

When 'trial' means 'development': A mathematics unit standard trial

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In 1995 various secondary schools throughout New Zealand became trial schools for the mathematics Unit Standards. This study centred on one such school. Data on the trial were collected from both staff and students. It quickly became apparent that the trials were more a development of Unit Standard assessments than the trial of newly produced resources. Involvement in such development soon threw up issues to do with work load, reassessment, sufficiency, moderation between schools, and tracking. The paper concludes with some recommendations for future improvements.

Introduction

New Zealand is in an era of major educational reform, including curriculum reform. *The New Zealand Curriculum Framework* (Ministry of Education, 1993a) sets the framework for all that is to be taught and assessed in New Zealand schools. In terms of assessment it promotes a programme where "... clear learning outcomes are set and students' progress is measured against these learning outcomes" (p.24). At the senior secondary school level this assessment is taking the shape of Unit Standards Assessment. Such assessment is behaviourally based since, in order to achieve the standard, the student must demonstrate the appropriate behaviour (Eisner, 1995). In Neyland's (1994) view, Unit Standards Assessment also reduces mathematical knowledge to a structured set of skills within a particular unit of work.

This contrasts with the open-ended, discovery and problem-solving approach promoted by *Mathematics in the New Zealand Curriculum* (Ministry of Education, 1992), an approach which is consistent with constructivist learning theory (Wheatley, 1991) which recognises that students learn best when they have the opportunity to construct their own knowledge by developing or modifying their prior understandings. Like teaching, student learning is a complex activity in which students often form intricate networks of understanding between concepts in bursts rather than in gradual and structured ways (Neyland, 1994). The mathematics curriculum approach in turn is congruent with the current view that mathematics is an ever-developing series of socially constructed ideas and processes, rather than a linearly organised, highly structured body of existing knowledge.

Despite the fact that Unit Standards Assessment is totally inconsistent with the present philosophy of mathematics, what research has revealed about the way students

learn, and the mathematics curriculum, the New Zealand government decided that such assessment was the best way to identify student's academic achievement, and hence our nation's educational progress. In the government's way of thinking, what could be more simple and effective than students demonstrating competence according to checklists of performance criteria? This thinking was bolstered by visions of standards being raised as teachers came under increasing pressure to ensure that more and more students displayed the criterion behaviours. The vehicle created to implement this assessment approach was the New Zealand Qualifications Authority (NZQA).

In late 1994, NZQA offered secondary schools the opportunity to take part in trialing Unit Standards Assessment. Incentives to participate included the offer of substantial financial grant, guaranteed field visits by NZQA staff, and the advice that Units Standard Assessment would be compulsory for all sixth form students in 1996, and indeed would replace School Certificate and University Bursary in 1997 when the external examinations became optional (Ministry of Education, 1993b). What follows is a discussion of how one secondary school mathematics department became involved with the Unit Standards trials in 1995, and the issues the department encountered as a result. In essence it is a case study involving most of the school's mathematics department staff, and a sample of their senior students.

Method

Subject Selection

The people selected to take part in this research were some mathematics students and mathematics department staff at a large (1400 students) co-educational secondary school that prided itself on academic excellence.

The students were initially selected randomly from a list of students who had been involved in either the Mathematics Unit Standards trials in 1995, or the Unit Standards Assessment in 1996 at the time this research was undertaken (or who had been involved in both). Five students from each year level (11, 12 and 13) were selected. If a selected student did not want to take part in the research then the next person on the list was selected. An attempt was made later to adjust the randomly selected group to ensure that there was a reasonable balance of students in terms of gender and mathematical ability.

Of the 11 teaching staff in the mathematics department eight participated in the research. These eight ranged in teaching experience from just short of one year to twenty eight years, with a mean of fifteen years.

Procedure

Data for this study were collected by means of a questionnaire (see Appendix 1)

given to each subject. Students were asked to return their questionnaire within 24 hours, and staff theirs within one week. In some cases follow-up interviews were conducted to clarify points written on the questionnaire. These interviews were not taped, but clarification points made by those interviewed were recorded by hand and used later in the data analysis.

