Catching the Translanguaging Wave: Considerations for Young Multilingual Learners' Mathematical Meaning-Making

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In this position paper we highlight language as a perennial factor contributing to compromised meaning-making in multilingual primary school mathematics classrooms. We note use of the term 'translanguaging' in discussions around mitigating this meaning-making challenge. The paper argues that, while much work remains to be done towards clarifying the pedagogical insights, skills, and resources needed to ensure that translanguaging practices achieve their intended goals, potentially important parallels may be found between horizontal and vertical forms of translanguaging and horizontal and vertical mathematisation.

This position paper explores some implications for primary-level school mathematics of the increasing use of the term 'translanguaging' in our professional literature on ways for enhancing bi- and multilingual learners' opportunities to make meaning of classroom mathematics. Our focus is principally upon ways for improving circumstances in mathematics classrooms in our own, South African, context, but we see our discussion as having relevance for many other contexts where mathematics learners may not yet have developed sufficient proficiency in the *de facto* dominant language of learning and teaching (LoLT).

As we discuss in our penultimate sub-section, the word translanguaging first entered educational parlance some two decades ago in relation to a particular pedagogical strategy for developing and strengthening learners' bilingual proficiencies. Perhaps the earliest use of the term in a publication in English was a 2000 journal article by Cen Williams. In the 1980s he coined, in Welsh, the term *trawsieithu* to describe a particular approach to bilingual (Welsh/English) language pedagogy. The term has subsequently taken on more of a social justice orientation; this in response to concerns about the educational prospects of bilingual learners whose full access to mainstream education may be compromised by the dominance of a particular LoLT. A leading figure in this more political facet of the term's (re-) emergence is Cuban-born Ofelia García, Professor Emerita (Urban Education and Latin American, Iberian, and Latino Cultures) for the City University of New York's Graduate Centre. Translanguaging theory poses significant challenges to 'established' theory around second-language teaching and learning and about how best teachers (mathematics teachers in this instance) might harness and mediate the linguistic and other meaning-making (semiotic) resources their learners bring into their classrooms. These challenges derive from the fact that, traditionally, as Makalela (2015) notes, the language teaching profession has tended to focus on languages as "separate and bounded entities" (p. 200). In other words, the teaching profession's focus is essentially 'monolingual' and 'purist'. By contrast, translanguaging advocates (see, e.g., Garcia & Wei, 2014), focus on bilingual speakers' languaging practices. They argue that these practices derive not from two or more separate language systems, but rather from a single, unified linguistic system or repertoire.

In honour of MERGA 46's surfing theme, our title speaks to the notion of 'catching' the translanguaging wave. Much more important, however, is the issue of successfully 'riding' this wave once caught. In this paper we argue that not being able to do so poses the real threat to equity, and that much work is still required towards ensuring that we clarify what pedagogical insights, skills, and resources are needed to ensure that our translanguaging practices do indeed help our learners get safely to their hoped-for shorelines.

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Our Trajectory Towards the Translanguaging Space

English remains the preferred LoLT in South African schools despite its being the native language of less than a tenth of our population. Reports on our learners' achievement in national and international assessments of mathematical proficiency directly implicate levels of proficiency in the LoLT as a significant factor influencing their performance. In light, for instance, of South Africa's disappointing TIMSS 2015 outcomes it was decided that, although TIMSS generally assesses learners at Grade 4 level, for 2019 we would instead test our learners at Grade 5 level using an easier version of the assessment (Reddy et al., 2020). These adjustments notwithstanding, only 5% of South Africa's participating Grade 5s attained the 'High and advanced' benchmark category (> 550); a distressing 63% scored in the 'Below low' benchmark category (< 399) (Gondwe, 2022). In relation to participating learners from no fee schools, only one in four spoke the language of the test at home (Reddy et al., 2022). "No silver bullet," these authors cautioned, "will fix low performance, remediate years of social imbalance throughout the system, and penetrate the indelible association between one's circumstances at birth and economic and social outcomes" (p. xvi). We regard the fact that the overwhelming majority of South African learners do not have sustained and systematic opportunities to take advantage of the mediating power of their strongest linguistic resource, their first language (L1), for making meaning of their school subjects, as central to addressing at least part of these inequitable circumstances. This requires that we clarify how best we might harness the meaning-making potential translanguaging offers.

