

## Numeracy Across the Curriculum: Recognising and Responding to the Demands and Numeracy Opportunities Inherent in Secondary Teaching

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The 1998 Report of the National Standards and Guidelines for Initial Teacher Education Project, *Preparing a Profession* (Australian Council of Deans of Education, 1998), illustrates the emphasis being placed in Australia on the development of numeracy skills amongst not only primary but also secondary school pupils. This report demands that graduates of all initial teacher training courses should not only be numerate themselves, but should also understand the contribution of numeracy to education and daily life, and be able to identify and respond to pupils' numeracy learning needs. This report and its implementation in the state of Victoria through the *Guidelines for the Evaluation of Teacher Education Courses* (Standards Council of the Teaching Profession, 1998), led to the introduction in 1999 of a compulsory unit *Numeracy Across the Curriculum* for all Deakin University students in the final year of their secondary teacher training course. This paper discusses the nature of the current emphasis on numeracy. It also describes the rationale, development and delivery of the first year of the *Numeracy Across the Curriculum* unit, provides a brief evaluation from the perspective of staff and students, and discusses what impact such teacher education programs might have on secondary schools' approaches to numeracy.

Recent government initiatives in Australia, as in the United Kingdom, have placed an increasing emphasis on the development of literacy and numeracy skills of pupils, particularly at the primary school level. In England, for example, this has resulted in the *National Numeracy Strategy* (Numeracy Task Force, 1998; Brown, Askew, Baker, Denvir, & Millett, 1998; Straker, 1990).

In Australia, the Federal Minister for Education, Training and Youth Affairs has recently released the Commonwealth Policy Paper, *Numeracy, a priority for all: Challenges for Australian schools* (Department of Education, Training and Youth Affairs, 2000). This policy paper outlines current and future Government programs aimed at improving pupils' numeracy as part of the *National Literacy and Numeracy Plan*, agreed to by Commonwealth, State and Territory Ministers for Education.

A large number of existing numeracy programs and projects focus on the early years of schooling. Some of these focus on early identification – for example, the Commonwealth funded project, *Assessing Literacy and Numeracy in the Early Years of Schooling* (Curriculum Corporation, 1999) – while others involve both identification and intervention – for example, the New South Wales program *Count Me In Too* (Bobis & Gould, 1999) and Tasmania's *Flying Start* program. Other projects, such as Victoria's *Early Numeracy Research Project* (Clarke, 2000), are examining a broader range of strategies in order to achieve significant improvements in pupils' numeracy.

While the rhetoric of government numeracy plans is most often directed at the "crucial early years of schooling" (Department of Education, Training and Youth

Affairs, 2000, p. v), there is also recognition that this is not enough to ensure levels of numeracy sufficient to prepare pupils for life beyond school. Thus funding has recently been provided for projects such as the *Junior Secondary Numeracy Project* in South Australia, Western Australia's *Transition Numeracy Project* and Tasmania's *Planning and Teaching for Numeracy Project*.

At the same time, there is a growing awareness that numeracy is not the sole responsibility of primary teachers and secondary mathematics teachers. The report of the Numeracy Education Strategy Development Conference (1997) *Numeracy = everyone's business* has as one of its four "common understandings" the cross-curricular nature of numeracy. In particular, the report suggests that "all teachers in all subject areas accept responsibility for the development of numeracy" (p. 88), and adds as a footnote that "although this seems an ambitious goal, the suggestion is made in the context of substantial systemic efforts around the country to achieve precisely this in relation to literacy". The report further suggests that

all teachers need to recognise the numeracy demands within learning areas and subjects and deal appropriately with them by taking opportunities to develop and enhance students' numeracy within the learning area and subject. (p. 88)

In order to help achieve these aims, the report recommended that "the Australian Council of Deans of Education report ... on actions taken in pre-service and in-service courses" (Numeracy Education Strategy Development Conference, 1997, p. 42).

