Shape of ACT Senior Secondary Curriculum

Bridging Numeracy - A/M

September 2023

Bridging Numeracy

1. Purpose

1.1 The *Shape of ACT Senior Secondary Curriculum: Bridging Numeracy* will guide the development of the *Bridging Numeracy A/M* course. This will replace the course *Contemporary Mathematics A/M.*

1.2 This paper has been prepared in consultation with subject experts from the CIT, the University of Canberra, and the deliberations of the *Bridging Numeracy Shape Paper* writing panel.

1.3 The paper should be read in conjunction with *The Shape of the ACT Senior Secondary Curriculum* located at: http://www.bsss.act.edu.au/curriculum/bsss_course_development_consultation

2. Introduction

2.1 The *Bridging Numeracy* course will be the basis of planning, teaching, learning and assessment in ACT senior secondary schools. It will be useful for and useable by experienced and less experienced teachers.

3. Background

3.1 *Contemporary Mathematics A/M* was initially conceived as a course that was intended for a student group who needed further explicit teaching to reach the Australian Core Skills Framework (ACSF) Level 3 in Numeracy skills.

3.2 In 2023, the Office of the ACT Board of Senior Secondary Studies conducted a desktop review of the *Contemporary Mathematics* course. Findings of this review concluded that the course be redeveloped to reflect more recent approaches to numeracy learning. In addition, it was decided to develop Year 11 and 12 Bridging Numeracy Achievement Standards.

3.3 In November 2022, the Board approved the following:

1. That the *Bridging Literacy A/M* and *Bridging Numeracy A/M* courses be developed including:
    a) Achievement Standards specific to *Bridging Literacy A/M* and *Bridging Numeracy A/M* courses respectively.
    b) Courses are informed by the Australian Core Skills Framework (ACSF), research and consultations with experts in the field.
    c) Eligibility requirements are established for the student group studying these courses.
2. That Mathematics and English Integrated A courses be developed to make provision to draw units from *Bridging Numeracy* or *Bridging Literacy* and *Essential Mathematics* or *Essential English* respectively to form a course.
3. That the *Contemporary Mathematics A/M* and *Contemporary English A/M* courses be phased out by December 2024.

3.4 All courses under development are required to meet Board design specifications and to align with Board requirements for senior secondary curriculum. These specifications align with ACARA course design specifications and provide teachers with flexibility to plan, teach and assess according to the needs and interests of their students.

3.5 The *Bridging Numeracy* course is to be developed under the *Mathematics Framework* located at:
https://www.bsss.act.edu.au/act_senior_secondary_system/curriculum/frameworks

The rationale for the study of Mathematics in the *Mathematics Framework* is:

> *Mathematics is a way of thinking in which problems are explored and solved through observation, reflection, and logical reasoning. It is the study of pattern, relation, dimension, quantity, uncertainty, shape, and change. From its origins in counting and measuring, mathematics has developed into a highly sophisticated language used to describe much of the contemporary world. It is a concise system of communication, with written, symbolic, spoken, and visual components. Students identify appropriate mathematical processes, transfer skills between contexts, make informed decisions, make connections, and develop mathematical arguments. Students undertaking mathematics will develop their critical and creative thinking, problem solving skills, oral and written communication, information, and communication technologies (ICT) capability, ability to collaborate, and sense of personal and social responsibility. This is achieved through setting and monitoring personal and academic goals, taking initiative, and building adaptability, communication, and teamwork. Students develop their ethical understanding by considering the social consequences of making decisions based on mathematical results.*

4. Concepts and Knowledge

Concepts and knowledge include:

- numbers
- equivalence and comparison
- operations and relationships
- properties
- basic facts and algorithms
- estimation
- patterns
- variables
- proportionality
- relations and functions
- equations and inequalities
- shapes and solids
- orientation and location
- transformations
- measurement
- data (collection, representation, distribution)
- chance

5. Skills

Skills include:

- computational fluency
- analysis
- synthesis
- evaluation
- critical and creative thinking
- communication
- measurement
- modelling
- problem solving
- reasoning and proof
- interpersonal and intrapersonal
- reflection

5.1 All courses based on the *Mathematics Framework* should enable students to:

- critically and creatively apply mathematical concepts, models, and techniques
- evaluate the reasonableness of solutions to problems
- develop a critical appreciation of the use of information and communication technology in mathematics
- communicate using appropriate mathematical language
- develop mathematical judgements and arguments through inquiry
- learn with purpose and persistence, independently and collaboratively
- evaluate the potential of mathematics to generate knowledge in the public good
- reflect on thinking and learning

