

Book Review: Numeracy Across the Curriculum: Research Strategies for Enhancing Teaching and Learning

by

Goos, M., Geiger, V., Dole, S., Forgasz, H., & Bennison, A., 2019. Published
by Allen & Unwin.

Glenda Anthony
Massey University

Received: 17/1/2019 Accepted: 12/6/2019

© Mathematics Education Research Group of Australasia, Inc.

In *Numeracy across the curriculum: Research strategies for enhancing teaching and learning*, the authors provide a powerful resource in the form of practical, research-based strategies that will support prospective teachers, teachers, and teacher educators as they respond to the expectation that educators, across all levels and within all disciplines, will know and understand numeracy teaching strategies and their application. A critical and exciting feature of the book is the clear articulation that numeracy must move from a “mathematics concern” to an across curriculum focus. The authenticity of the advocated practices is informed by the authors’ many years of research in Australian educational, home, work, and community/civic settings. To that end, the text carefully explains the nature of numeracy and how it developed as an educational goal for the mathematics classroom and beyond. From the beginning chapters, and throughout, readers are prompted to engage in productive learnings with the inclusion of reflection prompts and numerous classroom exemplars of task design, assessment practices, and how to deal with the challenges and dilemmas of enactment in practice.

Addressing the urgent need to integrate numeracy across the curriculum requires a reframing of numeracy to accommodate the evolving nature of knowledge, work, technology, and 21st century competencies (Thornton, 2016). To address this need, the authors offer an extended definition of numeracy in the form of the *21st Century Numeracy Model*. This model consists of four core dimensions: “Attention to real-life *contexts*; application of *mathematical knowledge*; use of physical, representational and digital *tools*; and promotion of positive *dispositions* toward the use of mathematics. These four dimensions are embedded in a fifth dimension—a *critical orientation*” (p. 58).

The book notes that meeting the challenge to embed numeracy across the curriculum will require more than a “quick fix”. Framed within the *21st Century Numeracy Model* components, the text provides a logical and considered plan of action to support educators. Challenges addressed in the text include the need to broaden and adapt our understanding of numeracy in the 21st century (Department of Education, Science and Training, 2005), with reference to ways that school leavers will work in a technology-based work environment, the importance of teacher knowledge and confidence around adequate and appropriate numeracy skills, and the associated enactment of numeracy across the curriculum. It is the latter aspect that the text makes the most significant



contribution. Set in the Australian education context related to initial teacher education provisions and teacher standards (Australian Institute for Teaching and School Leadership, 2017), the text provides research evidenced-based recommendations for task design and task enactment. Care is taken to drive home the point that the provision of numeracy tasks in the form of resources across a range of contexts does not in itself provide teachers with direction for how to promote numeracy capability. Advocating a whole school approach, supported by leadership across the school, the text explores the value of both a numeracy demands audit across all disciplines, alongside the recognition of numeracy opportunities that teachers can create through the strategies they implement in their planning, task design, and classroom practice.

It was pleasing to see the authors develop the argument—with exemplars of how numeracy can be interpreted, represented, and promoted across the curriculum—that attending to numeracy is not just for numeracy's sake, but is also important for the enhancement of disciplinary learning. The call for teachers to pay attention to opportunities—captured in the notion of a numeracy moment—reminded me of Blanton and Kaput's (2003) notion of "developing eyes and ears", in their case, in reference to algebra moments.

In noting the socio-political influences associated with efforts to improve numeracy learning and teaching, the authors acknowledge the tension between continual struggles to promote a rich definition of numeracy versus the political agenda of measuring and reporting students' numeracy outcomes at particular school year levels. However, in light of the systemic challenges around equity in student achievement (Ford, 2013), there remains scope in future considerations to further develop, for example, Zevenbergen's notion of "cultural numeracy"—in terms of discussion of definition, enactment, and equity/power (Evans, 2017; Jorgensen, 2016).

Overall, I suspect that the question of "What is numeracy?" is one that will continue to challenge educators in our changing information and technology driven society. For example, in addressing mathematical literacy, the initial draft framework for PISA 2021 (Schleicher, 2018) recognises the increasing need for students to demonstrate computational thinking as part of their problem-solving practice. The dimensions of the *21st Century Numeracy Model* readily acknowledges computational thinking skills, including "pattern recognition, decomposition, determining which (if any) computing tools could be employed in analysing or solving a problem, and defining algorithms as part of a detailed solution" (p. 6), as an aspect of numeracy. In this regard, the text reflects the need to be cognisant of changing numeracy demands and be focused on developing stronger orientation towards problem-solving and estimation utilised in the workplace.

In addressing the vexed question, "What is numeracy?" this book offers an excellent resource for the intended audience. In particular, the guided interrogation of existing practice, and the research-evidenced suggestions for changes in practice make it a very useful text addition in any pre-service programme, especially for those programmes that claim time constraints in introducing prospective teachers to the concept/challenge of numeracy across the curriculum.

References

- Australian Institute for Teaching and School Leadership. (2017). *Australian Professional Standards for Teachers*. Retrieved from <https://www.aitsl.edu.au/teach/standards>
- Blanton, M. L., & Kaput, J. J. (2003). Developing elementary teachers' "algebra eyes and ears". *Teaching Children Mathematics*, 10(2), 70-76.

- Department of Education, Science and Training. (2005). *Numeracy research and development initiative, 2001-2004: An overview of the numeracy projects*. Canberra: Commonwealth of Australia.
- Evans, D. (2017). Examining the literacy within numeracy to provide access to the curriculum for all. In M. Milton (Ed.), *Inclusive principles and practices in literacy education* (pp. 35-51). Bingley: Emerald Publishing Limited.
- Ford, M. (2013). Achievement gaps in Australia: What NAPLAN reveals about education inequality in Australia. *Race Ethnicity and Education, 16*(1), 82-102.
- Jorgensen, R. (2016). Middle leadership: A key role of numeracy reform. *Australian Primary Mathematics Classroom, 21*(3), 32.
- Schleicher, A. (2018). *PISA 2021 Mathematics Framework (First draft)*. Retrieved from <https://www.upc.smm.lt/naujienos/smm/penkiolikmeciu-matematinis-rastingumas/GB-2018-4-PISA-2021-Mathematics-Framework-First-Draft.pdf>
- Thornton, S. (2016). Mathematics education, virtues and 21st century competencies. In P. C. Toh & B. Kaur (Eds.), *Developing 21st century competencies in the mathematics classroom* (pp. 13-31). Singapore: World Scientific and AME.
- Zevenbergen, R. (1995). Towards a socially critical numeracy. *Critical Forum, 3*(2-3), 82-102.
-

Author

Glenda Anthony
Massey University
email: g.j.anthony@massey.ac.nz