MATHEMATICS IN THE NATIONAL CURRICULUM:
Opinions on the Draft Curriculum Statement for Mathematics Arising from the Achievement Initiative

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Overview: One of the objectives arising from 'The Achievement Initiative', a major Government educational policy for New Zealand schools announced in 1991, was the development of a national curriculum statement for mathematics. The resulting document, in draft form, was circulated to all schools. An indepth survey of opinion on the draft curriculum was then conducted with a sample of schools. Some key points from the survey were:

. Amongst the schools which responded, there was a high level of overall support for the draft curriculum statement and, therefore, little evidence that respondents saw a need for any substantial changes to be made;
. Secondary school respondents were more likely than those from primary schools to express concerns about aspects of the draft mathematics curriculum;
. Aims and objectives for mathematics - ie, the philosophy behind the proposed curriculum - gained the highest level of support of any aspect of the document;
. The time-consuming nature of the proposed assessment/evaluation process was seen as a problem by some; there were also concerns about how to implement the assessment/evaluation process and how to ensure comparability of standards;
. Some levels within some strands were thought to be too difficult, or inappropriate, for the students at whom they were directed;
. Expected teaching time for some strands was thought to be too great, especially if justice was to be done to all other strands which teachers were expected to cover;
. It was felt that the language used in the draft document could be considerably improved - for example, by removing use of 'jargon' and replacing it with everyday language familiar to teachers; it was also felt that the layout and presentation of the document could be improved to make it more accessible to practitioners;
. There was seen to be a need for more resources in the computing and other areas and a need for increased financial assistance for the purchase of resources;

. Respondents wanted opportunities to participate in teacher development and support activities relating to the teaching of mathematics as proposed within the draft curriculum statement;

. Results of the survey have been taken into account in the redrafting of the curriculum statement.

Introduction

In April 1991, 'The Achievement Initiative' was announced as the Government's key educational policy. In an article on The Achievement Initiative, published in the 16 April 1991 edition of The New Zealand Education Gazette, it was stated:

> 'With this policy, the Government has made a strong commitment to improving further the levels of achievement in New Zealand schools, and to ensuring a clear sense of direction for all involved in schooling.'

The article went on to describe the 'three main elements' of The Achievement Initiative as:

> '1. the establishing of clear achievement standards for all levels of compulsory schooling, first in the basic subjects of English, mathematics, science and technology, and later in other subjects;
> 2. the developing of national assessment procedures at key stages of schooling, by which the learning progress of all students can be monitored in those basic subjects;
> 3. the allocating of resources to schools to meet particular learning needs. These needs may be those of underachieving students, or those of students of exceptional ability. The allocation of resources to schools will include provision for teacher development programmes.' (p.1)

It was further stated that The Achievement Initiative '...is intended to strengthen the work of schools by giving an increased emphasis on continuity and progression in the curriculum'.

Part of the curriculum focus of The Achievement Initiative was to develop a national curriculum statement for mathematics. To aid the development process, copies of a

draft statement were distributed to schools to enable comprehensive consultation to occur before steps were taken to produce a final document for use in schools. All primary school teachers and all teachers of mathematics in secondary schools were sent a copy. Although this article focuses only on schools, the
Learning and Assessment Section of the Ministry's Policy Division also sought comment on the draft document from the wider community, including the industrial and commercial sector.

The Achievement Initiative in Mathematics was the first of the Achievement Initiatives to go to schools for comment.

The Draft Curriculum Statement

The document containing the draft curriculum statement lays out the general aims of mathematics education, the achievement aims of the mathematics curriculum, approaches

to teaching and learning in mathematics, and assessment and evaluation in mathematics. The document also outlines changes in emphasis from former curriculum statements.

The proposed curriculum is presented in six 'strands' - mathematical processes, number, measurement, geometry, patterns and algebra, and statistics - each reflecting one of the six main achievement aims of the curriculum. The strands are then divided into eight (or, in one instance, six) levels, with each level having its own achievement objectives, learning programme pointers, and exemplar assessment tasks.

