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Response to The New Zealand Curriculum: Draft for consultation 2006

New Zealand Council for Educational Research



NEW ZEALAND COUNCIL FOR EDUCATIONAL RESEARCH

TE RŪNANGA O AOTEAROA MŌ TE RANGAHAU I TE MĀTAURANGA

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Introduction

The New Zealand Council for Educational Research is an independent educational research organisation with an international reputation for producing quality educational research and research-based resources. The contributors to this response collectively have deep understanding of current educational issues and initiatives. Individually they have been involved in a combination of some or all of the following:

- They have worked closely with schools and classroom teachers;
- They have been involved in research about educational issues;
- They have contributed to current educational initiatives and futures thinking; and/or
- They have classroom teaching experience.

NZCER supports the:

- general tenor of the draft NZ curriculum document;
- bringing together of all aspects of the curriculum in one document;
- inclusion of the Key Competencies; and
- reduction of Achievement Objectives in many of the curriculum areas.

This submission focuses on the areas we consider need more clarity. We have organised this submission under some of the headings suggested on the feedback questionnaire located at the end of the document. Firstly this submission addresses some of the big picture issues about the draft curriculum document. Secondly, specific comments about some of the learning areas are included.

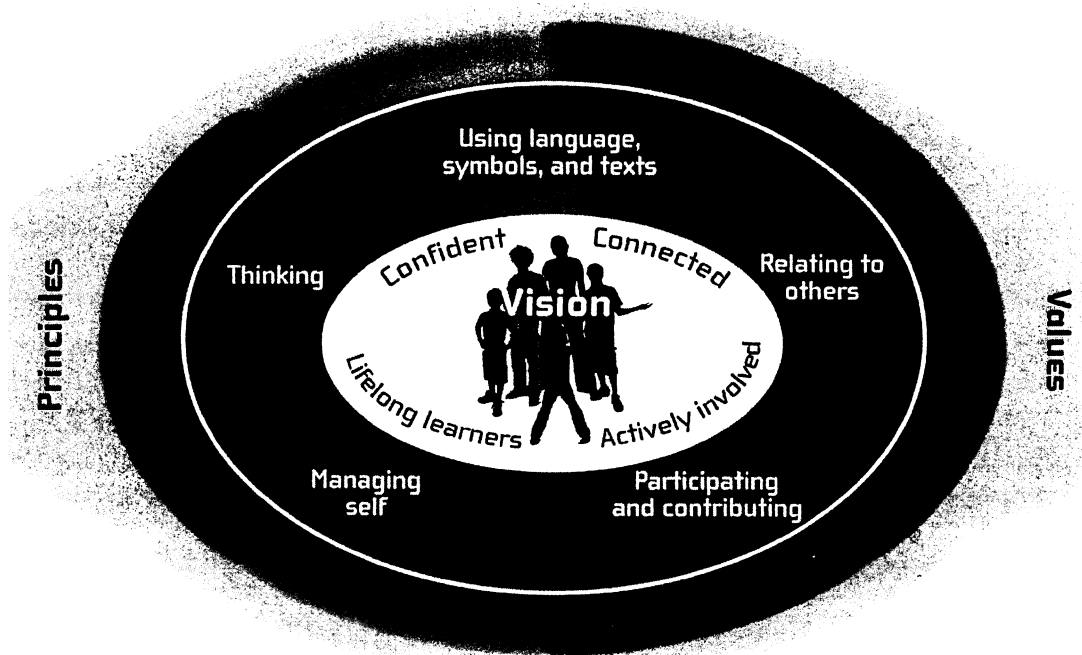
Questions 3, 7, 8: Intent and direction

Underpinning rationale

Within the education sector there are differing ideas about the purpose of a curriculum document. In the draft document there is no clarification of why this is an important document, and what its purpose is.

In addition, the draft curriculum does not give a coherent message about priorities. Is the priority literacy and numeracy or development of the Key Competencies (KCs), or addressing both alongside each other?

The visual representations in this document give messages about priorities. The diagram below (from page 7) suggests that the KCs are at the heart of the curriculum with the learning areas surrounding them.



Other sections of the document give a different message. For example, the “Planning for coherent pathways” (pages 32-33) is mostly about literacy and numeracy (and achievement in relation to these areas).

