trolleys. Describe the experiment that you have to do. You could still do that in an exam environment where they have to create the hypothesis, create a procedure, explain how it would be rigorously investigated and how you get reliable results. That could be one part. You then have the next part where they are given a set of data that has already been collected and then interpret that. So it can be done in a rigorous, repeatable way in an exam.

Mr Hill: I endorse that entirely. In fact, I use—as I am sure you do—such questions in my written exams.

Mrs SCOTT: When you consider how our curriculum and our assessment are now and where you would like them to be, I imagine that would take some years to change? You cannot just radically change it. Do you have any comments on the steps that would need to be taken early on or progressively? Have you thought about remedying what you feel is a flawed system?

Mr Evans: First of all, as Jeevan mentioned, there are already external examinations in Queensland so that needs to be looked at. Now that is not going to take a lot of time to look at. Secondly, there needs to be a timetable that is put out in August-September to let teachers know that there is going to be significant change; that the parliamentary inquiry has listened to teachers and it is actually going to do something, not just say, 'The status quo stays. Thank you very much for all your lovely submissions but we are not listening.' If that happens, Queensland will lose a vast resource of experienced teachers who are fed up.

Look at the external system, first of all. Then look at whether that external system has the types of exam questions that allow you to assess the ability to analyse data and the ability to produce a justified conclusion. If it does have this, then, again, it should not take that long to implement. Yes, there are going to be some processes that need to be gone through and obviously there will be a lot of training or notification to teachers about how the system is going to run so they can develop their strategies in teaching and pedagogy, but it should not take 10 years to make the change. Within a couple of years there should be change. The external examination already exists. Helen Stevens from Hubbard's has said that it is very well supported. It has very good results out of it. That should be looked at as a first point.

Mr Hill: Can I add that one of the great strengths I found with the external system is that it freed me up to do what I do best, and that is to teach. I did not have to spend hours and hours writing assessment. You might be interested to know that in my opinion—and you can endorse this or otherwise—to write a good assessment piece takes about 10 hours. That does not include marking; that is just writing the paper. If that burden is taken away, then I can teach. I can spend time thinking about how best to teach things, why that student did not understand such and such and so on. At the moment that sort of thing is a luxury.

Mr Evans: I totally endorse the fact that it takes so long to prepare these assignments. Then you might get feedback from the panel that says, 'No, it is not right. You have to change it.' First of all, the feedback from the panel is very unhelpful. It is very vague because they are limited to a database of comments that they have to give which are not specific. If we do not have that continuous worry about our assessment in the assignment items that we are using plus the drafting plus the marking, it frees you up to think about how you can develop the methods that I am teaching.

Back to the time line, the UK literally put out, 'One year we are going to make this change from internal assessment.' The following year, it happened. So it does not need to be a long time. Obviously, a lot of hours need to be put into making it happen, but it does not need to be an extended time. Go and look at the UK system or other systems that exist that are out there. So that would be another thing to look at so that you can look at and learn from other practices that are occurring, because we are not best practice. World's best practice would mean that everybody in the world would be doing what we are doing. They are not. So to actually say that it is world's best practice, I am just stunned, because it is not, because there are a lot of people in the world who are seemingly quite happy with their assessment model and it does not include the criterion based marking and external moderation that we have.

Mr Soorya Dhas: If I may add to that? I do not see why we need a lot of time to introduce a new system. We already have a QSA syllabus for external exam. That has been in use for 13 years—since 2000—and other schools use it as well. We have the processes in place and we have New South Wales, Victoria—other states—doing external exam. So I cannot see why we cannot introduce a system in 2014 for the new incoming group. The current year 11s would still have to go through the old system for next year but for the groups that are coming in, into year 11 next year, I cannot see why we cannot introduce a new system for them.

CHAIR: Thank you. Gentlemen, I am afraid our time has come to an end. We have been particularly interested in your comments and the submissions that you have put in. I do need to clarify the process in that, regardless of what we put in the recommendations that we may put to the parliament, it is going to be up to the government to make the decisions. However, we have listened with much empathy, could I say, to your comments this morning. Thank you.

ANTROBUS, Mr Peter, Teacher

HOLMES, Ms Lisa, Mathematics teacher

RYAN, Mr Steve, Mathematics teacher

WATKINS, Mr Dave, Teacher

CHAIR: Good morning and thank you so much for joining us. Before we ask you questions, would you each like to make a three-minute opening statement?

Mr Ryan: I have been a maths head of department for 35½ years. With reference to the inquiry, I was a little bit disappointed that it did not include biology and marine studies. I am in a staffroom of about 25 people—basically, maths/science teachers—and for whatever reason a lot of the issues raised also concern biology and marine studies. Today, we have had a fair emphasis on physics.

In trying to address the criteria, the first dot point was ensuring assessment practices were supported by teachers. At Sunshine Beach High where I am—and this seems to be the model followed by most schools—we have a combination of a midsemester exam, an assignment or extended modelling and problem-solving task, and also an end-of-semester exam. That seems to be the model that most schools follow. In a nutshell, we are quite happy with that model. However, we are quite aware that the length of the assignment, or the extended modelling and problem solving, is an issue. It has been addressed by the previous people and it is a real problem. It appears that QSA does not have a length. For example, 1,500, 2,000 words would be really useful. We have also had the issue of spending hours on weekends marking drafts and final assignments. So that is a real problem as far as we are concerned. As I said, we are quite happy with the concept of alternative assessment items, but we would like it to be limited to about 25 per cent. We think 25 per cent is reasonable.

The next major issue that I have is with marks. There are three criteria and when you rattle off maths in these guidelines, there are actually three syllabuses. You are all aware that there is a maths A syllabus and a maths B and a maths C. There are actually three separate subjects and there are three criteria. We are quite happy to use marks in both the knowledge and modelling and problem-solving criteria. QSA guidelines have exerted great pressure on schools not to use marks and to use some sort of a tick system. We are not in favour of that. I have a real issue with weighting. The tick system does not seem to take into account the weighting of questions. Some questions are clearly more important than others. Marks automatically take into account weighting. So that is a real issue I have. The question: is this model supported by staff at our school? Yes it is, with a few reservations—the reservations being the length of assignments and the pressure we are under not to use marks.

In the communication criteria, it is not possible to use marks. It is the most objective of the criteria that we have to use and it is the one where teachers are least confident in decision making. When they have to decide is a student an A, B, C, D, E, usually they are fairly confident in knowledge and modelling and problem solving but, in the communication criteria, the confidence is not there.