Results

Perceptions of a Unit Standard

Generally all those who responded knew what a Unit Standard was. It is a standard against which evidence collected on a learner is judged (Ministry of Education, 1995a). It gives details of what is to be assessed (elements), the standard to be achieved (performance criteria), and the level of achievement required. To achieve a Unit Standard, a student must be able to achieve every element of the performance criteria. It is perhaps this last requirement that makes Unit Standards so difficult to implement, and disliked by two-thirds (67%) of the students surveyed.

Issues

The main issues raised in this study are summarised below. The percentages were calculated by considering the number in each group who indicated that the particular category was an issue for them.

TEACHERS (N = 8)		STUDENTS (N = 15)	
Workload	100%	Reassessment	73%
Reassessment	100%	Meeting Standard	53%
Sufficiency	100%	Talented students	27%
Moderation	100%	Employer understgd	53%
Tracking	88%	Like the system	33%
Meeting Standard	50%	Dislike the system	67%
Over assessing	50%		
Interpretation			
Training	25%		

Value of Unit Standards: The one-third of students who felt that Unit Standards were good gave as their reasons (i) being able to resit assessments as often as they needed to, and (ii) being able to sit assessment after each topic instead of trying to remember a whole year's work for a three hour examination.

Workload: The extra workload that the Unit Standards Assessment entails was one of the major issues for all teachers surveyed. Workload involves:

- the time it takes to read and interpret the Unit Standard for any particular topic,
- writing the assessment for that Unit Standard,
- trying to make sure that the Unit Standard assessment fits the philosophy of the mathematics curriculum (a near impossible task),
- meeting to discuss the assessment and its suitability for the students,
- meeting again once the assessment has been administered to discuss the marking scheme and students' alternative answers,
- marking the Unit Standard, and then cross-checking five papers from a colleague,
- tracking students' performances based on how many performance criteria they achieve - which could be as many as 12 per unit per student,
- writing and administering reassessments for students who do not gain full credit the first time, second time or third time around.

One casualty of the focus on Unit Standards was implementation of the new Mathematics curriculum. As one teacher explained,

Before the trial we were implementing the new Mathematics curriculum and really doing a great job ... With the trial of the Unit Standards all that stopped. There was no longer time to develop resources because it was all spent on writing assessments, Unit Standard meetings, cross-marking, tracking, and then reassessment and remarking.

A sense of frustration was evident among the teachers at the extra time required for the assessment work. This is illustrated by the teacher who asserted,

We have been hoodwinked into developing the Unit Standards rather than trialing them, as we thought we were doing. As the Unit Standards are now ... it is impossible for me as a full time teacher with no time allowance to cope with the extra work necessary on top of trying to do the best for my classes.

Such teacher frustration stemming from the burden imposed upon them was recognised by NZQA in an interim report in 1995 (Ministry of Education, 1995b).

Reassessment: Reassessment relates to the opportunity for a student who has not been credited with a particular Unit Standard the first time to try for it again, supposedly as often as the student wishes until every element of the Unit Standard has been completed successfully. This study revealed that in reality reassessment poses several problems. Firstly, failure to achieve a Unit Standard did not necessarily mean that a student lacked understanding of the mathematics involved. As one Form 7 student commented,

I believe Unit Standard assessment is bad. This is because even though I fully understand the concepts when I am tested, and make a silly mistake, I fail the unit. You must get almost 100% to pass a unit. With tests and exams you only need 50% to pass, which proves you still know what you're doing. With Unit Standard assessment you are not

credited with part of a unit.

The 10 students who disliked the Unit Standards assessment approach all commented along similar lines.

Secondly, to avoid disrupting the class programme, reassessments had to be offered during lunch breaks and after school. However, some students could not make these times because of sports practices or after school work commitments. This difficulty would be magnified if the whole school moved to Unit Standards assessment since other subject areas would probably be vying for the same reassessment time. There is the likelihood that a particular student would have to do a reassessment every lunchtime during the course of a week.

Thirdly, mathematics department staff were not able to keep up with writing enough reassessments for all the students who wanted to resit a unit several times.

Sufficiency: Sufficiency involves deciding whether a student is competent in a particular unit of work and hence can be awarded the Unit Standard. Because of the need to ensure authenticity of students' work, the school which participated in this study used a pen and paper form of assessment. The fear here is that a Unit Standard will have undue influence on curriculum practice, rather than being a progression of it. One teacher echoed the concern of several with the observation,

Assessment is beginning to drive our curriculum, and not the curriculum driving the assessment. There is the potential for teaching to become an assessment nightmare. We are beginning to over-assess.