Although all schools were invited by the Ministry of Education's Policy Division to send in - on an informal basis - comments about the draft document if they wished to do so, the Research Section of the Ministry of Education undertook to survey a random sample of schools in order to provide a more systematic means of gaining feedback on the draft curriculum. A questionnaire, designed for the purpose, was used for the survey.

Raw data resulting from the survey were presented to the document writing team in August of this year for them to be able to proceed with compilation of the final document. It is anticipated that the revised curriculum statement for juniors to form 4 students will be implemented in 1993 and for forms 5-7 students in 1994.

Following statement of the research objectives and a brief description of the methodology, this article provides a summary of the main findings from the questionnaires used to survey opinions in schools.

Research Aims and Objectives

The aim of the research was to obtain feedback from schools on the draft document Mathematics in the National Curriculum to assist in developing the final curriculum statement. More specifically, the objectives were:

(a) to determine the level of support for various aspects of the draft document and to obtain comments from respondents about the various aspects; and
(b) to establish how helpful (in terms of both content and format) the document was for the teaching of mathematics.

Method

In February 1992, a random sample of 251 primary schools and 121 secondary (including composite Composite schools (often also referred to as area
schools) are those which cater for junior right through to form 7 students.
) schools were sent
a questionnaire along with copies of the draft statement 'Mathematics in the National Curriculum'.

The questionnaire differed slightly depending on the type

of school for which it was intended. That is, while there were certain questions common to all recipients, in the sections dealing with the six strands of the proposed curriculum, the version for primary schools asked about levels 1 to 5 only, whereas the version for secondary schools asked only about levels 4 to 8. The questionnaire for composite schools included questions on all eight levels of each strand within the curriculum statement.

Schools were sent questionnaires well in advance of when feedback was required to give them time to consider the draft document and, if possible, to trial aspects of it prior to commenting. Because of the lengthy elapse of time, a prompt was sent closer to the due date to remind people about returning the questionnaire. In early July, a further reminder was sent to schools from which a

questionnaire had not been received. As well, in early August, primary schools were approached by telephone to increase the - at that stage - low return rate.

Respondents

Altogether, completed questionnaires were received from 162 primary schools and 88 secondary schools, giving a return rate of 65% for primary schools and 73% for secondary schools. A further 12 primary schools and four secondary schools returned questionnaires which had not been filled out These were returned by schools which stated that they did not have time to consider the draft curriculum in sufficient depth to be able to comment on it. Time constraints and pressure of work generally in schools may help explain the only modest response rate overall.
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In the instructions given in the questionnaires, it was requested that they be completed by the person responsible for the school's mathematics programme (primary level) or by the head of the mathematics department (secondary level) after discussion and consultation about the draft document with other (mathematics) teachers in the school. The majority of respondents - 142 primary and 86 secondary schools - reported that they had consulted with others. In the 142 primary schools where consultation had occurred, a total of 1,118 teachers were reportedly involved, and, in the case of the 86 secondary schools, a total of 761 teachers.

RESULTS

Schools - particularly primary schools - were generally very supportive of the draft curriculum statement in mathematics, with the majority indicating that they supported 'all or almost all aspects' or 'most aspects' Although only those who supported 'all or almost all
aspects' or 'most aspects' are reported in the tables presented in this report, the rating scale provided in the questionnaire also allowed respondents to indicate whether they supported 'about half of the aspects', 'some of the aspects', or 'few, if any, aspects'; respondents were also given the options of: 'have no opinion on aspects' or

'teachers' opinions [are] too diverse to be able to rate [this section of the document]'.
of
the draft document. However, as will be shown below, this

support was offset to some extent by a number of concerns about the document.

Support for the Background/Explanatory Sections of the Draft Document

Respondents were first asked to indicate their level of support for the sections of the draft curriculum which cover aims and objectives of mathematics, suggestions for approaching the teaching of mathematics, and the rationale behind the format of the proposed curriculum. The results are summarised in Table 1 below.