6. Literature Review

The literature surrounding numeracy is relatively recent, the concept of 'numeracy' or 'being numerate' being largely an artefact of the last 40 years of research and public policy. Australia's national curriculum authority, ACARA, defines numeracy as:

> *Numeracy encompasses the knowledge, skills, behaviours, and dispositions that students need to use mathematics in a wide range of situations. It involves students recognising and understanding the role of mathematics in the world and having the dispositions and capacities to use mathematical knowledge and skills purposefully. (ACARA, 2017)*

A definition of the term 'numerate', widely cited by mathematics educators, appeared in a British government report on mathematics education (Cockcroft, 1982):

> *We would wish the word numerate to imply the possession of two attributes. The first of this at an "at homeness" with numbers and an ability to make use of mathematical skills which enables an individual to cope with the practical demands of everyday life. The second is an ability to have some appreciation and understanding of information which is presented in mathematical form.*

It should be noted that in some jurisdictions and countries, the terms 'quantitative literacy' or 'mathematical literacy' is preferred. The National Adult Literacy Survey (NCES, 1993) defines *quantitative literacy* as:

> *The knowledge and skills required to apply arithmetic operations, either alone or sequentially, using numbers embedded in printed material (e.g., balancing a budget, completing an order form)*

The National Centre for Education Statistics (NCES) defines the closely related knowledge and skills required to locate and use information (e.g., in payroll forms, transportation schedules, maps, tables and graphs) as document literacy.

In contrast, the International Life Skills Survey (ILSS, 2000) defines quantitative literacy in a much more comprehensive manner as:

> *An aggregate of skills, knowledge, beliefs, dispositions, habits of mind, communication capabilities, and problem solving that people need in order to engage effectively in quantitative situations arising in life and work.*

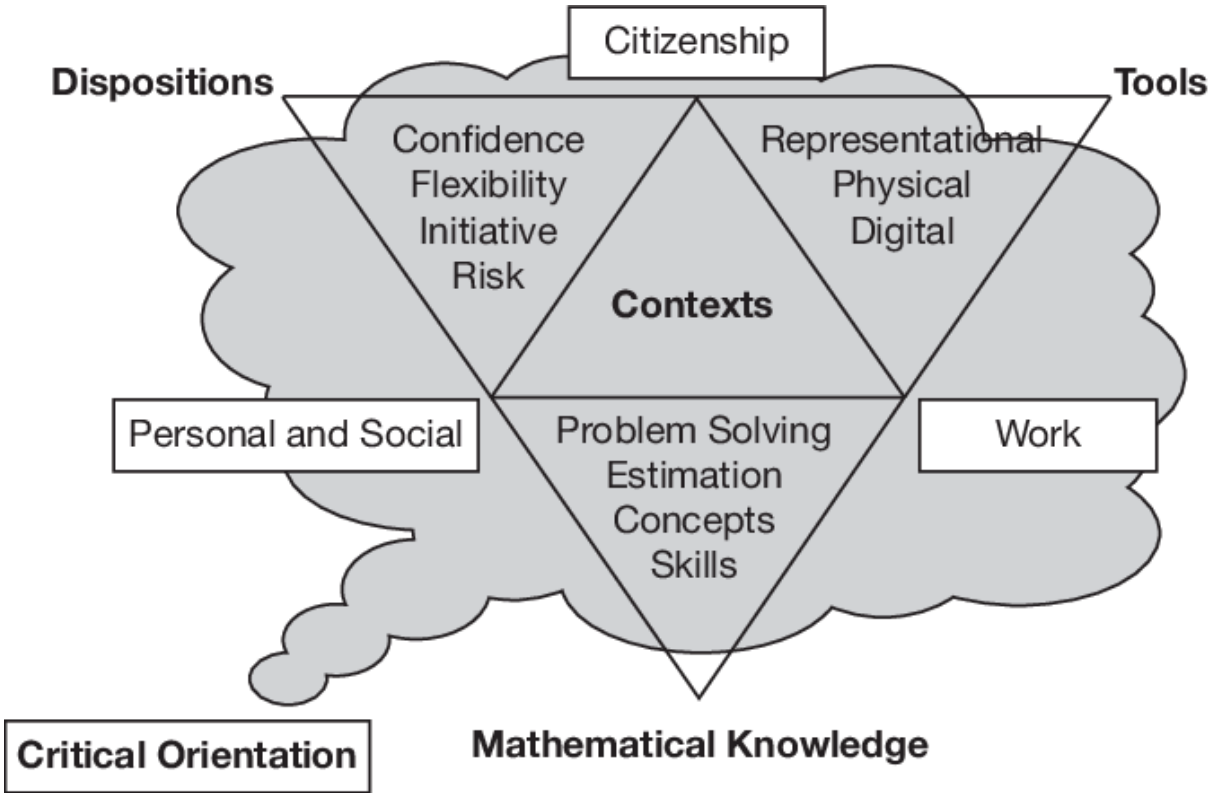
The Programme for International Student Assessment (PISA, 2000) adopts a similar definition but calls it mathematics literacy:

