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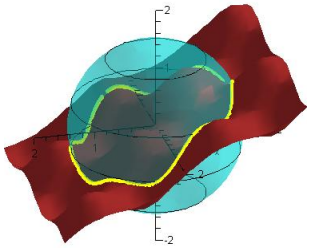

Intersection Points

The Newsletter of the Research Council on Mathematics Learning

January 2011

Volume 35, No. 3

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.unlv.edu/RCML

President's Column

A Balance of Theory and Practice in Teacher Preparation

by Anne Reynolds

While we know that teacher education is only part of improving mathematics learning in our schools, it is one endeavor in which many of our RCML members are involved. A recently released report from the National Council for Accreditation of Teacher Education (NCATE) calls for more focus on hands-on clinical instruction, similar to how doctors are trained. I know that many of our institutions already incorporate a significant level of field experience in our programs. For example, here at Kent State a field experience component of several hours a week is included in our early classes; this increases to two days a week in the two semesters preceding their final semester full time in the field. At the same time I know there are preparation programs where students do **no** field work until their final semester of student teaching.

What is the appropriate balance of theory and practice in the preparation of teachers? The medical model has been held up as a possible standard. Let's examine this more closely. In order to become a doctor in the US, a potential medical student must first complete an undergraduate degree in any subject before applying to medical school. Once enrolled in a medical school, the course of study is divided

into two roughly equal components: pre-clinical and clinical (consisting of rotations through different wards of a teaching hospital). The MD degree is granted at the conclusion of four years of graduate study. This allows the holder to practice medicine **after** completing an accredited residency program. Is this what is intended by the recommendations of those who see the model for training of doctors as the model for the preparation of teachers? While I would like to believe so I am doubtful that is the case. In fact I believe there is evidence to the contrary.

Let's just take the example of mathematics education. Alternative certification programs are in place in many states. Programs like *Teach for America* recruit recent college graduates of all academic majors and career interests to the field. The philosophical basis for such programs is that if one has a degree in mathematics (or science in some cases) then, with a minimum of "training" in classroom management one is well equipped to teach high school mathematics. While we know that teaching mathematics in K-12 settings requires a deep knowledge of mathematics, we as researchers and professionals in the field have built up a body of evidence that demonstrates that being a successful mathematics teacher also requires deep knowledge of how students learn and the difficulties they face in learning mathematics with understanding. Indeed our organization has its roots in the need for research into how best to help students learn mathematics, particularly those who are struggling. This is the knowledge needed for teaching mathematics beyond general classroom management skills and understanding of the administrative structure of schools. Right now, when the necessary field experience component of a teacher preparation program is increased, it is usually at the expense of the classroom time needed for focus on this knowledge needed for teaching mathematics. If indeed we want to take seriously the proposal for more "hands on" clinical training, then we need to also institute the medical model by extending the time it takes to prepare teachers beyond what is now common practice. There are implications for such a move, not least of which are financial.

Another aspect to consider in this proposal to adopt the medical model is the clinical component itself. Currently, the practice in education is for the "hands on" component to occur in the local K-12 schools. While we do our best to place students in field sites where they will see and be involved in what are considered best practices for teaching mathematics, this happens less frequently than is appropriate for the education of our future teachers. How often do our students come back to our classrooms and share stories of teachers telling them to "get real, and forget all that theory" in order to be successful? In medicine, such clinical practice happens in hospitals designated as teaching hospitals where there is a commitment to providing future doctors with the best examples of clinical practice. Again, the implications for such a system in education are worth envisioning. The NCATE report outlines some important steps toward establishing such a system.

I am afraid that this push for a focus on more hands-on, clinical instruction will be at the expense of the knowledge about mathematics learning that our future teachers need rather than in partnership with such knowledge. Let us be a strong voice in this conversation in light of our RCML mission to continue our work "to stimulate, generate, coordinate, and disseminate research efforts designed to understand and/or influence factors that affect mathematics learning."

