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What 'counts' as numeracy preparation in enabling education programs? Results of a national audit

Evonne Irwin

English Language and Foundation Studies Centre, University of Newcastle, Newcastle, Australia

Email: evonne.irwin@newcastle.edu.au

Sally Baker

School of Social Sciences, University of New South Wales, Sydney, Australia

Email: sally.baker@unsw.edu.au

Ben Carter

English Language and Foundation Studies Centre, University of Newcastle, Newcastle, Australia

Email: ben.l.carter@newcastle.edu.au

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Enabling education plays an important role in facilitating the entry of 'non-traditional' students into Australian higher education through offering a (currently) cost-free, low stakes alternative pathway into undergraduate study. As such, enabling programs have opened access to students who would otherwise be prohibited from studying at university. In offering pathways that are alternative to the 'norm' of school to university transition, enabling education occupies a multifaceted space in higher education and although the definition of enabling education offered by Commonwealth legislation is very broad, we understand its role to be meeting entry requirements through preparing for, inducting, and supporting students in the demands of undergraduate study. This paper takes a fresh look at enabling education through the lens of numeracy as a social practice (Baker & Street, 2004). Through a national audit we map the location of numeracy in enabling programs and explore practitioner perceptions and practices with regard to academic numeracy in enabling education. Our central focus is to understand what enabling educators consider are key numerical and mathematical content and concepts for 'academic preparedness' so that we may develop richer understandings of what enabling educators perceive as constituting 'preparedness' for undergraduate study. This project is one attempt to add a layer of critical analysis and research to the enabling story as a way of enhancing its important place as a social justice initiative in Australia's education sector.

Key Words: academic numeracy, mathematics, enabling education, academic literacies, academic preparedness, numeracy as social practice.

1. Introduction

For many years, enabling education has been an important feature in the Australian higher education landscape, facilitating the entry of 'non-traditional' students into undergraduate education

through offering a (currently) cost-free, low-stakes, alternative pathway. Enabling programs fulfil government policy goals to ensure equitable access to higher education for disadvantaged groups by satisfying the conditions of achievement, aspiration and access (Pitman et al., 2016) for students who would otherwise be prohibited from entering university. In offering alternative pathways to the 'norm' of school to university transition, enabling education occupies a multifaceted space in higher education. Moreover, despite a broad definition of enabling education offered by Commonwealth legislation, we articulate its remit in terms of preparing, inducting, and supporting students for the demands of undergraduate study.

This paper focuses on perceptions and practices with regard to academic numeracy in enabling education. The rationale for this focus is two-fold. Firstly, in a previous study the authors explored the national terrain of academic language and literacies provision in enabling education (Baker & Irwin, 2015, 2016), and in this work we identified five dominant programmatic models for enabling education, with academic literacy and/or academic numeracy featuring as compulsory modules in all but one of the 35 programs surveyed. Secondly, the literature suggests that students' decisions to seek alternative entry into higher education appear to be strongly connected to their experiences of school mathematics. For many students, these experiences may leave an emotional legacy of negative attitudes and emotions related to fear and anxiety (e.g. Wedege, 2002; Whannell & Allen, 2012). These rationales necessitate a fresh look at the field of enabling education through the lens of numeracy as social practice (Baker & Street, 2004). In looking for similarities and differences in how numeracy is taught, assessed, supported and valued in enabling education programs, we aim to add more detailed information to the field of enabling education, and to develop richer understandings of what enabling educators perceive as constituting 'preparedness' for undergraduate study.

This paper will present key major findings of this second national audit of enabling education, which was also funded by the AALL. First, we explore terminology and understandings associated with numeracy and mathematics; we then trace the research terrain of numeracy as a social practice before providing a brief background to enabling education in Australia and taking a closer look at numeracy in enabling education. Finally, we offer our findings which explore patterns connected to:

- what is considered to be 'core' numeracy content for academic preparation;
- how it is positioned within enabling programs;
- what connections exist (if at all) with undergraduate discipline areas; and
- whether academic numeracy is considered to be part of 'academic literacies'.

