Teaching Math to Second Language Learners

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Why this focus?

Students' linguistic backgrounds and capabilities impact on every aspect of their education, and, though the myth of mathematics as the "universal language" persists,[1] math is no exception. In fact, students with first languages other than English face specific challenges in the field of math.[2] Despite the fact that English Language Learners (ELLs) are a growing demographic in Ontario schools, with 56% of students in the Toronto District School Board speaking a language other than English at home,[3] teachers are underprepared to teach these students, which some researchers say is a primary factor causing academic failure.[4] It is therefore imperative that teachers learn about and employ the most effective techniques, strategies, and approaches in teaching math to this diverse and ever-changing group of students in order to provide an equitable education to all. Improving practice in this area will also prove helpful for first language English speakers, who in some ways can be understood to be going through a process of language acquisition as they learn to communicate in the "mathematical register".[5]

What does the research say?

- Compared with other content areas, math for ELL students is under-researched[4]
- Being able to participate in math discourse requires more of students than knowing technical terms[6]
- Mathematical language is complex and less easily acquired than everyday language for several reasons: use of multiple semiotic systems, technical vocabulary, academic grammatical features[5]

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Who are ELL students?

The term ELL refers to a wide range of students with varying linguistic, cultural, and educational backgrounds. ELLs' native language is considered to be a language other than English, and their level of English proficiency may influence academic achievement in classrooms where the language of instruction is English.[8] ELL students can be refugees, economic migrants, children born in Canada to parents of diverse linguistic communities, Indigenous students, and students who speak a dialect of English that is significantly different from "school English."[2] ELL students come from various racial, ethnic, and class backgrounds, and their prior education may vary considerably. Some students may appear to have conversational English that is indistinguishable from that of their English L1 peers. However, these students may not have an adequate level of academic language to be able to learn and communicate effectively in math.[1]

References + Resources

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Strategies

It may seem obvious, but…

- First languages belong in the classroom! Teachers, students, and families should be encouraged to bring them into the work of the class [4, 7, 8]
- Listen to your students and try to understand what they are saying - this is not the time for language correction[7]
- Observe your students carefully to identify their strengths and needs, rather than stereotypes[4]
- Connect with students' families and reflect their cultures and backgrounds in the classroom[4, 7]
- Link math to other content areas to provide more context and meaning for students[8]

Teacher Talk

- Use gestures and visual or tactile aids (including manipulatives) to ground and clarify meaning[7, 8]
  - This must be paired with language, since visuals do not hold inherent meaning unless the child already has the concept[7]
- Use clear and consistent mathematical terminology[4]
  - Explicitly teach vocabulary to students and hold high expectations for them to use it as well[5, 7, 8]
  - Teach argumentation practices specific to the discipline[5]
- Be able to explain one concept in a variety of ways, using different expressions and representations[2, 7, 8]
- Accept what students say and build on from their responses[7]
- "Revoice" student statements to bring the thoughts expressed in line with the disciplinary language[7]
- Prompt students to clarify their meaning[7]

Student Talk

- Build opportunities for oral language use and “math talk” into instruction wherever possible[4]
  - Encourage students to talk through problems and explain reasoning
  - If students speak the same home language, their discussion in their home language can support conceptual understanding, also providing the foundation for future English learning[2, 4, 7]
- Structure lessons to include work in cooperative groups, to maximize exchange of math language[2]
- Set norms for discussion[7]

Assessment

- Try to focus on students' meaning-making rather than vocabulary or grammar[6]
- Assessments should measure math knowledge and skills separate from language proficiency[4]

Cultural Sensitivity

Culturally responsive instruction is defined in the literature as pedagogical knowledge, teacher beliefs, and instructional practices that promote mathematical thinking, value student identity in terms of knowledge, and incorporate issues of power and social justice in mathematics education. Culturally responsive mathematics instruction should be informed by ELLs’ prior experiences with mathematics content, language experiences and proficiencies, and educational background. Recommendations for equitable instructions include a focus on conceptual understanding and reasoning, strategic support for ELLs’ participation in mathematical discussions, as they learn English by drawing on available resources (i.e., objects, drawings, graphs, and gestures), and the value of native language and home experiences in instructions.[1, 7, 8]