I have been on panel for virtually all of my teaching life. I have been a panel chair. I am one of the people who was demonised by the previous speakers. I am a head of a department and I have been on panel. I have trouble with the tick sheets and communication criteria panel. I think it is a real issue and we as a staff would be quite happy if these criteria were eliminated.

The second question is on student participation levels. By and large, I do not think assessment has had any influence on the participation level of students in senior maths. In fact, this year I have 23 students in my year 11 maths C class, which is a record for our school. In talking to other people at panel, there seems to be a resurgence in students doing maths C. In fact, to make it even more of a resurgence, we started to teach maths C in grade 10 semester 2 and yesterday I started out with 23 students in grade 10 maths C. So at our place, it is just the opposite. The senior maths—the maths B and maths C, the more difficult subjects—seem to be making a resurgence. Whether that is because of the mining boom and the fact that people see engineering and the sciences as a good future career, I do not know. So just to reiterate, student participation levels have not been affected in my opinion.

CHAIR: I may have to remind you of time.

Mr Ryan: Okay. I will be very brief. The final dot point on the criteria was the ability of assessment practices to support valid and reliable judgements. By and large, we think it does. I realise there are some issues at panel. Finally, I am afraid our entire staff is opposed to external exams. Thank you.

CHAIR: Thank you, Mr Ryan.

Ms Holmes: I would like to thank the committee for the opportunity to speak. I am a mathematics teacher with 23 years of experience both in middle management in schools and in the classrooms in the UK and here. The matter that is most concerning about assessment in mathematics in Queensland is comparability. Because all schools create their own assessment, there is a serious problem that different assessments written by different teachers will be of differing levels of difficulty and there will even be important topics missed that all students need to know despite going to different schools. So whilst teachers with the best will for their students are trying to write assessment which allows students to demonstrate a standard, there is no guarantee that the particular standard has been met by all schools and, therefore, all students. I realise that the checks and balances are supposedly in place in the current system, but these do fail and, as always, with a complicated system there is a greater likelihood that something will slip through. The outcome is that student work, the work of the school and indeed the work of a teacher becomes incomparable between schools, regions and across the state.

In the system of assessment that is used in the United Kingdom under which I have worked, there are examinations at various key stages in the schooling. As students' work under these examinations becomes comparable, school results become comparable and teacher performance becomes comparable. It should be noted that at present schools in Queensland are compared on their results in all subjects separately despite the fact that there are no common assessments on individual subjects. So to make this comparison between students without a state-wide test in each subject in a particular year level is statistically invalid, yet the comparison is still made. We need to adopt systems similar to other states in Australia, I believe, where at least the majority of our assessment is done by all students—a standardised external examination as a minimum in mathematics.

In the system of assessment in the United Kingdom, until recently there was what was called GCSE coursework. Coursework is another name for an internal school project or an assignment that students at year 11 had to produce in mathematics. This was a lengthy piece of work to be graded by teachers with the external moderation process involving random sampling after the grading process in schools. Teachers lived in fear that their marking would be sampled and they would be found to be doing the wrong thing. This was because no-one was really sure if they were doing the right thing when it came to grading the work, because the grading of tasks was done using tables of standards rather than numerical marks. These coursework assignments have since been abandoned, justified by public outcry that they did not produce valid results. There has now been a return to assessment using only marked examinations, tests that are sat by students on the one day and which have objective independent markers. Recently, the UK education minister has announced the intention to have proper exams instead of assignments for almost all subjects.

In summary, based on 23 years of experience in two settings and two different countries, I suggest that to do justice to our students we need comparability. To do justice to our state, we need justice for our students so that they and their parents and teachers feel a confidence in the system in which we operate. We need an externally set and graded system of assessment urgently for our students at the very least in mathematics. Thank you.

CHAIR: Thank you. Mr Antrobus?

Mr Antrobus: I am a teacher and also a maths B panel chair for the Queensland Studies Authority. In looking at this I took a different point of view from what I have had for my submission and made a few comments in relation to that. I would like to say that assessments should match the learning experiences that occur in the classroom. If tests are the only way this happens, then the problem-solving investigative process is clearly diminished. Also, the teaching to the test will occur. Practice books will again appear on the shelves as they are for quite a number of other items. I experienced that in my own upbringing, because I was an external examination student. I was the second last of the external examination students. In that respect, the teaching to the test happened a lot. We had booklets after booklets of past papers and they proliferated in our classrooms.

With respect to marks, which was mentioned by Steve, as far as panels are concerned, I know that there are some panellists who do not like marks. Personally, I do not have a problem with them, but what I have a concern about is the adding of marks across from different assessment items. When addition occurs, when they are different items and different points of view, this can

give a decision which may be inappropriate to the criteria that is being addressed. We have seen that where marks have just been deliberately added or put in in that particular way they can disadvantage some students, particularly those who are at LA, SA level.

With regard to aspects about choosing maths B, in the past students were choosing the subject because of external pressure—parents, public perceptions or OP. However, students choosing it now, or at our school in particular, are more likely to succeed at least to a SA level. There are very few students these days achieving LA and VLA, and that is a good thing. So we are looking for students to achieve some success. That is only at the level that we might consider at high school, not necessarily at university, because I do not perceive that a SA level is adequate preparation for university studies. Students who are doing maths B should be looking at at least a HA or a VHA. In my experience over the years that I have been doing this students enjoy the opportunity to try assessment that has less of a time constraint. They can achieve success and be given the time to think, be challenged, provide innovative responses and solve problems at their own level and ability. In the past I have actually had students who go on to university come back to get their assignments back because they have found that that would be useful in their further studies. They have seen that the things that they did were worthwhile and would provide some benefit for them in their future studies. As I said before, success at university level I think should be based on at least achieving a HA for maths B. In terms of students who do maths B and C—and I am pleased to see that Steve's school is actually increasing its numbers in B and C; we have had some of the largest numbers, but our school is in decline at the present time with student numbers overall because of where we are placed—our numbers in maths C have been maintained and we are really seeing that they have had a great deal of success, particularly in science and engineering. I have had my three daughters go through these systems and have found that they really have had a great deal of success in their future careers. That is all I can say at the present time.

CHAIR: Thank you. Mr Watkins?

Mr Watkins: I am a teacher but with a long experience—over 44 years—in education. I wish to speak not to my submission, because that is tabled and anyone can read that, but there were a few questions which came up today which I want to talk about. I have a long experience in assessment. For many years I was in the Curriculum and Assessment Branch in the Northern Territory. I was first there as senior education officer of assessment, research in mathematics. One of my jobs was to create and administer the year 10 external exam that we had in the Northern Territory. It was introduced and then taken away later, but it had some phenomenal impact.

