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To: The Education and Innovation Committee, Queensland Parliament

Submission: Assessment Methods for Senior Maths, Chemistry and Physics

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About the author:

I have over 42 years experience teaching high school Mathematics in New York City, Boston, Melbourne, throughout Tasmania, in Perth and in rural Western Australia and most recently in Brisbane. I hold a Masters Degree in Educational Studies and have served three times as Head of Department in both Government and Catholic schools. I have been awarded "Excellence in Education" medallion from Catholic Education in Perth and have successfully attained Advanced Skills Teacher status in the Government system. I was selected by my peers to serve on the Syllabus Development Committee of The Schools Board of Tasmania.

My submission:

Only having taught in Queensland for two terms (Term 3, 2011 and Term 2, 2012) I do not feel experienced enough to submit on the first two issues, "Ensuring assessment processes are supported by teachers" and "Student participation levels". However I feel more than qualified to address the third issue, "The ability of assessment processes to support valid and reliable judgements of student outcomes". However in my brief Queensland experience I have found that our assessment stands alone as an extremely questionable practice. More importantly, published research also questions the validity and reliability of our assessment.

In their submission to this committee (7/3/13) the CEO of the Queensland Studies Authority makes two claims I would like to address.

First: "The assessment system we have in place in Queensland today has evolved over 40 years. It is new and bears no relationship to the system of outcomes based education (OBE) recently discarded in Western Australia." (*The underlining is mine.*)

The QSA is employing a trick of semantics to distance its system from the hated OBE system. One only has to look at the assessment matrix to realise it is very much influenced by outcomes based education. Both systems synthetically divide Mathematics into different components of learning. The QSA has three "criteria" (the word "outcome" can be used with the same meaning) which are assessed separately. They are "Knowledge and procedures", "Modelling and problem solving", and "Communication and justification". OBE also divides assessment into the "outcomes" (or "criteria") such as "Clarifying, choosing, using, checking and interpreting, and communicating". Each is assessed separately, without numerical marks as is done in Queensland. Needless to say, both outcomes based education and Queensland's assessments are the products of sociologists and psychologists, not mathematicians or empirical scientists. To divide human reasoning and assess components separately does not make sense. It goes against the epistemology of human thought processes. Think of the possible implications in engineering, "Sorry the bridge fell down killing those

people. But it was only the knowledge and procedures that were faulty, the modelling and communication were of a high standard!"

Second: To quote the QSA in their briefing: "Queensland syllabuses are not based on the latest fads in education.... Does the QSA consider that the concept of inquiry is appropriate for assessing students? Clearly we do....Leading academics support the concept of inquiry. I will not detail the research evidence here..."

"Inquiry based learning" is part of the "Constructivist" paradigm. The QSA would have you believe that it is universally accepted and applauded around the world. It is not. Although the inquiry method has some applications and can be useful in many areas, as a principal model of teaching and particularly for assessing it is not at all suited to mathematics or the empirical sciences. Allow me to quote E.D. Hirsch Jr.'s definition of constructivism.

> *Constructivism is a psychological term used by educational specialists to sanction the practice of 'self-paced learning' and 'discovery learning.' The term implies that only constructed knowledge—knowledge which one finds out for one's elf—is truly integrated and understood....This incorrect claim plays on an ambiguity between technical and nontechnical use of the term 'construct' in psychological literature. "* (E.D. Hirsch Jr., *The Schools We Need: Why We Don't Have Them,* Anchor Books, 1996)

The QSA celebrates its constructivist use of inquiry based assessment in the lengthy assignments it requires. While inquiry can be a valuable tool in learning, if not used in isolation, its application for assessment is suspect. I am sure that one of the "leading academics" that the QSA made reference to is not Paul Kirschner of the research Centre Learning in Interaction, Utrecht University, The Netherlands. With John Sweller of the University of New South Wales and Richard E. Clark of the University of Southern California they published an article in Educational Psychologist (vol 4, #2, 2006) entitled, "Why minimal Guidance During instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experimental, and Inquiry-Based Teaching". I would encourage anyone who wonders about the QSA's model to read this article. Here is a significant statement which belies the QSA'a claim that their inquiry method is supported by leading academics

After a half century of advocacy associated with instruction using minimal guidance, there appears no body of research supporting the technique. In so far as there is any evidence from controlled studies, it almost uniformly supports direct, strong instructional guidance rather than constructivist-based minimal guidance during the instruction of novice to intermediate learners. Even for students with considerable prior knowledge, strong guidance while learning is most often found to be equally effective as unguided approaches. Not only is unguided instruction normally less effective; there is also evidence that it may have negative results when student acquire misconceptions or incomplete or disorganized knowledge

— Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of

Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching by Kirschner, Sweller, Clark

We do not have to look towards overseas "leading academics" for evidence of the failure of inquiry based learning and assessing. In Saturday's Courier Mail newspaper Tanya Chilcott wrote an article entitled, "Teaching plan earns top marks". In my mind it clearly demonstrates why Queensland must divorce itself from the QSA's inquiry method.

> *Northern Peninsula Area State College on the tip of Cape York is pioneering teaching practices that have led to some of the state's most improved student NAPLAN performances.... The John Fleming Explicit Instruction model uses an "I do, we do, you do" revision approach in which teachers show students how to do something, the class then tries it together, before students do it independently. ... College principal Ken Maclean said he had witnessed "massive" improvements since the framework and Fleming model were introduced. (Courier Mail, 7/4/13)*

John Fleming is the principal of Haileybury College, Berwick campus, Victoria. Of his Explicit Instruction method ACER's research director, Professor Steve Dinham writes, "The evidence is overwhelming. Direct Instruction and explicit teaching is two to three times more effective than inquiry-based or problem based learning."

I have to ask, how the QSA can claim their assessment is not based on a fad. They continually make statements about their assessment being valid, reliable and successful. Yet they offer no evidence of to substantiate this. The evidence, on the other hand, shows quite the opposite. Even, as mentioned above, in a Queensland school.

In conclusion I would like to point out one of the claims that the QSA makes about their assessment is that they are emphasising the higher order thinking skills, at the expense of rote learning and routine procedures. The QSA model is based the writings of Robert Carkhuff of the U.S. State of Washington. Carkhuff emphasised higher order thinking at the expense of those that he thought were not as important, rote learning and fundamental algorithms. In 2004 Carkhuff was paid one million dollars by the State of Washington to establish his "higher order thinking" system in the state. A similar system celebrated by the QSA here. Two years later Washington declared the system a failure and returned to former educational paradigms. (See Snohmish County Tribune, 13 Sept 2006). Queensland, however, persists in following the "higher order" model.

Although I was not going to make a comment on the first two dot points of this inquiry I would like to state that during the two months I served as a tutor in the Kip McGrath network this year, 80% of

my time was taken up with helping senior school students on their maths assignments. I feel sorry for the parents who cannot afford tutoring.

So in answer to the third dot point, I **do not** believe that our assessment processes support valid and reliable judgements in student outcomes in Mathematics.

Maybe someday, someone on a Parliamentary committee will investigate why we get so many of our educational innovations from the United States when we are ranked 17 places above them on the OECD Program for International Student Assessment in Mathematics. We already copied their failed OBE system which we had to throw out because, as the Senate Inquiry had shown, it had "dumbed down" education. Why should we copy their "higher order thinking" system after they discarded it?

Perhaps in the light of the corporate trend for outsourcing, maybe Queensland would be best served by dissolving the QSA and outsourcing our senior school assessment to New South Wales. They can't come close to us in State of Origin, but are way ahead in education.

Thank you for your attention.

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