However, according to Units Standard philosophy sufficiency may be judged by naturally occurring evidence derived from observations, discussion, project work and assignments. A concern with this is that the standard of one teacher looking for naturally occurring evidence may be quite different from the standard of a colleague, or from teachers in other schools. Some may be more lenient than others. Neyland (1994) and Nightingale (1995) both allude to the fact that with Units Standard Assessment there is the temptation for teachers to become more lenient when assessing their students and consequently improve the pass rate of their school.

Moderation: Moderation within Units Standard assessment is another concern revealed by the data. It involves sending away 25% of all assessments to a local moderator. The local moderator checks the assessment to make sure it meets the particular Unit Standard requirements, and to make sure that it is comparable with other local school standards. However, the teachers in this study felt that it was debatable whether the system worked. One commented, "Moderation is complicated and I have doubts about the comparability of standards between schools".

I knew what the teacher meant because I have had personal experience of this

with a Form 6 class assessing Unit Standard 5245 Co-ordinate Geometry. I taught the topic using appropriate formulae but our school policy was not to give students the formulae to use during formal pen and paper assessment. Students who could apply the formulae, but had not learnt them by heart, were immediately disadvantaged and as a consequence were unable to gain credit for that particular unit. On the other hand, I know that other schools in the area provided their students with the formulae where necessary (and similar formulae are given out in the Bursary exams). This means that, despite local moderation, our school obviously set a standard higher than others in the area.

Tracking: Tracking involves recording students' performances according to how many performance criteria they achieve. The data indicates that a serious workload concern arises from tracking. Whilst tracking under the revised Unit Standards involves recording only at the element level, marking still requires teachers to look for evidence of each performance criteria. At worst a Unit Standard may have 12 performance criteria to judge, and three elements to track. Assessing a class of 33 students would therefore involve judging 396 performance criteria and 99 elements. Across four classes this means tracking 396 elements. This entails a tremendous workload to record each student's personal level of achievement.

Recognition of superior achievement: The data shows that talented students were concerned that their abilities would not be recognised under the Unit Standard assessment system. One talented Form 6 student, for example, said,

I don't like Unit Standards because it puts everybody on the same level. Reassessment is stupid because everybody can pass. How will an employer know if I am better than another person?

Unit Standards philosophy is that talented students can demonstrate their superior knowledge by gaining more Unit Standard credits during the course of a year but, to my knowledge, resources are not available which allow students the freedom to work independently on particular units of work and then request assessment from the teacher.

The data show that teachers also had a concern about the achievement of very able students. They felt that without the natural competitive nature of tests and external examinations talented students would lack motivation and become bored. Some felt that students who had to seek many reassessments would also lose motivation. This is illustrated by the teacher who commented,

There is as yet no recognition for just achieving, or achieving the standard really well. How do we get the best out of the brighter kids? I can see them coasting. What happens to the student who repeatedly fails to reach the standard?

Employer understanding: This issue, raised by just over half of the students, follows (in part) from the previous concern. These students were concerned that employers would not know what a Unit Standard meant, and would not therefore be able to make valid judgments when employing staff. One student who perceived himself as having superior mathematical ability expressed the view that Unit Standards assessment would disadvantage him because it would put him on the same level as everyone else.

Discussion

Most of the concerns raised by the teachers and students in this case study seem to be reasonably valid and need to be addressed. For example,

- a school-wide policy needs to be developed on how, in what form, and at what time reassessments will be offered,
- teachers must be given time as part of their daily teaching duties to assimilate the changes and to develop appropriate resources,
- the concept of sufficiency, in terms of naturally occurring evidence, must be explained better to all teachers,
- a time boundary probably needs to be set indicating how soon after a concept has been taught it can be assessed for Unit Standard purposes,
- moderation between schools needs to be improved to make Unit Standards assessment fair to all students, perhaps by requiring every school to administer the same assessment at the end of a unit,
- a simpler method of tracking must be devised so that teachers do not stress out under an increased workload.
- talented students must be given the opportunity to be rewarded for excellence, and
- a campaign must be launched over a period of time to inform the public, especially employers what a Unit Standard is.

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