Please withhold my name from the public.

To whom it may concern,

I was a school captain and I graduated in 2009 with an OP 1, and I am now studying engineering at the University of Queensland. At school, I studied Physics and Chemistry under the previous system (where assessment was based on marks, and before the introduction of EEIs). Maths B and C were still on the previous system also, however letter-based grading had been introduced into MPS question. The cohort below me had completely shifted to the new system in all four of the above subjects. At the time, I discussed the changes at some length with both students and teachers, and finally I worked with my younger brother as he moved through his senior years (2011 and 2012) under the current methods, including E.E.I.'s. Through the above, I've experienced and observed both earlier marks-based systems and the current grade-based, assignment-heavier system, and would like to share my thoughts on the two.

Allow me to be frank: it is my personal opinion that the current approach to assessing senior students in mathematics and the sciences in Queensland schools is an embarrassment. We have ourselves a system that has introduced unnecessary subjectivity, complexity and confusion in an attempt to fix systems in which these did were not problems. I intend here to cover three areas: some flaws of the current system from a student's perspective, the effect it has had on students, and the effect it has had on teachers. Again, my perspective is one of a student who has experience with both systems, and who is currently studying engineering at the tertiary level (a natural progression from secondary Physics, Chemistry, Maths B and Maths C).

FLAWS IN THE CURRENT SYSTEM

In the following I will refer to assessment by a numerical based method as '**marking**' (using marks like 17/20 and/or percentages) and by assigning letter-based grades (A to E) in accordance with a criteria sheet as '**grading'**. Here are four key areas in which I believe the current system fails.

1. **Transparency**

Transparency in grades is extremely important. An effective system of assessment should aid teachers in defending their decisions to students, parents, panel or any other source of inquiry. Marking a question against a set **marking** scheme is very defensible; **grading** a question with the currently encouraged liberal use of a teacher's "professional judgement", not so much. This is not to suggest a teacher's judgement is invalid or even likely to be wrong; however, *a student or parent is far more likely to accept and understand a demonstrated position reflecting a clear mark scheme than when the teacher says "I just 'felt' you were a C, not a B" based on a vague and interpretive criteria matrix – and, honestly, why should they accept the latter?*

2. **Objectivity**

I believe everyone will agree that subjectivity is to be avoided in assessing student's work wherever possible. By shifting from rigid **marking** schemes, the current system of **grading** mathematics questions according to a vague criteria matrix has introduced a level of unnecessary subjectivity that did not exist in previous systems. On any given student assessment piece, it is very possible for two teachers to disagree on which criteria descriptions have been met. Maths and science are fortunate enough to have a definite correct answer for almost all imaginable questions. In the humanities, subjectivity in grading is somewhat inherent, and great efforts are taken to ensure its effect is limited. *Why unnecessarily introduce this subjectivity into maths and science where it wasn't as significant an issue?*

3. **Accountability**

In a competitive tertiary entrance system such as the Overall Position, students are judged relative to other students. It is therefore critically important that a student's results be an accurate and accountable judgement of their abilities. There can be no argument that unsupervised assessment such as take-home assignments has a far greater potential for abuse than supervised assessment such as exams.

When an assignment is submitted, it is rare that it will be 100% the student's own work. More likely, it will be an amalgamation of the student's ideas and those of their teachers, friends, tutors and parents, in varying amounts. It is for this reason the exposition-friendly humanities still include supervised assessment such as in-class essays as a large part of their assessment regime, and it is for this reason that the progressive shift towards heavily weighted unsupervised pieces in maths and the sciences in very concerning. *Take-home assignments hold undeniable value to the learning process; however, to make their value equivalent or greater than that of examination (as is currently happening with the introduction of E.E.I.'s as a significant portion of science assessment) is damaging to the integrity of that process.*

4. **Simplicity**

I believe this is a case in which Occam's razor is extremely accurate, in that the best system of effective assessment is the simplest system that achieves the goal. In moving from marks to letter grades, the current system has added a layer of abstraction and obfuscation to assessment and results that doesn't need to be there. *This increased complexity has lead to the amusing situation where grading (or in the student case, deciphering the grades of) a paper can be more difficult than sitting it!*

THE EFFECT ON STUDENTS

The most notable effect I've witnessed of the current method on students is an increased sense of apathy towards their own results. In my experience, when exams (with marks) were first returned to students, this scenario always played out exactly: a brief period of intense review, followed by an all-out assault on the poor teacher over every missed mark the students disagreed with. If someone got a score of 9/10 for a question, you can be sure that they wanted to know why the last mark was docked.

