QAMT feedback on the P-10 Australian Curriculum Mathematics: Consultation Curriculum

The Queensland Association of Mathematics Teachers' (QAMT) mission is to provide professional engagement, voice and support for mathematics education in Queensland. This feedback, provided to ACARA, is one of the ways the QAMT advocates for Queensland teachers. Thank-you for the opportunity to give voice to the opinion of teachers across the country. Feedback provided was collected during five free webinars offered to all Queensland Mathematics teachers (QAMT members and non-members). Details of these sessions can be found in **Appendix 2**.

The QAMT would like the acknowledge and thank, Rachael Whitney-Smith and her team for delivering two sessions to our members to unpack the review process and provide some clarity around the core concepts. They were open to discussion, questions and comments whilst being professional and patient in their responses. Our members greatly benefited from these sessions as they built confidence in and community ownership of the review and consultation process.

Overall feedback

	Strongly agree	Agree	Disagree	Strongly disagree	*Don't know*
The introductory sections provide important information.					
The quality of content descriptions has been improved.					
The quality of achievement standards has been improved.					
The quality of content elaborations has been improved.					
Curriculum content has been refined, realigned and decluttered.					
The revised Australian Curriculum in the learning area/subject is an improvement on the current version.					

Biggest Strengths and Greatest concerns

Greatest concerns

Year 10 pathways. It is noted that the inclusion of additional content into the year 10 content descriptions aims to prepare students for all levels of senior secondary mathematics. As a result, the consultation curriculum year 10 achievement standard has a higher achievement expectation then the current. This will result in increased student failure rates and in turn reduced student disposition to mathematics and decline in mid-level mathematics subject enrolment. It is recommended that multiple pathways be developed for year 10 students with associated achievement standards.

An increase in mathematics terminology (new to many teachers) was noted. Additional time and support will be needed for teachers to unpack this curriculum. This is especially of concern to new or out of field teachers.

Increased time requirements with the increased cognitive demand from the inclusion of the proficiency strands in the achievement strands.

Digital technologies mandated in achievement standard will lead to students without access failing mathematics.

An increased focus on problem solving may lead to a reduction in time spent on the core skills required to reduce cognitive load.

Biggest Strengths

Inclusion of the proficiency strands in content descriptions.

Greater focus on digital technologies (GC)and Aboriginal and Torres Strait Islander Histories and Cultures (CCP)

Revision of the statistics strand content descriptions is a great improvement. It has greater clarity, development progression and strong integration of the general capabilities and 21st century skills. Great work!

The increased functionality of the Australian Curriculum website is a welcome addition to support teachers.

The focus on experimentation and role play in Foundation and Year 1.

We look forward to additional resources in way of an in-depth and multi-modal glossary as well as some professional learning resources around the Aboriginal and Torres Strait Islander Histories and Cultures CCP.

Specific Feedback

Introductory elements

Rationale

The rationale is clear about the importance of the learning area/subject

Strongly agree	Agree	Disagree	Strongly disagree	*Don't know*

It is appreciated that the rationale includes reference to the beauty of mathematics as well as its essential everyday applications and processes utilised.

Aims

The aims identify the major learning that students will demonstrate

Strongly agree	Agree	Disagree	Strongly disagree	*Don't know*

These aims are consistent with the aims of Queensland mathematics teachers. The emphasis on a productive disposition about mathematics is well received.

Organisational structure

The strands/sub-strands provide a coherent organisational structure

Strongly agree	Agree	Disagree	Strongly disagree	*Don't know*

Organisation under six interrelated strands is a logical and welcome revision. It highlights that all strands are interrelated rather than in pairs only. We believe that this will strengthen connections between strands (especially number) and allow a focus on Key concepts across all strands.

The strands/sub-strands and core concepts are clear about what is important in the learning area/subject

Strongly agree	Agree	Disagree	Strongly disagree	*Don't know*

The introduction of the core concepts is of concern. It is unclear how teachers are to use them, resulting in teacher anxiety. It is understood that they are not essential for the day-to-day teaching and learning, so their inclusion in the introductory elements is confusing. At best, it has the appearance of a bolt-on to the curriculum (similar to the past position of the proficiency strands); at worst it adds additional unnecessary complexity.

Language (terminology and tenor of paragraphs) will be a significant barrier to beginning teachers and those teaching out of field.