I would like to talk about two things that came into that. Mrs Scott talked about how we can be sure of the reliability of external exams and the marking. I would like to talk about year 10 and year 12 and how that was done. They are blind marked. The paper is set up so that there is a tear-off strip on the right. A first marker marks everything and that strip is torn off, and this applied to the South Australian system where we did our year 12 exams in the Northern Territory and our year 10 exam. That is torn off and then it is re-marked again and that is torn off and compared. If there is a difference of more than four per cent over the entire paper it is marked a third time—because there is a third strip on the paper—and it is marked by the chair or an assistant chair to get comparability. That is exactly the same in year 12 where I was principal education officer for some time and chief moderator in the South Australian system. It is marked exactly the same in South Australia where there is blind marking for the first two and when there is a difference greater than four per cent it is re-marked. So I think you can put a lot of reliability on the comparability between markers in that system. I do not think we can do it under our current system here.

Just to put things in perspective, last year we had—I am on a maths B panel—a maths B panel training session and, lo and behold, it was Peter's paper that was put up for comment. The panel members looked at the papers and the paper he put up was a VHA 8. I actually thought it was a VHA 7 because I remember seeing this paper before; I was actually one of the panel members who looked at this paper. Peter's stuff is always good. However, in the panel consisting of experienced teachers and panel members the results went from someone who thought it was a HA 8 up to a VHA 8. That is a 10-point range from experienced panel members. That is not realistic. Professor Meyers talked about repeatability, saying that marks are not repeatable. I think that it is far more realistic that marks are much more predictable and repeatable, from my own experience, than criteria. Criteria is extremely subjective whereas marks tend to be far more objective and you do get repeatability. As I said, over many years I was involved in curriculum assessment for over a decade and I saw it year after year after year. Even when I was just senior assessment officer doing year 10 exams, I was still on the year 12 moderation panels.

I honestly think that our system here is incredibly flawed. I like doing EMPSTs, the extended model and problem-solving tasks, in maths. They are great fun. They go too long and we should shorten them somewhat, but a reliable and authentic set of instruments they are not. Are they valid? Absolutely not. Our school is a fairly affluent school. I am from a government school but it is in a fairly affluent area and I know that our kids will pay up to \$500 to university students to write their EMPSTs. I have been told this quite specifically by students and there is no doubt that this happens. Also of course we come from a school where many of the parents are professionals—engineers and quasi-mathematic backgrounds—who will help their students prolifically. So I do not believe that under any circumstances are our extended modelling and problem-solving tasks a valid way of assessing students. I believe they are a fantastic teaching tool. I love doing them.

Let us get to the crunch: should we have external exams or not? I have never been in a system except when I was a student myself where we had external exams that counted 100 per cent. It has always been 50 per cent external exams and 50 per cent school based exams, so students who did not do well in exams were not penalised because their school assessment would bring them up. The exam became 50 per cent of their assessment and the exam became the moderator of the school results—a very fair system. I thought it worked extremely well. I think that would be great for Queensland.

CHAIR: Thanks, Mr Watkins. When the committee asks questions, all of you feel free to make a comment—all or any of you, whoever wishes to make a comment. Firstly, I want to bring up one point that was made—teaching to the test. That should be okay, though, should it not, if the test can assess the whole of the syllabus?

Mr Watkins: I would like to answer that one. Teaching to the test I think is fantastic: at least you know that they know something.

Mr Antrobus: Teaching to the test can be taken too far. It can be actually giving them the exact questions which in actual fact is a parrot fashion. So therefore you are not teaching; you are teaching their ability to reproduce the product that they were given. It does not necessarily address those higher order ones of analysis and synthesis that you were talking about before with physics and so forth. It is teaching to the concepts or the context that you might want to deal with on the test rather than giving the specific questions, which I think was mentioned by some other people before.

Ms Holmes: Yes. It is about teaching the skills that are required rather than the actual questions. I think that is what we are saying, isn't it?

Mr Antrobus: Yes.

CHAIR: One of the earlier witnesses, when we put to them if an exam paper could actually test analysis, synthesis and research skills, claimed that it could. Would you comment on that?

Mr Antrobus: To a limited extent because of the time constraints that might be put in with respect to that. For analysis you have got only a certain amount of time in which to deal with that, and you are actually addressing their knowledge, the skills that they have learnt as well as their ability to put that knowledge and skills in various contexts and provide a solution to a variety of situations. So therefore the time factor of being involved with those higher order issues may be diminished with respect to that.

Mr SYMES: Is there anything unique about maths, chemistry and physics that could make them more suited to external exams rather than, say, English or history?

Ms Holmes: I would like to answer that. They have a core set of skills. If you look at the good mathematics, most of it came from about 2,000 years ago and not long after, so yes.

Mr BENNETT: I asked a similar question to the panel before about teachers needing extra personal development time and extra resources to be able to cope with the perception of criteria based learning. Would you want to make a comment in that space as well please?

Ms Holmes: I would actually as well on that. As far as the professional development that has been offered by the Queensland Studies Authority in the last couple of years, my staff, if I ask them would they attend, usually say they would prefer not to; they would prefer to be in front of their classes because they find the professional development that is being provided really is not worthwhile. They say it costs me—as in my faculty—the money in TRS days and also the registration. So I do not think that that is the answer, no.

Mr Antrobus: If I may say something about professional development, in my experience professional development is a requirement for all teachers. It is something that we need to be. If we are going to teach students to learn, we need to be learners as well. Regardless of what we are doing, we need to learn and have good-quality professional development along the way. If a person believes that they are not going to get that, I would say that that is a concern. I do believe that I

have been to nearly every one of the professional developments that have been offered, particularly in my subject, and have offered those. The responses usually that we have been given have been in the affirmative as in positive. I cannot guarantee that for everybody, but if you are actively involved in those it is really quite a useful process. Being on a panel is one of the best things that teachers can deal with, because they actually learn to see and they see lots of others. There is only one year that I missed out on being on a panel because I was actually teaching in England at that stage, so it has been really a worthwhile thing. I have never doubted my usefulness in respect of that.

Mr BENNETT: Is there a theme with teaching in England?

Ms Holmes: It is certainly good to experience a different system to see what it is like operating under external examinations. To iterate what one of the physics men said before, you certainly do get a lot of time to concentrate on constructing good lessons as opposed to worrying about how you are going to assess.

Mr Antrobus: I do not know that I agree with that, because my experience was very negative.

Mr Watkins: I am doubtful that we can supply enough PD to teachers to really bring up their standard. In mathematics most of the teachers, I think, need at least two years full time at university to produce enough standard in mathematics so that they can call themselves mathematics teachers.