Aims of Mathematics Education and of the Mathematics Curriculum

Of all the sections listed in Table 1, 'General Aims of Mathematics Education' gained the greatest support, with 99% of primary schools and 95% of secondary school respondents giving this section a rating of either 'support all or almost all aspects' or 'support most aspects'. Each of the more specific 'Achievement Aims of the Mathematics Curriculum' were also given a high level of support by over 90% of both primary and secondary school respondents.

Table 1: Level of support for each of the background/explanatory sections of the draft document

	Primary		Secondary	
	Support all/ almost all	Support most	Support all/ almost all	Support most
General Aims of Mathematics Education	75.3	24.1	79.5	15.9
Achievement Aims of the Mathematics Curriculum				
. to participate in real mathematical situations	68.5	26.5	69.3	22.7
. to gain confidence and competence in the use of number	81.5	14.8	84.1	9.1
. to develop the skills of measurement	75.9	19.8	70.5	20.5
. to develop geometrical knowledge and skills associated with shape and space	72.2	22.2	77.3	13.6

. to generalise from patterns and
relationships71.625.372.720.5
. to manipulate data77.219.876.118.2

Approaches to Teaching and Learning in
Mathematics

. Problem solving67.327.848.935.2
. Catering for individual needs54.331.538.630.7
. Use of resources58.030.240.942.0

Assessment and Evaluation in
Mathematics45.136.434.136.4

Format and Presentation of Document

. Strands53.731.559.123.9
. Levels48.130.928.439.8
. Achievement objectives44.432.131.845.5
. Learning programme pointers43.834.036.438.6
. Exemplar assessment tasks37.033.329.539.8
. Development band45.731.545.529.5

Courses for Senior Secondary School--37.5
23.9

Number of schools 162 88

'Approaches to Teaching and Learning in Mathematics'

Compared to the results mentioned above, support for the different 'Approaches to Teaching and Learning in Mathematics' was less clear cut. For example, secondary schools were considerably less supportive than primary schools of the arguments put forward on the importance of

'catering for [the] individual needs [of all students]' (69% of secondary schools supported 'all or almost all' or 'most' aspects compared to 86% of primary schools who gave these ratings).

Some of the reasons given by (mainly secondary school) respondents for not supporting the philosophy of catering for individual needs more strongly was that more resources and teacher training would be required to implement such an approach, that smaller classes were essential to make this a possibility, and that tension would arise from trying to balance the needs of individual students with those of

Maori and female students.

Although a large majority of both primary and secondary school respondents supported the suggestions put forward under 'Use of Resources' for teaching and learning in mathematics (ie, that students be encouraged to use 'apparatus' in their mathematical studies, that 'technology' - such as computers and calculators - be readily available, and that teachers constantly re-evaluate the worth of available textbooks before using them in class), many schools also stressed the need for more financial assistance - in particular, for the purchase of computers and appropriate software, and also the need for more teacher training.

'Assessment and Evaluation in Mathematics'

Despite the finding that secondary and primary schools generally gave a high level of support to the 'Assessment and Evaluation in Mathematics' section, the level of support was lower than that given for most other aspects of the draft document listed in Table 1 (the exceptions were aspects of the section on 'Format and Presentation of [the] Document' and, in the case of secondary schools, the section on 'Courses for Senior Secondary School'). Respondents indicated a belief that the assessment/evaluation process would be very time-consuming and that staff training would be required to facilitate its implementation.

'Format and Presentation of the Document'

Relative to most of the other sections, both primary and secondary school respondents gave lower overall support to the 'Format and Presentation' section of the document. This is the section which explained why the proposed curriculum had been divided into 'strands' and 'levels' 'Strands' and 'levels' are explained in more detail on pages 9 to 11 of this article.

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described the purpose and format of the 'achievement objectives', and provided definitions of 'learning programme pointers', 'exemplar assessment tasks', and 'development bands'. Once again, the comments which were expressed crossed a wide spectrum. There were, however, some major themes evident.