> *An individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded mathematical judgements and to engage in mathematics in ways that meet the needs of that individual's current and future life as a constructive, concerned, and reflective citizen.*

It can therefore be assumed that the concept of numeracy is multilayered and variable. It is probable that educators, students, and other stakeholders have a notion of what 'numeracy' means; equally, it is probable that assumptions made about what is an acceptable standard of numeracy, and what skills are included, differ from person to person, and context to context. For the purposes of the *Bridging Numeracy* course, the defined acceptable standard is meeting the Australian Core Skills Framework (ACSF) descriptors for level 3.

Regarding the pedagogies of numeracy, much of the literature from Australia in recent years tests and affirms the *21st Century Numeracy Model*, developed by Merrilyn Goos, Vince Geiger and Shelley Dole (University of the Sunshine Coast and Australian Catholic University). This approach has been examined in a suite of papers across more than 10 years.

The *21st Century Numeracy Model* specifies the importance of developing students' mathematical knowledge, their development of the tools of mathematics and their dispositions towards learning in numeracy to be confident and able to flexibly apply their learning. This is underpinned by the importance of imbedding their learning in contexts that are relevant and meaningful to students allowing them to see how to problems solve using real world tools flexibly and confidently in their work lives, personal and social lives, or their lives as contributing citizenry of a developed nation. Goos et al express this model through the diagram reproduced below.



(Goos, Geiger, and Dole, 2014)

Goos, Geiger, and Dole (2014) go on to define the following dimensions of their Numeracy model:

Dimension	Explanation
Contexts	Use of mathematics to act in and on the world and thus in a range of real-world situations both within schools and beyond school settings.
Mathematical Knowledge	Concepts and skills, problem solving knowledge strategies and estimation capacities.
Dispositions	Confidence and willingness to use mathematical approaches to engage with life-related tasks; preparedness to make flexible and adaptive use of mathematical knowledge.
Tools	Use of physical (e.g., models, measuring instruments), representational (e.g., symbol systems, graphs, maps, tables) and digital (e.g., computers applications, internet) tools to mediate and shape thinking.
Critical Orientation	Use of mathematical information and activity to analyse and evaluate information and data within a given context, make decisions and judgements, form opinions, add support to arguments and challenge an argument or position.

Context is positioned at the centre of the model because numeracy is about the use of mathematics to act on the real world (Quantitative Literacy Design Team, 2001). The vital role of context in applying mathematics to the real world means that a numerate person needs to be able to select and use mathematics in a manner specific to the features of a particular problem. This implies that the process of becoming more numerate is not necessarily about learning more mathematics; instead, it involves extending one's capacity to apply mathematics to an increasing range of different circumstances or contexts. (Quantitative Literacy Design Team, 2001 and AAMT & AiG, 2014)

Another conceptual framework that has gained traction in the discourse of mathematics pedagogies and their relationship to the world outside of school-based education is that of "Techno-mathematical Literacies". This model posits that mathematics as used in the workplace is different to that as presented in many school and university contexts – in essence, calling for an applied rather than conceptual mathematical model to be taught to students. While popular in engineering, this concept of numeracy offers some guidance for all disciplines; particularly, as people undergo a range of complex quantitative tasks in their regular work that they may not necessarily conceptualise as "mathematics" (e.g., measuring social media metrics (van de Wal, Bakker, and Drivers, 2017), using spreadsheet-based timesheets, or apportioning materials to a task). This model emphasises the interdisciplinary nature of mathematics in decision making in areas such as health, the built environment, and the sciences. Van der Wal et al (2017) represent techno-mathematical literacies as containing elements such as data literacy, technical software skills, sense of both error and number, and the technical communication and creativity skills to identify, solve, and communicate about quantitative problems.

