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Damien Wallace

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In regards to the Paliamentary committee inquiry into Assessment methods for Senior Maths, Chemistry and Physics

Preface:

I am the Maths Head of Department at [redacted] which is a Prep to 12 Education Queensland school of almost 2900 students located on the northern outskirts of Brisbane. I have been teaching for 16 years, a Maths HOD for 7 years and currently perform a couple of roles for QSA.

I think our current system needs some changes. I am going to try and approach the current issue from a real world context using an analogy of applying for a job. If I was applying for any job, there would be a list of duties that I would need to perform and there would be some sort of selection process to determine the best applicant (Either criteria that is used or a weighted system of marks). I would hope that the method used to determine the best applicant is fair, transparent, cost effective and easily understood. I don't believe our current system, at this point of time, fits any of these traits.

Introduction

Our current system requires us to compare student performance against a set of standards, then at the end of Year 12 our students (job applicants) are ranked both within our school and in comparison to other schools. Mathematicians (and Scientists) are generally logical, structured thinkers. We prefer quantitative (measurable and reproducible) methods of comparison as opposed to qualitative (no defined measurable standard) methods of comparison. The current criteria used to assess students in Mathematics are QUALITATIVE in that they are trying to describe the qualities of a student's work. When you consider that a single assessment piece has over 100 different qualities that we are trying to analyse, our natural tendencies are to apply a quantitative measure to record how many qualities we have observed. Some qualities are more important/difficult and so there needs to be some weighting given to these in the ranking. This is true in a job application also.

I have surveyed my staff and students at the school to judge their opinions in this matter. Most of my staff share a similar sentiment to me. Using the inquiry website sample survey questions for students, the responses are shown in Appendix 1 and 2. Feedback provided about the survey was that some students found it difficult to answer the first question as they had not been exposed to a marks based system.

Ensuring assessment processes are supported by teachers

The current system of assessment in Mathematics is not the preferred model of my staff (as evidenced in appendix 2). They find the criteria more difficult to interpret, more time consuming to grade against and that pass standards are not sufficiently rigourous. While we are all professionals and try to work within the system to achieve the best for our students, the uncertainty around criteria is not instilling confidence in assessment and ranking amongst staff.

Student participation levels

Maths is a compulsory subject til Year 12 at most schools including mine. The percentage of students studying each of the subjects has remained fairly steady over time, however the quality of the student work over that time has diminished (I have observed that it is now so much easier to achieve a passing grade compared to the previous syllabus/marks system)

The ability of assessment processes to support valid and reliable judgments of student outcomes.

The issues as I see them (as alluded to in the traits I mentioned earlier):

1. Fairness (Equity): As a HOD of 26 staff in my school and as a District Panellist, I regularly see staff and schools trying to interpret and apply the standards, some with more success than others. Would it not be fairer and more comparable if we all sat the same assessment? I am not saying that a single end of course exam is the best answer, but a series of exams each semester might be worth considering. Assignments are not indicative (valid) grades currently as I know students discuss amongst themselves/tutors/parents/teachers how to do the assignment. I would weight the assignments to reflect this and to be fairer (not all students have the same level of assistance available).

   I think that the use of marks tends to lend itself to be fairer as I think there is more of a shared understanding among students and teachers as to how to allocate marks. In my experience when I used marks I would frequently have students try and improve their grade by analysing the part marks awarded. Now I very rarely have a student try and challenge their grade as I don't believe they know the criteria well enough to mount an argument (despite our best attempts to explain it to them).

   In the current system at our school we grade each question as "simple rehearsed" through to "complex non-routine" to align with the syllabus descriptors. Our difficulty has been in penalising student error in a fair and equitable manner. It has become almost "all or nothing" in the allocation of a grading for that question. This can lead to a student who

almost got the question correct being given the same grade as someone who didn't attempt it? I believe marks better reflect the issue of fairness/equity here.