Mr Ryan: Can I just take up one of the points that Peter made. I think the best PD people can get is actually working on panels where they see work from other schools, but I have trouble getting people at my place to go to panel, to apply for panel. I have been hassling people for the last couple of years to join the maths A panel, but I cannot get them to go. Part of the reason is there is a fair bit of time involved in your own time, usually on weekends, going through the work from other schools and, secondly, it is fairly stressful when you have to make decisions on other schools' work. You have to say, yes, you agree with them, but if you disagree you have to be able to justify why you disagree. It is pretty stressful stuff. I have not been able to get anyone to go on the maths A panel, and I have got some crackerjack people. They are really good, but they do not want to put themselves through the stress.

Mr BENNETT: But, Mr Ryan, you do not have teachers in your school that want external examinations either.

Mr Ryan: No. All of my people have worked throughout the length and breadth of Queensland. It is a geography lesson if I tell you where they came from. I myself did external exams. I have been through that system. I have taught it. I would not like to go back to it. I think it is too constricting. I think the kids that are really going to get screwed under this system will be from west of the Great Divide—in a nutshell, that is it—because there is a pool of schools where they really have not got a lot of experienced teachers. I am pretty sure some of you represent electorates where that is the case. It's just a fact of life; I'm sorry.

Mr Watkins: Madam Chair, there are ways around that. The Northern Territory had that situation. We did not have a situation in the Northern Territory where teachers were made to go out bush. They were just given incentives to go bush. They were given sabbaticals if they went long enough out bush—a few years—to an isolated area and they got sabbaticals. You got more pay. That encouraged teachers to go to isolated areas. I do not think that the fact that we do not have sufficient experienced teachers west of the Great Divide is sufficient reason to say that those east of the Great Divide should also have to be in a situation where we have an invalid unreliable assessment system.

Mrs SCOTT: You can visit a university that does a lot of research and really high-end stuff, and a lot of that you then see commercialised and so on. When you look at Australia's place in the world, it is really clear that Australia's place is in research and being able to replace some of the manufacturing that we have now with really high-end stuff that we sell to the rest of the world. We are very, very innovative, so science is a really important area. Looking at the actual teaching and those who say they do not want all of the huge assessment required for the EEIs and so on, is it so that you are giving students the formulae, the basic knowledge of science, that they will need to actually go on and, I guess, become those people who we need up at the high end? Maybe the EEIs and those types of things are where you let the students really put those formulae and so on into practice and then, through your encouragement and so on, you see those who really have huge talent in that area progress through and learn how to become really great scientists, going on to university where they can really fly. I just want a bit of a feeling of what all of those roles in your teaching do with the students?

Mr Antrobus: I would like to respond to that. The issue about those extended, which give me great joy because the students actually enjoy the process of doing this research on themselves. Their involvement in it, in some cases, exceeds what I would say is reasonable as far as getting those high results. The thing about it is that a lot of those students who have done as well as they have at school come back and tell us the stories of what they are researching. I have had students who have worked over in Western Australia, in the government over there, designing three-dimensional traffic models and things like that, using their mathematics to deal with those. I have had students who have gone on to fly air craft with the Air Force. They come back and land on our field and tell the students about what is going on with them. They say the mathematics that they did, the physics that they did, all the bits and pieces that they did at their school meant something to their future careers. My daughter told me she was going off to Scotland. She is now in Scotland helping set up a project for the University of Edinburgh. She has only just finished recently her doctorate at the University of Queensland. There are many stories I can tell you. Almost every year there is someone who comes back and tells us a story about why they did something at school and how what they did at school has meant something to them. It is usually not about the tests; it is usually about the teaching and the assignments and the way in which it has been developed there. It is about how we provided a platform for them to go on to those future studies.

Mr Ryan: Can I take up from where Peter left off. I think one of the problems or the criticisms of the system is that kids who do maths B, maths C, physics and chem.—particularly those four—can get hammered with four what science calls EEs; we call them EMPS. They are different names, the same thing. Kids can get hammered with four of those around about the same time. As hard as we try to stagger those things in a school, sometimes it just does not happen. I think if we can restrict the length, because some of the kids will write 10,000 words if you give them a chance. But if there was a strict word limit, and it was reduced—I am saying 25 per cent, but I am not going to argue the toss, as long as it is not 50 per cent—then I think a lot of that criticism can be taken away and I think that the learning that the kids get through that is phenomenal. That is one of the criticisms I have against the external exams. When those kids then go to university, you will probably find they are doing those sorts of projects at uni. I have a daughter in third-year engineering. They do not do purely exams; they are doing this sort of stuff as well. If they do not do it at high school, where are they going to learn these skills?

Mr Watkins: There was one little thing that I meant to say in my original statement. I read every submission that people wrote. A lot of people commented about the use of technology in mathematics as being detrimental. I would like to say that, far from that, I think of the use of technology in mathematics, particularly graphic calculators, programs like Mathematica and even Excel, as being the saviour of mathematics.

Mr HOPPER: My question is to Steve, just on your comments before about teachers west of the range. I represent a fairly vast western electorate. What I have noticed in my career is that students who come from small schools where there might be 20 or 30 students get to high school and can end up dux or school captain. They are pretty smart kids. Could you elaborate on your statement about the quality of teachers in the west?

Mr Ryan: I did not mean the quality; I meant the experience. I think the problem will be that we have a pool of inexperienced people and if we go to an external exam system I think they will not have any mentors to help with the external exams.

CHAIR: I guess the other side of it then is with school based exams. Do they have the same experience for that?

Mr Ryan: To a certain extent they do because they have been brought up through that system. But it becomes a real issue if you are in a small school. You might be the only physics teacher for a couple of hundred kilometres or 100 kilometres. There might be only a couple of senior maths teachers. I was head of department at Mirani for many years. One of our guys got transferred to Glendon. He was the physics teacher, the chem. teacher, the IT—he was it at Glendon. Lucky this particular guy had a few years' experience with me at Mirani, but at Glendon he was it.

CHAIR: I think there are many more challenges that all of our regional teachers do have to face. I know it is something that we have discussed, certainly.

Mrs SCOTT: I was going to comment: shouldn't we be going to new technology and doing teleconferences and linking people up in networks so that they are actually speaking to each other and giving a lot of professional input?

Mr Ryan: This was 15, 16, 17—say, 20 years ago. We did not have those sorts of facilities around then.

Mrs SCOTT: I hope they would do it now.

CHAIR: I think that is a relevant point. Do we have any further questions from the committee? No. I think your responses have definitely assisted the committee, by the sound of it. I thank you all very much for your comments and also some new views that have been brought in during this last session. Thank you very much.

