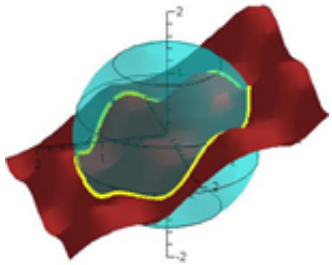
INTERSECTION POINTS

The Newsletter of the Research Council on Mathematics Learning



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The Research Council on Mathematics Learning seeks to stimulate, generate, coordinate, and disseminate research efforts designed to understand and/or influence factors that affect mathematics learning.

Visit us on the Web at: **www.rcml-math.org**

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President's Column

Megan Che
Clemson University

As this academic year draws to a close and we all prepare to—with whatever balance works—relax, rejuvenate, and write, I find myself reflecting on this past year and looking ahead to the next.

The Charlotte RCML conference in February stands out as a major highlight of this year. I am glad to have this opportunity to extend deep thanks to all of the people involved in contributing to the success of this conference, and I wish to especially thank Kerri Richardson and Sarah Pratt as well as Tyrette Carter for all of their hours of effort. The result was a vibrant conference at which we were able to launch a new RCML award, the Jim W. Heddens Distinguished Service Award. We once again extend our congratulations to our inaugural awardee, William R. Speer, and we were honored to have Jim Heddens personally present to confer the award.

As we shared at the Charlotte conference, the RCML Board is prioritizing three focus areas over the next year: Membership, Board structure, and Visibility. In terms of membership, we will explore ways to optimize our impact-to-size ratio with the aim of having an "outsized" impact upon our field. Our RCML community is strongly committed to maintaining our supportive, close-yet-friendly nature while extending the ways we contribute to and push our field. Connected to this aim, we will explore how to amplify ways graduate students engage with RCML, perhaps by increasing the graduate student awards we offer and/or including a graduate student voice on the Board in an formal structure.

In addition to considering board-level graduate student input, we are also examining ways to effectively and efficiently manage communications, which range from social media posts, to newsletters, to marketing and branding. Staying current with means and modes of communication is tied to our third focus area, visibility. To this end, the Board is exploring ways to cultivate our imprint so that our work and contributions are visible while holding true to our community focus. Our community focus truly derives from our members, and I encourage you to consider becoming even more engaged in our unique organization by serving on a committee, running for office, reviewing conference proposals and proceedings, and reviewing for Investigations. Over the next two years, I hope to get to know each of you better as you and I engage in new and exciting ways in RCML.

Call for Proposals

Increasing the Odds for All Mathematics Learners

The 47th Annual Conference of the Research Council on Mathematics Learning (RCML) will be held in Las Vegas, Nevada**, March 5-7, 2020,** at the Alexis Park All-Suite Resort.

If you are interested in presenting at this year's RCML conference, proposals may be submitted beginning on **June 1, 2019**, and closing on **September 8, 2019**. Before

submitting your paper, please review the Proposal Submission Guidelines on the RCML website. Click the "Speaker Proposal Form" to submit your speaker proposal.

Conference Registration Rates:

- Early bird regular conference registration price: $200
- Early bird student conference registration price: $150
- Guest registration price (for those who are not presenting or attending the conference sessions): $150
- If registering after January 20 – price increases by $50

Information regarding hotel accommodations are posted on the RCML website. Information regarding local activities and transportation is forthcoming. As always, you may check the RCML website for the most current information.

Also, note that RCML publishes peer-reviewed conference proceedings of selected papers that have been accepted as conference presentations. Acceptance of a proposal does not guarantee acceptance of the associated publication for the proceedings; however, all authors whose conference proposal has been accepted are invited to submit a paper based on their proposal. **Manuscripts proposed for the conference proceedings are due by October 31, 2019**. Conference proposals and papers submitted to the *RCML Proceedings* are **peer reviewed**. The lead author on the proceedings paper *must* register for the conference.
If you have questions, please contact us via email at one of the addresses below:

- Sarah Pratt (rcmlconference@gmail.com), VP for Conferences
- Linda Venenciano (lhirashi@hawaii.edu), Program Chair
- Bill Speer (william.speer@unlv.edu) & Jeff Shih (jshih@unlv.nevada.edu), Local Host Co-Chairs
- Jennifer Cribbs (jennifer.cribbs@okstate.edu, Proceedings Editor

Connection Points

Karl Kosko
Kent State University

Reconsidering our Visual Models for Teaching Multiplication

Over the past several years, I have investigated elementary children's multiplicative reasoning (Kosko, 2019). Like others (Baroody, 1985), I've found that many students can demonstrate various algorithms and recite multiplication facts, but, when pressed, cannot explain these concepts without resorting to count-by-1s strategies. In fact, anywhere between 15 – 25% of rising sixth graders have still not developed multiplicative reasoning (Kosko, 2019). One reason I believe many students are left behind in their multiplicative development is that they are often afforded only those visual models that require counting by 1s, and do not require multiplicative reasoning.