Another issue is that a student only has to demonstrate a criteria once to be "at that standard". This means that a student who answers one simple routine and one simple rehearsed question is a C standard (passes). This is 2/20 correctly answered. How is this fair compared to previous years where 50% of the work needed to be correct to pass?

2. Transparent: As a panellist I have viewed over 20 different school submissions. Different interpretations of the syllabus and standards makes it hard to compare between schools and students. Every single school has done something different. I have frequently suggested the movement of a student's position because I believed a school interpretation is not accurate. Surely if our current system was transparent, we would all be interpreting and judging in a similar manner? The QSA through the use of the QCS test is able to compare student performance in a subject versus student performance in the QCS test. If you took a Mid HA student (mid B) from each school for Maths B and compared their QCS test results, that you would find a vast range (otherwise why would QSA need to scale scores after the QCS test). Even if all the Mid HA students in Maths B were given a test on Maths B content at the end of their course, their results would be wildly different (as this is what is happening in Universities once they leave us). How is this transparent?

3. Cost effective: Currently QSA pays panellists $74 per school to review work. On top of this cost is the school cost that is incurred to replace a teacher for year 11 monitoring in February (Year 12 verification is currently done in the Student Free Day in October), travel to venues, Panel chair conferences etc. (what is the actual cost to QSA?) There is also the wage of two staff that are employed as the subject advisors for Maths. How would this compare to the cost of say 4 external exams and markers (note that there already exists external exams for Maths A and B that are written by teachers that could be used)? Would we still need the QCS test then as well? There is also the human cost involved in the current system. There is a lot of stressed teachers that are trying to set, grade and rank students that are then being "second guessed" by panels. I have high quality, experienced senior staff that do not wish to teach senior Maths or Science subjects due to this.

4. Easily understood: as previously mentioned as a panellist and HOD I know that there is a wide range of responses from teachers and schools in the attempt to interpret the syllabus descriptors. If you compare the 2001 syllabus descriptors to the 2008 descriptors (appendix 3 has the 2001 descriptors) you will notice that there is not a lot of terminology that is different. Most of the terms from 2001 have just been given their own section. The effect of this though is that now people think that each section is equally important. I would argue that the "recall, selection and use of rules, definitions and procedures" is far more important and tested more frequently than the "appropriate selection and use of technology". i.e I think the more important skills/qualities should be weighted more heavily like in a job application

How to move forward

I make the following suggestions:

- If we keep the current system:
    1. Consistent messages given by those in authority (maybe a Q and A section on the website)
    2. The National Curriculum has already published its achievement standards for the 4 strands of Senior Maths. They are not too dissimilar to the ones we use currently (http://www.australiancurriculum.edu.au/SeniorSecondary/Mathematics/Mathematical-Methods/AchievementStandards). The biggest difference (and a step in the right direction) is that there is only "routine" and "non-routine" questions. I would like to see these adopted immediately. Some worked examples of ALL standards to accompany would be necessary.
    3. There needs to be more than just "A level" exemplars where everything is near perfect. There needs to be lots of examples of where a student does an element wrongly and what effect this has on their grade (if any). This needs to be followed up with in-school PD rather than just "placed on the internet"
    4. There needs to be a model system that is easy for schools to use/adopt that prevents the need for schools to each "re-create the wheel".
- If we change the current system:
    1. Consult with ALL staff about what the new system is and train them to use it properly (shared understanding). Teachers are happy to work with fair, transparent, cost effective and easily understood systems.

Damien Wallace
[redacted]

Appendix 1 ; student survey responses

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	N/A
That you believe assessing against defined standards, rather than numerical grades, provides a better indicator of your achievements and knowledge of maths.	12	3	19	21	23	2
That you understand how your grades were assessed (individual assessment tasks and/or overall achievement in the subject).	1	9	9	42	20	1
That the assessment process allowed you to prioritise your workload	13	30	21	15	2	1
That the timeframe for completing Extended Modelling and Problem Solving tasks (assignments) was adequate	4	23	20	29	2	
That the assessment workload in senior maths, chemistry and physics compares to other subjects	26	25	14	12	3	1

Note: not all students answered every question (for example a Maths A student not studying physics or Chemistry could not answer Q5 and left it blank rather than N/A).