Our pathway towards the translanguaging space began with our work at the literacy/ numeracy interface where we looked at the place of language in supporting young learners' mathematical development. Our focus was almost exclusively on classroom talk (or the virtual absence thereof from learners). Our analysis of the talk taking place in one Grade 4 mathematics classroom where English was the school's chosen official LoLT revealed that such talk as did take place was almost exclusively teacher talk. Observed learner talk was limited, largely monosyllabic and formulaic, often chorused, and frequently no more than a mirroring of small chunks of the teacher's talk. It gave scant evidence that the children were engaging in genuine mathematically-oriented verbal exploration of the ideas their teacher was putting before them (Robertson & Graven, 2019). Both the teacher and all of her learners were first language (L1) speakers of isiXhosa, the principal language for almost 80% of people living in the Eastern Cape province. Were it not for the school's stringent adherence to its straight-for-English policy and its discouragement of using isiXhosa anywhere other than in the isiXhosa language class, we believe that use of isiXhosa alongside English would have greatly aided learners in their mathematical meaning-making, encouraging also more participatory behaviour. Our analysis of the talk taking place in another Grade 4 mathematics classroom at a school where isiXhosa was the official LoLT for the first three years followed by a gradual transition across into English from Grade 4, showed a different picture. Although the teacher did most of the talking, her scaffolding of the learners' mathematical meaning-making through allowing access to isiXhosa, the L1 she shared with all her learners, appeared to give the learners a greater sense of confidence and agency in managing various mathematical tasks (Robertson & Graven, 2020a; Robertson & Graven, 2020b). To exemplify we share an excerpt from one of her Grade 4 mathematics lessons. It shows her blend of English and isiXhosa (in italics) usage, with some transliteration. English translations are in square brackets:

> Pointing to the test written up on the chalkboard, the teacher says,
>
> Nantsi itest ebhodini, Bethuna. Nantsi test ebhodini. Bendinixelele, mos? [Here is a test on the board, People. Here is the test on the board. I told you that you going to write, didn't I?]
>
> She quickly goes through various of the test item requirements. Pointing, for example, to one such item (to do with recognising number patterns), she says,

> Copy and complete. It's 93; 83; 73; -; - . What is next? 5, 9, 13; -; - . What is next? Siyevana? [Do you understand?] … Ukuba aku understandi uphakamise osandla. [If you don't understand, just put your hand up.]

Our next step towards the translanguaging space took us into multimodal territory. Here we focussed on the role non-linguistic semiotic resources can play alongside talk around mathematical ideas. This formed the substance of our presentations at the last three MERGA Conferences (Robertson & Graven, 2021; Robertson & Graven, 2022; Robertson & Graven, 2023) where we shared micro-ethnographic data illustrating some of the ways in which mathematical meaning was co-constructed in the course of an after-school mathematics club session with Grade 3 learners. The session was conducted almost exclusively in English, a language none of the children were at ease with even though it was the language of instruction in their classrooms. Most of the verbal input thus came from the club facilitator. With the additional semiotic input via gesturing, looking at and producing various images and inscriptions, and the use of concrete objects, the club members were able to work with the facilitator in reaching the solution to the mathematical challenge she had set them. This success highlighted the power of multi-modality for harnessing as much mathematical meaning-making potential as possible alongside the linguistic input, especially in contexts where understanding the linguistic input might be a challenge for learners. This could simply be because they have not yet become proficient users of a particular language. It might be a result of differences between the language registers of schooling and those experienced at home. In the case of the club members, both of these factors were at play. Not only were all of the children from isiXhosa- or Afrikaans-speaking homes, but all came also from socio-economically vulnerable backgrounds. Quite frequently in the latter circumstance, the oral and literacy patterns of the home differ substantially from such patterns at school. The seminal work of, for example, Bernstein (1971) bears testament to some of the challenges arising from such home/school linguistic divergence.

