Chapter 36
Language of Teaching and Learning and School Mathematics Curriculum Reform: Tensions in Equity and Access

Anjum Halai

This Chapter provides reflections and commentary on this ICMI Study 24 volume entitled *Mathematics Curriculum Reforms Around the World*. The book looks at school mathematics curriculum reforms where curriculum is conceptualised from two dimensions, *curriculum levels* (intended, implemented and attained) and *curriculum components* (goals, content, teaching approaches, materials and assessment). Curriculum reforms are then studied under these two dimensions and in five thematic areas namely: (a) learning from the past: driving forces and barriers shaping mathematics curriculum reforms; (b) analysing school mathematics curriculum reforms for coherence and relevance; (c) implementation of reformed mathematics curricula within and across different contexts and traditions; (d) globalisation and internationalisation and their impacts on mathematics curriculum reforms; (e) agents and processes of curriculum design, development and reforms in school mathematics.

The above thematic framework is comprehensive and covers the field historically bringing it up to date to issues of globalisation and internationalisation. However, the issues and questions are largely framed within the western tradition of mathematics and its manifestation in school mathematics curricula reforms.

The rationale for a comprehensive and in-depth piece of work on curriculum reform in school mathematics education is well justified. The editors state that, "while there is considerable scholarly developments in general education on curriculum reform studies, these have not crossed boundaries to the same extent into mathematics education as other areas or have not been developed by mathematics educators themselves to the same extent" (Shimizu and Vithal, Chap. 1, p. 4). This issue reflects a broader concern i.e. the need to ensure that the field of mathematics education research is not insular to other developments in the field of education.

A. Halai (✉)
The Aga Khan University, Karachi, Pakistan
e-mail: anjum.halai@aku.edu

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There are several threads that could be expanded upon in this commentary. For focus and depth, I look at the role of language of instruction or the language of teaching and learning and its impact on curriculum as implemented and attained.

The language in which the intended curriculum is implemented significantly impacts the curriculum components of teaching, learning and assessment. However, decisions about the language of instruction are not necessarily taken from a perspective of cognition and learning. For a variety of cultural, historical and political reasons ministries of education and policy makers employ national or global languages as the language of instruction, which are often not the languages children speak at home or their proximate language. This decision of introducing a global or a national language of instruction in mathematics classrooms is often guided by a strongly prevalent view that mathematics has a universal language of abstract symbols and signs and therefore mathematics transcends culture (Parker Waller & Flood, 2016). Hence, from this perspective it is seen as immaterial which language of instruction is employed to implement the mathematics curriculum in schools.

However, as is noted in this volume that the 'social and cultural turn' in curricular reform is based on sustained and compelling evidence that learning mathematics is socio-culturally embedded (Kilpatrick, Chap. 2). Language is a strong cultural tool that mediates the implementation of curriculum in the classroom this is especially the case in problem solving and the application of components of the curriculum. Students who learn in their first or proximate language are able to engage deeply with the curriculum process as compared to students who are learning mathematics in a second or third language.

Consequently, "a government or educational authority, in very unequal societies, can claim to offer the same curriculum when in fact they are referring only to the intended official curriculum, the implemented and/or the attained curriculum can reveal deep inequalities given by different resources etc" (Shimizu and Vithal, Chap. 1, p. 15). Halai and Muzaffar (2016) drew on a large-scale study in Pakistan that involved qualitative observations of teaching and learning processes in one hundred and twenty-six primary classrooms in Punjab, the largest province in the country. In the province, new policy had introduced English as a medium of instruction in primary school classrooms where English was the third language for almost all the teachers and students. Classroom interaction patterns showed that students were mostly silent, and seldom uttered a full sentence in English, and were not engaged in meaningful mathematical communication.

It stands to reason that acquiring academic knowledge and higher order thinking is not just a cognitive function, it is also dependent on the tools of thinking that are provided by culture, significant among them being the language. This limited nature of students' participation in the classroom potentially defeated the goals of the intended mathematics curriculum that aimed to promote problem solving and critical thinking.