In turn, the 1998 Report of the National Standards and Guidelines for Initial Teacher Education Project, *Preparing a Profession* (Australian Council of Deans of Education, 1998), states that graduates of all initial teacher training courses should not only be numerate themselves, but should also understand the contribution of numeracy to education and daily life, and be able to identify and respond to pupils' numeracy learning needs.

This report and its implementation in Victoria through the *Guidelines for the Evaluation of Teacher Education Courses* (Standards Council of the Teaching Profession, 1998), led to the introduction in 1999 of a compulsory unit, *Numeracy Across the Curriculum*, for all Deakin University students in the final year of their secondary teacher training course. (A similar unit in literacy was also introduced).

This paper describes the rationale, development and delivery of the first year of this *Numeracy Across the Curriculum* unit, provides a brief evaluation from the perspective of staff and students, and discusses what impact such teacher education programs might have on secondary schools' approaches to numeracy.

## The Numeracy Across the Curriculum Unit

In 1999, Deakin introduced two units, *Numeracy Across the Curriculum* and *Literacy Across the Curriculum* to replace two elective units in the course.

### *The Aims and Content of the Unit*

Before the final decision was taken to have one literacy and one numeracy unit in the course, there was considerable discussion about combining the two. While

there are many reasons in favour of such integration, the fact that there was an existing elective literacy unit and a fear that numeracy might be swamped in an integrated unit led to the two separate units being developed, at least for 1999.

The unit description developed by the course team stated that the aims of the unit were to enable students to:

- understand the nature of numeracy and its scope and role in everyday life;
- develop their personal numeracy skills;
- recognise the role of numeracy and its inherent demands and opportunities within their areas of specialisation; and
- develop teaching strategies to discern and respond to individual students' numeracy learning needs within these areas.

These four aims were stressed in all of the materials prepared for the students and were closely reflected in the statement of the content, which listed the topics to be addressed as including:

- The nature of numeracy and the extent to which it encompasses not only mathematical concepts and skills (e.g. numerical, spatial, graphical, statistical and algebraic), but also mathematical thinking, general thinking skills, problem solving strategies and a deep understanding of the contexts within which these concepts and skills are to be applied.
- The meaning of numeracy within the different curriculum areas and the inherent demands and opportunities for secondary students.
- Strategies to enhance personal numeracy skills as required in everyday life, the professional lives of teachers, and specific curriculum areas.
- An examination of the way in which numeracy is dealt with in the classroom in particular areas of specialisation and the development of relevant teaching strategies to discern and respond to individual students' numeracy learning needs.

In terms of personal numeracy, students were told in the Unit Guide that attention would be paid to "personal numeracy skills, as well as numeracy demands on teachers in areas such as planning, timetabling, assessment and reporting – including, in particular, the underlying principles, mechanisms and effects of VCE assessment". (VCE is the Victorian Certificate of Education for pupils in years 11 and 12. Results from the VCE are used at the end of year 12 to produce a single score for pupils for the purpose of selection for university.)

### *The Students*

Although it is the usual practice to "pipeline" courses and not require students to make changes during their degree, because of the emphasis being placed on literacy and numeracy, it was seen as important to introduce these units immediately. While a small number of students sought (and gained) exemption from undertaking these units, for a variety of reasons, by and large all students enrolled in both the literacy and the numeracy unit.

A total of 146 students enrolled in the *Numeracy Across the Curriculum* unit. Table 1 shows the distribution of the 24 different subject areas in which the students were undertaking their curriculum studies. Almost all students undertook curriculum studies in two separate areas.