Recommendations:

- Less emphasis on the core concepts in the introductory section – more details could be included as an appendix.
- Further clarity to the use of the core concepts from a teacher perspective rather than a curriculum development perspective.
- Professional learning and additional academic references around the core concepts (including how they are represented in the six strands and their impact on pedagogical choices) would be of great benefit.

Key connections

The key connections section identifies the most relevant general capabilities

Strongly agree	Agree	Disagree	Strongly disagree	*Don't know*

Creative and Critical Thinking is strengthen by the explicit inclusion of problem solving (inquiry, experimentation, investigation and computational thinking).

The strong emphasis on digital technologies has been well received. By scaffolding its use from the early years, it acts to deepen and broaden the use of technologies both specific to mathematics (i.e. graphing software) and for teaching and learning (word processing and other applications). We hope that positive outcomes from this will be reflected in fluency of the use of digital technologies in senior secondary.

The emphasis on numeracy is supported. As numeracy is by definition mathematics used in real-life contexts it is logical that numeracy should play a larger role in all learning areas. It is understood that some of the prior knowledge for Mathematics content descriptions is developed in the numeracy continuum rather than the mathematics curriculum (e.g. concepts of discrete and continuous data). The development of this continuum was not as widely consulted on resulting in a lack of awareness of the interrelationship between the mathematics curriculum and the numeracy continuum, a lack of understanding of accountability for its delivery, a lack of teacher ownership, and the fear that this essential pre-requisite knowledge will not be adequately provided.

Ethical Understanding is strengthened in this review, especially in the Statistics strand.

Recommendations:

- For deeper connection and cohesion across learning areas and to support our teacher colleagues in other learning areas, additional resources outlining numeracy opportunities in learning areas other than mathematics would be of great benefit.
- If the general capabilities aim to equip young Australians with the knowledge, skills, behaviours and dispositions to live and work successfully we wonder if a 'productive disposition' is a general capability that should be considered in mathematics and the wider P-10 curriculum. We understand that this is out of the scope of this review, however it should be considered for the future.
- Improve communication and clarity of the interrelationship between the numeracy continuum and the mathematics curriculum by outlining the pre-requisite knowledge developed in the numeracy continuum. This could be achieved through hyperlinking in the new Australian Curriculum website.

The key connections section identifies the most relevant cross-curriculum priorities

Strongly agree	Agree	Disagree	Strongly disagree	*Don't know*

A greater emphasis on Aboriginal and Torres Strait Islander Histories and Cultures is a welcome revision to the elaborations. Unfortunately, many teachers do not feel they have the required depth of cultural understanding nor know where to find credible resources to confidently use them. From fear of unintentionally showing disrespect teachers will prefer to use another CCP. Due to this lack of depth of cultural understanding it was difficult to make informed judgements or feedback on the alignment/authenticity of the proposed elaborations. We interrogated the Yr7 elaborations in details and have provided some specific feedback in **Appendix 1**.

The exclusion of the CCP Asia and Australia's engagement with Asia, is a missed opportunity to understand global contexts though the lens of Mathematics.

Recommendations:

- Additional professional learning and a bank of credible resources/references (with ease of access) will increase the use of the Aboriginal and Torres Strait Islander Histories and Cultures CCP.
- Further identified links to and elaborations from the other CCPs be included in the online resources.

The key connections section identifies the key opportunities to connect with other learning areas

Strongly agree	Agree	Disagree	Strongly disagree	*Don't know*

Explicit connections made between Mathematics and other learning areas is a welcome addition for both primary and secondary teachers. The proposed hyperlinking in the revised Australian Curriculum Website will be a powerful and useful tool to encourage and enhance cross curriculum teaching and learning. Thank-you.

Key considerations

The key considerations section provides important information for planning teaching and learning

Strongly agree	Agree	Disagree	Strongly disagree	*Don't know*

The inclusion of the proficiency strands in the key considerations is strongly supported. It provides clarity on the role of these proficiencies. The description of problem solving processes (experimenting, investigating, modelling and computational thinking) strengthens and deepens student mathematical proficiency by highlighting the different experiences with problem solving that could be part of teaching and learning.

The addition of computational thinking in mathematics is new in Queensland and therefore the understanding of what is it and how to teach it effectively is of concern.

The inclusion of Computation, algorithms and the use of digital tools in mathematics although welcome, is confusing in this section as it is not a traditional proficiency strand. It is important and maybe overlooked in this position. Suggested re-location options could be with the digital technologies general capability and the glossary.