Most recently our edging towards the translanguaging space has involved exploring the growing importance of making multilingualism official. This is particularly important for educational contexts such as ours. Our colonial history has resulted in the imposition of a language from outside, with, as noted relative to our learners' TIMSS outcomes, potentially extremely negative consequences for academic and other success. We have frequently cited Setati's point (2008) about the perception that an English-medium education is the one most likely to provide learners their access to what she termed 'social goods' (p. 115). Such perception takes little account, however, of the additional burden learning through a second language (L2) often poses in relation to learners' epistemological access to, in the context of Setati's research, mathematics. We take the view that biliteracy is the obvious route through this impasse: academic proficiency in one's L1 plus academic proficiency in a global language (in this instance, English). Such biliteracy is more easily asserted than achieved, though, hence the almost worldwide ruing of the slowness of what has been called 'the multilingual turn' (after May, 2014). In two recent publications (Robertson & Graven, 2024a; 2024b) we explore reasons behind this slowness and highlight the importance that this turn be taken. Ironically our own country's Language in Education Policy strongly advocates multilingualism; and, in particular, the principle of additive bilingualism, yet with a 'purist' approach to the use of languages and translated mathematical terms in the classroom. The politics of language is preventing teachers and their learners from using their everyday home language for epistemological access, and, for a variety of reasons which we do not explore here, mere advocacy is proving an inadequate driver for ensuring its implementation. Increasingly, however, the idea of translanguaging is being identified as an important means of mitigating the linguistic hurdles faced by African learners (Essien et al., 2024).

‘Translanguaging’: Origins and Some ways Forward

Poza (2017) observes that “many questions remain about translanguaging pedagogies, especially regarding their implementation and outcomes” (p. 120). He cautions that inconsistencies in the way the term is conceived may dilute its ‘social justice’ implications. Heugh (2019) notes that while linguists agree that translanguaging “can benefit learning”, there are some “contradictory understandings” of what this involves (para. 1). She distinguishes between two such understandings: one originating in the Welsh context in the 1990s; the other, a more recent, and increasingly popular understanding, of which Ofelia García (e.g., 2017) is amongst its leading proponents.

Vertical and Horizontal Translanguaging

In describing key elements of these contradictory understandings, Heugh makes the useful distinction between horizontal and vertical translanguaging. And, while she makes it clear that she accepts there is considerable merit in horizontal translanguaging relative to the initial stages of any meaning-making endeavour, she identifies the original (Welsh) practice of ‘trawsieithu’ (translanguaging) as coming closer to the kind of vertical translanguaging most conducive to learners’ development of *higher levels* of academic proficiency in both their L1 and in whatever is their target L2. Williams (2000) explains of the Welsh bilingual education, that “where two languages are used equally in both oral and written contexts, there is room for ‘translanguaging’, i.e. reading in one language and writing in the other” (p. 144). We note the implicit emphasis on ‘equally’. Such purposeful and systematic switching across discrete languages involves, as Heugh (2019) remarks, “highly complex metacognitive and metalinguistic processes and capabilities” (para. 3).

The emphasis in horizontal translanguaging foregrounded by linguists such as García is more on “fluid linguistic practices rather than deliberate alternation between two clearly demarcated standard languages” (Heugh, 2019, para. 4). Here the goal appears to be geared more towards political, social justice imperatives in education than towards pedagogical ones. This is not, of course, to imply that these imperatives are mutually exclusive goals. School language, García argues, “acts as the barrera that keeps the very few powerful” (2017, p. 257). She contends that “only those whose language practices can easily pass through the narrow linguistic passageway that schools construct, have then access to knowledge, knowledge of ciencia, historia, literature, matemáticas, and all other ways of understanding the world” (2017, p. 257). We note in these statements García’s exercise of translanguaging. As she explained in an earlier article co-authored with Wei (2014), the ‘trans-’ in ‘translanguaging’ allows for this kind of transgression of traditional language boundaries of, for instance, the structures and practices both of language and of education systems. This transgression, achieved in transdisciplinary ways, aims at transforming conventional cognitive and social structures. Amongst the important social justice imperatives identified by García (2023a) is “ensuring that racialised bilingual speakers’ lives and languaging are valued as meaning-making systems that are not only legitimate, but also academic [so flattening] … the hierarchies produced when named languages are attached to national or social groups that are always ranked on a social scale” (p. 7). In another recent publication she explains that “racialized bilinguals do language by assembling a repertoire of language and semiotic features and practices from all the different communities and individuals with whom they interact” (García, 2023b, pp. xxi–xxii).