Common to both models are the explicit contextualisation of mathematics, the use of mathematical tools, and the development of a mathematical disposition, i.e., being open to mathematics as a problem-solving tool, and understanding when and how to use one's mathematical skills. The transfer of quantitative skills to novel problem areas is emphasised, as is the relationship to practical, everyday applications of quantitative thinking, tools, knowledge, and a readiness to employ these paradigms in service of one's goals.

The intent of the *Bridging Numeracy* course is that it will develop students' ability to transfer their numeracy skills across the many facets of their lives such as work, personal and social relationships, and citizenship. Ward (2005) as quoted in Goos et al (2015) expresses a similar pedagogical goal succinctly and accurately: "…a bridge to connect the abstract, symbolic language of mathematics with their own world." (p.5).

7. The Context of the ACT

Courses of study for the *ACT Senior Secondary Certificate*:

- provide a variety of pathways, to meet different learning needs and encourage students to complete their secondary education
- enable students to develop the essential capabilities for twenty-first century learners
- empower students as active participants in their own learning
- engage students in contemporary issues relevant to their lives
- foster students' intellectual, social, and ethical development
- nurture students' wellbeing, and physical and spiritual development
- enable effective and respectful participation in a diverse society

7.1 Each course of study:

- comprises an integrated and interconnected set of knowledge, skills, behaviours, and dispositions that students develop and use in their learning across the curriculum
- is based on a model of learning that integrates intended student outcomes, pedagogy, and assessment
- outlines teaching strategies which are grounded in learning principles and encompass quality teaching
- promotes intellectual quality, establishes a rich learning environment, and generates relevant connections between learning and life experiences
- provides formal assessment and certification of students' achievements.

7.2 In consideration of the ACT context, and in response to contemporary research the *Bridging Numeracy* course should include:

- a student-centred pedagogical approach
- the educational needs of young people with respect to Numeracy
- the *Mathematics Framework* and Achievement Standards for *Bridging Numeracy*
- the needs of different schools and sectors (government and non-government)
- skills to work individually, collaboratively, and reflectively
- mathematical skills using relevant IT tools and reading and using graphs and tables effectively to inform decision making
- mathematical skills essential for daily life after school as they are used in everyday contexts, such as personal finances, shopping, cooking, home repairs and workplace numeracy skills, including:
    - Basic Arithmetic- using whole numbers, fractions, decimals, and percentages effectively in all aspects of life.
    - Estimation- the ability to estimate the outcome of a calculation or the value of a quantity is important for making informed decisions or picking up when a calculation error may have occurred.
    - Measurement-- the ability to choose, use and understand units of measurement appropriately and their conversions.
    - Data interpretation- the ability to read and interpret data is important for making informed decisions based on real data for numeracy in citizenship.
    - Problem Solving- that ability to choose and apply appropriate mathematical concepts to solve problems across all aspects of life.
    - Financial literacy- the ability to understand and manage personal finances, including budgeting, savings, invested, understanding interest rates is essential for financial stability in personal finances and in the workplace.
    - Spatial reasoning – the ability to understand and manipulate shapes and spatial relationships is important in many practical situations in work and home life.

8. Aims of the *Bridging Numeracy* Curriculum

8.1 Bridging Numeracy

The *Bridging Numeracy* course will be accompanied with a dedicated set of Achievement Standards.

The *Bridging Numeracy* course will use the Australian Core Skills Framework (ACSF) (Level 3) and numeracy skills embedded in context at its core. *Bridging Numeracy* intends to create numerate citizens able to use mathematics to inform decision making.

8.2 Students

This course is aimed at students who have not yet met ACSF Level 3 in Numeracy. The purpose of the course, and of the discrete achievement standards given *Bridging Numeracy*, is to enable students to fulfil the requirements of ACSF 3 in Numeracy.

It is intended that students will be assessed for their inclusion in this course through either a standardised measure (e.g., NAPLAN, PAT testing) or through recommendation by the principal and/or numeracy specialists within the school.

The *Bridging Numeracy* course aims to take a positive view of student capacity and potential and to offer what is, indeed, a foundational pedagogy of the ACT Senior Secondary System – teaching and treating students as individuals, young adults, and capable learners (Lane, 1980).