From these findings, we have updated our digital typology of Australian enabling education, which now includes detail and description of the academic numeracy provision in each enabling program added to the initial 2015 iteration, which outlines the academic language and literacies provision.[1]

2. Background

2.1. Mathematics and numeracy: terminology and understandings

There is a great deal of slippage between the two most dominant terms – 'numeracy' and 'mathematics' – with these terms used sometimes interchangeably and sometimes contrastively. Numeracy and mathematics are not entirely separate entities; rather, they are overlapping parts of a superordinate typology that refers to knowledge production and constructing the world through the use of numbers. A similar, and for some, more recognisable analogy can be made with the relationship between literacy and literature. Indeed, Wilkins (2016) notes that numeracy is "an

[1] Enabling Typology: http://enablingeducators.org/enablingtypology/

umbrella term that, in a way, means to be literate in mathematics" (p. A-71). The nominal relationship between numeracy and literacy becomes complex, however, when slippage in how numeracy is understood and used leads to it being invisibilised or subordinated, particularly when it is positioned alongside literacy (Rossetto & Wilkins, 2015).

Although the notion of academic numeracy has been discussed extensively (Chapman, 1998; Wedege, 2002; Taylor & Galligan, 2009; Galligan, 2011, 2013; Wilkins, 2016; Boreland, 2016), it remains an ambiguous construct. We consider numeracy to be qualitatively different from mathematics and use the term 'academic numeracy' throughout this paper to refer to: the teaching, learning and application of 'necessary maths' for professional and/ or disciplinary contexts in ways that are contextual, adaptive and developmental, and which foreground issues of students' mathematical competence, critical awareness and confidence.

2.2. Numeracy as social practice

Following from the theoretic frame used in our previous work (Baker & Irwin, 2015), we again draw on the conceptual tools offered by Academic Literacies (Lea & Street, 1998) to develop critical and holistic understandings of academic numeracy in the enabling context. From an academic literacies perspective, literacies are a set of sociocultural practices that are deeply embedded within contexts, and which are constituted by/ are constitutive of particular disciplinary epistemologies and values. As such, academic literacies offer significant opportunities and limitations for a person's capacity to make meaning (or demonstrate learning) in their educational contexts. Academic literacies are also historically situated, and are embedded in (often hegemonic) institutional systems, and are reflective of the power that educational institutions exercise (largely through assessment regimes). Understood in these terms, literacy/ies are not neutral conduits for teaching and learning (or 'autonomous', using Street's 1984 term); rather they are loaded with power and privilege.

Others have argued that a similar argument can be made of numeracy/ies (see Baker, 1995; Baker & Street, 2004; Prince & Archer, 2008). For example, Baker (1995) made the case for a social practices view of numeracy, arguing for a four-part understanding of maths/numeracy: content, context, culture and ideology. Baker argued that these four components open a space of acceptance for the idea of multiple numeracies. When Baker advanced his argument in the mid-1990s, it challenged the mainstream prescriptive and singular view of maths/numeracy as espoused in the UK mathematics curriculum. Some would argue that such autonomous views still prevail in contemporary education systems. Indeed, the transformative view offered in numeracy as social practice has significant implications for the status quo, in terms of curriculum, pedagogy and power relations. This is particularly pertinent for an 'alternative entry' space like enabling education, which offers the flexibility and creativity not made available in formal and rigid systems of schooling or higher education.