We need to decide whether the focus of the curriculum is on learning to learn, or on raising achievement, or on both. This document appears to be trying to encourage both but hasn’t made a clear statement about priorities or intentions.

Recommendations

1. The document needs to include a rationale statement that clearly identifies whether the priority is learning to learn, raising achievement, or both.
2. Diagrams need to clearly reflect the documents' priorities, and, if aspects are interwoven, this needs to be visually represented.
3. More verbal text explaining diagrams is necessary.

Coherence

At the moment the document reads as if different groups have written each of the introductory sections (e.g., "Vision", "Principles", and "Values"). These three sections do not flow coherently from one to the other, and there are inconsistencies and a lack of inter-weaving between sections. For example, equity is defined in two different ways on pages 9 and 10. Definitions also need to be consistent with, or refer to, current legislation (e.g., The Human Rights Act 1993). The statements about equity, for example, do not refer to gender or ethnicity.

Some important areas are missing. Although the Treaty of Waitangi is implicit in some of the statements, there is no reference to it explicitly. Its omission means there is no backup for schools who are challenged by stakeholders for putting in place processes for meeting Treaty obligations, nor is there a statement that requires schools to do so. The principle about "Cultural Heritage" does not value New Zealand's bicultural heritage strongly enough.

The subheadings under "Principles" are not principles; they are the concepts on which the principle is based.

Recommendations

4. The inconsistencies are removed or these introductory sections are combined into one section.
5. The Treaty of Waitangi is explicitly mentioned.
6. The principle about "Cultural heritage" is reworded to put more value on biculturalism for all New Zealanders. For example:

"All students experience a curriculum that **values** New Zealand's bicultural heritage and its multicultural society. Students who identify as Māori have the opportunity to experience a curriculum that is **grounded** in te ao Māori."

Inconsistent messages are also apparent between the sections on "Effective pedagogy", "Planning with a focus on outcomes", "Planning for the development of the key competencies", and "Planning for purposely assessment". One example is the "Planning for coherent pathways" section (pages 32-33) which is mostly about literacy and numeracy. It does not address other aspects of learning such as the rich opportunities schools can give students to develop a broad

range of interests and competencies such as social and cultural understanding, teamwork, planning, physical, social and leadership skills. This section currently focuses on literacy and numeracy outcomes and does not do justice to the possible complexity of KC outcomes. Similarly, some sections have messages about real-life contexts and challenges (e.g., “Designing a school curriculum”, p.26) but setting up situations such as these is not part of the “Effective pedagogy” section.

Recommendation

7. If one of the key rationales for the document is a focus on learning to learn, then how this impacts on all the other sections needs to be considered so that a consistency of message is promoted.

Coherence of messages about curriculum approaches

There is a thread running through the curriculum that suggests that curriculum integration around significant themes is the preferred option. If this is the case, should it be stated more explicitly? For example, a statement on page 26 reads, “different schools will organise their learning programme in different ways. Some will integrate.... others will organise by learning areas....”

This implies that schools have the flexibility to choose between curriculum integration and separation. But this section continues on to note that “the knowledge skills and attitudes that students need for addressing real-life issues and real-life contexts are seldom found within a single learning area” Similarly, “significant themes offer schools opportunities for engaging students and integrating learning across the KC and the different LA”

The underpinning message appears to be: “We want you to integrate” rather than “Decide for yourself”.

Recommendation

8. If there are preferred curriculum approaches, then these are stated explicitly and a rationale given.

Pedagogy

This section is so watered down that it does not provide any guidance for teachers about their teaching practice. Are changes in practice expected? The messages about pedagogy are not comprehensive. For example, no direct reference to the *Best Evidence Syntheses (BES)* are made, although the findings seem to be partly underpinning this section.

Recommendation

9. Redraft this section, making reference to *Best Evidence Syntheses* (Alton-Lee, 2003)
10. Provide second tier material that gives clear direction to teachers about what their teaching practice should look like, supported by examples.

Key Competencies

NZCER considers the Key Competencies (KCs) to be a valuable addition to the curriculum document. We are heartened to see that no attempt has been made to try and develop levels of achievement for the KCs. The diagram showing cross-sector alignment (page 33) is important to demonstrate continuity of the KCs throughout a student's education.

We consider that *Using language, symbols, and texts* should have some explicit reference to critical literacy. The fact that language can be used for different purposes and that we use it differently for different audiences is part of literacy understanding.