Ways Forward

The above descriptions of the apparently contradictory interpretations of translanguaging derive from what Bonacina-Pugh et al. (2021) call the differences between the ‘fixed language approach’ and the ‘fluid languaging approach’. Both, in our view, have a place in the mathematics classroom. This is particularly so for the multilingual classrooms that predominate

in South Africa where, for too long, a majority of learners have had only diminished opportunity to use their dominant (L1) language as a genuine resource (after Ruiz, 1984), a genuine source of linguistic capital with which to invest (after Bourdieu, 1977) in their mathematical meaning-making. Heugh (2019), too, urges the need to focus on both the vertical and the horizontal forms of translanguaging, arguing that without such dual focus "we will neither reduce socio-economic and political inequalities nor achieve equitable opportunities for our students' futures" (Conclusion section). What we argue for here is that our mathematics education community comes to see the two forms as complementary rather than contradictory. Both have value, serving different purposes at different stages of the learning trajectory in the same way that movement from the more concrete (and familiar) towards the more abstract and symbolic (from the horizontal to the vertical) mathematisation occurs (after Freudenthal, 1973). A 'fluid' form of languaging using whatever linguistic and other semiotic resources are available is what happens in the initial phase of meaning-making. 'Fixed language' representations of the meanings are then built upon this, ideally in both the L1 and the L2, so consolidating and refining these meaning/s in more formal and mathematically-appropriate ways. Mathematics requires learners to (particularly in the assessment stage) express ideas from within the boundaries of a single language system. This facilitates maximal exploitation of that system's power of linguistic expression. In systemic functional linguistics Halliday and Matthiessen (2004) use the phrase 'cline of instantiation' to describe the movement towards increasingly sophisticated, precise, discipline-specific expressions of ideas. In the same way that using the language of, say, school geography to talk about school mathematics would inevitably compromise the precision with which mathematical ideas could be expressed, so too, we believe, could stepping too far beyond the boundaries of a particular language system compromise this precision.

A great deal of well-researched evidence around second language acquisition has demonstrated that, even in the case of so-called 'fixed language' views, it is impossible, and—indeed—undesirable to exclude learners' L1s from the classroom (see, e.g., Swain & Lapkin, 2013). We have elsewhere written (e.g., Robertson & Graven, 2024b) on the compelling evidence put forward by, amongst others, Skutnabb-Kangas (1981) and Cummins (2005) about the important role that learners' L1s play in the subsequent development of their L2 proficiency, and the longer-term benefit of working towards high levels of academic proficiency in both languages. In specific reference to the work of Cummins, and as Conteh (2018) noted, Cummins's "concepts of 'common underlying proficiency' and linguistic interdependence stress the positive benefits of transfer in language learning" (p. 445). Included amongst the benefits of bilingualism are the metacognitive and metalinguistic advantages that can accrue from becoming proficient users of more than a single language. Bialystok et al. (2012) reported on this. Included in their list of advantages are greater mental flexibility, increased executive and cognitive control, and, reassuringly, in the long term, a potential extension of the timeline towards the onset of age-related dementia. More immediately, in relation to young learners, are what might be termed the socio-emotional advantages of having classroom access to their L1 alongside an L2. These include making closer links between learners' home and classroom lives; developing a stronger sense of socio-cultural and personal identity and agency; and thereby increasing the likelihood of a greater willingness and motivation to participate actively in classroom activities and discussion.

Conteh (2018) notes that some question the need for the notion of 'translanguaging' "when the familiar concepts of code-switching and code mixing already provide a framework to understand multilingual language use" (p. 446). In the South African context, code-switching was frowned upon during the apartheid era as it was thought that mixing languages would interfere with learners' L2 acquisition. One isiXhosa-speaking science teacher captured this view 'confessing' to a researcher (Probyn, 2001) that he felt guilty of 'smuggling the vernacular

into the classroom'. The liberation involved in increased acceptance of pedagogies employing translanguaging is captured in the third paper included in a recent symposium presentation. (See Tyler et al., 2024.) Paper 3's title began: 'No more smuggling the vernacular.'