Numeracy and the socio-political turn: critical numeracies

A further area of literature that holds relevance for the teaching and learning of academic numeracies in enabling education is that of critical numeracies. The literature (particularly North American) suggests a growing movement toward new and radical approaches to research and pedagogy in mathematics education framed by equity and social justice discourses. This resistance against traditional, cognitive approaches to mathematics pedagogy has been referred to by Gutiérrez (2013) as 'the socio-political turn' and has largely been practised drawing on Freire's critical pedagogies (see for example, Gutstein, 2003; Martin, 2009; Gonzalez, 2009; Stinson et al., 2012; Gutiérrez, 2013). At the heart of calls for praxis-oriented change among these researcher-practitioners is a commitment to the promise of critical/radical pedagogies in conjunction with teaching for social justice to drive social change for marginalised communities (Gonzalez, 2009; Stinson et al., 2012). As Sondel et al. (2017) highlight, such critical approaches to teaching numeracy/ies offer more recognitive (and disruptive) possibilities for students whose educational experiences

have not aligned with dominant forms of schooling. As a form of academic preparedness that is in part needed *because of* school mathematics pedagogies, enabling education offers opportunities to engage in andragogies that challenge and offer real alternatives to traditional and limiting approaches to teaching academic numeracy.

In the next section we briefly give context to Australia's enabling education field, focusing on its role as a pathway to higher education for students who may fall into 'equity' student categories.

2.3. Enabling education in Australia

Enabling programs constitute a significant space in Australian higher education, offering alternative pathways for 'non-traditional' students; in particular, high numbers of students from backgrounds associated with the federal government's equity categories enter higher education via this route (Pitman et al., 2016). Research shows that enabling education has benefits that are "multi-layered and profound" (Crawford, 2014, p. 27) and enabling programs have a significant positive impact on students' academic performance (Klinger & Tranter, 2009; Andrewartha & Harvey, 2014) and their sense of self and confidence (Debenham & May, 2005; Murray & Klinger, 2012; Crawford, 2014; Hall, 2015; Johns et al., 2016). However, Habel (2012) reminds us to be cautious about reading such positive accounts without applying a critical lens because we "can [be] distract[ed] . . . from the need for rigorous analysis and research on the issue" (p. 813). This study is one attempt to add a layer of critical analysis and research to the enabling story as a way of enhancing its important place as a social justice initiative in Australia's education sector.

With 36 programs across 27 institutions (this does not include Indigenous-specific enabling programs), enabling programs are prolific in Australia (Baker & Irwin, 2015). Despite this proliferation, the status of enabling programs in the higher education sector is arguably marginal, both in terms of structural and physical location, with programs largely situated in university-affiliated colleges and student/learning support centres. Indeed, only six of the 27 institutions surveyed in Baker & Irwin (2015) hosted their enabling programs within a faculty. These positionings may suggest a view that the work undertaken in enabling programs is less academic and therefore less legitimate than the work undertaken in the faculties. Furthermore, these positionings are significant not only in terms of communicating what enabling programs do to a broader audience, they can also impact on the relationships held between enabling educators and their colleagues teaching into under- (and post-) graduate programs.

Pitman et al. (2016) state that "an enabling program is not a higher education award in and of itself; rather it prepares the student to enter a course (typically an undergraduate degree) by providing them with requisite academic skills" (p. 10). This focus on the provision of 'academic preparedness' underpins all enabling programs and it is our contention that close relationships with faculties facilitates practitioners' ability to enable and prepare. In addition, a key finding from our previous audit of enabling education (Baker & Irwin, 2015) was that several participants suggested numeracy was part of a broad suite of 'academic literacies', and therefore we extend our argument to include numeracies as a core part of enabling education.

Numeracy in enabling education

When thinking about the place and role of academic numeracy in enabling education, we need also to consider both what has come before (often school mathematics and/or perhaps adult education numeracy) and what is to come after (perhaps a diploma or undergraduate study). The literature tells us that there are significant challenges for students and teachers alike when it comes to academic numeracy, which often plays out in three main discourses: students are under-prepared for the level of maths required for undergraduate study (Gordon & Nicholas, 2010; Poladian & Nicholas, 2013; Gordon & Nicholas, 2015); school mathematics causes anxiety about numbers

(Whannell & Allen, 2012; Poladian & Nicholas, 2013); and academic numeracy should be embedded in disciplinary curricula (for example, Huijser, Kimmins & Galligan, 2008; Taylor & Galligan, 2009; Galligan, 2013; Boreland, 2016).