There are some useful statements about using ICT throughout the document. However, the statement in the KCs section (page 12) places emphasis on communication and accessing information without reference to using ICT to manipulate information or create new knowledge.

Recommendations

11. Make explicit connections to the work in multiliteracies and critical literacy by people like Cope and Kalantzis (1995), Gee (1992), Kress (1990), Lankshear and Knobel (2003), and Luke and Freebody (1997).
12. Add to the statement on page 12:

“They use ICT confidently to overcome barriers, to communication, access information, [and] interact with others, and... **enhance their learning.**”

Planning for Purposeful Assessment

In the section “Planning for purposeful assessment” there is no explicit mention of classroom assessment. This perpetuates a notion, that many teachers still retain, that assessment is formal testing. The diagram (page 31) doesn't give the message that “Information for learning” is the central reason for assessment. It provides a hierarchical picture, with “Information for stewardship” being the foundation. It does not show the relationships between the different purposes.

Recommendations

13. Insert a subheading “**Classroom assessment**” above “School-wide assessment”, followed by a brief statement about its importance.
14. The diagram on page 31 should place “Information for learning” in a central position and show how the other purposes are related to the central purpose. A two dimensional diagram probably shows this better than the existing three-dimensional one. An alternative is to include a brief explanation of the intention of the diagram.

Question 4: Overall clarity (Order of contents and layout)

For the purposes of continuity, the placement of each section of the document needs to be reviewed and in particular the location of the sections on “Learning Areas” (pages 14-23).

Some aspects of the layout could be improved to assist the reader. For example, it is difficult to identify the levels on the fold-out pages.

Teachers may not recognise that, at the primary levels, the science achievement levels apply over four rather than two years.

Recommendations

15. The sections on “Learning Areas” (pages 14-23) need to be located next to the “Achievement objectives by level” (Page 34).
16. To support ease of viewing include the curriculum level on each of the fold-out Achievement Objective pages.
17. Clearly indicate that the science achievement objectives are the same at Levels 1 and 2, and at Levels 3 and 4.

There is inconsistency regarding Achievement Aims. In some learning areas they seem to be subsumed in the essence statement, while in others, for example science, they appear on the accompanying charts “Achievement Objectives by Learning Area”, although not in the curriculum document. In those areas that do have Achievement Aims, some are explicitly presented, for example in science, while others, such as Social Studies, they are just a statement at the top of the page.

The Achievement Aims are important because they provide a clear indication for teachers of the final outcomes that curriculum writers had in mind, and so contribute to coherence.

Recommendation

18. The Achievement Aims should be visible, and in a consistent format across learning areas.

Questions 9 and 10: Learning area descriptions and Statements of outcomes

Achievement objectives by levels

While the use of levels was a given for the draft curriculum, their presence needs to be the subject of debate. They are unhelpful for some curriculum areas. This has been demonstrated in English, for example, where an attempt has been made to further unpack vague markers such as “understanding” (Level 3) and “understanding and appreciation” (Level 4). These sorts of progressions fail to take into account the importance of the effect of context and task complexity in students’ ability to operate at a “level”.

English, science, and mathematics

Feedback specific to these learning areas follows on separate pages.

English

“Why study English?” paragraph 3. “By studying English, students gain an appreciation of the heritage of English literature and of literature available in translation. In this way, English contributes to each student’s developing sense of identity and of their place in the world.”

There is a danger that “English literature and the literature available in translation” will be interpreted as just the European canon. Such an interpretation will limit our thinking about the forms the English language takes, since it suggests there is only one “correct” form of English usage.

Recommendations

19. The statement needs to make reference to the range of literacies practised, their viability, and transformative potential, if studying English is to make an authentic contribution to “each student’s developing sense of identity and their place in the world.”
20. Explicit connections need to be made to the work in multiliteracies and critical literacy by people like Cope and Kalantzis (1995), Gee (1992), Kress (1990), Lankshear and Knobel (2003), and Luke and Freebody (1997).

Science

Making explicit how the KCs can be addressed in science will be helpful to teachers, and is an area that other learning areas could consider.

Levels 3 and 4, Material World, Particles, states, “Begin to develop an understanding of the interaction of particles in phase changes and chemical reactions.”