Recommendations:

- Professional learning and additional resources around computation thinking is required.
- As teachers become more aware of the psychology of learning/forgetting, the description of fluency could include reference to spaced and interleaved practices for retention, this would support the spiral nature of the curriculum and perhaps reduce some of the time needed to review/re-learn pre-requisite knowledge each year.
- To enhance the description of reasoning a distinction could be made between reasoning for argumentation and for generalization. We believe that this would strengthen the understanding of the overarching (across strands) ideas in mathematics.

Curriculum elements

Year/band level descriptions

The year/band level descriptions provide a clear overview of the learning that students should experience at the year/band level

Strongly agree	Agree	Disagree	Strongly disagree	*Don't know*

It is unclear what additional clarity/information the level descriptions provide above what is described in the achievement standard and content descriptions. Interrelationships of the content stands are not clear.

Recommendations:

- Perhaps this would be an opportunity to highlight the interrelationships through the core concepts, common misconceptions or note the prior-content knowledge students should bring to this year level.

Achievement standards

The achievement standards clearly describe the expected quality of learning students should typically demonstrate by the end of the year/band

Strongly agree	Agree	Disagree	Strongly disagree	*Don't know*

The inclusion of the proficiencies in the achievement standards is supported and welcome.

Many teachers have expressed concern about the inclusion of digital technologies in the achievement standard. In Queensland the achievement standard is interpreted as a 'C' level achievement, due to equity of access to technologies this would mean that a significant number of students would fail mathematics due to this lack of access.

There are some achievement standards that require a higher cognition than that which is identified in the content description. This does not set up students to succeed. Some of these cases are outlined in **Appendix 1**.

Some phrases in the achievement standard are ambiguous (due to unfamiliar terminology, multiple cognitions, or complex sentence structure), resulting in a need to seek clarification from the content descriptions, requiring increased teacher time. As these statements determine a pass level, Queensland would appreciate increased specificity.

Recommendations

- Removal of references to digital technologies in the achievement standards. This general capability is sufficiently represented in the content descriptions.
- Review the levels of cognition required are equal to or below the cognition of the content descriptions.

The achievement standards adequately reflect a clear developmental progression.

Strongly agree	Agree	Disagree	Strongly disagree	*Don't know*

The learning described in the achievement standards aligns with the essential content students should be taught

Strongly agree	Agree	Disagree	Strongly disagree	*Don't know*

Without clarity around the core concepts, it is hard to answer this question in context.

The content covered in the curriculum is not significantly different to that which was taught in the past and the additional content increases the alignment to senior secondary mathematics pathways.

The addition of the proficiencies in the achievement strands creates greater alignment to the essential processes the student should engage in.

In most cases there is alignment between the content description content and the achievement standard content.

Content descriptions

The content descriptions specify the essential knowledge, understanding and skills that should be learned.

Strongly agree	Agree	Disagree	Strongly disagree	*Don't know*

The inclusion of the proficiencies in the content descriptions is supported and welcome.

The general capabilities of creative and critical thinking and digital technologies is clear and well developed.

It is noted that with the inclusion of the proficiencies there is an increase in cognitive demand. This is welcome as it increases the rigor of the curriculum, however it also increases time requirements and the need for additional professional learning.

The content descriptions make it clear to teachers what should be taught.

Strongly agree	Agree	Disagree	Strongly disagree	*Don't know*

Combining of content descriptions results in too many concepts and cognitions in one content description. This results in a loss of clarity and the need to use the elaborations to confirm meaning. This requires more teacher time.

The increase in mathematical terminology, although positive for teacher professional discourse, decreases readability and increases time taken by teachers to re-phrase content descriptions for a student/parent audience. It may also be a barrier to new or out of field teachers.

Recommendations:

- Review combined content descriptions to ensure that only one concept/cognition is covered in short, simple sentences to increase clarity and readability.

The amount of content can be covered in each year/band.

Strongly agree	Agree	Disagree	Strongly disagree	*Don't know*

There is no evident reduction in the amount of content to be covered. We have great concerns that with the inclusion of the proficiencies in content description, although welcome, has increased the cognitive demand. It is noted that although the number of content descriptions have been slightly reduced this is a result of combining content descriptions. It is noted that there has also been an increase in the amount of content to be covered with the addition of content that assists the transition to senior secondary (i.e. networks) and introduction of computational thinking content descriptions. We doubt that the current curriculum content can be taught within time frames.

There is also concern that due to movement of content descriptions between year levels that Years 4 and 6 have increased content expectations. This compounds the issue described above during year levels that students are known to disengage with mathematics.