Table 1  
*Percentage of students undertaking each Curriculum Study*

20 – 24 %	15 – 19 %	10 – 14 %	5 – 9 %	≤ 4 %
Physical Education		Biology	Dance	Mathematics
Health		Drama	Science	Economics
English		Society & Environment	Accounting	Commerce
Psychology		English as a Second Language	History	Legal Studies
		Media Studies	Geography	Art & Craft
			Environmental Science	Politics
			Information Technology	Music
				Languages Other Than English

Columns ordered in decreasing percentage order

This resulted in 53 different combinations of subject areas. The most popular combinations were Physical Education and Health (7%), Physical Education and Psychology (6%), Health and Psychology (6%), English and English as a Second Language (5%). Only 4% of all students were undertaking a curriculum study in Mathematics.

### *Developing the Unit*

As well as the discussions about integrating the literacy and the numeracy units, there was also considerable ongoing discussion about who should be responsible for teaching the numeracy unit – in particular, whether it should be the domain of mathematics education staff or whether it should be taken in whole or part by staff in the various curriculum areas.

Staff responsible for the literacy unit had made the decision that students who were undertaking their curriculum studies in English and English as a Second Language (approximately 28% of the students) would be placed in separate tutorials, while the other students would be placed in mixed tutorial groups. As

there were no lectures in the literacy unit, this effectively meant that the English and English as a Second Language students were treated as a separate cohort. Not only would this have been totally impractical in the numeracy unit, given that only 4% of students were undertaking curriculum studies in Mathematics or Information Technology, but we believed that having students in mixed tutorial groups would enable students to broaden their view of the numeracy demands and opportunities within their own subject areas by exposing students to the numeracy demands and opportunities in a range of areas. We believed that this was one of the strong arguments against having the *Numeracy Across the Curriculum* unit taken by staff in the various curriculum areas. It was probably this argument, which was strongly put at every opportunity, as well as the apparent general satisfaction with the aims and content outline, which eventually ensured that mathematics education staff were the ones responsible for taking the unit – although there was quite a bit of helpful input from staff in other areas during the early stages of development of the unit.

Another argument was that there was little evidence of teachers in schools, or most staff taking curriculum units, having very much awareness of the role of numeracy within their subject areas. The co-ordinator of the literacy unit had produced a questionnaire for staff taking the curriculum units, asking them about the reading and writing genres required to be used by secondary students in their subjects, the oral competencies required, texts and resources commonly used, and publications which address issues of literacy in their areas. A similar questionnaire was prepared and distributed for the numeracy unit, this time focusing on the numeracy demands and opportunities instead of the language genres and competencies. Few responses were received. One, from someone taking English curriculum studies, was particularly helpful in suggesting that we devote some time to the intricacies of VCE assessment. (This suggestion was adopted.) A few others suggested text books and materials, but most people either did not reply or indicated that there were few, if any, numeracy demands and opportunities in their particular areas.

It should, however, be pointed out that the mathematics education staff were acutely aware of their own ignorance of details of the curriculum in other subject areas, the numeracy demands and opportunities inherent in these areas, and, most of all, what actually happens in the classrooms and the teaching strategies which can be used to discern and respond to individual students' numeracy learning needs within these areas. A very steep learning curve was required.

As a result of the substantial email correspondence generated during the development of the unit, "Dance and Drama students" somehow came to signify the imagined extreme case where numeracy demands and opportunities were likely to be minimal. As a result, we were all very aware throughout the development and teaching of the unit for the need to cater for the "Dance and Drama students".

A serious constraint on the development and delivery of the unit was the fact that, due to a high concentration of teaching practice in the last semester of the four year course, there were only six weeks in which to deliver a unit when, nominally, a semester has between 10 and 13 weeks. (Since 2000 there have been eight weeks,

which allows a much fuller treatment of the content.) Moreover, the unit commenced with two weeks of classes, followed by a three week teaching practice, followed by the remaining four weeks of classes, after which the students again went on teaching practice. As there was no opportunity for contact or feedback after the second teaching practice, effectively the unit had to be completed within the six weeks of classes and the three weeks of the first teaching practice.