Previous research by the authors (see Baker & Irwin, 2015) has identified that numeracy is considered to be a key component of enabling curricula and constitutes a part of 'academic literacies'. This finding is particularly pertinent in the Australian context where the secondary education system broadly does not require students to study mathematics beyond Year 10 (although there is variation in this in the Northern Territory and Tasmania), and students can elect to study mathematics at three levels: entry, intermediate or advanced. In the context of a declining uptake of secondary mathematics education, particularly at the intermediate and advanced level (Kennedy, Lyons & Quinn, 2014), and where many universities have removed mathematics prerequisites for undergraduate programs (Taylor & Galligan, 2005), numeracy, it seems, is a taken-for-granted, yet essential element of enabling education.

We understand that the challenges concerning enabling numeracy educators are not unique to the enabling field. In his review of the international and national literature into the transitions of students from high school into university-level mathematics, Jennings (2009, p. 273) identifies a number of initiatives introduced by institutions in order to address the concerns raised by a more diverse cohort, declining engagement with advanced mathematics at high school level, and drop in university entry requirements. This project, however, situated in the enabling field as it is, acknowledges and supports the important role of numeracy in the enabling curriculum.

In 2005, Janet Taylor and Linda Galligan examined the networking and research activity of bridging mathematics educators from 1992 on – here we acknowledge that there is slippage in the use of the term 'bridging program' which is used in New Zealand and in some cases, Australia, to define what we know as 'enabling program' (Galligan & Taylor, 2008) – and concluded by raising some critical research questions for future exploration, canvassing notions of 'success' in mathematics, the numeracy demands of university courses, effective ways to support mathematics study at university, and whether mathematics skills are considered as separate from or integral to "other skills believed necessary for success at university" (2005, p. 10). Finally, Taylor and Galligan (2005) called for bridging mathematics practitioners to "actively campaign the importance of academic numeracy skills in all university programs" and "rigorously defend the notion that bridging mathematics is an academic activity" (p. 11). This attempt at rousing discussion, research and advocacy seems to have gone relatively unheeded – at least in the research domain – as the literature on numeracy/ mathematics in bridging or enabling education is sparse, with relatively little written on 'what works' or the challenges of teaching and learning academic numeracy in the last ten years.

Enabling education in Australia has undergone many shape-shifts which have largely been activated by changes to government educational policies and subsequent funding opportunities. What this has meant in practice is that the field has emerged sporadically with the implementation of new programs clustered around the various policy turns. It is this lack of consistency which may have contributed to the scarcity of literature emerging with respect to the field in general and to numeracy in particular.

What does exist is an exploration largely of students' attitude to mathematics centring on confidence and anxiety as well as the 'richness' embedded in enabling numeracy education. For example, Wandel et al. (2015) examined perceptions of preparedness and confidence levels in students who had undertaken mathematics at different levels as part of an enabling program in a regional university in Australia. They found that academic staff perceived students as being less prepared for undergraduate studies than the students themselves. In Gordon and Nicholas' (2013) study, enabling students also developed positive perceptions toward mathematics as well as an enhanced knowledge of mathematics. In their review of adult students returning to study mathematics across community and further education sectors, Galligan and Taylor (2008) indicate that

the types of numeracy encountered by these students is rich and embedded, however, they remark, as we have found here, that "there is little to no discussion of teaching practices" (p. 113) with the lens focused on students "and what they bring with them" (p. 113).

The next sections of this paper outline our research and findings with respect to enabling educators' perceptions of what 'counts' as numeracy preparation for undergraduate studies.

3. Methodology

3.1. Research design

As was the case with our audit of academic language and literacies in enabling education (Baker & Irwin, 2015), this project worked within a qualitative, interpretive methodology and adopted an evaluative stocktaking approach to scoping the enabling sector provision. Following this design, an evaluative and interpretive analytic approach was adopted, with key interview data/ documents collected and analysed for thematic links across the sector.