38th Annual Conference of the Research Council on Mathematics learning

10-12 March 2011
Cincinnati, Ohio

Please plan on attending the 38th annual conference of RCML and encourage your colleagues and graduate students to do the same. We have a full board of presentations, wonderful guest speakers, and time to mingle, socialize, and network with mathematics educators from across the country.

Please find the conference schedule and a preliminary overview of the sessions below. Registration and pick up of nametags and packets begins at 2:00 on Thursday, 10 March 2011, at the hotel. Please join us at the opening reception on Thursday evening at 6:00 in the hotel.

Conference registration: **due 1 February 2011**, after that date a late fee of $10 is assessed. The conference registration form can be found on our website *http://www.unlv.edu/RCML/*

Hotel reservation: Call the Hilton Cincinnati Netherland Plaza (513) 421-9100. Our conference rate of $99 is only available by telephone through 10 February 2011 (ask for the *Research Council* rate). For more hotel information, visit www.cincinnatinetherlandplaza.hilton.com

Parking: Self-parking is $15 per day at the hotel.

Airport information: The Cincinnati-Northern Kentucky International Airport is 13 miles from the hotel. The cost of a taxi from the airport to the hotel is approximately $30.

Schedule of Events

All sessions will be held at the
Hilton Cincinnati Netherland Plaza

Thursday, March 10, 2011

Registration at the Hilton Cincinnati Netherland Plaza	**2:00 -6:00 pm**
Reception at the Hilton Cincinnati Netherland Plaza	**6:00 -7:30 pm**

Friday, March 11, 2011

Registration (Hilton)	**8:00 am-5:30 pm**
Sessions 1-8 (Hilton)	**8:30-9:15 am**
Sessions 9-16 (Hilton)	**9:30-10:15 am**
Sessions 17-24 (Hilton)	**10:30-11:15 am**
Sessions 25-32 (Hilton)	**11:30-12:15 pm**
Lunch & Business Meeting (Hilton)	**12:15-2:00 pm**
Sessions 33-40 (Hilton)	**2:00- 2:45 pm**
Sessions 41-48 (Hilton)	**3:00-3:45 pm**
Sessions 49-56 (Hilton)	**4:00-4:45 pm**
Wilson Speaker-Dr. Linda Sheffield	**5:00-5:45 pm**

Dinner (On your own)

Saturday, March 12, 2011

Registration (Hilton)	**8:00 am-10:00 am**
Founder Speaker (Hilton)	**8:30-9:15 am**
Sessions 57-64 (Hilton)	**9:30-10:15 am**
Sessions 65-72 (Hilton)	**10:30-11:15 am**
Sessions 73-80 (Hilton)	**11:30-12:15 am**
Lunch (Hilton)	**12:15-1:30**
Executive Board Meeting	**2:00-4:30 pm**