A difficulty identified in relation to South Africa's constitutional commitment to 12 official languages (the recent 12th addition being sign language), and the Language in Education Policy ratification that, depending upon the decisions and circumstances of individual school's contexts, any one of these languages may be chosen as the official LoLT, is that standardisation of South Africa's indigenous African languages is still underway. Despite isiXhosa having a long history of lexicography dating back to the 18th century (Nkomo & Wababa, 2013), it is as yet not fully standardised, and disagreements about terminology and means of expression are common. Booi et al. (2024) note considerable variation depending on where speakers' come from creating problems both for teachers and for their learners. Translations of written texts have "tended to adopt a purist approach to language that results in the use of outdated or unfamiliar so-called 'standardised version' of isiXhosa that is unfamiliar" (Booi et al., 2024, p. 3). A further challenge these authors have identified is that of finding common terms across regional dialects, perhaps most particularly across the urban/ rural divide. These authors point out that the formal standardised isiXhosa used in school teaching and learning support materials is often at odds with the spoken home language—informal non-standardised isiXhosa used outside of school ('*lokshin*' isiXhosa). '*Lokshin*' here refers to a 'location' (English) or, in Afrikaans, '*lokasie*', a residential area set aside for black Africans during the apartheid era. Booi et al. (2024) suggest the use of translanguaging to mediate such differences (e.g., using the less formal term '*ukudabulisha*' for 'double', the '*uku-*' meaning 'to' and '*-dabulisha*' 'double') in place of the more formal and 'standardised', but less familiar phrase '*ukuphinda kabini*' (also meaning 'to repeat' or 'to multiply twice'). Evident in this example is some phonetic transliteration between English and isiXhosa in the less formal term ('*dabul*'/ 'double'). Such transliteration is useful in the sense that it potentially offers learners a 'double dip' at discerning the meanings of certain words. Another example would be using the word '*isikwere*' (or '*isqueri*') to refer to a 'square', a shape which one local isiXhosa-speaking person initially told us she would call '*ifourcorners*'. Working cross-lingually in this way, and asking children to consider the different equivalents for various mathematical terms would be one way of raising their metalinguistic awareness about how different languages work in expressing the same or similar ideas. More challenging than terminology, is mediating the learning of 'the language in-between' (Prediger, personal communication, January 12, 2023). This is the language required for exploring and reasoning through the demands of mathematical ideas and tasks, for justifying one's interpretations of what a task requires, or for responding constructively to the interpretations of others. It is perhaps in this largely oral domain that horizontal translanguaging can prove particularly powerful for helping learners' mathematical meaning-making, especially when augmented with other semiotic modes (e.g., gesture, image, inscriptions of various sorts).

Concluding Remarks

In this paper we have shared our concern that catching the translanguaging wave is all well and good, but that knowing how to ride it successfully is more important. We have outlined some of the differences in viewpoint reflected in the literature around translanguaging, and argued that such differences are perhaps more apparent than real. Heugh's distinction between horizontal and vertical forms of translanguaging (2019) is important. It helps towards the understanding that these forms can be seen as complementary rather than contradictory. We recognise complementarity also between these translanguaging axes and the axes of horizontal and vertical mathematisation. Just as horizontal mathematization starts with a focus on the everyday, so too does initial classroom discussion around mathematical ideas, concepts and procedures need a more everyday register, drawing on the widest possible repertoire of

linguistic and other semiotic resources. Beyond this initial horizontal stage of communication more careful consideration is then needed in the vertical where specific terminology is key to faithfully capturing critical ideas in the concept. So, for example, the everyday, '*ifourcorners*' provides a mathematics teacher with a potentially valuable opportunity to start learners thinking through the reasons why there needs to be the specific name 'square' ('*isikwere*') in order to distinguish this shape from other four-cornered shapes. This is critical for vertical mathematisation of understanding squares as a special subset of quadrilaterals, parallelograms, and rectangles. The final point we want to reiterate is the meaning-making and conceptual value of what we called the 'double dip' aspect to the transliteration of English, and, frequently too, Afrikaans words into their isiXhosa form.