Following the 2015 AALL project, this project had three main components:

- A 'desktop' review of information or curricula/ teaching and learning documentation offered publicly by each HEI
- A telephone-based survey with key staff in all HEIs that offer enabling courses across Australia, with follow-up phone calls organised if necessary
- Thematic and critical discourse analysis of interview (phone call) and document data

We crafted five descriptive research questions, around which we developed our interview schedule (for a full account, see Irwin, Baker, & Carter, forthcoming). The questions relevant to the data presented in this paper are as follows:

- What numeracy or mathematics modules are offered in each enabling program offered across Australia, and are they core or optional?
- What core numeracy concepts and content are considered necessary for 'tertiary preparation'?

Twenty-six participants from 27 enabling programs across 23 participating institutions took part in the interviews. From these interviews, we sought to collect further detail of what happens in enabling programs across Australia so as to develop a richer description of the field of enabling education and add to the digital typology created as an output of the previous AALL-funded audit of ALL. In addition to this further layer of description, this project also set out to explore how numeracy is perceived and positioned in the wider context of university-readiness, and whether it is considered to have an integral place in the notion of academic literacies, or whether it is seen/ positioned as a separate entity in terms of academic preparation.

3.2. Analysis

The data gathered in this project were analysed iteratively. Therefore, the data gathered from the desktop review informed the interview schedule and the responses from the interviews fed into follow-up questioning. Data were thematically analysed then partitioned and further analysis of a subset of the data – discourses arising from participants' perceptions of academic numeracy – was analysed against Baker's (1995) four-part continuum of numeracy (see Figure 1 and discussion above).

Content	Context	Culture	Ideology
Autonomous	Events	Values	Ideological
Activities	Purposes	Beliefs	Relationships
Techniques	Appropriacy	Epistemologies	Power
Skills			Legitimacy

Figure 1. Baker's (1995) 4-part model of numeracy: depicted as a continuum.

4. Findings

The findings reported here are organised around four areas which we have identified as significant in the shaping and understanding of numeracy preparation in enabling education in Australia: the positioning of numeracy in enabling programs; core numeracy content for academic preparedness; connections with undergraduate faculties; and perceptions of academic numeracies/literacies.

4.1. How is numeracy positioned in enabling programs?

Under current teaching standards and funding arrangements, enabling programs in Australia may determine their own curricula based on the identified and perceived needs of their particular contexts (Baker & Irwin, 2015; Pitman, et al., 2016). Each program, therefore, is different in its structure and requirements for completion. For some programs, academic numeracy and mathematics may be viewed as foundational preparation for entry into university and therefore part of the core curriculum, yet for others, academic numeracy/mathematics courses are available as electives or as part of disciplinary streams. The way in which academic numeracy and/or mathematics is embedded in a program at the structural or discipline level may indicate program-level attitudes to the importance of numeracy in academic preparedness.

Our data reveals that enabling program designers and educators largely view mathematics or academic numeracy to be essential preparation for university study with 72 per cent of our 27 participant programs including numeracy or mathematics as a core or compulsory part of the program. Of those core program components, numeracy or mathematics was positioned either as a discrete, compulsory unit; as a core part of a particular disciplinary stream; or embedded in a program where there are no individual units.

In addition to these core program units, numeracy was also reported as embedded in other available program units. Most examples of 'embedding' numeracy were in relation to courses specific to the sciences, for example Physics or Chemistry units, or introductory science units. Participant responses to questions of numeracy embeddedness often reflected an assumed 'natural' relationship between numeracy and these types of units, for example, "So we have a science course and that can't help but have embedded numeracy in it" (Participant 9); and "some of it is embedded into the science because it naturally goes with that" (Participant 8). Assumptions of these types, while undeniable, run the risk of masking the complexities of numeracy practices in these particular discipline areas where 'naturalness' may equate with 'invisible' and 'tacit'.