For numerate students the alternative to *Bridging Numeracy* is *Essential Mathematics*. It is envisioned that students undertaking *Bridging Numeracy* would articulate into *Essential Mathematics* when they achieve an A grade, which would signify they have reached the minimum standard of ACSF Level 3. *Essential Mathematics* allows for a variety of settings and pedagogies. M courses will be available in both *Essential Mathematics* and *Bridging Numeracy* for students who meet specific disability criteria.

BSSS accredited courses should enable students to develop essential capabilities for twenty-first century learners. The Australian Curriculum General Capabilities comprise of an integrated and interconnected set of knowledge, skills, behaviours, and dispositions that students develop and use in their learning across the curriculum. The *Bridging Numeracy* course will enable students to develop the general capabilities of numeracy, ICT, and personal and social capabilities. Students undertaking the Bridging Numeracy course, will develop knowledge, skills, behaviours, and dispositions to interpret and use numbers confidently for learning and communicating in and out of school and for participating effectively in society.

9. Structure of the *Bridging Numeracy* Curriculum

It is anticipated that the *Bridging Numeracy* course will require teachers to work with students to develop their numeracy skills in contexts they are likely to encounter in their lives within and beyond year 11 and 12. To be effective, numeracy skills, must be taught and learned in settings that are both meaningful and memorable. (Quantitative Literacy Design Team, 2001). In addition to this, the use of technology is key to success in Numeracy in the workplace.

The AAMT and Australian Industry Group (2014) acknowledge that many workplaces “are engaged with technology, particularly in using spreadsheets and graphical outputs. There is an interdependency of mathematical skills and the use of technology in the workplace in ways that are not commonly reflected in current teaching practice”.

9.1 Course Objectives

Objectives of the *Bridging Numeracy* course include:

- providing students with a solid foundation in numeracy, which includes an understanding of numerical and mathematical concepts and techniques tailored to real-world applications.
- cultivating critical thinking, problem-solving, and collaboration skills through authentic tasks and experiences that mirror the challenges students will encounter in higher education and professional settings.
- developing students' confidence and self-efficacy in their numeracy abilities, enabling them to effectively navigate the demands of diverse academic disciplines and real-world situations.
- fostering an appreciation for the value of numeracy skills in personal, academic, and professional contexts, encouraging lifelong learning and continuous skill development.

9.2 Rationale

Bridging Numeracy is built on a foundation of students seeing and understanding how quantitative skills and understanding can be applied to their own lives; in the workplace, in their personal life, and as part of effective citizenship.

The *Bridging Numeracy* course is designed to support senior secondary students aged 16-18 in achieving the benchmark of the Australian Core Skills Framework (ACSF) Level 3. This course is grounded in disciplinary numeracy and authentic experience, aiming to empower students to effectively engage with quantitative tasks across diverse subjects and real-world contexts.

The need for a comprehensive numeracy course arises from the increasing demands of academic and professional settings, where students are expected to demonstrate strong reasoning and logic skills, critical thinking, and the ability to analyse and interpret graphs and tables. The development of these skills is essential for success in higher education and active participation in today's rapidly evolving society.

9.3 Units

The units have been drafted for discussion as follows:

Practical Numeracy

Students learn about the versatility and practical applications of mathematics in personal, workplace and social contexts. Students will study numeracy in the workplace, workplace problem solving, and be empowered to interpret mathematics pertaining to pay and conditions. Students will be able to effectively select, interpret and use mathematical and problem-solving strategies in workplace situations with confidence and flexibility. Students practice transferring these skills to other situations of personal, social, or academic importance. Students learn to identify when a problem is making use of quantitative thinking and skills -- they build a disposition of understanding when and how to use their mathematical skills, including identifying when to make the contextual leap to apply quantitative skills to both semi-familiar and novel problems.

Techno-mathematical Skills

Students learn use and manipulate quantitative information with a focus on data literacy and technical software skills. Students will study personal financial numeracy. Students will be able to effectively select, interpret and use mathematical and problem-solving strategies and tools in the management of their personal or work life to make informed and well-reasoned financial decisions. Students learn to communicate mathematical understanding and decisions using spreadsheets. Students build a disposition of confidence and calculated risk, using their understanding of data literacy, sense of number and sense of error, including knowing when to make use of physical, representational, and digital tools in service of their quantitative goals.