FRASER, Mr Anthony, teacher

MCKENZIE, Ms Alison, teacher

PINK, Mr Ian, teacher

SULLIVAN, Mr Paul, teacher

CHAIR: Good afternoon. I welcome Ms Alison McKenzie, Mr Anthony Fraser, Mr Paul Sullivan and Mr Ian Pink. Thank you so much for joining us this morning. Before we ask you questions, would you each like to make a three-minute opening statement?

Ms McKenzie: I am head of chemistry at a local independent college and a member of the chemistry discussions group, which is online and very active. I have been a panellist since the early moderation days, volunteered for the trial pilot for chemistry, the extended trial pilot of the chemistry syllabus and implemented the current syllabus at my present place of employment.

Out of the three main areas of focus, the ability of assessment processes to support valid and reliable judgements of student outcomes is of greatest concern. My concerns are threefold. Firstly, I question the consistency statewide of assessment organisation work programs and I question the consistency in standards of expectations for assignments across the state. Secondly, the longer an assignment task runs I question the integrity or the utility of that task and the originality of authorship for that EEI and/or ERT. Thirdly, there has been general disappointment existing with current textbooks to address sample KCU, IP and EC style questions reflective of the syllabus' intentions in Queensland. For the first concern, I suggest that panel membership and the code of practice need to be more stringently organised. For the second concern, in order to reinvigorate assignment topics, a major rewrite of the work programs is ultimately unavoidable, which then has to go through a re-approval process. This is both time consuming and laborious, and to what end is achieved only to repeat same, same. The third concern requires a team of dedicated teachers to produce a variety of original sample questions for publication.

I am here out of curiosity to see if change is possible as I advocate change to the current assessment system. I am here to be part of the solution to the stress that science minded students endure if, in choosing say two senior sciences, they produce four EEIs and four ERTs, plus other assignments for the usual six timetable subjects over the two years of senior study. I am here to find a reasonable response to the assessment dilemma of criteria based assessment versus marks based assessment.

The EEI teaches students the scientific method from first principles, but does each science subject have to do a major research task? Instead, could the fourth term of year 11 be given over to a rich task where students may choose a topic that has aspects of, say, both chemistry and physics or chemistry and biology in it? This would reflect the current trend of research teams in universities around the world. Further, the class time available would be double as both chemistry and, say, physics lessons would be given over to this one task. The respective subject teachers would supervise as per their normal timetable. Marking and grading—that is a whole other story line.

The drafting of work is important for the feedback provided. This suits meeting certain criteria. However, whenever high-stakes testing is involved, marks are employed. The OP calculations come down to a number of 1 to 20 plus. The SAs awarded by schools is a number between 200 and 400. The R7 is a numerical rank from VLA 1 to VHA 10. So ultimately the A to E grading system of the chemistry course is converted to numbers. So why not use numbers?

In conclusion, what I do like about the current Queensland system is the opportunity of the individual teacher to direct, create and write a chemistry course for their students. But my experience of the current syllabus is that there is great variation and expectations across the region and that it is difficult to keep reinventing assignments to meet syllabus requirements and maintain the integrity of the assessment piece. Thank you for listening.

CHAIR: Thank you, Mr Fraser?

Mr Fraser: I am a head of science at a college at Burpengary. We are a relatively new college. We had our first year 12s last year and our second year 12s this year, obviously. I have taught chemistry but I am more of a biology teacher. But I have written the program for physics and chemistry and biology. I have some really, really good teachers teaching with me. Because a couple of them are new to the field, they are quite excited by the whole prospect. They feel that they are not being hampered by having to teach content after content as in a big test, but they are quite excited by the prospect of EEIs and ERTs where we can challenge the students and students have

the freedom to be able to work within a topic that they feel comfortable with. I want to provide an example. We had a year 12 student who was researching rotational motion. We took the students to Dreamworld and she wrote an exceptional piece because of her interest in it and the freedom that she had to work that way.

I like the syllabus. I think there are issues in terms of panel training and in terms of the ability to monitor student work, but I feel that overall it provides us with flexibility and the freedom to really push students and to help to direct them in their further careers. Thank you.

CHAIR: Thank you, Mr Fraser. Mr Sullivan?

Mr Sullivan: I have been a district panel chair, a state panel member and I am the head of science at the moment. I would like to look firstly at the question of the science syllabi—how they were written, what they were written for. The syllabus themselves have been written to provide a framework from which the schools could then design a course of study that is suitable for high school students. I think we need to keep that in mind. The syllabi have not been written as a pre-entry to university. We need to consider the vast number of students who would take physics, chemistry and biology, maths and not go on to university to use those skills at a university level. If we considered that to be our criteria, then every student in the school perhaps across the state, since they all do English, should all be going into the arts faculties at universities rather than science.

However, their syllabi identify a set of key concepts and ideas that must be developed through that schoolwork program. The syllabus then provides sufficient flexibility to enable schools to develop the concepts and ideas within context that match the schools' and the students' backgrounds. The students' understanding of the concepts and ideas rather than the context is what is assessed and that then provides a measure of comparability across the state, because it is the concepts and key ideas that are comparable in all of the work that is assessed.

There are three commonly used assessment types: the supervised assessment or written task in biology, extended experimental investigations and extended response tasks. The first two of these are mandated in chemistry and physics. So when previous people have said about 25 per cent, it would be my understanding that, with four pieces of assessment, one an EEI, that would be 25 per cent across the assessment package. In biology, it is a little different, where the EEIs and the ERTs are mandated as well, which means that in an assessment package 50 per cent of the assessment would be from non-supervised assessment.

However, of those different types of assessment tasks, it appears that EEI seems to be one of the most contentious—the negative comment being made about the complexity of the task, the time required to complete the task and the length of the task. However, it is my opinion that most of the concerns are basically of the schools' making. EEIs do not need to be extraordinarily involved or demanding tasks. Some of the work that was produced in conjunction with Education Queensland, QSA and the STAQ when the biology syllabus was released had simple formats for EEIs. They were basically simple experiments and there were statements in there that said, 'If a student took an experiment from a prac manual, performed it, organised it themselves, wrote it up, gathered their results, wrote up their report, they would be operating at a C standard'—not a demanding task—and it might take them all of about two weeks to do. As well as that, all that is required in the EEI task is that the task provide students with the opportunity to plan, choose equipment, choose their resources, perform the investigation, collect and present their data, analyse it and draw conclusions. Having done that, then the requirements of an EEI have been fulfilled.