The concepts of 'strands' and 'levels', in particular, were

found to be confusing and/or difficult by some respondents from both primary and secondary schools. There were also respondents who felt that some of the achievement objectives (for each strand/level) were too broad. Consequently, these respondents expressed concern about the nature of assessment and standards and about the difficulties that would be likely to occur when reporting on student progress to parents, given that the draft document suggests that '...in assessing students' progress, teachers will make judgments as to an individual's standard of achievement, and will include commentary on that standard when reporting to parents' (p.14).

Also, 'learning programme pointers' Although 'learning programme pointers' are not specifically defined, the draft document states that 'the activities and experiences which make up the pointers are drawn from the best contemporary practice, and are intended to help students reach the aims and achievement objectives of the mathematics curriculum' (p.15).
and 'exemplar assessment tasks' 'Exemplar assessment tasks' are illustrations of '...tasks that can be used to assess a full range of accomplishments. ... The suggestions include multiple assessment techniques including written, oral, and demonstration formats. Suggestions for group and team assessments are included' (p.15).
were perceived as being vague and in need of refinement by some respondents, as were 'development band' activities In relation to 'development bands', the draft document states that the intention of the development band at each level is to encourage teachers to offer broader and richer mathematical experiences to faster students. ... Development band activities aim either to extend and deepen students' understanding of a topic, or to introduce them to a whole new topic which would not otherwise be studied.' (p.16)
. (An example of respondents' confusion over what was intended by the latter is the statement from a number of respondents that they would like to see provision not only for acceleration but also for 'sideways development' in the development band activities - even though the document states that 'Faster students can be extended in their mathematical experience without necessarily accelerating them to a higher level, which for many students may itself limit the extent of their learning' (p.16).) Both primary and secondary school respondents felt there was a need to provide more examples of assessment tasks, that there should be more guidelines

and training provided for teachers to effectively carry out the proposed ideas, and that more resources were required. As for the 'Assessment and Evaluation in Mathematics' section, the time-consuming nature of the proposed suggestions for implementing the curriculum were mentioned by respondents from both the primary and secondary sectors.

Although not specifically asked to do so, as well as commenting on the specific aspects of the 'Format and Presentation' section discussed above, there were also respondents who commented at this point on their dislike of the overall format of the document, finding it difficult to follow It is of interest to note, however, that this sort of

response seemed to be more typical of respondents who had not had the opportunity to trial the draft curriculum statement in their school. (Over a third (38%) of primary schools and just over half (52%) of secondary schools had used at least some of the material detailed in the document.) In an article entitled 'Mathematics in the National Curriculum' contained in the 1 September 1992 issue of The New Zealand Education Gazette, it was stated that although 'the layout of the document was an issue for some respondents', those 'who had trialed part of the statement with their classes' later commented '...that, after having found the document initially forbidding, it was in fact quite easy to work with'. (p.1)
. For example:

'The format and presentation of the document from here on is very unhelpful, and unable to be implemented in its present form. For all the rhetoric of 'levels' and 'strands', schools are still in the situation of having to provide a 'third form programme' etc. This is definitely a retrograde step from the previous teachers guides (forms 3 and 4).'

'Courses for Senior Secondary School'

Respondents from secondary schools (this section was of course not relevant to primary schools) gave their lowest rating of support to the section of the draft document headed 'Courses for Senior Secondary School', with only 61% saying that they supported 'all or almost all' or 'most' aspects. Some respondents simply stated that the entire section was too brief and imprecise to be helpful while others stated that rather than having schools '...construct courses according to the particular needs of ... diverse

groups of students' (p. 17 of the draft document), there needed to be consistency in any national guidelines. Concern was also expressed about how the increased flexibility in courses designed for senior students, as proposed in the draft document, would fit with the National Certificate Qualification and other external examinations.

Support for the Strands and Levels of the Draft Curriculum Statement

The following sections concentrate on respondents' opinions about the actual content of the proposed curriculum. But prior to discussion of results, some background information on what is meant - according to the draft document - by 'strands' and 'levels' is provided.