Making Informed Numeracy Decisions

Students learn how to interpret quantitative information to inform decision-making in personal and societal contexts. Students will be able to effectively select, interpret and use mathematical and problem-solving strategies for managing their own lives, including common experiences such as assessing the accuracy of claims made in the media, signing contracts, tenancy, or the mathematics of transport and travel. They will understand how information is represented to favour particular points of view or interests and build a disposition toward implementing their critical quantitative skills when faced with both familiar and novel information presented by online, media and commercial sources.

Interdisciplinary Mathematics

Students use numeracy skills required for one or more interdisciplinary contexts, such as maintaining personal and supporting others' health, sports, the built environment, or personal areas of interest such as volunteering, community work, or gaming. Students will be able to effectively select, interpret and use mathematical and problem-solving strategies to make informed and well-reasoned decisions within a discipline or circumstance. Students will transfer their quantitative skills to novel problems and areas of study and build a disposition of valuing the link between numeracy and practical application of quantitative skills in contexts that link to their interests.

Independent Study

The Independent Study unit is intended for students studying a 4th semester of Bridging Numeracy who wishes to and has achieved sufficient skill to engage with concepts of Essential Mathematics.

Prerequisites

Independent Study units are only available to individual students in Year 12. A student can only study a maximum of one Independent Study unit in each course. Students must have studied at least three standard 1.0 units from this course. An Independent Study unit requires the principal's written approval. Principal approval can also be sought by a student in Year 12 to enrol concurrently in an Independent Study unit and their third or fourth 1.0 unit in this course of study.

Unit Description

An Independent Study unit has an important place in senior secondary courses. It is a valuable pedagogical approach that empowers students to make decisions about their own learning. An Independent Study unit can be proposed by an individual student for their own independent study and negotiated with their teacher. The program of learning for an Independent Study unit must meet the unit goals and content descriptions as they appear in the course.

10. Considerations

10.1 Underpinning Beliefs

The *Bridging Numeracy* course aims to connect the numeracy events that are part of the culture and context of the learner and the numeracy expectations offered in the ACSF and other frameworks.

10.2 Mathematics Curriculum

The current ACT Senior Secondary Mathematics Curriculum closely follows the Australian Curriculum regarding the other courses on offer (*Essential Mathematics, Mathematical Applications, Mathematical Methods,* and *Specialist Mathematics*) and have appropriate T, A and M level Achievement Standards to gauge student achievement. However, the *Bridging Numeracy* course does not currently exist in the Australian Curriculum and as such needs a set of Achievement Standards that reflect the curriculum and aim of working with students to achieve ACSF3 level of numeracy.

10.3 Equity and Opportunity

The *Bridging Numeracy* course develops functional numeracy skills as outlined in ACSF level 3. The factors that influence this choice include school and community contexts, local community learning opportunities, contemporary and local issues, and available learning resources.

10.4 Connections to other learning areas

As one of the General Capabilities, Numeracy has links to all other learning areas across the ACT Senior Secondary Curriculum and through the teaching of this course, teachers should be looking for resources and teaching strategies that demonstrate Numeracy in action in any other learning areas their students may be undertaking.

10.5 Role of digital technologies

Students and teachers integrate a growing range of online information, tools and applications of diverse origins and perspectives. Throughout the use of the *Bridging Numeracy* course students should be provided access, when appropriate, to calculators and spreadsheets to support their discovery and collation of relevant data, graphs, and calculations. Students are encouraged to apply quantitative skills when interacting with digital providers and other online sources.

10.6 Clarity of the curriculum

The curriculum is sufficiently rich and descriptive to guide teachers with limited experience but avoids excessive prescription that would hamper experienced teachers from exercising their skills. The curriculum document is expressed clearly in terms that are accessible to a new teacher, while allowing teachers to enhance it with their own or their students interests and expertise.

10.7 Breadth and depth of Study

Content descriptions specify the knowledge, understanding and skills that students are expected to learn and that teachers are expected to teach. Teachers are required to develop a Program of Learning that allows students to demonstrate all the content descriptions within a unit.

A Program of Learning is what a college uses to implement the course for a subject meeting students' needs and interests. It is at the discretion of the teacher to emphasis some content descriptions over others. The teacher may teach additional (not listed) content if it meets the specific unit goals providing that it does not duplicate content in other units. The teacher and students may choose to learn the content descriptions through the contextual lens of the electives for each unit. The nature of the learner

This course aims to address the needs of learners who have not yet reached the ACSF level 3 in Numeracy. This course will be offered at A and M levels of study.