Appendix 2 Staff survey

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	N/A
That you support the current QSA assessment processes		3	4			
That current assessment processes support valid and reliable judgments of student outcomes		3	2	2		
That you are comfortable that your school grading that is checked by district panel is comparable to other schools within the district. (that panel agrees with your school placements and that QCS test results should be reflected in subject results)		2		4	1	
That you are comfortable with the consistency in grades across classes at your school (teachers all have a common, shared understanding and are applying standards consistently across classes)			2	2	3	
That you know and can interpret the criteria well		1	1	3	2	
That your students have a good understanding of the way they are assessed			2	4	1	
That you think teacher judgement is consistent across the state (possibly seen by random sampling done by panellists or from new teachers with experience in another area of the state)	1	5		1		
That assessment practices are becoming more time consuming		1		4	2	
That you think that it has become a lot easier to obtain a passing grade			1	1	5	

Appendix 3 2001 criteria

	Standard *A*	**Standard *B***	**Standard *C***	**Standard *D***	**Standard *E***
Criterion: Knowledge and procedures	The **overall quality** of a student's achievement across the full range within the contexts of application, technology and complexity, and across topics, **consistently demonstrates**: • accurate recall, selection and use of definitions, results and rules • appropriate use of technology • appropriate selection, and accurate and proficient use of procedures • effective transfer and application of mathematical procedures	The **overall quality** of a student's achievement across a range within the contexts of application, technology and complexity, and across topics, **generally demonstrates**: • accurate recall, selection and use of definitions, results and rules • appropriate use of technology • appropriate selection and accurate use of procedures.	The **overall quality** of a student's achievement in the contexts of application, technology and complexity **generally demonstrates**: • accurate recall and use of basic definitions, results and rules • appropriate use of some technology • accurate use of basic procedures.	The **overall quality** of a student's achievement in the contexts of application, technology and complexity **sometimes demonstrates**: • accurate recall and use of some definitions, results and rules • appropriate use of some technology.	The **overall quality** of a student's achievement **rarely demonstrates** knowledge and use of procedures.

	Standard *A*	**Standard *B***	**Standard *C***	**Standard *D***	**Standard *E***
Criterion: Modelling and problem solving	The **overall quality** of a student's achievement across the full range within each context, and across topics **generally demonstrates mathematical thinking** which includes: • interpreting, clarifying and analysing a range of situations, identifying assumptions and variables • selecting and using effective strategies • selecting appropriate procedures required to solve a wide range of problems • appropriate synthesis of procedures and strategies; … *and* in some contexts and topics **demonstrates** mathematical thinking which includes: • synthesis of procedures and strategies to solve problems • initiative and insight in exploring the problem • exploring strengths and limitations of models • extending and generalising from solutions.	The **overall quality** of a student's achievement across a range within each context, and across topics, **generally demonstrates mathematical thinking** which includes: • interpreting, clarifying and analysing a range of situations, identifying assumptions and variables • selecting and using effective strategies • selecting appropriate procedures required to solve a range of problems; … *and* in some contexts and topics **demonstrates** mathematical thinking which includes appropriate synthesis of procedures and strategies.	The **overall quality** of a student's achievement in all contexts **generally demonstrates mathematical thinking** which includes: • interpreting and clarifying a range of situations • selecting strategies and/or procedures appropriate to problems.	The **overall quality** of a student's achievement **sometimes demonstrates mathematical thinking** which includes following basic procedures and/or using basic strategies.	The **overall quality** of a student's achievement **rarely demonstrates mathematical thinking** which includes following basic procedures and/or using basic strategies.