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References

Bernstein, B. (1971). *Class, codes and control (Volume 1): Theoretical studies towards a sociology of language*. Routledge.

Bialystok, E., Craik, F. I. M., & Luk, G. (2012). Bilingualism: Consequences for mind and brain. *Trends in Cognitive Sciences*, *16*(4), 240–250.

Booi, T., Vale, P., & Graven, M. (in press). Research-informed translation of comprehensible isiXhosa mental strategy teaching materials into isiXhosa: Doubling and halving as a mental strategy. *South African Journal of Early Childhood Education*.

Bourdieu, P. (1977). Cultural reproduction and social reproduction. In J. Karabel, & A. H. Halsey (Eds.), *Power and ideology in education* (pp. 487–511). Oxford University Press.

Bonacina-Pugh, F., da Costa Cabral, I., & Huang, J. (2021). Translanguaging in education. *Language Teaching*, *54*, 439–471.

Conteh, J. (2018). Translanguaging. *ELT Journal*, *72*(4), 445–447.

Cummins, J. (2005). Teaching for cross-language transfer in dual language education: Possibilities and pitfalls. In C. Alptekin, B. Seidlhofer, J. Cummins (Eds.), *TESOL symposium on dual language education: Teaching and learning two languages in the EFL setting* (pp. 1–18) Bogazici University, Istanbul, Turkey.

Essien, A. A., Sapire, I., & Moleko, M. M. (2024). The concept of language-as-resource/sources of meaning from an African perspective: Challenges and opportunities in mathematics education. In A. Essien (Ed.), *Multilingualism in the teaching and learning of mathematics in Africa: Issues for mathematics education research* (pp. 1–20). Bloomsbury.

Freudenthal, H. (1973). *Mathematics as an educational task*. D. Reidel Publishing.

García, O. (2017). Translanguaging in schools: Subiendo y Bajando, Bajando y Subiendo as afterword. *Journal of Language, Identity and Education*, *16*(4), 256–263.

García, O. (2023a). Translanguaged TESOL in Transit. *NYS TESOL Journal*, *10*(1), 5–18.

García, O. (2023b). Foreword: Doing translanguaging research/teaching/learning Juntos. In L. Shepard-Carey & Z. Tian (Eds.), (*Re)imagining translanguaging pedagogies through teacher–researcher collaboration* (pp. xvii–xxiv). Multilingual Matters.

García, O., & Wei, L. (2014). *Translanguaging: Language, bilingualism and education*. Palgrave Macmillan.

Gondwe, J. (2022). *Mathematics performance of South African primary school learners: Lessons from TIMSS 2019*. Department of Economics and the Bureau for Economic Research, Stellenbosch University.

Halliday, M. A. K., & Matthiessen, C. M. I. M. (2004). *An introduction to functional grammar*. Continuum.

Heugh, K. (2019). The place of translanguaging in multilingual education and assessment [Online]. *TIMSS SA Newsletter*. https://www.timss-sa.org/blog/the-place-of-translanguaging-in-multilingual-education-and-assessment

Makalela, L. (2015). Moving out of linguistic boxes: the effects of translanguaging strategies for multilingual classrooms. *Language and Education*, *29*(3), 200–217.

May. S. (2014). Disciplinary divides, knowledge construction and the multilingual turn. In S. May (Ed.), *The multilingual turn: Implications for SLA, TESOL and bilingual education* (pp. 7–31). Routledge.

Nkomo, D., & Wababa, Z. (2013). IsiXhosa lexicography: Past, present and future. *Lexikos*, *23*(1), 348–370.

Poza, L. (2017). Translanguaging: Definitions, implications, and further needs in burgeoning inquiry. *Berkeley Review of Education*, *6*(2), 101–128.

Probyn, M. J. (2001). Teachers' voices: Teachers' reflections on learning and teaching through the medium of English as a second language. *International Journal of Bilingual Education and Bilingualism*, *4*(4), 249–466.