The syllabus requires teachers to allow some class time to provide supervision at times for students to enable the effective undertaking of these sorts of tasks. An EEI may assess an entire unit's work, but the task itself does not need to occupy every teaching moment of that unit. I would assume that most teachers would still teach the key concepts and key ideas that they have identified and associate with that task so that the students are able to use some of their learning to make valid assessment of the data that they have collected from their EEI. I am a biology teacher and typically in my classes for an EEI I would assign to a student two lessons to do their planning—that would be their research planning—two lessons to plan their experiment, three lessons to do it and perhaps three lessons of class time to write it up. That becomes three and a bit weeks out of a 10-week unit. It is nowhere near 50 per cent. Students would then finish up the writing of the report in their own time. Given the consideration that this is a major piece of assessment, that would fall in lieu of students having to do other sorts of homework and assessment work that I would expect them to do in their own time.

When it comes to the word length, when these syllabi were developed initially there were no word lengths for any of them. It was assumed—perhaps falsely—that teachers would manage the tasks through their supervision of the students. However, that clearly did not happen and there was quite a meeting of interested parties to look at that question within a few years of those syllabi being put into implementation. At that point, word limits were put on the science syllabi and they were realistic word limits. However, it is pretty apparent when you look at the work that comes through from the schools, both as a district panel chair and a state panel member, that those word limits that are there—a maximum of about 2,000, 2,500 words per assignment—are not being adhered to. So I see it as a school problem, not the syllabus problem and not a QSA problem. Teachers should be supervising their students, saying that the work that they are to do is suitable for school standard and not suitable for something other.

With the use of written standards, however, if we look at the assessment type of thing or standard descriptors, it is not new to science. Personally, I have been using written standards for the past 15 years and my strong support for those standards stems from the observations as a district panel chair in trying to compare work which consisted of numerous recall multiple choice questions with work that required students to explain and synthesise ideas. All too often, because of the marks allocated to them, the students were getting high grades on these simple recall facts whereas students who had made endeavours with the synthesis and explanation-type questions and not getting them 100 per cent correct, even though their level of thinking was far higher, were being downgraded because of that.

CHAIR: I must remind you of time.

Mr Sullivan: Over the years the QSA has commended and pushed the use of written standards and these disparities in supervised assessments and written tasks has significantly diminished and the quality of tasks has improved and so has the state-wide comparability of tasks. However, if assessment is to be fair, students must be made aware of the standard descriptors and be shown what is required by them to meet the demands of the standards.

For many teachers, this required a change in pedagogy, which required significant professional development. In this area, the QSA provided some limited PD with the rollout of the due syllabi but the focus has always been on panel training of members in gauging the quality of student work and then hoping that that information filtered back to the majority of teachers by some sort of professional conversations at the school level. Certainly, in my experience that rarely happens and, when it does happen, the information that filters back is certainly tailored to the understanding of the panellist. It is my opinion that most of the negativity regarding the science syllabi could have been avoided by the QSA being proactive in providing the PD necessary to support the changes in teaching practice that are required for the implementation of those syllabi. Thank you.

CHAIR: Thank you.

Mr Pink: I have taught in Queensland State High Schools for 25 years and you may notice a grey hair or two. I ask that leave be granted to submit documents supporting my submission today.

CHAIR: Is leave granted? Could we perhaps see the documents first before we grant leave if that is acceptable?

Mr Pink: Sure. It is a copy of what I will be saying.

CHAIR: Thank you. Is the committee in agreement that we table the documents? Yes, thank you, Mr Pink.

Mr Pink: I would like to thank parliament for asking for the views of classroom teachers. It is not often we are given that privilege. This education debate has developed into two opposing sides. Both sides claim to know what is best for educating and assessing children. Both are correct and both are wrong. If anyone has missed the fact that the inquiry is about maths and science teaching only, now you are warned. The people involved in these subjects have by and large been trained in these areas and have a good understanding of data. If scientist A is presented with data from 20 other scientists that definitely proves without doubt that matter is made up of atoms and not green leprechauns, then scientist A must change their mind and accept the atomic theory.

Point 1: to the QSA and the supporters of the current system, the data you have been presented with shows that a majority of submissions from teachers, parents and university staff say that your system is causing problems. Accept this fact. It is real data. So what is the simplest change? The simplest change is to return to marks and percentages for assessment. Why? They are easily understood by everybody. University submissions have shown how to use marks and percentages with criteria.

Point 2: to those opposing the current system, the data shows that a substantial minority agree with the current system and that cannot be discounted. Accept this fact. This is real data. So what is the simplest change? The simplest change is no change. Keep the current system of school based externally moderated assessment.

Point 3: there should be a return to direct explicit teaching of very, very specific learning objectives, also a change to how and when EEs and ERTs are implemented.

Point 4: what support is there for points 1, 2, and 3? For me, it was from reading some books by Daniel T Willingham, a Professor of Cognitive Science from the University of Virginia. When I read his two books I finally understood the big picture and I finally constructed in my mind after five years of research on this educational theory as to why the situation had developed that we are currently in and where we could go. Reading his two books were career changing for me. The books are *Why students don't like school* and *When can you trust the experts?* and also reading his blog and watching his YouTube videos.

His research shows and proves why the spiralling curriculum is wrong for most students, why learning science is so damned difficult for most students, why to teach students like they are mini-me scientists and mini-me mathematicians won't work for most students and why educational theory doesn't work when implemented into the real world of schools. Another researcher, Stanley Pogrow, also proves the point.

Reading Willingham's books then led me to go back to reading direct instruction work from Siegfried Engelmann and Douglas Carnine. My friendly and supremely professional school librarian—and please keep the funding for these—found an updated and extremely extensively trialled version of direct instruction. Direct instruction is shown by Hattie to have a very positive influence on student outcomes. Project follow-through also supports the efficacy of direct instruction methods. That led me to a book by John Hollingsworth and Sylvia Ybarra from the USA on explicit direct instruction. From this book the final piece of the puzzle was in place. Using a very simple example they very clearly show the underlying problem with state-wide external exams and at the same time show why you must have very, very explicit learning objectives and, if you excuse me, not the weasel word objectives that we have now based on Bloom's taxonomy.

Also support for my belief that state-wide external exams are not effective in assessing students came from reading the assessor reports that go with the VCE, the Victorian assessment, physics papers. Also, do universities have state-wide exams? Also supporting my belief that very, very specific learning objectives must be given in the syllabus comes from reading the QSA state panel reports for physics and also the submissions to this inquiry. The learning objectives must be so specific that there is no room to question their meaning or intent. Finally, reading two papers by Professor Wu, a professor of mathematics from the University of California. These two papers brought home very vividly how a so-called good idea from psychobabble research gets implemented into schools without any real thought or care. It gets implemented due to vanity: 'Wow, look what my school is doing now', or 'Wow, look what I'm doing in my class. It's from the latest research.' It doesn't work.