FRIDAY SESSIONS			
8:30—9:15 a.m.	**9:30—10:15 a.m.**	**10:30—11:15 a.m.**	**11:30—12:15 p.m.**
1. **Daniel Brahier:** What Are Undergraduates Looking For in a Methods Experience?	**9**. **Lynn Columba:** Mathematical Discourse Embedded in Stories **9. Bob M. Drake:** Altering Emphasis: Changing Practices	**17. Adele Hanlon:** The Influence of "Quick Draw" on Pre-service Teachers Spatial & Geometric Thinking	**25**. **Sue Brown:** Supporting Teachers as They Create Multiple-Choice Assessment Items & Use Assessment Data for Planning Instruction
2. Elaine Young & Sarah Ives: Fraction Models: Eggs over Easy	**10. Brian R. Evans: D**etermining Teacher Quality in Teach for America Alternative Certification Teachers	**18. Brian R. Evans:** Teacher Differences in Mathematics Knowledge, Attitudes & Self-Efficacy Among NYC Teaching Fellows	**26. Michael Todd Edwards & Suzanne Rushton Harper:** The Zone of Optimal Learning: Building More Effective On-Line Learning Objects in an Age of Information Overload
3. Sean Yee: How Metaphors Affect Mathematical Problem Solving	**11. Justin Fletcher & Dr. Darlinda Cassel:** The Good, the Better, and the Ugly: Three Ways that Math is Taught in Middle School	**19. Betty Eaton & Darlinda Cassel:** Investigating Math Curricula for Student-Centered Learning	**27. Kerri Richardson & Darlinda Cassel: R**epresentations of Fifth Grade Students: A Look into the Development of Early Algebra Concepts
4. Stacy Reeder & Timothy A. Laubach: Creating Critical Connections in Mathematics & Science through Engineering (C3MSE)	**12. James Dogbey, Gladis Kersaint & John Gyening:** Factoring Quadratic Polynomials: An Alternative Approach	**20. Brenda Strassfeld:** Geometry: What High School Mathematics Teachers Believe about Teaching It	**28. Jane M. Wilburne & M. Lynn Breyfogle:** Increasing Elementary Preservice Teachers' Mathematical Content Knowledge & Habits of Mind with Math Olympiads
5. Angela Krebs: Slicing a Cube: A Geometry Investigation across Many Levels	**13. Alan Zollman:** Write is Right: Students Using Graphic Organizers to Improve Their Problem-Solving Skills & Abilities	**21. Tamora Jackson & Dr. Angiline Powell:** Fated, Over-looked, Disregarded: Nevermore! Middle School African American Math Students	**29. Valerie Sharon & Teresa Hughes:** Impact of Instruction on Prospective Elementary Teachers' Self-efficacy to Teach Fraction Concepts
6. Thomas J. Faulkenberry: Individual Differences in Magnitude-based Fraction Representations	**14. Kay A. Wohlhuter:** Mathematics Education: Learning from our Colleagues in India	**22. Darlene E. Kohrman:** The Effects of Concept Images & Concept Definitions on the Quadrilateral Understanding of K–8 Pre-service Teachers	**30. Juliana Utley, Adrienne Redmond & Cynthia Ornona:** Relationship between Pre-Service Elementary Teachers' Mathematical Learning Experiences and their Belief about Mathematics
7. Cathleen Rossman: Working Together: Student Engagement in a Middle School Mathematics Classroom	**15. Lisa Douglass & Alissa Horstman:** Integrating Inquiry-Based Mathematics into RtI Mathematics	**23. Timothy McKeny:** Better Mathematics through Literacy: Building Bridges to Meaningful Learning	**31. Gary Christie:** Base Ten Blocks in Elementary School Education