However, other participants identified that numeracy was embedded in units that were not specifically mathematics- or science-related, such as in an academic writing unit … when you're looking at data …" (Participant 3a), or a critical thinking unit where:

> ... one of the issues we analyse is the growth in population and what it means if the world now has 7 billion people. Now that draws back on some of the concepts and materials that they were introduced to in their very first module in maths when we start looking at volume in numbers. (Participant 7).

And more generally, one participant commented: "Numeracy pops up everywhere, even if you're writing because if you're reading an article that has a table in it then that's numeracy. Reading tables is not as straightforward as you think" (Participant 9). Although limited in the data, these responses emerged primarily from participants whose positions afford an overall picture of program curriculum, such as program convenors, and reveal attitudes to academic numeracy which move beyond 'skills' discourses and acknowledge the social interconnectedness of numeracy practices and their complexity in academic contexts.

4.2. Enabling educators' perceptions of 'core' numeracy content for academic preparation

Data related to core numeracy content for academic preparation was gathered from participants and validated via publicly available information such as institutional websites. These data were notionally gathered into seven categories – Arithmetic, Geometry, Thinking, Algebra, Number, Language, and Statistics – and these categories were validated by a discipline faculty member. We acknowledge that there is potential overlap and relationality in and between many of the topic areas identified by our participants and through our audit of institutional information.

Table 1 shows the number of participants who identified as 'core' the topics/numeracy content in each of the seven categories.

Table 1. Core numeracy categories and number of participants.

Category	Number of participants
Arithmetic	17
Number	16
Algebra	14
Statistics	14
Language	11
Thinking	7
Geometry	4

In their study of freshman year educators, Corbishley and Truxaw (2010) found that reasoning and generalisation were viewed as the most important constructs of numeracy when entering undergraduate studies, yet students were ill-prepared in these areas: "[t]hese findings suggest that precollege mathematics should include emphases on algebraic reasoning, geometry, and number sense" (Corbishley & Truxaw, 2010, p. 82). The data gathered in this study describing core academic numeracies reflect, in part, these priorities, with the exception of geometry. Many participants indicated that understanding how to interpret data in academic research contexts formed an important part of what they considered to be academic numeracy. This indicates that curriculum design is underpinned by a view forward to undergraduate studies and an attentiveness to the context of university preparation.

4.3. Connections with undergraduate discipline areas

As mentioned above, one of the underpinning notions connecting Australia's diverse enabling programs is the imperative to prepare students for university study. Therefore, as a team we were interested in the types of relationships that exist between enabling teaching staff and their undergraduate colleagues. A range of experiences were related by participants including some who reported having no connection at all with undergraduate faculties through to others who were engaged in (predominantly) informal and (some) formalised relationships with undergraduate staff and programs (21 out of the 25 participants who were able to answer this question).

The most common form of relationship described was made possible via staff teaching into both enabling and undergraduate courses. Enabling staff who [had] also taught in the faculties – sometimes concurrently with their enabling teaching and for others, historically – described informal or ad hoc connections, or as one participant described, "back door . . . not an official sort of thing" (Participant 21). These connections largely emerged based on personal and professional relationships developed through those 'cross-over' teaching experiences. Some sessional staff were better placed to form these relationships due to their need for work necessitating moves across and between different programs. For other staff across the country, the nature of permanent, full-time teaching work in an enabling program means that the opportunities to work in undergraduate programs is restricted, due to both institutionally-imposed workload models and available time.