Another apparent constraint was the apprehension of some students about undertaking such a unit. The co-ordinator of the literacy unit had already reported that many students in areas other than English or English as a Second Language were worried about their own levels of literacy and whether this would become apparent in her unit. Other students had asked her what would happen in the second semester numeracy unit as “maths was their worst subject at school”. During the faculty wide email discussions about the unit, many staff also expressed concern that the unit should not become “just another mathematics unit”. These considerations and constraints strongly influenced the shape and structure of the unit as it was delivered in 1999.

### *Delivering the Unit*

Classes for the unit consisted of one 1 hour lecture and one 2 hour tutorial (workshop) each week, with tutorial groups deliberately being randomly assigned so that students from different subject areas could have the opportunity to share information and expand their understanding of the scope of numeracy in their own areas.

Given the positioning of the teaching practice, the fact that there were only six weeks of classes and the apparent apprehension of students regarding personal numeracy, it was decided that, in terms of staff input, the lectures and tutorials would emphasise the nature of numeracy and its role in everyday life, and the inherent numeracy demands and opportunities within the various subject areas. The fact that the students were to go on teaching practice for three weeks between the second and third weeks of the course, was seen as an opportunity for students to gather information about actual school practice and to feed this into the classes in the weeks after the teaching practice, providing rich, authentic information to share with fellow students and staff. The first assignment (which is discussed later in this paper) was seen as the means of ensuring that this would happen.

Table 2 shows the unit outline as developed by the course team. Personal numeracy – a huge topic on its own and certainly not one which could be dealt with in the time span of such a course – was treated in fairly general terms, with students being given the opportunity to request certain aspects to be dealt with in detail in class. Within the course outline, personal numeracy was dealt with under four aspects: numeracy demands in interpreting graphs and data in everyday life, number sense, the underlying concepts and conventions of measurement and chance, and the professional numeracy demands placed on secondary teachers. There was no real attempt to deal with the fourth (and possibly most important) aim of the unit – the development of teaching strategies to discern and respond to individual students’ numeracy learning needs across the curriculum. This was

partly because of the overcrowded nature of the unit, but also because the course team realised that, in the first year of running the unit, they did not yet have the detailed knowledge of the possibilities and constraints in the different subject areas and therefore the expertise to achieve this goal.

Table 2  
Unit outline for 1999 Numeracy Across the Curriculum

Lecture	Tutorial (Workshop)
<p><i>Numeracy = Everyone's Business</i></p> <ul style="list-style-type: none"> <li>• Literacy = more than reading &amp; writing</li> <li>• Numeracy is more than arithmetic</li> <li>• Numeracy is everyone's business</li> </ul>	<p><i>What is numeracy?</i></p> <ul style="list-style-type: none"> <li>• Startling statements!</li> <li>• Thinking broadly about numeracy</li> <li>• Administration</li> </ul>
<p><i>Numeracy Across the Curriculum – Some Examples</i></p> <ul style="list-style-type: none"> <li>• Quick examples of numeracy in everyday life</li> <li>• Examples of numeracy demands across the curriculum</li> <li>• Exploring social science issues</li> </ul>	<p><i>Numeracy in a Reading &amp; Writing Class</i></p> <ul style="list-style-type: none"> <li>• Sample GAT (test) writing task on Greenhouse Effect – example of numeracy demand</li> <li>• Spread of Cane Toads – example of numeracy opportunity</li> </ul>
<p><i>Numeracy in Everyday Life – Some Aspects of Personal Numeracy</i></p> <ul style="list-style-type: none"> <li>• Interpreting graphs &amp; data</li> <li>• Examples of state-wide testing &amp; what the results say</li> <li>• What is a benchmark?</li> </ul>	<p><i>Numeracy Across the Curriculum &amp; Personal Numeracy 1</i></p> <ul style="list-style-type: none"> <li>• Work in groups to discuss results from Assignment 1 &amp; plan presentations (half session)</li> <li>• Personal numeracy 1 – interpreting graphs &amp; data</li> </ul>
<p><i>Personal Numeracy 2 – Number Sense</i></p> <ul style="list-style-type: none"> <li>• Calculators vs mental computation vs paper &amp; pencil arithmetic</li> <li>• Estimation</li> <li>• Thinking strategies</li> </ul>	<p><i>Numeracy Across the Curriculum &amp; Personal Numeracy 2</i></p> <ul style="list-style-type: none"> <li>• Groups presentations 1 (half session)</li> <li>• Personal numeracy 2 – developing intuitive understanding of decimals</li> </ul>
<p><i>Personal Numeracy 3 – Measurement &amp; Chance</i></p> <ul style="list-style-type: none"> <li>• Understanding the metric system</li> <li>• Estimation &amp; benchmarks</li> <li>• Chance – conceptions and misconceptions</li> </ul>	<p><i>Numeracy Across the Curriculum &amp; Personal Numeracy 3</i></p> <ul style="list-style-type: none"> <li>• Groups presentations 2 (half session)</li> <li>• Personal numeracy 3 – measurement &amp; chance: the underlying concepts</li> </ul>
<p><i>Professional Numeracy Demands in Secondary Teaching – An Example</i></p> <ul style="list-style-type: none"> <li>• Scaling of VCE (year 12) scores</li> <li>• Effect of the GAT (General Achievement Test)</li> <li>• Obtaining the University entrance score</li> </ul>	<p><i>Final Session</i></p> <ul style="list-style-type: none"> <li>• Elaboration of professional numeracy examples from the lecture</li> <li>• Aspects of personal numeracy as requested by students</li> <li>• Student evaluation of unit</li> </ul>