8. **Summer Bateiha:** Mathematical Transformation through Social Understanding: A Case Study of a Social Issue Mathematics Course for Preservice Teachers	**16. Ann R. Crawford & Cynthia F. Copolo:** Effects of the Use of a Multi-Step Warm-up Problem on Mathematics Learning, Grades 6-8 & the Teachers	**24. Carol Livingston:** Extending to Symbols	**32. Edward Wall:** Mathematics Knowledge for Teaching: Some Pragmatics
FRIDAY SESSIONS			
2:00—2:45 p.m.	**3:00—3:45 p.m.**	**4:00—4:45 p.m.**	**5:00-5:45 p.m.**
33. Michael Mikusa, Joanne Caniglia & Sarah Koebley: The Evolution of a High School Mathematics Teacher Community & Its Impact on Instruction	**41. Pat Lamphere Jordan & Toni Ivey:** Secondary Mathematics & Science Teachers' Interpretation of Integration	**49. Anne Reynolds & Michael Mikusa:** Mathematical Explorations for Middle Grades Teachers	Wilson Speaker
34. Jeremy F. Strayer: Tasks & Tools that Promote Reasoning & Sense Making in Introduction to Statistics	**42. Kansas Pope:** Why does it have to be right before it can be shared?	**50. Gabriel Matney & Jack Jackson:** Assessment & Complexity of Non-Routine Problem Solving Involving Proportion Reasoning of Middle School Students	
35. Tony Thompson: An analysis of thinking skills on Algebra I End-of-Course tests	**43. Donna H. Foss:** Teacher Learning: Connecting Professional Development to the Mathematics Classroom	**51. Jason Petula:** A Standards-Aligned Systemic Approach to Elementary Mathematics: Elementary Mathematics Clinics as an Intervention	
36. Nirmala Naresh & Iris DeLoach Johnson: The Impact of Multicultural Games of Chance on Undergraduate Students' Understanding of Probability	**44. Rebecca Ortiz & James Valles:** An Examination of Pre-Service Teachers: Content Acquisition & Implementation	**52. Ben Sloop & S. Megan Che:** Effects of a Reform-based Mathematics Content Course for Elementary Teachers	
37. Delinda van Garderen-Anderson, Christa Jackson & Amy Scheuermann: How Students of Diverse Abilities Solve Mathematics Problems	**45. Mary B. Swarthout & Beth Cory:** Popsicle Sticks, Ping Pong Balls & Pennies: Tasks & Instruction Designed for Place Value Understanding	**53. Jean McGehee:** Teaching Lesson Plan Writing: From Applied Theory to Real Practice	
38. Eileen Durand Faulkenberry: A Conceptual Approach to Transformations of Functions	**46. Armando M. Martínez-Cruz & José N. Contreras:** Pre-service Elementary Teachers' Understanding of the Arbitrary Nature of a Unit	**54. José N. Contreras & Armando M. Martínez-Cruz:** Pre-service Elementary Teachers' Use of Realistic Considerations for Solving Problematic Word Problems	

39. Adrian M. DeWindt-King: The Effect of Learning Strategies, Learner Characteristics, and Prerequisite Knowledge on Student Success in Intermediate Algebra at a Community College	**47. Scott Courtney:** Characterizing an Orientation toward Learning & Teaching Mathematics that Constrains Reflection	**55. Carolyn Pinchback:** Manipulatives & Fractions	
40. Edel Reilly: Improving Female Interest in Mathematics	**48. Bea Babbitt:** Mathematics for Students with Special Needs	**56. Vivian R. Moody, Summer Bateiha, Hope Marchionda & Wanda Weidemann:** Preservice Teachers Coming to Know Mathematics	

SATURDAY SESSIONS

8:30—9:15 a.m.	9:30—10:15 a.m.	10:30—11:15 a.m.	11:30—12:15 p.m.
Founder Speaker	**57. Juan Manuel Gerardo:** The Sociopolitical Mathematical Student Experience: Negotiating Equity, Identity & Power as a Secondary Mathematics Student-Teacher	**65. Farshid Safi:** Facilitating Prospective Teachers' Conjecturing & Questioning Strategies using Dynamic Technology-Supported Instruction	**73. Nancy Cerezo:** Pre-service Teacher Efficacy of Teaching Mathematics
	58. Patrick Wachira & Enock Meshack: Digital & Online Technology in Mathematics Education	**66. Jerry Obiekwe:** An Alternative Approach to Assessing Critical Thinking Skills in Undergraduate Mathematics	**74. Jennifer Wilhelm:** Assessing How Pre-service Teachers Understand Balance through Clinical Interviews & a Virtual Tool
	59. Stephanie Kolitsch & Joyce Swan: An Early Professional Development Opportunity for Preservice Teachers	**67. Wendy James:** Comparing the Use of Vectors in Trigonometry & Physics Drawings	**75. Sarah Kasten:** A Framework to Study Preservice Teachers' Practices of Anticipating Students' Mathematical Responses
	60. Karen L. Terrell: Preparing Secondary Mathematics Teachers for Academic Language & Practice	**68. Dohyoung Ryang & Tony Thompson:** Revision of the MTEBI for Korean Preservice Teachers	**76. Dohyoung Ryang:** Exploratory Analysis of Korean Elementary Preservice Teachers' Efficacy Beliefs in Mathematics Teaching