In the present system, a question that once received 9/10 now receives an 'A', and the student will leave it at that. In my English and Literature classes, we who were most interested in our education knew that the grades our essays were given were a 'front' for a 20-point scale; was an 'A' a 17, or was it a perfect 20? We insisted on seeing our true numerical score. Now, Maths / Science teachers are forced to use a 5-point letter scale, though many still use a numeric system behind it (a practice evidently still used even the humanities). The letter now served in maths/science does nothing but obfuscate the effective result.

This gets back to the aforementioned idea of added abstraction. Given both how reliant the current system is on a teacher's professional judgement and the added complexity of the grading scheme, *a student is now in the unfortunate position of being far less equipped to question their own results, while more justified in doing so than ever before. It is a student's right to question their grades and be given a comprehendible, defensible justification.*

Another effect I've noted is a shift in the art of taking exams. In my current tertiary studies, marks are labelled beside each question on paper, allowing a student to quickly judge, prioritise, and properly manage their time. In secondary mathematics today, students are struck with the bizarre notion of grade-standard questions; e.g. a "B-question". I always found the idea of 'D' questions, on which 'D' is the best possible grade, ridiculous; a question you must pass, in order to fail? To date, I am yet to see a letter-grade on any assessment in my tertiary studies. If you were to suggest moving from rigid marks to vague criteria for assessing students in Maths, Science or Engineering to grade students at UQ because you think it's 'fairer', you'd be laughed out of the room. *Do secondary schools in Queensland truly believe they've struck a fairer, more effective system of assessment than that which is proven and employed by the state's top universities?*

The general effect of these grade-standard questions is that rather than being able to effectively manage their exam, students are going in blind. Marks are marks; with grade-standard questions and wordy criteria sheets, it is *much* harder for a student to judge where and how their time should be best spent, because very few are capable of deciphering just how the results will be formulated into a final grade for the paper. *How does this complicating the process of sitting an exam improve the validity of a student's results?*

The most worrying effect of all, however, is an increasing sense of dread at the very notion of taking studying the sciences at all. In Year 12, my subject line-up was English, Maths B, Maths C, Physics, Chemistry and Literature (Criticism). I imagine this is a fairly typical set of subjects for high achieving students, particularly Maths / Science/ Engineering hopefuls. After seeing them in practice, there is no doubt in my mind that an E.E.I. is more involved than anything I had to do elsewhere, including term-long theses in Literature. *The introduction of E.E.I.'s into physics and chemistry (subjects often taken together) creates a near-ridiculous home workload on high achieving students. Younger students see this, and are reacting reasonably and expectably by avoiding taking multiple sciences or worse yet, avoiding taking a science at all. When the nature of assessment is openly driving students (who would otherwise have taken the subject) away, something is terribly wrong.*

THE EFFECT ON TEACHERS

I was blessed in my schooling to have the privilege of working with many examples of excellent teachers; people truly passionate about both their work and their field. I attribute much of my secondary academic success to them. With the introduction of the current assessment methods, I have seen very distressing consequences in talented teachers, including stress leave and moving away from the sciences. Every Maths and Science teacher I have discussed the current methods with has fallen into one of two camps: they hate the changes and are actively

fighting them… or they hate the change, but haven't the time or energy to fight for change. This is obviously anecdotal evidence, but it concerns me that *I have yet to meet a Maths / Science teacher (or anyone, for that matter, including students, parents and academics) who believes the current is a remotely fair method of student assessment.*

