Aspects of excellence in mathematics education

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The theme of the plenary panel is Excellence in Mathematics Education. Taking excellence to mean a commitment to bring out the best leads us to view excellence in mathematics education as a goal such that teachers, students and curriculum, the three corners of the didactical triangle, and their interactions result in the best possible outcomes. Each of the four panellists share with us a unique aspect of Excellence in Mathematics Education.

The theme of this plenary panel is Excellence in Mathematics Education. In the context of this panel discussion, excellence in mathematics education is viewed as a commitment through means to bring out the best amongst the interactions between teachers, students and curriculum, the vertices of the didactic triangle shown in Figure 1.

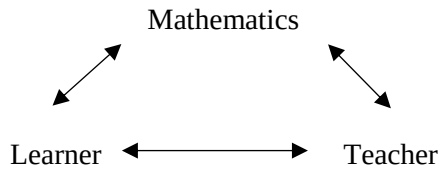

Figure 1. Didactic triangle (Straesser, 2007, p. 165)

As noted by Schoenfeld (2012), it is clear that each of the entities in the figure, each of the arrows, and the triad denote something of importance. As such excellence is mathematics education is multi-faceted. In some ways mathematically powerful classrooms encompass all the interactions between mathematics, teachers and students. This is evident in the Teaching for Robust Understanding (TRU) framework (Schoenfeld, 2016, p.10) shown in Figure 2.

The Five Dimensions of Mathematically Powerful Classrooms	
The Mathematics	The extent to which the mathematics discussed is focussed and coherent, and to which connections between procedures, concepts and contexts (where appropriate) are addressed and explained.
Cognitive Demand	The extent to which classroom interactions create and maintain an environment of productive intellectual challenge conducive to students' mathematical development.
Access to Mathematical Content	The extent to which classroom activity structures invite and support the active engagement of all of the students in the classroom with the core mathematics being addressed by the class.
Agency, Authority, and Identity	The extent to which students have opportunities to conjecture, explain, make mathematical arguments, and build on one another's ideas, in ways that contribute to their development of agency and authority resulting in positive identities as doers of mathematics.
Formative Assessment	The extent to which the teacher solicits student thinking and subsequent instruction responds to those ideas, by building on productive beginnings or addressing emerging misunderstandings.

Figure 2. The five dimensions of mathematically powerful classrooms

The four panelists were asked to present their perspective on excellence in mathematics education and describe research and developmental project (s) that they have been involved in related to any aspects of excellence in mathematics education. It is apparent that each of them has approached the theme in a unique way.

2021. 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)*, pp. 47-48. Singapore: MERGA.

Choy notes that having high expectations and providing strong support to all students, a notion of equity, is a necessary constituent for achieving excellence in mathematics education (NCTM, 2000). He uses the metaphor of confluences to characterize excellence and illuminates how confluences of "Big Things' such as societal expectations, policy formulation and implementation, and 'Small Things' such as classroom practices – teachers juggling the balance between developing procedural fluency and conceptual understanding in their instructional practice whilst ensuring that students have adequate practice for examinations orchestrate in tandem in Singapore thereby resulting in excellence in mathematics education at the systemic level.

Kwon whilst unpacking the complexity of the term *excellence* draws on all the three vertices of the didactic triangle and opines that excellence in mathematics education is best described in terms of research-based curriculum development, research-based teaching practices, and professional development of mathematics educators. She draws on her research projects: Inquiry Oriented Differential Equations (IO-DE) curriculum development project; Inquiry-Oriented teacher Actions (IOTA) research-based teaching practices project; and Community-Based Teacher Professional Development Model a professional development project to illuminate the three aspects of excellence in mathematics education.

Attard notes that while we continually strive for excellence in mathematics education this strive comes with challenges. She illuminates how the current COVID-19 pandemic has highlighted the many variances in technology-infused mathematics teaching due to influences such as school context, community support, school commitment to technology use and school culture. Adopting a holistic model of technology integration she notes that clarity regarding contextual affordances and constraints may assist teachers in their planning of mathematics teaching and learning thereby facilitating pursuit of excellence in mathematics education.

Tan proposes a framework for teaching excellence in mathematics. In the context of undergraduate mathematics, the framework encompasses four aspects namely module learning outcomes, lesson plan, teaching nodes and motivational strategies. Tan notes that although the learning component rests on students' initiatives, there are several aspects of the learning process that teachers can facilitate.

It is apparent from the four panelists presentations that a framework like that of TRU by Schoenfeld could provide a more holistic lens when considering excellence in mathematics education from both the perspectives of educators and researchers. This would allow for deeper understandings of the inter-relationships of the vertices of the didactic triangle. Following the presentations by the four panelists, it is hoped that the questions posed by the conference participants will illuminate other facets of excellence in mathematics too. Lastly, we hope the panel discussion will ignite conversations that would continue beyond the session during the conference.

References

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