The draft curriculum statement divides mathematics into six strands, namely: mathematical processes, number, measurement, geometry, patterns and algebra, and statistics. Each strand reflects a particular aim of the curriculum. The draft document, Mathematics in the National Curriculum, states that the '...division is a convenient way of categorising the outcomes for mathematics education in schools' and that '...the division does not

mean that mathematics is expected to be learned in disjoint "packages"' (p.13).

Each strand, other than 'number', is divided into eight levels, covering the mathematics curriculum from junior primary school through to the seventh form. The draft document points out that the division of the curriculum into these eight levels '...does not mean that there are eight well-identified stages, which learners must pass through in the development of mathematical understanding', but are more of a general guide (based on the judgement of experienced teachers as well as on research evidence) as to what might appropriately be introduced to students of a particular age/class level and what students overall might reasonably be expected to have mastered at a particular stage of their schooling. They also recognise that '...the effective learning of some ideas depends on a prior understanding of other ideas'.

The eight levels of each strand are intended to encourage flexibility, and an awareness that '...each learner is an individual whose learning development and rate of progress is different from others' and that '...different students will be ready for particular mathematical content and

experiences at different times' (p.14). The draft document goes on to state:

'The levels are not meant to be interpreted as the rungs of a ladder which is to be climbed as quickly as possible. Nor are they meant to be interpreted as hurdles over which each student must pass before moving to any new work. Rather, they are meant to focus the mathematics programmes of schools in a consistent way. They provide a basis for reporting students' achievements to parents in a way that is clear and demonstrates progression in learning.' (p.14)

Figure 1 This figure was prepared by Dawn Barry of Learning Media for inclusion in the redrafted curriculum statement. Permission to reproduce the figure for the purposes of this article is gratefully acknowledged.
below depicts the levels and their general relationship to school years.

Figure 1: The levels and their general relationship to school years

Each level of each strand other than 'mathematical processes' is divided into achievement objectives, learning programme pointers, exemplar assessment tasks, and exemplar development band activities. Mathematical processes has the first three divisions only In the draft document it is explained that: 'As the

objectives of the mathematical processes strand are not to be studied independently of the content of the other strands, no development band exemplars are provided for it. The development band exemplars attached to the other strands assume competence in mathematical processes at the relevant level.' (p.17)
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In the following sections, the main points from respondents' comments about each strand of the draft curriculum statement are outlined. Because there were very few consistent trends or patterns in respondents' ratings of aspects of each level of each strand - other than that, overall, support was at a high level - the rating scale data have been presented in tables (Tables A1 - A6) In relation to the appendix tables, it should be noted
that because of the varying nature of schools - eg, that some cater for students in forms 3-7 while others cater for students from form 1 through to form 7 - difficulties arose in obtaining a base number from which to calculate percentages for responses relating to each level of each strand - ie, because not all levels were relevant to particular schools. In addition, some respondents omitted to give ratings and/or comments for all aspects - as listed in the questionnaire - of each level. It was, therefore, decided that if a given respondent had made even one response in relation to an aspect of a level, then they would be included in the calculations for that level, even though they may have omitted to answer all the other items pertaining to that level.
in an
appendix to this article, rather than in the text itself.

'Mathematical Processes'

Comments regarding 'mathematical processes' varied between primary and secondary school It should also be noted that, in the discussion of
results relating to the strands within the document, the category of 'secondary schools' does not include the 14 composite schools which were surveyed; however, when data from these schools were analysed, it was found that the views expressed were similar in nature to those expressed by respondents from secondary schools.
respondents.

An important concern expressed by primary school respondents was that concerning the presentation of mathematical processes, with some feeling that there was too much repetition, too much use of jargon, and

unnecessary padding. In addition, while some felt that

individual levels were well conceived - some especially approving of the fact that they fitted in well with the Beginning School Mathematics (BSM) Beginning School Mathematics (BSM) is a New Zealand
Ministry of Education (formerly Department of Education) resource which supports the teaching of mathematics in primary schools. BSM replaced the previous main resource, Mathematics in Infant Classes (published in 1963), and has been widely used in New Zealand primary schools since 1987. (It is presently also being trialed in a number of schools in Michigan, USA). Consisting of 12 stages or cycles, the resource is designed for use during the three years of the junior mathematics programme.
resource - others felt
that certain levels, in particular level 1, would be too difficult for most of the students for whom they were intended. Many of the exemplar assessment tasks given for levels 1 through 5 were also perceived by some to be too difficult for most students.