### *The Collection of Readings*

Deakin University has a long tradition of off-campus delivery of units. Materials developed for off-campus use are often used with on-campus students taking the same unit. Typically, course teams produce a study guide and a collection of readings (usually referred to as “the reader”) for off-campus units, together with other materials such as monographs, video-tapes, audio-tapes, and, increasingly, on-line materials. For this (totally on-campus) unit, the course team compiled a 93 page book of readings, which contained a range of materials directed at all aspects of the unit.

In particular, it contained a copy of the six page *Policy on numeracy education in schools* (Australian Association of Mathematics Teachers, 1998), extracts from the report of the Numeracy Education Strategy Development Conference (1997), *Numeracy = everyone’s business*, as well as two articles on the nature and role of numeracy in everyday life (one of these being in the form of a number of provocative extracts for students to read, discuss and respond to in class).

The reader also contained several extracts from the report on the *Survey of Aspects of Literacy* (McLennan, 1997), which reported on the 1996 survey of 9302 people aged 15 to 74 on prose, document and quantitative literacy. Data in this survey were collected in respondents’ homes through personal interviews followed by an assessment of some literacy skills through written tasks. Perhaps the most surprising aspect of this study for our students was the extent to which not only the quantitative literacy items, but also the document literacy items, relied on numeracy skills.

As part of their first assignment, students were going to be asked to interview a person about the numeracy demands of their work, A collection of seven *Maths at work* articles based on primary children’s interviews with people in the workforce were included in the reader.

Perhaps because of the course team’s heightened awareness of the “Dance and Drama students”, the reader contained possibly rather too many extracts from materials for dance teachers illustrating the numeracy demands in terms of spatial aspects, floor patterns, symbolic representation of dance positions and rhythmic structure. It also contained two highly quantitative articles on designing your own diet by a well-known nutritionist, coincidentally taken from a dance magazine, but illustrative of aspects of health education.

In terms of numeracy across the curriculum, the reader also contained a number of what we regarded as excellent articles illustrating the numeracy demands and opportunities in English and Social Studies classrooms (e.g., Barin, 1993; Barnes, 1994; Chapman, Kemp, & Kissane, 1990).

### *The Assessment*

The assessment for the unit consisted of two assignments, the first contributing a total of 45% of the marks, and the second 55%.

