Exploring the Development of a Mathematics Curriculum Framework: Cambridge Mathematics

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This discussion group aimed to use a work-in-progress project as an example to fuel discussion of curriculum coherence and the importance of the relationships between curriculum, context, and implementation. These are major considerations influencing curriculum development at national and international levels. Our example was the framework being developed by Cambridge Mathematics for presenting and organising the domain of school mathematics in a form that emphasises connections and interdependencies between learners' mathematical experiences, and the different routes that can successfully facilitate learners' development mathematical understanding.

Two themes stood out strongly in both sessions. The first had to do with the importance of finding ways of communicating design, design methods, and research methods that can drive productive collaboration among researchers, administrators, policy makers, and teachers during framework development. Focal points for communication with one group of stakeholders might not provide critical information needed for another to engage. Consideration of the priorities and needs of each group in the collaborative process can help to make the final result more useful for all groups, and consequently more likely to be put to use and refined.

Some specific features of a curriculum framework were identified as having the potential to benefit collaboration around emerging curriculum frameworks, and the subsequent quality of those frameworks. Framework design and documentation should be able to:

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- make the decision process around structural and content-specific choices explicit, including the balance of research, consultation, and experience involved
- demonstrate which decisions involved stronger or weaker support from research and collaboration, allowing the framework to be more directly evaluated by curriculum designers making decisions according to their own sets of criteria
- allow users of the framework to independently evaluate the framework authors' evaluation criteria for the quality of evidence and collaboration
- allow users of the framework to adapt their use based on an understanding of the designers' goals and intended audience.

The second theme that emerged involved the ways in which frameworks represent areas of mathematical understanding that cut across specific topics throughout the entire curriculum, including what are sometimes called habits of mind, a set of broadly defined skills including problem-solving, reasoning, generalising, and critical thinking. This was linked to discussion of curriculum coherence and the role of framework design in setting out structures for communicating the potential for progression in these areas, so that support for the development of higher order thinking can be supported throughout a learner's entire journey through the curriculum.

This discussion took place during an early, exploratory stage of the Cambridge Mathematics framework project, and we felt that it had occurred at a very helpful time to influence the work going forward. A third theme for us therefore became the importance of being able to discuss early-stage work with a diverse group. This is a challenge in many areas of design, since early work often involves unresolved fundamental questions and prototypical outputs that can be difficult to communicate and evaluate. Nevertheless, there was benefit in doing so for all involved. We are grateful to all of the participants in each session for their thoughtful discussions. The ideas raised here have broad application to other curriculum design efforts, and we look forward to being able to share the way our work has been influenced by these themes at the next ICME.

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