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The Co-ordinator
Draft Curriculum Feedback
Ministry of Education
PO Box 1666
Thorndon
WELLINGTON

Dear Sir/Madam

DRAFT MATHEMATICS CURRICULUM

Thank you for the opportunity to comment on the new draft curriculum.

We have attached detailed comments on a number of aspects of the draft Mathematics curriculum. Our Mathematics Faculty comprises many experienced teachers and all are in full agreement with the comments in this submission.

We would like to stress the need for the next tier of information setting out in more detail what we are required to teach for each of the objectives. This is particularly important for beginning teachers, teachers new to New Zealand and for teachers in small schools with small departments. We suggest the development of material similar to the Ideas booklets published by the Department of Education prior to the last curriculum review.

Successful implementation of the new curriculum will be dependent on the opportunity for professional development. This will give teachers the opportunity to understand the thinking behind the changes being promoted.

Yours faithfully

Valerie Smith
Head of Mathematics

Sally Kerr
Assistant Head of Mathematics

Margaret Clarke

Margaret Craigie

Ron Gibbard

Margaret Knight

Sue Staples

CURRICULUM REVIEW OF THE PROBABILITY AND STATISTICS STRAND LEVEL 3 TO LEVEL 8

General Comments

- There is an assumption that everyone understand and agrees on the meaning of the language used in this section
- The statistical literacy section will require more clarification and in the later levels access to appropriate resources
- The Venn diagram proportions indicate more time is to be spent on this topic especially at Level 5/6. What implication has this for NCEA Level 1 programme?
- Professional Development will have to increase markedly to upskill teachers in the new concepts, particularly statistical literacy.
- Very unclear on what is actually to be taught – too much jargon and too little detail

Specific Comments

Level 3

- The Statistical Enquiry Cycle needs further explanation

What is 'multi-variate category data'?

What is meant by 'between data sets' male v female?

Level 4

- The Statistical Enquiry Cycle again needs further clarification

What is meant by 'selecting the data collection methods to be used'? Sampling techniques?

- Further clarification is needed on 'detect patterns, variation, relationships and trends'. What is expected at this level?

- Statistical Literacy – clarification on

'implication of data displays'

'possible causes of variation'

- Probability: clarification on

'unreasonable sample variation – don't agree with word unreasonable! We would prefer 'unexpected'

Level 5

Statistical Enquiry Cycle needs clarification

- Why consider **sources of variation** second to choosing the variables and selecting measures?
- What is meant by 'cleaning data'?

- This approach seems to require a high level of literacy; are verbal responses to be considered at NCEA testing.

Probability

- Don't like the word ratios in probability
- What is a reasonable range from trial data?
- Does multi-stage imply tree diagrams and 2 way tables? We would like to see these two areas included.

Level 6

Stats Investigation

- Clarification on justifying attributes and measures selected
- Why create multiple displays. We would like the word appropriate rather than multiple.

Literacy

- Easy access to resources needed from the media so as not to be a burden on teacher time!

Level 7

More clarification is needed on the meaning and understanding of the following:

- Exploratory data analysis
- The aspect of sample size: Often in the past this has been contentious and needs a clearer explanation for all teachers.

Stats Literacy: Explain

- Risk and relative risk?
- Identifying non-sampling errors

Level 8

- Is the statistical knowledge gained at this level enough for what is required in other subjects at this level ie Biology Economics. We would like to see some relationship to other subjects.
- Like to see Hypothesis testing returned to this course.

Clarification needed:

- Define experimental design principles
- Sources of variation

- Randomisation? As a method to assess strength of evidence. Do you mean dealing with residuals? If this is the case is exponential / power modelling still in the course?
- Which subject domain lines up with level 8 in terms of University Entrance.

Comments on the New Curriculum Draft Document

Mathematics

Levels 3-6 Number and Algebra

The content listed appears not to address the issues of the 'overcrowded curriculum'.

There is no indication of the depth required. More information is needed.