The first assignment required students to research the numeracy demands and opportunities in one of their subject areas (other than mathematics). The assignment consisted of three parts, each worth 15%, with some choice within two



of the three parts. In part one, students were asked to either carry out a document analysis, in terms of the numeracy demands and opportunities evident, of a curriculum document, a secondary text book or a professional journal or magazine, or observe and document the demands and opportunities for numeracy in a lesson in their chosen subject area and interview a secondary teacher on their views on the numeracy demands and opportunities in that area. For part two, students were asked to conduct and report on an interview with either a secondary teacher, someone in the workplace outside a school, or an employer about their perceptions of the numeracy demands in the workplace. (It was possible for a student to interview a secondary teacher in both parts of this assignment, as the focus of the two interviews was different.)

For the final part of the first assignment, students were organised into groups of four during the workshop in week 3 and were given time to discuss their findings from parts 1 and 2 of the assignment. They were then asked, as a group, to select one or more issues to highlight in a "pithy" (TV grab style) report to the rest of their workshop. The maximum time allowed for each presentation was 10 minutes with students asked to allow adequate time for questions and discussion. At least two members of the group were required to present the information. Students were informed that the criteria for assessment were their ability to: identify key issues from the group's findings; synthesise information from the different group members; organise and present material in a succinct and engaging format; and, engage and respond to class discussion. Ideally, in a tutorial group of 32 students there would have been four presentations in each of weeks 4 and 5, taking about half the session. (In fact, in my group there were over 40 students, and considerably more time was spent on the presentations with a corresponding decrease in time available for developing personal numeracy skills.)

The presentations for the final part of the first assignment were mostly entertaining and to the point – groups that contained Drama students were at a clear advantage! One group produced an outstanding video in the form of a current affairs program. Not only was the technical quality high (one student was undertaking media studies), but the presentation was also outstanding in every respect except for its failure to engage the rest of the class in questions or discussion. Other groups also imitated TV program formats, with varying degrees of success in focusing on one or two issues. The weakest presentations were those that failed to identify key issues and synthesise information, but instead presented a large amount of apparently unconnected information. At least one group used their presentation to make the point that numeracy should not be forced onto students in other subject areas when it was not appropriate to the context of the lesson.

Apart from the difficulties in fitting in the presentations in one very large tutorial group, this part of the assignment was seen as highly worthwhile by most students and most members of the course team. It provided the opportunity for students to gain an insight into numeracy across curriculum areas other than their own, which often sharpened their understanding of their own area. Moreover, students who found very little in the way of numeracy demands or opportunities

in a particular subject area were often surprised by the ones found by their classmates for the same area.

The second assignment, which was due at the end of the unit, asked students to imagine that they been appointed to a secondary school where the new Principal saw numeracy as an emerging issue and had decided to appoint them to the newly created position of Numeracy Across the Curriculum Officer. The Principal had requested them to develop a school numeracy policy and make a presentation to the parents. Students were asked to prepare an outline of the school numeracy policy, indicating how teachers in at least three curriculum areas could be involved in numeracy across the curriculum. The assignment could be presented in any format, for example as a written essay, a video, or a PowerPoint presentation. Many excellent PowerPoint presentations were submitted, both in electronic form and as hard copies.

### Evaluating the Unit

Students were provided with an extensive evaluation form, consisting of 26 questions, many of which required a free response. All questionnaires were read and a quantitative summary made for questions where appropriate. The main points arising from the evaluation and changes to the unit proposed in light of the findings are summarised below.

#### *Expectations for the Unit*

Many students had no expectations or believed that it would be similar to the literacy unit. Many others expected that the unit would focus on the development of personal numeracy skills. As this was the first year of the unit, possibly the lack of expectations should not be surprising. However, the handbook gave a clear outline of the content and students were also given a two-page handout about the unit a month before it commenced.