Curriculum as attained is often reflected in students' performance in tests and is also mediated by the language of instruction and testing. It is very common to find that children from linguistic minority (or low socio-economic status) to be among the low performers in mathematics. For example, in reviewing Pakistan's performance in the country's first ever participation in TIMSS 2019,[1] Halai (2020) holds that the percentage of students in the sample of fourth graders from Pakistan who reported speaking the language of the test at home was: always (22%); almost always (10%); sometimes (32%); never (36%). However, overall results of TIMSS 2019 showed that there were few students (5%) at fourth grade, on average who 'never' spoke the language of the test at home and had much lower average achievement in mathematics as compared to those students at fourth grade, who, on average, reported 'always' (63%) or 'almost always' (32%) speaking the language of the test at home.

Elsewhere, in a study that investigated the role of language in students' performance in examinations in science and mathematics, Rea-Dickins et al. (2009) concluded that students are normally disadvantaged when they are assessed in a language other than the language they speak at home. The students in their study demonstrated difficulties in the interpretation and understanding of examination questions especially word problems. A challenge in assessing the curriculum attained by the students is ensuring that all are provided the same opportunity to demonstrate their skills and understanding. However, when mathematics tests are written in language that may not be the home or proximate language of all students test items are skewed in favour of some (Halai et al., 2015).

To conclude, this volume *Mathematics Curriculum Reforms Around the World* is a much needed and comprehensive work that documents the curriculum reforms in school mathematics in all its complexities and identifies the challenges and opportunities in the process. Among the challenges in mathematics curriculum reform is the issue of equitable access for all learners to the mathematics content and process in the classroom. Language of implementation of mathematics curriculum is a gatekeeper in accessing the curriculum content and potentially marginalises students from diverse language backgrounds. However, several evidence-based approaches and strategies have emerged in the field of education that provide a way forward for curriculum, teaching, learning and assessment in settings where language of instruction is not the first at times not even the second language of the learners (e.g. Barwell et al., 2015; Street et al., 2005). It is important for school mathematics education community to be outward looking in its gaze on curriculum reforms to ensure that it benefits from cross fertilisation of ideas, frameworks and approaches from the broader curricular reforms in school education.

[1] https://timssandpirls.bc.edu/timss2019/

References

Barwell, R., Clarkson, P., Halai, A., Kazima, M., Moschkovich, J., Planas, N., Setati-Phakeng, M., Valero, P., & Villavicencio Ubillús, M. (Eds.). (2015). *Mathematics education and language diversity* (ICMI Study 21). Springer.

Halai, A. (2020). *TIMSS 2019 Pakistan: Where to next?*. https://www.researchgate.net/publication/348266119_TIMSS_2019_Pakistan_Where_to_next

Halai, A., & Muzaffar, I. (2016). Language of instruction and learners' participation in mathematics: Dynamics of distributive justice in the classroom. In A. Halai & P. Clarkson (Eds.), *Teaching and learning mathematics in multilingual classrooms: Issues for policy and practice* (pp. 57–72). Sense Publishers.

Halai, A., Muzaffar, I., & Valero, P. (2015). Research rationalities and the construction of the deficient multilingual mathematics learner. In R. Barwell, P. Clarkson, A. Halai, M. Kazima, J. Moschkovich, N. Planas, M. Setati-Phakeng, P. Valero, & M. V. Ubillús (Eds.), *Mathematics education and language diversity* (ICMI Study 21) (pp. 279–295). Springer.

Parker Waller, P., & Flood, C. (2016). Mathematics as a universal language: Transcending cultural lines. *Journal for Multicultural Education, 10*(3), 294–306.

Rea-Dickins, P., Afitska, O., Yu, G., Erduran, S., Ingram, N., Olivero, F., & Said, S. (2009). *Investigating the language factor in school examinations: Exploratory studies* (SPINE Working Paper No. 2). University of Bristol.

Street, B., Baker, D., & Tomlin, A. (2005). *Navigating numeracies: Home/school numeracy practices*. Springer.