10.8 General capabilities

The primary focus of *Bridging Numeracy A/*M is Numeracy. Additionally, this course is well-placed to develop the General Capabilities in meaningful and seamless ways particularly the capabilities of creative and critical thinking, ICT, ethical understanding, and numeracy. The other capabilities such as literacy, self-management, teamwork, and personal and social competence are represented in the courses in ways appropriate to the unit's content descriptors.

10.9 Cross curriculum perspectives

Each of these perspectives, Aboriginal and Torres Strait Islander Histories and Cultures, Asia and Australia's Engagement with Asia, and Sustainability, are represented in the courses in ways appropriate to that area. Curriculum documents are explicit as to how the perspectives are dealt with in each course and how links can be made between learning areas. Through the analysis of relevant data, students are provided with opportunities to further develop an understanding of the diverse nature of the cross-curriculum perspectives.

10.9.1 Conclusion

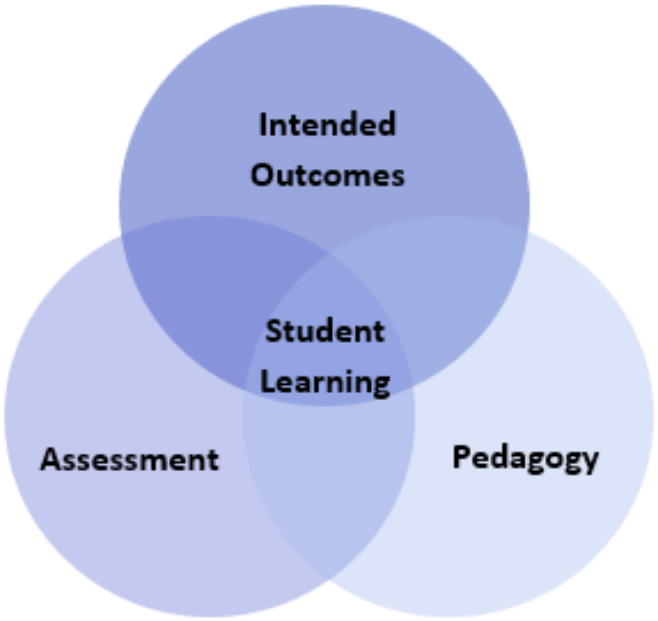
Ultimately, the aim of the *Bridging Numeracy* course is to give teachers and students the capacity to address numeracy gaps using numeracy embedded in disciplines, and new achievement standards appropriate to learners aiming for ACSF 3.

11. Pedagogy and Assessment

The underpinning beliefs and learning principles for the development of the ACT Board of Senior Secondary School curriculum as are follows:

11.1 Underpinning beliefs

- All students are able to learn
- Learning is a partnership between students and teachers
- Teachers are responsible for advancing student learning



11.2 Learning Principles

1. Learning builds on existing knowledge, understandings, and skills.

   (Prior knowledge)

2. When learning is organised around major concepts, principles, and significant real-world issues, within and across disciplines, it helps students make connections and build knowledge structures.

   (Deep knowledge and connectedness)

3. Learning is facilitated when students actively monitor their own learning and consciously develop ways of organising and applying knowledge within and across contexts.

   (Metacognition)

4. Learners' sense of self and motivation to learn affects learning.

   (Self-concept)

5. Learning needs to take place in a context of high expectations.

   (High expectations)

6. Learners learn in different ways and at different rates.

   (Individual differences)

7. Different cultural environments, including the use of language, shape learners' understandings and the way they learn.

   (Socio-cultural effects)

8. Learning is a social and collaborative function as well as an individual one.

   (Collaborative learning)

9. Learning is strengthened when learning outcomes and criteria for judging learning are made explicit and when students receive frequent feedback on their progress.

   (Explicit expectations and feedback).

12. Conclusion

A new course called *Bridging Numeracy* will be developed with its own Achievement Standards under the Mathematics Framework. The *Bridging Numeracy* course is designed to support senior secondary students in achieving the benchmark of the Australian Core Skills Framework (ACSF) Level 3 and will have an entrance requirement of not yet achieving ACSF 3.