Although the draft document states that 'It is not intended that the Mathematical Processes strand will be taught in isolation from the other major content areas of mathematics' (p.18), at the secondary school level, some respondents nevertheless stated that they felt that mathematical processes should be integrated into other strands. The need for more resources - in particular, computers - was also mentioned by some secondary respondents, as were concerns about whether many students would be able to cope - both in terms of ability and/or social skills - with the group approach to the study of mathematical processes advocated in the curriculum statement. As well, there were a few respondents who considered that levels 6, 7, and 8 of mathematical processes would be too time-consuming to implement.

Data regarding the proportion of respondents who supported 'all or almost all' or 'most' aspects of each level of the mathematical processes strand are presented in Table A1 on page 21.

'Number'

Comments from primary school respondents regarding 'number' were varied. Although some respondents felt that it was good that there was an emphasis on the concept of number, a larger number of respondents felt that the objectives and

tasks involved would be too difficult for most students, particularly those proposed at levels 1, 2, and 3. Particular concern was expressed about the introduction of decimals at levels 2 and 3. A small number of respondents questioned the suggested use of calculators at level 1, both because calculators are not used in BSM and because they are costly items to provide. Also questioned by a small number of respondents from primary schools was the use of Maori terminology at levels 1 and 2, although there were others who expressed approval of its inclusion.

Overall, respondents from secondary schools made fewer comments with regard to number than did primary school

respondents. Of those from secondary schools who did comment, a few in each case felt that number needed to be developed further, that more examples needed to be provided, and that number should be extended to levels 7 and 8. Some concern was also expressed about the appropriateness of teaching fractions, especially at levels 5 and 6.

For further information on 'number', refer to Table A2 (p.22).

'Measurement' In the questionnaire for both primary and secondary schools, the 'Measurement' strand was referred to as 'Measurement (and Calculus)'.

Diverse concerns were expressed by primary school respondents with regard to 'measurement'. While some felt positively about individual levels within the measurement strand - for example, how they related to the everyday world and provided students with practical, hands-on experience, and how well they (but particularly level 1) fitted in with the BSM resource - others felt that the concepts introduced at certain levels would be too difficult for most students. Respondents gave as examples the proposed objective of children being able to 'read analogue time to the nearest quarter hour' (level 1), being able to 'read time and know the units of time - minutes, hour, day, week, month and year' (level 2), and 'area' (level 3). Some respondents felt that certain tasks suggested in the document were impractical and also questioned their purpose and/or value. One such example was the emphasis in the draft curriculum on analogue time at level 1 when, respondents believed, children at this level are much more likely to use digital time.

Concerns expressed by respondents from secondary schools in connection with 'measurement' included the feeling that the time and cost involved in the teaching/learning process was too high, that the objectives were aiming too high, and that proposed content was too difficult, especially at levels 4, 5, and 6. Secondary school respondents also expressed concern about including measurement of qualitative data at level 4, some because they felt students would find it too difficult and others because they felt it did not have relevance in a practical sense at this level.

Data on level of support for aspects of the measurement strand are given in Table A3.

'Geometry'

While comments about the 'geometry' strand covered a wide range of views, a recurrent theme amongst those made by secondary school respondents was that there was a need for more resources in order to do justice to the proposed curriculum, and a corresponding need for increased financial assistance to help provide necessary resources,

particularly computer hardware and software. Respondents also stressed the desirability of providing opportunities for staff development in the teaching of geometry, especially at level 8.