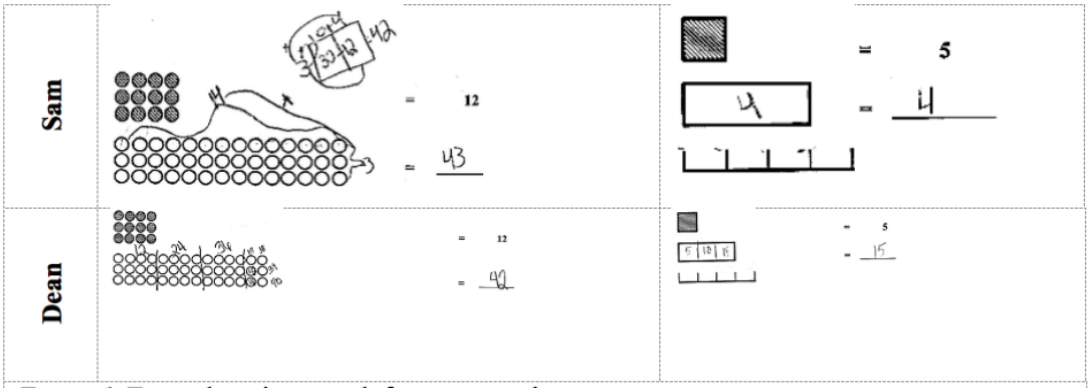

Figure 1. Example written work from two students.

Part of my work has focused on how children respond to different visual models for multiplication and division. For context, consider Sam and Dean's written responses to a set and length model task in Figure 1. A Rasch model estimated both items to have a similar difficulty level (i.e., they measure about the same level of reasoning).

Interestingly, Sam used a box algorithm for the set model, and a count-by-1s strategy for the length model. Specifically, Sam was able to apply the box algorithm to the set model because he recognized there were groups of 1s, but was unable to conceptually recognize a 12 as an object that could be manipulated on its own. This is why when prompted to manipulate a 5, he was unable to do so. He needed to perceive the 1s. By contrast, Dean had similar exposure to length models, but was able to anticipate a composite unit and interact multiplicatively with both representations.

Various research suggests that when students are provided models that include visible discrete units of 1, many will use count-by-1s strategies to solve it. However, when students are presented a context where the unit of 1 is disallowed, they are more likely to engage in multiplicative reasoning. Consider the responses by Cass in Figure 2 to two similar area model tasks. In the first task, Cass counts each individual square unit, instead of considering the column in reference to 20. But when each square unit must be inferred, Cass showed skip-counting in his work.

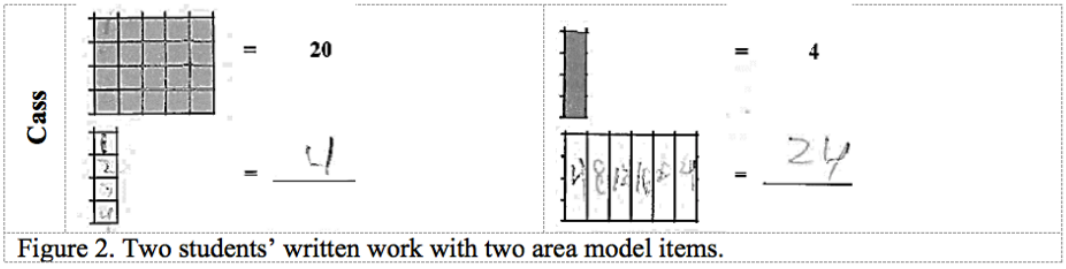

Figure 2. Two students' written work with two area model items.

The two sets of examples pragmatically exemplify what much of my work explains empirically; that the visual models teachers use with students matter significantly. Although there is great benefit in using set representations like the standard array model, teachers (and teacher educators) can overuse such representations. If overused, some children will not infer the multiplicative nature of the arrays because they are only exposed to contexts where they can rely on counting-by-1s to reason why their algorithms produce correct answers. As noted by Davydov (1991), "a precondition for multiplication…is denying direct counting, one by one" (p. 21). The question is whether teachers and teacher educators enable children to meet this precondition.

References

Baroody, A. J. (1985). Mastery of basic number combinations: Internalization of relationships or facts? *Journal for Research in Mathematics Education, 16*(2), 83–98.

Davydov, V. V. (1991). A psychological analysis of the operation of multiplication. In V.V. Davydov (Ed.), *Psychological abilities of primary school children in learning mathematics* (pp. 9-85). Reston, VA: National Council of Teachers of Mathematics.

Kosko, K. W. (2019). The form of mathematics in assessment items: How items convey and measure multiplicative reasoning differently. In J. Bostic, E. Krupa, & J. Shih (Eds.), *Quantitative measures of mathematical knowledge: Researching instruments and perspectives*. New York, NY: Routledge.

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