Primary school teachers, many of whom have a limited science background, are likely to be more familiar with the term “changes of state” than “phase changes” Especially at primary levels there is a well documented need to encourage generalist teachers to teach science (for example, Hipkins and English, 2000). The terminology used here does not do that.

Recommendation

21. Change this statement to:

Begin to develop an understanding of the interaction of particles in **changes of state** and chemical reactions.

Maths

Our submissions on mathematics only cover Levels 1 through 6 of the curriculum, as this is the area in which we have considerable expertise. This has been built up through extensive testing with small, medium, and large scale assessment projects, as well as a number of research projects in mathematics education. Our comments are restricted to the *Learning Areas* and to the *Achievement Objectives by Levels*.

The direction of the new curriculum has much to admire. The joining together of strands is pleasing, and will help make the connections between different areas of mathematics become clearer. For example, *Measurement* fits well with *Geometry*, but also has strong links to *Statistics*. Statistics uses measurement data, and all measurement is subject to chance variation, which is at the heart of Statistics. Many areas of algebra, including spatial patterns, have strong links to Geometry.

Recommendation:

22. Provide further information regarding the interconnectedness of the mathematics strands in Tier 2.

The essence statement is clear and concise, and paints a fair picture of the discipline. It allows for mathematics to be a discipline applied to the real world without insisting that all mathematics should be treated this way.

The phrasing for “quantities, space, and data” found on pages 12 and 13 is not sufficiently clear. “Space” is a fair description of *Measurement and Geometry*, “data” does conjure up *Statistics*, albeit in a rather perfunctory way, but “quantities” is inadequate for *Number and Algebra*. It conjures up ideas of the measurement of quantities.

Recommendation:

23. Find a better descriptor for “quantities” in *Number and Algebra* and explore if there is a more holistic descriptor of *Statistics* than “data”.

Mathematics Essence statement and Learning area

Estimation and the reasonableness of answers: This issue applies not only to number strategies, but to all areas of mathematics, especially measurement and statistics, and also to algebra and geometry. In the Achievement Objectives (AOs) it is only mentioned at Levels 3, 4, and 5 of *Number Strategies*. At Level 6 “estimation” is explicitly mentioned, but appropriate estimation strategies are available at all curriculum levels. Estimation and the reasonableness of answers need to be included at all levels of each strand. Students need to be constantly aware of how reasonable their results and statements are. “Approximation” has a more specific, less general definition than “estimation”.

Recommendations:

24. Remove the sentence “It also involves when to use approximation and discerning the reasonableness of answers” from the *Number and Algebra* part in the section *How is the learning area structured?* (p19) and replace it with “**Students should know when it is appropriate to use estimation, and have an appreciation of the reasonableness of their results.**”
25. Include the statement “**Students should have an appreciation of the reasonableness of their results**” in the stem (In a range of meaningful contexts ...) at each of Levels 1-8.

Achievement Objectives by Levels

Number and Algebra

Fractional thinking: We applaud the early recognition of fractions and fractional thinking. However we have two reservations. Firstly, the progression of fractional thinking is not sufficiently clear for teachers. In particular the use of “simple fractions” at Level 1 and “fractions” at Level 2 implies that the generality of fractions are covered at Level 2. And just what are “simple fractions”? At Levels 3 and 4 the expression “common fractions” is used. A progression should be visible, such as equal sharing, partitioning, simple unit fractions, unit fractions, simple proper fractions, proper fractions, mixed or improper fractions. Even within this progression there are subtle differences, for example one half is far simpler than one third even though both are unit fractions. Secondly, the draft has students performing number strategies employing fractions before meeting them in *Number knowledge*. In *The Number Framework* this is largely reversed, where more emphasis is on knowledge than strategies at levels 1 to 5 of the framework.

These same comments apply more widely to the related area of proportional reasoning, including decimals and percentages. The fractions one tenth and one hundredth are vital and should be met as early as possible to prepare for decimals. Simple benchmark percentages such as 100%, 50%, 0% (and even 25%) are understood in common parlance and should be introduced earlier.

Rates (ratios) at Level 5 confuse these two issues. Clear definitions of both of these need to be made, as they are separate but related ideas. Indeed, ratio has two meanings, a part to whole relationship between two like quantities, or a part to part relationship between two or more like quantities. Rate is a part to whole relationship between two different quantities.