Concern about content was evident for each level of the geometry strand, with some respondents expressing concern about the appropriateness of the level of work - citing such examples as having children make three-dimensional shapes at level 1 and, at level 2, requiring children to translate two-dimensional drawings into three-dimensional models and vice-versa - and others questioning the practicality, purpose, or value of specific objectives and/or activities. The comment which follows typifies the concern expressed about difficulty level within the geometry strand.

'Students need a conceptual development in geometry. Many of the concepts are introduced before the students have these abilities.'

There were also respondents from both primary and secondary schools who felt that the teaching of geometry, as outlined in the draft document, would be too

time-consuming. (Refer also Table A4.)

'Patterns and Algebra'

As for the 'geometry' strand, some respondents expressed concern about the appropriateness of content and degree of difficulty at various levels of the 'patterns and algebra' strand. For example, some primary respondents felt that the level of language comprehension required at level 1 was too high for students who are not yet able to write, while others considered that expecting students at level 2 to '...determine and record as many ways as possible to show a particular number, for example, 16 = 4 x 4 = 2 x 2 + 12 = ...' was too ambitious an aim. As well, amongst secondary respondents, there were a number who felt that including matrices at level 5 (although exploration of these was suggested only as a development band activity) and quadratic equations at level 6 was inappropriate.

The suggested use of calculators for the study of patterns and algebra at levels 1 and 2 was again questioned (for the same reasons as those given in connection with the number strand); concern was also expressed by primary level respondents at the use of jargon and at the lack of clarity in describing certain aspects of the requirements within each level.

A few secondary school respondents stressed the need for more computers and software for students studying level 8 patterns and algebra. (Table A5.)

'Statistics'

The main concern that respondents overall seemed to have

about the 'statistics' strand was that it was too complex, and that some concepts - such as 'stem and leaf' graphs at level 2, probability at level 4, and 'box and whisker' plots at level 5 - were introduced too soon. A small number of respondents felt that the normal distribution should be included at level 7 (they appeared to have missed specific mention of the normal distribution in the achievement objectives for level 7) and that procedures such as the non-parametric test chi square (included in the draft document under the development band for level 7) and Student's t probability distribution (included under the development band suggestions for level 8) should both be specifically studied at level 8.

Some primary school respondents felt that there were items which were unclear; the achievement objectives for level 1 were one example.

As for other strands, some secondary respondents again mentioned the need for more resources, including ideas and guidelines to help teachers in the planning and delivery of statistics lessons.

Lastly, according to some respondents, the teaching of the statistics strand would require more time than that allocated by the overall framework of the draft curriculum. (Table A6.)

Views on the Achievement Objectives for Mathematics as Stated in the Draft Curriculum Statement

The questionnaire listed a series of statements concerning the 'achievement objectives for mathematics'. Respondents were asked to tick all of the statements that they agreed with. The results are presented in Table 2.

Evidence of concern about the curriculum was once again higher amongst secondary than primary school respondents.

Considerable proportions of respondents (28% of primary and 48% of secondary) felt that the achievement objectives for specific levels were wrongly placed. The range of objectives identified by schools as being at the wrong level was diverse, with many of these being mentioned by only one school. A detailed list was nevertheless passed on to the curriculum writing team for their consideration.

A sizeable proportion (25%) of secondary school respondents also considered that some achievement objectives should, for a variety of reasons, have been left out. Again, the range of particular objectives specified was diverse.

Table 2: Respondents' views on the appropriateness of the

achievement objectives for mathematics

There are achievement objectives which...	Primary %	Secondary %
...are at the wrong level	27.8	47.7
...are in the wrong strand	8.0	13.6
...have been left out	8.0	25.0
...should not be there at all	9.3	12.5
Number of schools	162	88

Helpfulness of Each Aspect in the Draft Document

In general, it was evident that the majority of schools found most aspects of the draft document to be either 'very helpful' or 'helpful' (Table 3). As can be seen from the table, the glossary provided in the document was a notable example, especially in the case of primary school respondents. However, it was also clear that there were some problems experienced with the layout of the document, with less than half (44%) of secondary school and just over half (56%) of primary school respondents giving ratings of either 'very helpful' or 'helpful'. Such a finding (see also comments on page 9 of this article) has important implications for the format and presentation of this and other final documents if curriculum statements are to be utilised to their full potential. A number of respondents made suggestions for making the presentation of the document more 'user-friendly', for example, by including illustrations, flow charts, and diagrams and by colour-coding the different strands and levels.