Those participants who engaged in informal relationships with undergraduate faculty programs and colleagues expressed the value in these connections for informing their enabling curricula. Some articulated the benefits for their enabling students by indicating that they were better able to identify what students 'need' or 'require' to enter their undergraduate studies:

> Most of the tutors that we have also teach in undergraduate degrees and myself personally, I also work with undergraduate lecturers as well so I kind of feel like I have a good idea of what is required for them. (Participant 2)

Others spoke about their connection to faculty presenting better opportunities for 'progression' into undergraduate studies for students:

> … but I still have that sort of foot in the door with the first year subject and work closely with that lecturer so we've got a really good relationship and I suppose we've got a good perspective of the pathway from the [enabling program] to the first year course. (Participant 6)

Formalised relationships with undergraduate faculties were via the mechanisms of communities of practice, curriculum (re)development initiatives (typically described as once-off occurrences) and as part of quality assurance measures such as through academic boards or examination approvals processes. However, these formal relationships were scarce in the data, perhaps indicating the marginality of enabling programs in universities and misrecognitions regarding their role in a whole-of-university context in preparing students for undergraduate programs.

4.4. Academic numeracies/literacies: positions, perceptions and definitions

The positioning and substance of academic numeracies within enabling programs indicates their value in the preparation of students for undergraduate studies, yet tells us little about practitioner epistemologies, pedagogies and classroom practices. We asked our participants what 'academic numeracy' meant to them. The question elicited a broad range of responses; these were organised around 14 discourses and then analysed against Baker's (1995) model of numeracy (see Table 2).

Enabling educators consider communication, application and understanding of numerical concepts significant components of academic numeracy. We interpret this discourse as straddling the Context–Culture area of the Baker's (1995) continuum, indicating a move away from skills-based, context-less teaching and learning practices and toward an acknowledgement of the connections academic numeracies have to social worlds. Many participants also attached qualifications to their

meanings of academic numeracy signifying the particular 'level' of numeracy required and/or the specific target discipline. These responses indicate a particular belief that differing levels of academic numeracy proficiency afford access to specific knowledge domains and we understand these as moving towards the Ideology end of Baker's (1995) continuum. For example,

> … so to understand mathematical concepts or understand numbers in a conceptual way, so being able to apply that to particular disciplines or what might have been called real life situations. (Participant 10)
>
> My understanding is having . . . the concepts of steps and important processes and ability to use them . . . degrees of ability and levels and the skills that are needed in certain areas, and that's where we hopefully are developing courses that provide students with basic and foundational knowledge before they move on to their degree. (Participant 13)

Table 2. Discourses around definitions of academic numeracy.

Discourse	Number of participants who indicated discourse	Baker's (1995) model of numeracy
Identification and application of patterns	2	Context
Competency in skills	5	Content
'Maths-lite'	4	Content
Dependent on academic level	7	Culture–Ideology
Discipline-specific/dependant	5	Culture–Ideology
Logical thinking	3	Culture
Interpretation of graphs/tables	2	Context–Culture
Confidence	2	Culture
Fluency	2	Culture
Attach meaning to symbols	1	Content
Understand, communicate, apply concepts	10	Context–Culture
Socio-political	2	Ideology
Number sense	1	Content–Culture
Reason and argument	1	Context

Unsurprisingly, given our previous research (Baker & Irwin, 2015), participants overwhelmingly considered academic numeracy and/or mathematics to be a part of academic literacies (23 out of 26). One participant expressed caution about using 'academic literacies' as an umbrella term covering numeracy and mathematics, acknowledging that there is overlap but that numeracy is broader and should be considered as something "in its own right" (Participant 9).

Many participants elaborated on why they considered mathematics and numeracy to be a part of academic literacies. These elaborations took participants on a variety of paths with some revealing understandings about numeracy and its connection to 'everyday' practices, and others speaking about the numeracy and mathematical understanding required specifically for particular disciplines and, more generally, for higher education studies. For example:

> Academic writing, you need to be able to do a lot of simple numerical estimations and computations so that you can back up your own argument, for example. (Participant 17)

Table 3 offers a discourse analysis of participants' talk around the question of whether numeracy is considered a part of academic literacies which has been further analysed against Baker's (1995) model of numeracy.