In conclusion, irrespective of our beliefs and the system we are given to teach, any person who gets up day after day and faces class after class of teenagers and tries to teach them any subject deserves respect. Thank you again to parliament for the opportunity for classroom teachers, parents, students and other interested parties to have their say.

CHAIR: Thank you, Mr Pink, and all of you who have given this great information. Mr Pink, I would just query one comment you made there. You said, 'To those opposing the current system, the data shows that a substantial minority agree with the current system and this cannot be discounted.' Would you like to enlarge on your data?

Mr Pink: From the submissions that have been presented to the inquiry and from general conversations amongst colleagues.

CHAIR: Thank you. Questions from the committee?

Mr BENNETT: An open question similar to what I have been asking the other representatives here this morning—school teachers of course—about personal development and future training, about making reception of this current syllabus successful and how we achieve world's best practice for our students.

Mr Sullivan: I would like to respond. The syllabus that we have, because it is a QSA document, I think they should be responsible basically for the thrust of the PD. Initially when they rolled it out it wasn't part of their brief, I believe, to be involved in PD and that changed some time

later on. So the syllabi was introduced without much PD by the QSA who knew what was expected, what was wanted. The PD that came in after that was provided by second-hand providers who didn't have the background of where these syllabi came from and what their intent was.

As far as PD goes, I agree with previous speakers: I don't think there can be too little of it and I think the more that teachers get that is specifically targeted to some of the issues that surround the syllabi then that can only go to improve the standards of teaching and also improve student outcomes.

CHAIR: Would it be an improvement from your perspective if, rather than you and/or your school developing your own assessment task for students, that you had a set task from a bank of externally developed assessment tasks that were explicitly linked to the criteria and standards for maths, chemistry and physics?

Mr Fraser: I would like to respond to that. There are examples on the QSA website of different tasks and I have used the different tasks. The problem we have got is that you write them into your program, whether it be a writing tasks or whether it be an EEI or an ERT and it depends on the panellist whether it is suitable or not because certain panellists have different ideas, and this comes back to the PD. At certain times you'll be on different pages when we should all be on the same page. It is between panellists and panels and that is I think the big issue. The external thing is good. The other problem is that it may not work in every district. We have got the freedom now to design our tasks. We should be talking to other panel chairs. I recently had a meeting with the QSA officer which was invaluable, it was brilliant. For other people, if they don't take that opportunity it makes it difficult to know where they are going if they are not looking at the feedback from the panels themselves. Panel training is the key here. We have got to get that right. Schools have to be open to that, to be able to work with the QSA and the panellists.

Mr Pink: Unless there is a set of very, very specific objectives that somebody from Cooktown to somebody in Coolangatta can read and not come up with three or four different interpretations these problems will continue.

Mr Sullivan: I think once schools start to design their own units of work then it is important that they design assessment themselves that matches that task rather than trying to come away with a piece of assessment that someone else has produced, to try to squeeze it and shape it to make it fit the learning program that they have given the student. I do not see any benefit at all to be achieved from having a bank of set questions that might fit or may not fit. I think you design the assessment task to suit the teaching that you have given the student. In that way I guess, in response to what people said about teaching to the test, you have already done that. You have taught the work, you have designed the assessment task that matches the work you taught so students have a very good chance of meeting the expectations of the task.

Ms McKenzie: Could I respond also? I am just thinking about that bank of questions. I think the problem at the minute in Queensland is that we did go away and we did write all our own units and we did write our own assessments and whatever, and the reality is the door was opened or the gate was opened and then you sit in this room on one day, that is monitoring day or verification day, and you are sitting and looking at this work and saying, 'Well, geez, is that representative of what that school intended' in less than 20 to 30 minutes because you have few panel members on your team and you have got to get through so many things of work. The problem is that we do not have that understanding of what the school really intended. I think that is where we are getting the problem. There was huge variation in what was written and then what is presented on the day you cannot analyse quickly, do you know what I mean, and make a valid statement about, yes, that's good or that's not.

CHAIR: I appreciate that the school sets certain criteria, but students do have a certain amount of leeway in choosing their own direction in how they use that criteria or that particular subject, don't they? I spent some time on Google the other day asking about EEIs and ERTs and I came into all these websites, how deadly ERTs and EEIs are and there were dozens and dozens of these wonderful projects presented and then there are also other areas where you could get training and here is a tutor to help you write it et cetera, et cetera, et cetera. Now, as teachers how do you handle that? How are you sure that maybe students have not picked up and copied some of those and put it into their own work et cetera, et cetera?

Ms McKenzie: With the authentication of the EEI, schools will probably have a system where students can submit their work and it is crosschecked against previous years. They look for matches of common wording in the paragraphs. So we have that way of checking. I guess students have their own logbooks. But the reality is the internet being what it is can we be sure that they

haven't lifted something from South Africa or South America? How am I going to know? How can we know all that is out there? I think part of the problem with the assignments is how do you determine that originality of work. Sometimes students are fool enough to actually submit their tutor's notes in with their drafts so there is a dead giveaway. The authentication is problematic.

Mr Sullivan: I would agree with Alison. I think she was meaning the ERTs and I think they are probably the one task that has more issues than an EEI because when it comes to determining the validity of the EEI the student has done the experiment, the student has a unique set of data and when they analyse that data they cannot pick it up from somewhere else. If they have got their data in front of them, the analysis of that data will be unique as well. You can find out fairly easily whether students have just lifted something. It won't match their data. They might find some trends and generalisations from somewhere else, but science is about that: finding out what the trends and generalisations are from somewhere else and seeing if your data matches that. I find an EEI very easy to validate, but the ERT is somewhat more difficult and I suspect that is why it has been no longer made a mandatory task in physics and chemistry.

Mr Fraser: I agree. With the physics EEIs and ERTs for year 12 we go through and check them. I have got the physics teacher checking them and because I am head of the department I check them as well. We read them and we can track where the student is going with it. We understand what they have done, we understand their process. With an EEI we have got the logbook, we have got drafts. We can see that all the way through. So as Paul said, it is difficult for students to get these things by because we are seeing the process. With an ERT it is a bit more difficult but you also have the opportunity to observe drafts. Even in year 12 you will have a look, you will read through it and give some verbal feedback. We can even put things through a plagiarism detector and I have done that a few times to check and we have gone back to the student and said, 'Hey, you've got too much in here. It's not the final piece. You need to fix this up. You can't submit this.' We look at it in terms of what the school is doing, where we are at school, but we also look further on at university or when they are out in the workforce. You cannot cheat. We have got to teach them those sorts of skills of not relying on those sorts of processes.

CHAIR: It must add a lot to the work.