Additional 'space' in the amount of content delivered is needed year 7 to allow teachers time for the transition into secondary schooling.

Recommendations:

- As many schools use text-books to judge the depth/breadth of content to be covered, professional learning and clear messaging that the AC should be used as a measure of content depth/breadth is essential. It would also be recommended that professional learning be provided to text-book publishers/writers.
- Review content movement/spread across year levels.

What content should be removed or what revisions are needed to make the content more manageable in the learning area/subject curriculum?

There is no clear consensus of what, if anything, could be removed.

It is understood that the spiral nature of our curriculum is based in evidence based best practice, however students are not demonstrating an ability to retain knowledge between cycles. To make content more manageable an emphasis should be place on retention of content knowledge between year levels, as this would reduce the amount of time used re-teaching prior content. Additionally, investigation into the width of the content spiral could be investigated, i.e. what is the effect of increasing the amount of time between revisiting and building on a content concept? Can we teach a concept in more depth each time we spiral to it and spiral to it less often (if supported by good intermittent revision strategies)?

Content elaborations

The content elaborations provide useful illustrations and suggestions on how to plan and teach the content.

Strongly agree	Agree	Disagree	Strongly disagree	*Don't know*

The proposed revisions to the content elaborations are supported. They provide clarity to the sometimes-confusing content descriptions and provide diverse ideas with engaging contexts.

The content elaborations provide a range of contexts that support teachers to meaningfully integrate the general capabilities and cross-curriculum priorities.

Strongly agree	**Agree**	Disagree	Strongly disagree	*Don't know*

See comments from GP and CCPs

Appendix 1: Content Specific Feedback

Aboriginal and Torres Strait Islander Histories and Cultures CCP Alignment (Year 7 only)

Elaboration	Notes and Recommendations
AC9M7N06_E5 investigating equivalence in fractions, decimals and percentage forms in the patterns used in the weaving designs of Aboriginal and Torres Strait Islander Peoples (AC9M7N06_E5)	It is unknown how weaving patterns can model equivalence or negative fractions. Elaboration more suited to patterns or simple fractions. Authenticity: It is unclear how colour equivalence in weaving (specifically equivalence, rather than pattern symbology) is of cultural significance.
AC9M7N08_E6&7 investigating the proportion of land mass/area of Aboriginal Peoples' traditional grain belt compared with Australia's current grain belt (AC9M7N08_E6) investigating the nutritional value of grains traditionally cultivated by Aboriginal Peoples in proportion to the grains currently cultivated by Australia's farmers (AC9M7N08_E7)	A great authentic and thought-provoking elaboration. Could also be useful for content description M01
AC9M7A02_E3 exploring how cultural expressions of Aboriginal and Torres Strait Islander Peoples such as storytelling communicate mathematical relationships which can be represented as mathematical expressions (AC9M7A02_E3)	Examples needed
AC9M7A02_E4 exploring the concept of variable as something that can change in value the relationships between variables, and investigating its application to processes on-Country/Place including changes in the seasons (AC9M7A02_E4)	Needs a comma after 'value'. Examples needed for clarity
AC9M7A03_E3 & A04_E6 using graphs of evaporation rates to explore Aboriginal and Torres Strait Islander Peoples' methods of water resource management (AC9M7A03_E3) exploring Aboriginal and Torres Strait Islander Peoples' methods of water resource management, developing tables/graphs of evaporation rates to represent and describe relationships (AC9M7A04_E6)	A great authentic and thought-provoking elaboration.
AC9M7M02_E6 exploring the relationship between volume and capacity of different sized nets used by Aboriginal and Torres Strait Islander Peoples to catch different sized fish (AC9M7M02_E6)	Unsure about the shape of these nets – how this can relate to square or triangular prisms
AC9M7M03_E5 investigating the applications and significance of circles in everyday life of Aboriginal and Torres Strait Islander Peoples such as in basketry, symbols and architecture, exploring	A great authentic and thought-provoking elaboration.