#### *Attendance at Lectures and Workshops*

Attendance at lectures was very poor. Among reasons given was the fact that, although the students were meant to be full-time, on-campus students, for many this was the only unit that actually had on-campus classes. The lecture was at 8 am on Wednesdays – many students whose workshop times were on Mondays (half the cohort) or even on Wednesday afternoons, refused to come “for just one hour” of classes on a Wednesday morning. Other students had a clash at that time. Few students agreed that the lecture was valuable to them. However, many students who claimed lectures were not valuable indicated that they had never attended one. Attendance at workshops was generally high, with most students agreeing that they were valuable.

In an effort to encourage more students to attend the lecture over the past two years, the lecture time was changed to 12 noon, with two workshops from 10 am to 12 noon, another two from 2 pm to 4 pm and others around these times on the

same day. This has not resulted in a substantial increase in numbers and we are now discussing whether to move to a workshop only model for 2002.

### *Course Materials*

Most students purchased the reader, however, many students indicated that they read only a few of the articles. Not surprisingly, students who had read few or none of the articles did not find them valuable. All articles were referred to in lectures, with students being directed to read different articles each week. The readings were part of the Lecture Summaries that were posted on a noticeboard each week immediately after the lecture. However, after reading the evaluations and meeting to discuss them, the course team discovered that not all members had directed students' attention to this fact and that students who had not attended the lectures may well not have known that the summaries were posted on the noticeboard.

### *The Unit Aims*

Student perceptions of the importance of the aims and the extent to which they believed they had been addressed were canvassed in a question which required students to rate these on a scale of 1 to 5, with 1 = low and 5 = high. Table 3 shows the mean scores for both of these aspects for each of the four aims.

Table 3

*Student perceptions of the importance of the aims of the unit and the extent to which they were addressed*

Aim	Importance*	Extent addressed*
Understand the nature of numeracy and its scope and role in everyday life	4.5	4.2
Develop personal numeracy skills	3.2	3.2
Recognise the role of numeracy and its inherent demands and opportunities within areas of specialisation	4.2	3.9
Develop teaching strategies to discern and respond to individual students' numeracy learning needs within these areas	4.2	2.7

*Note:* \* Indicates mean scores on scale of 1 to 5 with 1 = low and 5 = high.

These results are pleasing for the first three aims and not surprising for the fourth aim in view of the fact that, as mentioned earlier, the course team had largely abandoned the idea of addressing this in any detail due to time and other constraints. In fact the rating for the extent to which the course had addressed teaching strategies to discern and respond to individual students' numeracy learning was surprising under the circumstances.

Members of the course team felt that personal numeracy skills had not been addressed adequately. One student made an excellent suggestion that the second and fourth aims could be addressed through an assignment where each person would consult a mathematics teacher at their school and ask to be fully tutored in a few areas of numeracy skills relevant to their subject area. They would then practise teaching these skills to the class. We may try a modified version of this in future. In 2000, we attempted to address the lack of attention to the fourth aim by focusing the extra two weeks of class time on this aspect and by inviting a teacher with recent experience in a school which places a high emphasis on numeracy across the curriculum to give two of the lectures. This teacher has also written a social studies textbook in which there is a high degree of numeracy demands and opportunities and similar materials for other areas.

### *Some Other Aspects*

In terms of the group presentations, which led to many favourable comments, students were asked to indicate the extent of their agreement with the following statement: "Preparing for and listening to the class presentation in this unit have stimulated my interest and learning in the area". Over half of the students strongly agreed or agreed with this statement, while less than 20% disagreed or strongly disagreed. Many students singled out the group presentations as the best aspect of the unit, although a number also stated that they were boring.

Overall the assessment for the unit was regarded favourably, with three quarters of the students strongly agreeing, or agreeing, with the statement that "The assessment for this unit is fair and assesses worthwhile aspects of the unit," and less than 5% disagreeing.

Although there was no question specifically addressing the issue of the placement of the unit in the course, many students commented in the evaluation or in conversation that they believed that this unit should have been in the first or second year of their course and not in the final semester of their fourth and final year. It would appear to be close to impossible for such a change to occur, although from 2004 the unit will be taken in third year.