Ms McKenzie: Can I make a comment about the EEI? There are two things that concern me. The first thing would be while you have got that data and whatever and you think you have got that original report, the reality is that a lot of time is spent doing that so our kids get good at doing a very narrow range of scientific analysis or scientific experimentation at the expense of other experiments that could have been carried out in that same time. The other thing that bothers me about the EEI is for the time that is spent on it is the educational outcome for the student valid? An A-student will always get the best educational outcome because they understand everything that is going on but the C-student just plods on and what do they really know anyway. For the amount of time that is spent and what you get out of it, I think, in terms of the student's learning.

Mr Sullivan: I will respond to that, Alison. I think most students really enjoy doing their EEIs, from the weakest students through to the strongest students, because it gives them the opportunity to develop their science to a level at which they can work at. A-students are the ones you do have to pull back and say, 'Look, you're going way beyond what is required for high school level. You need to finish that there and draw your conclusions and write up', but for the weaker kids it is more often, particularly the LA students, an opportunity for them to get success. They have gone with an experiment that may be very, very simple, they do it and they see a result that is a positive result in their experiment. Their report, what they write up on it, is a D standard, it is not world breaking, but they have achieved some success and they see some value in science in doing it. I think as a science educator that is what I see as being important—students still actively engaged in science rather than just trying to achieve a good result in an exam.

Ms McKenzie: I think that is why I am sort of now leaning towards a rich task or an immersion where they go and you let them run free and investigate, because all students do science because they have an innate curiosity about the world in which they live. But then do I need to make it worth an assessment contributing to their final score?

Mr Sullivan: I am not sure about what is in the physics and chemistry syllabi, but I know that in the biology one there is an additional category of assessment which is called 'Other' and into that teachers can put other tasks that they might deem as being worthy. So a rich task could easily fit in there.

Mr Fraser: In terms of the rich tasks, when I set a task, say, a biology task, I am expecting to see students use their other subjects—the knowledge or the skills they have used in their other subjects—and bring that into an understanding. When I see the data, I say, 'What does this mean in terms of the earth science or what does this mean in terms of flight and things like that?' I am

expecting to see those things in there, and we push our students to look for those connections. We cannot just go, 'It's just physics, so you just talk about that.' No, there other connections going on and where do they come from? So they have that freedom to do that, and they should be allowed that freedom to do that. So it is a rich task in itself.

Mr Pink: We tried rich tasks; they do not work. Many years ago the Queensland system was trying to move entirely towards rich tasks and basically teachers gave up on it. The way for students to transfer knowledge from one subject to another requires them to be explicitly taught in particular skills, procedural skills or declarative knowledge—however you like to put it—and it is a really difficult thing for students to walk out of maths and use their maths in physics because it is in a different context and it is a difficult task for them to do that. At my school they have to walk down 12 steps from maths to science. We go back at lunchtime and say, 'But they learnt that in maths. Why can't they walk down the 12 steps into physics and use the same maths again?' It is a difficult task, and to give students freedom and let them go is a dangerous way of going about it. They will go off in any other particular area than what you perhaps would like them to do. It has to be very explicit and very directed and then—and then maybe—they would start to get it. EEs have numerous possibilities for students to go off in all sorts of different directions and what we expect them to get from it is probably not happening.

Mr Fraser: Can I just make one comment. I have some year 11 physics students at the moment and luckily our physics teacher is a maths teacher and she brings the maths in. So when they submitted their last EEI it was really, really good because the analysis of the physics concepts was done using the maths, and that really became quite special to see. It was excellent. She was teaching that in maths at the same time, so it worked quite well. I have done it myself with biology and physics and used those sorts of concepts through. Yes, you do need to explicitly teach things, but you also need to allow the connections that they can see between subjects to come forward.

Mrs SCOTT: In terms of the submissions and a lot of the people who have come to forums such as this, we have probably seen many more males than females, and I noted that Mr Pink actually introduced the subject of gender imbalance within the teaching profession. I know from my point of view I applaud when I go to a primary school in particular and there are men, and sometimes occasionally there will be one in the prep and so on and I think how wonderful that is. But why are we not attracting more males into teaching? Do males actually teach in a different way to female teachers and so on? It is just something that you mentioned at the end of your submission.

Mr Pink: Yes.

Mrs SCOTT: Yes? Do you want to elaborate on that, or no?

Mr Pink: Giving a simple analogy, my wife and I have two boys. They can be rambunctious at times and both of us see them do something and the way we interpret what they are doing is different. It is that simple. My oldest boy had a male prep grade 1 teacher who loved pig hunting, drove a four-wheel drive and had guns. He experienced that sort of teacher, but he was really great with the kids—fabulous teacher, excellent. He instilled discipline and fairness and all of that. It was really good for him to experience. So, yes, there are different ways of approaching it. I hate to say it, but I think it is just common sense that men and women do approach teaching or any job in a different way.

Mrs SCOTT: Are males choosing to go off into other professions these days that have maybe bigger dollars attached to them and so on and not really grasping the importance of moulding a life and inspiring a young person to go on and become a great scientist or engineer or whatever?

Mr Pink: I think we have to be very careful in the primary schools. As you say, it is difficult to get a male to go into primary school teaching now. I think others could provide research as to why that is happening; I can only provide some anecdotal evidence. Just as a personal opinion, I think it does have an effect. At one school in Central Queensland where I was teaching, the primary feeder school was an all-female school. There were seven or eight teachers, including the principal. Comments were made.

Mr Sullivan: If I could just comment about that as well. I think we would find that teaching in itself is a fairly individual sort of profession. There are some basic constructs to the teaching that we do which would be common through the performance of most good teachers, but everyone will have their own individual slant to it and how they go about teaching it. Just as all male teachers will probably be different, so will all female teachers be different and so will all male and female teachers be different. As to why males may not be choosing to go into teaching careers these days, I think that is a question for our sociologists to look at and compare it. We could apply that sort of question to any sort of career.

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CHAIR: I think we have opened up quite an area of discussion there, actually. With respect, it is something that has come up quite a bit in submissions to do with the type of assessment. You have read the submissions and the male/female situation has come up in them. I want to thank all of you very much—Ms McKenzie, Mr Fraser, Mr Sullivan and Mr Pink—and all of our other witnesses this morning. We really do appreciate the information that you have given to us this morning and also appreciate the time that I know you have had to give up from your very busy schedules. On behalf of the committee, I want to thank all of the witnesses who have informed us today and those who have attended to observe the proceedings. I urge those of you with an interest in the work of this committee to subscribe to our email subscription list via the Queensland parliament's website. I now declare this hearing closed.

Committee adjourned at 1.00 pm