the relationships between the centre, radius, diameter and circumference (AC9M7M03_E5)	
AC9M7M04_E8 investigating commercialised substances founded on Aboriginal and Torres Strait Islander Peoples' knowledges of substances including pharmaceuticals and toxins, understanding how ratios are used in the development of them (AC9M7M04_E8)	Why is this elaboration limited to commercialised substances? Establishing if the substance is commercialised will limit its use.
AC9M7SP01_E6 exploring different representations of objects in Aboriginal and Torres Strait Islander Peoples artworks or cultural maps of Country/Place (AC9M7SP01_E6)	A great authentic and thought-provoking elaboration.
AC9M7ST04_E3 using secondary data from the Reconciliation Barometer to conduct and report on statistical investigations relating to Aboriginal and Torres Strait Islander Peoples (AC9M7ST04_E3)	A wonderful resource - thank you A good link to the Ethical Understanding general capability
AC9M7P02_E3 exploring and observing Aboriginal and Torres Strait Islander children's instructive games, for example, *Koara* from the Jawi and Bardi Peoples of Sunday Island in Western Australia, to investigate probability, predicting outcomes for an event and comparing with increasingly larger numbers of trials and between observed and expected results (AC9M7P02_E3)	Reference needed to understand game rules etc. The content description refers to simulated results – are their simulators for these games?

Example of misalignment of cognitions between Achievement standards and Content descriptions

Year Level	Achievement Standard	Related Content Description	Notes and Recommendation
Year 7	They solve problems involving rational numbers, percentages and ratios and explain their choice of representation of rational numbers and results when they model situations, including those in financial contexts.	...choosing representations that are suited to the context and enable efficient computational strategies (AC9M7N06) ... Interpret results in terms of the situation (AC9M7N08)	The achievement standard asks students to explain their choice of representation and their results; the content description only asks students to choose representations and interpret results.
Year 7	They use algebraic expressions to model situations and represent formulas.	...create algebraic expressions using constants, variables, operations and brackets. Interpret and factorise these expressions, applying the associative, commutative, identity and distributive laws as applicable" (AC9M7A02)	The achievement standard asks students to model situations, however modelling is not a key consideration listed in the associated content descriptions. Modelling could be included in content description AC9M7A02.
Year 7	...They develop, explain and apply measurement formulas...	"..establish the formulas for" areas/volume (AC9M7M01)(AC9M7M02)	The achievement standard asks students to explain. The content description cognition,

			establish, aligns to develop but not explain. It is recommended that explain be removed from the achievement standard.
Year 8	...recognise the relationship between fractions and their terminating or recurring decimal expansion.	Recognize and investigate irrational numbers in applied contexts including certain square roots and π (AC9M8N01) recognise and investigate terminating and recurring decimals (AC9M8N03)	The achievement standard students are asked to link fractions and terminating or recurring decimals. The content descriptions address each, fractions and decimals, but does not explicitly link them.

Webinar participants' comments:

Achievement standards, content descriptions, content elaborations

- I think it is clearer which makes it easier to know what to teach
- I still wish it would not say various techniques, it would be better being more prescriptive
- It is starting to lead our students towards the senior system
- Alignment of achievement standards with content and clarity of descriptions is a great improvement.
- Great to see the proficiencies explicitly included in the content descriptors. Much better achievement standards too - clearer.
- Great to see improved and more useful elaborations.
- I like that it is not additional to Year 10 content but an extension of the content descriptors.

Core concepts

- Nice job! I'd love an analogy for the core concepts. The connections are great, but it can make it tricky to unpack. I'm not sure how well teachers who are less keen on maths will understand them. We are a pretty biased sample.
- Those descriptions are so wordy. I'm not sure teachers will be able to unpack them properly.

Overall

- You have answered many of my questions and concerns. It looks like it will provide a lot more guidance for teachers, particularly in the primary school.
- This looks like a really great curriculum. Thanks to the ACARA staff for such a detailed document. Thanks for the presentation too - very clear.
- A very informative session. Thank you Rachael and team. There are some exciting and purposeful changes coming! Definitely a much CLEARER curriculum for teachers.
- I like the increased focus on the thinking skills required in maths. However, I'm concerned we still have the same quantity of content to deliver in the 7 -10 space.
- There is a lot more senior content move into middle school (networks, logs etc) into an already crowded curriculum. They didn't seem to 'refine and reduce' the content as per the purpose of the review.

Appendix 2: Details of the QAMT webinar sessions

Five free webinar sessions were held for QAMT members and non-members

These sessions covered different aspects of the consultation curriculum:

1. Overview of the Review process and major changes (facilitated by Rachael Whitney-Smith and her team)
2. Exploration of the Core Concepts (facilitated by Rachael Whitney-Smith and her team)
3. Interrogation of the achievement standards, content descriptions and content elaborations
4. A second session for the previous topic
5. CPPs and GC

Feedback was recorded by survey, chat and notes taken during professional discussion.