Overall the student response was highly polarised. Many students wrote glowing comments and stated that they valued the unit greatly and student assignments were by and large of a high standard. However, other students clearly indicated their dislike for the unit and also possibly some of their underlying fears and prejudices towards numeracy in general. The most extreme response perhaps was from a student who had no expectations of the unit, believed that lectures, in general, are a joke and so never attended, didn't buy the reader because a friend bought it and told him not to bother, missed two weeks of the unit, and still had no idea of what numeracy was. Unfortunately, some other students echoed many of these sentiments.

Most members of the course team were highly enthusiastic about preparing and teaching the unit and found the opportunity for sharing ideas as part of the preparation a positive feature of their work. However, the fact that we found it so difficult to address, (far less achieve), the aim of helping students to develop

teaching strategies to discern and respond to individual students' numeracy learning, was disappointing. We need to work hard to address this issue in future.

## Discussion and Conclusions

Perhaps the most remarkable aspect of this unit from my point of view was the way in which it arose. Usually, it is quite difficult to allocate as much time as we would want for mathematics units in initial teacher education courses. The fact that the political issues surrounding literacy and numeracy and the sequence of events outlined earlier in this paper resulted in a unit for *all* students in the final year of their secondary teacher training course brought with it many new opportunities (and corresponding challenges) as well as some recognition that numeracy, like literacy, is in fact *everyone's business*.

One of the challenges presented by this unit arises from the fact that there is little evidence in secondary schools in general of a recognition of the need for all teachers to take responsibility for the development of pupils' numeracy skills – even the Numeracy Education Strategy Development Conference (1997) *Numeracy = everyone's business* recognised this as an ambitious goal. The fact that there are *some* teachers and *some* schools provides evidence at least at the existence level to add credibility to the unit's aims, and the number of cases is increasing.

While it was possible to identify many numeracy demands and opportunities in all of the subject areas, it soon became apparent that these demands and opportunities are very unevenly spread across the years of schooling and across the topics and themes being taught. Perhaps the most striking example to illustrate this came from the "Dance and Drama students". As part of their first written assignment and group presentations, several students produced highly complex examples of the numeracy demands and opportunities, particularly in the area of performance, where lighting, set design, movement on the stage, etcetera all play a significant part. However, students who, on their teaching practice, were involved mainly in teaching improvisation found it very difficult to find authentic examples of numeracy demands and opportunities. Many gave as their only example a graphical representation of changes of mood or pitch of voice, etcetera, against time over the course of an improvisation. Some of these students were quite resentful of what they saw as an attempt to force numeracy to play a part in their teaching, with one group presentation being a skit on the positive aspects of a drama lesson without numeracy, compared with negative aspects of the same lesson being taught by a teacher who insists on imposing numeracy on the class.

Similarly, there were clearly identifiable, high level, numeracy demands and opportunities in some of the year 12 English work on "issues", while at the same time students' attempts to find similar aspects in literature classes were usually contrived. It is perhaps the English work on "issues" which best exemplifies one of the ways in which the aim of developing teaching strategies to discern and respond to individual students' numeracy learning needs can best be addressed. One of the most striking discoveries (for me anyway) from taking this unit was the fact that many teachers in many subject areas when confronted with a piece of text or a table or graph which makes significant numeracy demands on students (and more

importantly themselves), often ignore these completely and just “skip over” them. As part of the unit, it was possible to illustrate how these examples are usually included by the author in order to significantly enhance the work and that by ignoring them teachers are not only losing opportunities for developing pupils’ numeracy but are also losing a great part of the meaning intended to be conveyed. Hopefully by placing more emphasis on such examples it will be possible to address some of the issues relating to students’ personal numeracy skills within a supportive and relevant context as well as to develop their teaching strategies to discern and respond to individual students’ numeracy learning.

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