Reddy, V., Winnaar, L., Juan, A., Arends, F., Harvey, J., Hannan, S., Namome, C., & Zulu, N. (2020). *TIMSS 2019 highlights of South African grade 5 results in mathematics and science: Achievement and achievement gaps*. Human Sciences Research Council.

Reddy, V., Winnaar, L., Harvey, J., Hannan, S., Isdale, K., Arends, F., & Juan, A. (2022). *The South African TIMSS 2019 grade 5 results: Building achievement and bridging achievement gaps*. Human Sciences Research Council.

Robertson, S-A., & Graven, M. (2019). Exploratory mathematics talk in a second language: A sociolinguistic perspective. *Educational Studies in Mathematics*, *101*(2), 215–232.

Robertson, S-A., & Graven, M. (2020a). A mathematics teacher's response to a dilemma: 'I'm supposed to teach them in English but they don't understand'. *South African Journal of Childhood Education*, *10*(1), 1–11.

Robertson, S-A., & Graven, M. (2020b). Language as an including or excluding factor in mathematics teaching and learning. *Mathematics Education Research Journal*, *32*(1), 77–101.

Robertson, S-A., & Graven, M. (2021). Tuning-in to non-linguistic resources during collective problem-solving in a second language context. In Y. H. Leong, B. Kaur, B. H. Choy, J. B. W. Yeo, & S. L. Chin (Eds.), *Excellence in mathematics education: Foundations and pathways. Proceedings of the 43rd annual conference of the Mathematics Education Research Group of Australasia* (p. 444). Singapore: MERGA.

Robertson, S-A., & Graven, M. (2022). Working on and with verbal, visual and gestured confluences in mathematical meaning-making. In N. Fitzallen, C. Murphy, V. Hatisaru & N. Maher (Eds.), *Mathematical confluences and journeys. Proceedings of the 44th annual conference of the Mathematics Education Research Group of Australasia* (p. 610). Launceston: MERGA.

Robertson, S-A., & Graven, M. (2023). Orchestrating mediational means in solving a mathematical problem. In B. Reid-O'Connor, E. Prieto-Rodriguez, K. Holmes, & A. Hughes (Eds.), *Weaving mathematics education research from all perspectives. Proceedings of the 45th annual conference of the Mathematics Education Research Group of Australasia* (p. 596). Newcastle: MERGA.

Robertson, S-A., & Graven, M. (2024a). Exploring the implications of the multilingual turn in mathematics education research for South African policy makers, researchers and educators. In A. Essien (Ed.), *Multilingualism in the teaching and learning of mathematics in Africa: Issues for mathematics education research* (pp. 23–45). Bloomsbury.

Robertson, S-A., & Graven, M. (2024b). Let us take that multilingual turn to make language a genuinely inclusive resource for mathematical meaning-making. In L. Westaway, C. H Stevenson-Milln, K. M. Ngcoza, & C. Simuja (Eds.), *Proceedings of the 32nd annual conference for research in mathematics, science and technology education* (pp. 183–196). SAARMSTE.

Ruiz, R. (1984). Orientations in language planning. *NABE Journal*, *8*(2), 15–34.

Setati, M. (2008). Access to mathematics versus access to the language of power: The struggle in multilingual mathematics classrooms. *South African Journal of Education*, *28*(1), 103–116.

Skutnabb-Kangas, T. (1981). *Bilingualism or not: The education of minorities*. Multilingual Matters.

Swain, M., & Lapkin, S. (2013). A Vygotskian sociocultural perspective on immersion education: The L1/L2 debate. *Journal of Immersion and Content-Based Language Education*, *1*(1), 101–129.

Tyler, R., Probyn, M., Set, B., Opanga, D., & Williams, V. (2024). The multilingual option: Pedagogical translanguaging in science classrooms (Symposium). In L. Westaway, C. H Stevenson-Milln, K. M. Ngcoza, & C. Simuja (Eds.), *Proceedings of the 32nd annual conference for research in mathematics, science and technology education* (pp. 306–310). SAARMSTE.

Williams, C. (2000). Bilingual teaching and language distribution at 16+. *International Journal of Bilingual Education and Bilingualism*, *3*(2), 129–148.