Senior assessment methods should support teachers in their efforts to do what is required of them in finalising a student's senior results. Teachers are still required to generate SAI scores for Year 12 students, differentiating them on a 200-point scale. This is a simple task working from a percentage; extrapolating from a 5-point A-E scale, on the other hand, is near impossible to do effectively or fairly. In practice, teachers are required to keep a secondary measure of student success to make this task feasible. *In the competitive OP system, how can assessment methodology that doesn't sufficiently differentiate student performance between one another be considered effective or appropriate?*

FINAL THOUGHTS

The shift in time spent during maths and science from the acquisition of knowledge to such things as E.E.I.'s is, in my opinion, leaving students less and less prepared for tertiary study. If you pick up a mathematics assignment in a secondary classroom today, in order to comply with the current "standards" it is increasingly likely to begin something like this: "Use Microsoft Excel to…". As a result of the standards requiring students to "utilise technology to ___", assessment is becoming more reliant on calculators and software, often at the expense of mathematical rigour. *This is leading to students who are experts at using Excel and their calculators, but less capable in regards to their mental arithmetic and understanding. In my university time so far, I have taken five mathematics courses; of all of the exams for these courses, I have been permitted to use a calculator in precisely* ***zero****.*

For further example of this emphatic shift away from learning: in my senior chemistry, we studied chemistry. The year 11's in the next room (the first cohort on the new syllabus) were embroiled in a term-long E.E.I. project, experimenting on with chemical changes in the fermentation processes of alcohols. Over many weeks, while we studied, they experimented and wrote reports. *At the end of the term, our class had learned a significant volume of introductory organic chemistry while the Year 11 class had become equipped to home brew. Which is the more effective use of class time in a subject clearly aimed at students expecting pursuing tertiary education?*

The four subjects under review here are rigorous academic subjects, and *students who take them do so almost exclusively in the interest of pursuing tertiary study in demanding areas such as Mathematics, Science, Engineering and Medicine.* Thus, the primary focus of such subjects should not be on lab work and reports, but on *developing the knowledge base necessary to successfully transition into tertiary study.* This is not to say that lab work and reporting should be cut from the syllabus, simply that they should not constitute as significant a part of student time and results as the actual knowledge of subject matter. Similarly, the C&J criteria currently in place in mathematics is not a bad thing; communicating and justifying your results are important skills in mathematics and effective in distinguishing a good student from a great student. The current weighting of the criteria relative to a student's knowledge and procedural expertise, however, is not acceptable. Furthermore, requirements of this criteria (such as identifying assumptions in your working and their associated effects) should be assessed in assignments, rather than consuming valuable time during an examination as is currently the case. In reading other submissions, I note the general voice of university academics is resoundingly against the current system; the fact that the people who have to deal with these students once they leave high school are so against the current system speaks volumes as to its effectiveness in university preparation.

While reading other submissions, I came across the idea that "E.E.I.'s are excellent because they teach students to write reports, which they will need to do at university". As a current Engineering student, I completely disagree with this assertion. When I came through secondary school, laboratory reports were still part of the science curriculum. I have certainly had to write lengthy reports in my university studies, but I feel in no way disadvantaged because I didn't do E.E.I.'s in high school. If it is believed students do not know how to write in general, this is a problem with the (still-compulsory) English curriculum, and not Science's place to fix. Furthermore, it is far easier for a university to give a briefing on report style than it is for them to make up the deficiencies in assumed knowledge resulting from so much time being diverted from actual learning. *A term-long project like an E.E.I. in place of direct teaching time, knowledge acquisition and examination rigour is simply not necessary to teach report writing.*

Arts/language/the humanities are not same as maths/science. There is no such “one size fits all” approach to education, and one should not be sought. *Time should be spent developing approaches that work for the subject, ideally by consultation with experts who understand the field. It does not take an expert to know that the assessment time in Maths / Science should be quality, not quantity*

In summary, the current methods for assessing students in senior mathematics and science are:

- not sufficiently transparent, accountable, or objective.
- based on vague, interpretive criteria.
- unnecessarily complex.
- diverting significant time from acquisition of knowledge in academic subjects.
- **not adequately preparing students for tertiary study.**

For these reasons, the current method of assessment in mathematics and science is deeply flawed, and urgently needs to be revised.

Sincerely,

Concerned Student