Recommendations:

26. Provide a clearer progression of fractional thinking and decimal thinking by refining the descriptors in the achievement objectives, and provide Tier 2 material to further expand on and exemplify the progression.
27. Include rates and ratios as separate ideas and distinguish the separate definitions of rates and ratios possibly through the use of a glossary.
28. Include mention of ordering fractions and decimals in the AOs.

29. Ensure the Number Framework levels and the curriculum levels are in step.

Place value: The role of place value ideas in *Number knowledge* seems to be less obvious than would be desired. The key is that students understand the role it plays in the construction of numbers. This may be just an artifice of the words used in the AOs, where knowledge is stressed, but understanding is essential as well.

Recommendation:

30. Insert or weave in the words “**with understanding**” into the *Number Knowledge* AOs relating to place value (such as counting to 100 and 1000 at Levels 1 and 2 – counting to 99, and 999 is clearer).

Factorials: This seems out of place in Level 5 Number. It is most clearly linked with *Probability*.

Recommendation:

31. Drop the reference to “factorials” in Level 5 Number. Do not include it as an AO in *Probability*.

Equations and expressions, patterns and relationships: We are gratified to see that *Number and Algebra* are linked into the one strand. We do believe that there is still a bridge to cross between these two related modes of thinking. We consider that the AOs at Levels 1 to 4 in *Equations and expressions* are not clearly enough separated from the *Number knowledge/ Number strategies* threads. This is the same for the first AO under *Patterns and relationships* at Levels 1-4. Without a clearer message of the intent of these AOs, we are concerned that the more general mode of algebraic thinking will not emerge from number thinking sufficiently early.

Several key algebraic ideas appear to be missing. The equals sign needs to be given a central focus as early as possible to move student understanding from its common number meaning “and the answer is” to the algebraic “is the same as” balance model. Related concepts such as greater than, less than, and not equal to would also be of use. The centrality of number properties being generalised, and the importance of these to algebraic thinking is not clear. Number strategies are underpinned by number properties. Ideas such as the properties of 0 and 1, commutativity, distributivity, associativity, order of operations, etc., need to be explored and generalised (though using less formal jargon and by beginning in practical number based contexts).

The distinction between *Equations and expressions* and *Patterns and relationships* is unhelpful, especially at Levels 3 and above, as these are part of a contiguous whole. This can clearly be seen, for example, at Level 6, where the objectives become quite repetitive. *Patterns and relationships* are explored as a rich way of obtaining rules and generalisations, which will eventually be expressed as *Equations or expressions*. The links between graphs, tables, and equations will be clearer with this proposed merge.

Algebraic rules need to be given a clearer progression. This could be: copying and creating a pattern, predicting, predicting with a recursive rule, predicting using a direct rule, expressing the

rule as an algebraic equation. The concept of the gradient of graphs needs to be introduced earlier than Level 6. Introduce gradient ideas subjectively (faster, slower) at Level 3, progressing to simple whole number gradients at Level 4, etc.

Recommendations:

32. Include the phrase **“and number properties”** after the word “strategies” in the AOs for equations and expressions at Levels 1 to 4. Provide further information on these number properties at Tier 2.
33. Include an AO **“Understanding and exploring the meaning of the equals sign”** at Level 2.
34. Provide a clearer progression of the algebraic aspects of the AOs in *Equations and expressions* and *Patterns and relationships* by refining the AOs, and by providing Tier 2 material to further expand on and exemplify the progression of algebraic thinking. This applies to algebraic rules as well.
35. Delete the AO at Level 1 Patterns and relationships as it is clearly implied under the *Number knowledge* and *Number strategy* AOs.
36. Include the AO **“Copy and create repeating and sequential patterns, and create the next element”** at Level 1.
37. Include algebraic graphs earlier than Level 4. Include the ideas of co-ordinate systems and ordered pairs (which are one of the ways of representing an algebraic relationship) that are currently in *Position and orientation* into *Equations and expressions* and *Patterns and relationships*.
38. Introduce the concept of gradient earlier than Level 6 and provide a progression for this either in the AOs or in supporting Tier 2 information.
39. Merge *Equations and expressions* and *Patterns and relationships* as a single thread from Level 3 onwards.