It is intended that the *Bridging Numeracy* course will prepare students for numeracy of life. The need for a comprehensive numeracy course arises from the increasing demands of academic and professional settings, where students are expected to demonstrate problem solving, measurement, spatial, financial literacy, and data analysis skills along with basic arithmetic and estimation. The development of these skills is essential for success in higher education, career advancement, and active participation in today's rapidly evolving society.

13. References

ACARA, "Numeracy- General Capabilities", Australian Curriculum, ACARA. *https://www.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/numeracy/*

ACARA, The Shape of the Australian Curriculum Version 4.0, ACARA, October 2012. *https://docs.acara.edu.au/resources/The_Shape_of_the_Australian_Curriculum_v4.pdf*,

ACARA, Mathematics (Version 8.4) *https://www.australiancurriculum.edu.au/senior-secondary-curriculum/mathematics/*

ACT Board of Senior Secondary Studies, Mathematics Framework, 2021. *https://www.bsss.act.edu.au/__data/assets/pdf_file/0006/546963/Corrected_18_July_2021_BSSS_Mathematics_Framework_2021.pdf*

Ministerial Council on Education, Employment, Training and Youth Affairs. Melbourne Declaration on Educational Goals for Young Australians, December 2008. *http://www.curriculum.edu.au/verve/_resources/National_Declaration_on_the_Educational_Goals_for_Young_Australians.pdf*

Ministerial Council on Education, Employment, Training and Youth Affairs, Alice Springs (Mparntwe) Education Declaration, Commonwealth Department of Education Skills, and Employment. *https://docs.education.gov.au/documents/alice-springs-mparntwe-education-declaration*, *2019*

Australian Government Department of Education. n.d. National Assessment Program - Programme for International Student Assessment. *https://www.education.gov.au/national-assessment-program/national-assessment-program-programme-international-student-assessment*

Australian Association of Mathematical Teachers and Australian Industry Group, 2014, "Identifying and Supporting Quantitative Skills of 21st Century Workers" *https://aamt.edu.au/wp-content/uploads/2020/07/Quant-Math-Skills_Final-Report.pdf*

Australian Chief Scientist, 2014, "Tacking the School-Industry Mathematics Divide" *https://www.chiefscientist.gov.au/sites/default/files/Quantitative-Skills-of-21st-Century-Workers-Summary.pdf*

Black, Stephen & Yasukawa, Keiko (2013): Beyond deficit models for integrating language, literacy, and numeracy in Australian VET, Journal of Further and Higher Education, 37:4, 574-590

Cameron, L 2016, The salience of diversity in foundation skills contexts, pedagogies, and research, NCVER, Adelaide.

Daylight, R., and O'Carroll, J. 2019. Teaching University Students to Read and Write. Literacy and Numeracy Studies: An international journal in the education and training of adults, 27:1, 1-19. *https://doi.org/10.5130/lns.v27i1.6959*

Goos, Merrilyn (2020) Numeracy Across the Curriculum, Allen & Unwin, Cornwall

Goos, M., Geiger, V., Bennison, A., & Roberts, J. (2015). Numeracy teaching across the curriculum in Queensland: Resources for teachers. Final report. Brisbane: The University of Queensland.

Hilton, Alison & Saunders, Rebecca & Mansfield, Caroline. (2019). "In LANTITE, No One Can Hear You Scream!" Student Voices of High-Stakes Testing in Teacher Education.. Australian Journal of Teacher Education. 45. 57-72. 10.14221/ajte.202v45n12.4.

Lane, R. 1980. The development and implementation of the ACT schools accreditation system. Research report, evaluation and research, ACT schools authority.

Productivity Commission 2022, 5-year Productivity Inquiry: From learning to growth, Interim Report, Canberra, September

Quantitative Literacy Design Team, 2001, "The case for quantitative literacy" in L. Steen (ed.) *Mathematics and Democracy: The case for quantitative literacy*, pp1-22, Princeton, NJ: National Council on Education and Disciplines
https://www.maa.org/sites/default/files/pdf/QL/MathAndDemocracy.pdf

Strauss, P. (2016). I can see the rabbit! in Yasukawa, K., & In Black, S. R. (2016). Beyond economic interests: Critical perspectives on adult literacy and numeracy in a globalised world.

Van der Wal, N., Bakker, A., Drijvers, P. (2017). Which Techno-mathematical Literacies are essential for future engineers? Int J of Sci and Math Educ (2017) 15 (Suppl 1): S87–S104 DOI 10.1007/s10763-017-9810-x