Table 3: Respondents' views on how helpful specified aspects of the draft document were

Aspects of the draft document	Primary Very helpful	Secondary Very helpful	helpful

helpful
% % % %

The programme pointers for planning

programmes27.250.619.354.5

The exemplar assessment tasks25.945.121.6
53.4

The exemplar development band
activities22.853.715.953.4

The glossary50.634.628.440.9

The layout of the document21.634.615.928.4

Number of schools 162 88

Summary and Conclusions

In summing up, it was clear that respondents - particularly those from primary schools - were generally very supportive of the draft document Mathematics in the National Curriculum. However, although support was high, this was offset to some extent by a number of concerns. Chief amongst these concerns was the need for more resources to help implement the curriculum, the need for increased financial assistance for the purchase of resources (notably, computer hardware and software), and the need for increased opportunities for staff development and training, particularly in the assessment/evaluation area.

Another concern related to the vocabulary used in the draft document - that it was too complex, too 'wordy', and that it used too much 'jargon' and other language either not familiar or not in common usage amongst (mathematics) teachers in New Zealand schools.

Further concerns were those related to the time that would be involved in teaching some strands of the proposed curriculum and to the time-consuming nature of the suggested assessment/evaluation process.

There were respondents, too, who felt that some of the objectives, concepts, and activities proposed for certain levels within each strand of the draft curriculum were too difficult, or in some other way inappropriate, for the

students for whom they were intended. This finding has a number of possible explanations. One is that the writing team may not always have assessed levels of difficulty (etc) correctly; another is that teachers who operate under tight time constraints (including the time limit imposed by the consultation exercise itself), and who have to balance many competing duties, may not always have been able to consider the draft curriculum statement in all its aspects in as much depth as they would have liked; while still another is that of the possibility that the beliefs and expectations that many practising teachers have about their students' abilities are not always appropriate. There is research evidence which seems to give some support to the latter idea. Lindale and Biddulph (1991), for example, in

their study of the way in which use of calculators may contribute to children's development of numeracy, stated that:

> '...teachers who collected the data [for the study] came to the conclusion that their former teaching practices in mathematics had inadvertently placed a low, artificial ceiling on children's learning in this subject.' (p.151)

Such findings suggest a need for teacher development and support opportunities - something which a considerable number of respondents to the present survey clearly recognised and wanted in any case. It is a need also recognised by the Ministry of Education. That is, in the New Zealand Education Gazette of 15 October 1992 (p.1), the ministry states:

> 'The provision of a curriculum statement is only one step in the implementation of a new curriculum. Teachers need time, support and information to assist them to identify and make any changes to their teaching practice needed to effectively implement the new curriculum statements within their classrooms.'

The ministry further states that, because of the importance of enabling teachers to implement the curriculum:

> 'During each of the next three years, a number of contract teacher development programmes will run throughout the country. These programmes will support mathematics and science in 1993 [and, as new curriculum statements are completed, other

subjects]. The programmes will run for a minimum of six weeks [and will] provide for professional input and reflection, and time for teachers to try out some strategies or ideas within their classrooms.'

In conclusion, it can be said that surveying schools for opinions on the draft curriculum statement in mathematics has resulted in some valuable feedback. Not only has the exercise provided confirmation of the importance of affording opportunities for teacher development and support as an integral part of a curriculum exercise, but has indicated a number of ways that the draft statement could be improved. As a consequence, those working to redraft the curriculum statement are making '...some adjustments of detail and layout ... in response to the most common concerns' From The New Zealand Education Gazette, 1 September 1992.
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Special thanks are due to all the teachers who contributed considerable time and effort to providing valuable feedback about the draft curriculum statement in mathematics. Their input is gratefully acknowledged.