Measurement and Geometry

Angles: This is a more difficult area than the other measurement specified at Levels 1 and 2. It is also mentioned at three different places: turns (angles) under *Measurement*, half/quarter turns (through to bearings at Level 4) in *Position and orientation*, and turns (or rotations) under *Transformation*.

Recommendation:

40. Consolidate ideas on turns under *Transformation* at Levels 1 and 2.
41. Keep measurement of angles until Level 3 or Level 4.
42. Include bearing as Measurement in Level 4.

Area and Volume: This has its own progression, from counting whole units, counting whole and part units, multiplication of whole-number arrays, through to decimal multiplication. This needs to be made more explicit. Circles and triangles are not specifically mentioned in the AOs but should be included at least in Tier 2.

Recommendation:

43. Provide a clearer progression of area and volume understanding, either by refining the descriptors in the achievement objectives, or in providing Tier 2 material to further expand on and exemplify the progression.

Position and orientation: This could be subsumed into shape, as it is largely a look at 2-dimensional space. The concept of co-ordinate systems is far more closely related to algebra, and should be located there. Grid references apply to locating areas on a grid, not exact points. General descriptions of loci are reasonable in this strand, but very quickly become algebraic, especially if they are related to co-ordinate systems (and implicitly take a functional form). Orientation is needed as one of the variant / invariant aspect of Transformations.

Recommendation:

44. Move rectangular co-ordinate systems to Level 3 of *Number and Algebra*. This will unhook loci from its algebraic representations.
45. Bearings should be included with angles in *Measurement*.
46. Explore whether *Position and orientation* could be subsumed into the other *Measurement and Geometry* threads.

Transformation: Some of the richness of exploring what stays the same and what is invariant is lost when just invariant properties are stressed. Enlargement requires multiplicative thinking, and should therefore be at Level 3 and beyond. A reasonable progression for this is needed, from whole number scale factors, fractional enlargements (with both proper and improper fractions), and negative enlargement. The concept of symmetry under transformation needs to appear earlier.

Recommendations:

47. Insert the words “**variant and**” before “invariant” at Levels 4 and 5.
48. Move enlargement to Level 3 and above, and include a progression for it, either by refining the descriptors in the achievement objectives, or in providing Tier 2 material to further expand on and exemplify the progression.

Statistics

We concur with the distinctions made between mathematical and statistical thinking. Our research has often indicated the separate (though strongly linked) nature of these. We do acknowledge that statistics has strong formal mathematical underpinnings, but agree that these should be subservient to the more practically based, exploratory style espoused in the draft. The mathematical basis of statistics also needs to be acknowledged, but not at the cost of statistical investigations. We also recognise that statistics is a cross-curricular tool, which is vital in other learning areas, particularly *Science, Social Sciences, Health and Physical Education, and Technology*. It should stay under the *Mathematics and statistics* learning area so it retains its integrity as a mathematical discipline.

ICT needs to play an important role in statistics as a major tool to be employed in the exploration to explore and understand statistical data. This is a key competency, and is of greater importance than merely locating statistical information using ICT.

Statistical literacy: We completely support the aim of this thread, but question the name given to it. Traditionally *Statistical literacy* referred to critiquing statistical reports or displays created by others. It is increasingly being used more widely to include the sensible production and critiquing of students' own work, and hence encompasses *Statistical investigations* and *Probability* to some extent. It should also encompass the correct interpretation of other people's statistical information.

Recommendation:

49. Explore an alternative title for this thread, such as "Appraising statistical information".

Probability: We strongly approve of the way the draft encourages exploring probability from Level 1. The emphasis on probability in this practical way is excellent, rather than allowing it to become a highly abstract domain. We do believe, however, that probability needs to be quantified as early as possible in appropriate ways. Without this, the purpose of exposing students to chance and variation through rich probability experiences would soon become repetitive, and lose its purpose. Quantifying probability would involve just counting at Levels 1 and 2 with fixed sample sizes, and exploiting the fractional understandings they concurrently develop in Number. Indeed, probability is one of the authentic and accessible areas in which fractional thinking, including decimals, percentages, and ratios can be applied.

Recommendation:

50. Include quantification of probability ideas in the AOs at Level 2 and beyond, making a clear progression for it and providing Tier 2 material to further expand on and exemplify the progression.

General

We recommend a glossary of commonly used mathematical terms be developed as part of the second tier material to assist in clarifying ideas such as the difference between rate and ratio.

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