Concern that this document will be of limited use to new teachers or to teachers new to New Zealand. Much more detail is needed at the next tier.

Concern at the amount of jargon – much of which is not available anywhere for reference if we want clarification.

Level 3

Unclear Terminology: e.g. Partitioned and Combined additively - what does this mean?

Level 4

Further explanation needed of the references to:
Ratios, simple proportional strategies, partitioned and combined multiplicatively

Level 5

Introduces Factorials – This is new at this level. Are resources being made available?

Unclear Terminology: please clarify - 'simple exponential relationships',
'generalise the number properties...'

Level 6

New at this level:
Introduces irrational numbers, inequations, comparing the structure of expressions, rules for exponential relationships, rules for exponential equations – these need much more clarification.

Unclear terminology:
Scaling (in this context), converting between quantities and units, comparing the structure of expressions.

Comments on the New Curriculum

Mathematics Levels 5 and 6

Our comments are based on the understanding that all the content needs to be covered for those doing Achievements Standards for NCEA Level 1 and also with the view that we are preparing students for Years 12 and 13.

In general, we believe that there is too much material. There may be less objectives than the current curriculum, but they cover more topics. The objectives are very general, but we do note for example that “classify numbers as whole, real, integer and irrational” is mentioned specifically. This is a very specific objective. So there is an apparent lack of consistency.

Number – All material is included. We note that standard form is not mentioned specifically.

Algebra

- What does “record and interpret proportional strategies represented by words, diagrams and symbols” mean?
- We are concerned that there is a big gap between Levels 4 and 5 particularly “manipulate simple expressions” and we need to know exactly what is intended. Does this include, for example, simplify, factorise and expand, evaluate (substitution)
- Is $x^2 + 2x = 3$ “simple” at Level 6. What about $2x^2 + 7x + 3$?
- We recommend pushing more of the formal algebra back to Level 5 and Level 4.
- We are concerned about Graphs. At Level 4 there are linear only, but at Level 5 there are linear, quadratic and simple exponential.
- We assume that “relate rate of change to gradient” (Level 6) is for linear graphs only. We recommend that this should be included in linear graphs for Level 5.

Measurement and Geometry

- We note that circles are not mentioned specifically anywhere in Levels 3, 4 or 5 but then spheres, cones, etc appear at Level 6.
- At Level 4 mention is made of rectangle and cuboids only. We recommend the triangles, parallelograms, trapeziums, circles and other prisms be included. All these shapes are implied at Level 5 (except circles).
- Level 5 includes conversion of units, but some should be done at Level 4.
- At Level 6 properties of similar shapes is not mentioned specifically. Is this implied in the objective of Transformations?

Statistics and Probability

- What is meant by “cleaning data” (Level 5)?
- What is meant by “quantifying reasonable ranges for sample variation from trial data” at Level 5?

- We need some good models to use for long run trials – not just dice, spinners, cards, etc which have equally likely outcomes.
- We note that “using a range of random sampling techniques” is now at Level 6 (not 7).
- At Level 6 is the use of probability trees implied?
- What is meant by “estimating population parameters” (Level 6)?
- At Level 6 simulation is not mentioned nor is simple conditional probability. Does this mean the Achievement Standard will be altered to bring it in line with the curriculum?

Mathematics Level 7

We would like to see the relationship between integrals and area included under Calculus.

We note that the Probability objective includes more formal probability knowledge and that there is no mention of simulation. Is this what is intended?

Mathematics Level 8

At Level 8 we need clarification of where the objectives fit into Mathematics with Calculus or Statistics and Modelling. Otherwise we will be tempted to teach to NCEA criteria. We note that developing network diagrams is new. Where is it intended to include this in the examinations?

We note that under Equations and Expressions there is no mention of Factor Theorem or Binomial Expansions. Is this intended?

The Calculus objectives need reworking. For example, numerical methods really only apply to integration and forming and using differential equations is really part of integrating techniques.