Table 3. Discourses around numeracy as part of academic literacies

Discourse	Number of participants who indicated discourse	Baker's (1995) model of numeracy
Numeracy as tacit/ everyday/ invisible	3	Content
Numeracy as maths vocabulary	1	Content
Numeracy as specific and essential to particular disciplines	4	Context–Culture
Numeracy as mathematics 'lite'	4	Content
Numeracy as essential for HE	5	Context–Culture
Numeracy as a skill	1	Content
Numeracy intertwined with assumptions re aptitude	1	Content
Numeracy as logic	1	Content
Numeracy as applied maths	1	Context

5. Discussion

There is a strong connection between the findings of this study regarding academic numeracy and our previous work that explored academic language and literacies in Australian enabling education (Baker & Irwin, 2015, 2016). Firstly, the study presented in this paper further illustrates the diversity, complexity and context-dependence of each enabling program. The very fact that there is no 'normal' is illustrative of the rich and locally responsive nature of alternative entry provision, such as enabling education. However, there is relative consensus in terms of what 'should' be included in enabling programs; the inclusion of concepts under the categories of arithmetic, number, algebra and statistics indicate the genesis of a pre-undergraduate academic preparation numeracy curriculum. That this consensus appears to exist outside of a nationally established numeracy framework suggests that people working in this space share similar ideas of what is needed for, and what counts as, academic preparation. However, as the findings relating to relationships with undergraduate mathematics suggests, there is no formal outline of what should be included. Moreover, the conversations with undergraduate faculty appear to exist on a serendipitous basis rather than being formally mandated. There is clearly much more that can be done to 'bridge this gap' between enabling and undergraduate academic numeracy.

In terms of the relationship between academic numeracy and academic literacies, there is strong agreement among the participants that numeracy and literacy are symbiotic, and are part of a holistic and critical model of core forms of meaning making in the academic preparation space. Moreover, similar to enabling educators' views of academic literacies found in Baker & Irwin (2015, 2016), academic numeracy is believed to be a fundamental part of academic preparation

by the majority of participants. However, the idea of academic numeracy as a form of 'maths-lite' suggests that there is a spectrum of understandings in terms of how 'numeracy' is understood in relation to maths, which has significant consequences for the ways that academic numeracy are understood, taught and assessed in the varying contexts of academic preparation and undergraduate studies. Furthermore, in addition to this essentialist view, a more nuanced and disciplinary-specific understanding of academic numeracy was common, with several participants mentioning the relationship between particular subject areas and disciplinary epistemologies and the importance of teaching academic numeracy. At the same time, a comparable view is that of the everyday and tacit nature of academic numeracy. These two views – of academic numeracy as everyday and as academic/ subject-specific – reflect the spectrum of understandings, and foreground the need for further exploration of the content, nature and discourses of academic numeracy in higher education.

6. Conclusion

Due to the lack of prerequisites in many undergraduate courses, growing numbers of school students, both locally and internationally, are not taking the opportunity to prepare mathematically for university. While it is certainly not our suggestion that responsibility for plugging numeracy gaps created by systemic changes to university entry requirements or school curricula should rest solely with enabling programs, they are in the position of offering avenues for developing numeracy/mathematical preparedness for undergraduate study.

This study and its predecessor (Baker & Irwin, 2015) are underpinned by an understanding that academic literacies and academic numeracies are social practices (Baker, 1995; Baker & Street, 2004). In taking a broad interview-survey approach with practitioners across the national enabling field, we have aimed to uncover the position of academic numeracy in preparing students for undergraduate study via enabling pathways, as well as gather the perceptions of enabling educators regarding academic numeracies. These data and findings demonstrate that enabling educators, in their curricula design, attach significance to academic numeracy as a core element of preparation for university. Further, enabling educators are sensitive to the culture and context of numeracy in their discourses of academic numeracy. Yet, in an enabling context where the majority of students fall into the six defined equity categories (Pitman, 2016), mobilising the political in numeracy/ mathematics by implementing teaching for social justice frameworks has the potential to move teaching beyond content-, context- and culture-based pedagogies. Doing so may offer enabling educators opportunities to acknowledge not only what their students are preparing for, but what and where they (may) have come from.

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