	61. Jonathan Thomas, Edna Schack, Molly Fisher, Sara Eisenhardt, Janet Tassell, Todd Brown, Margaret Yoder, Patricia Higgins & Greg Gierhart: Noticing Numeracy Now (N^3): A Collaborative Research Project to Develop Preservice Teachers' Abilities to Professionally Notice Children's Mathematical Thinking	**69. Sandra Browning:** The Influence of Number Names on Children's Understanding of Place Value	**77. Gayle M. Millsaps:** Enhancing Preservice Teachers Geometric Reasoning with Shape Makers
	62. Candace Joswick & Sarah Gilchrist: The Rumored Math Gene	**70. Lindsay Prugh:** Spatial Reasoning & Student Discourse	**78. Elaine Wiegert & S. Megan Che:** Classroom Discourse in a Standards-Based Classroom
	63. Linda Marie Saliga & Lynne M. Pachnowski: Manipulatives, Pedagogical Content Knowledge & Mathematical Misconceptions	**71. Janet Herrelko:** A Mathematics Differentiation Model to Help New Teachers Engage All Students	**79. Linda K. Griffith & Patricia Rhodes Nicossa:** Developing Conceptual Knowledge about Division of Fractions with Pre-service Elementary Teachers
	64. George Abshire & Stacy Reeder: Developing and Sustaining Mathematical Discourse: The Possibility of Problematic Tasks	**72. Sarah Ives:** An In-depth Look at Secondary Preservice Teachers' Pedagogical Content Knowledge of Probability	**80. Mary Harper & Stacy Reeder:** Understanding the Lived Experiences of Non-credit College Mathematics Students

Connection Points

by Thomas J. Faulkenberry
Department of Psychology
& Special Education
Texas A&M University–
Commerce

Brain-Based Mathematics: Promising Practice or Hopeful Hype?

Much current curriculum design effort is placed on so-called *brain-based mathematics,* that is, teaching mathematics in ways that use what we know about the human brain. Indeed, the last several decades have yielded much fruit with respect to our knowledge of the structure and function of the human brain. It seems plausible that we as mathematics educators should use this abundant harvest to our advantage. I do wonder, however, whether much of this current interest in the brain is based on sound interpretation of scientific research, or rather, it is a symptom of a market-driven culture that is looking for the next educational cure-all.

Plausibility is surely one of the keys to selling science. Take, for example, the "fact" that the corpus callosum, which is the bundle of nerve fibers that connects the right and left hemispheres of the brain, is larger in girls than it is in boys. This would seem to imply that girls are better able to "crosstalk" between hemispheres, which could easily be (and often is!) used as support for anecdotal observations such as girls being better multi-taskers than boys. In spite of recent science that questions this myth, it is highly plausible, and as a result, it will continue to be sold to a willing consumer base.

A cursory Google search of "brain based learning" will lend one hours of reading. It will also give one the idea that, thanks to modern science, we know a lot about how the brain performs best in the classroom. Much of this claim is due to the fact that our popular culture is bombarded with reports of experiments that measure certain aspects of brain behavior (from volumetric analyses of structural components to measuring localized neural activity through blood-oxygen levels). While these studies yield fascinating conclusions about the structure and function of the brain, making the leap from varying hippocampal volumes to the need for cooperative groups is unsteady at best, and at worst, completely misleading.

Let me illustrate how this type of research can misinform education. Many decades of research in cognitive psychology have lead to the knowledge that continuous practice results in improved learning of list material, such as arithmetic facts. So, it is plausible that much time should be spent early in a child's educational career memorizing arithmetic facts until mastery. In fact, we are not far removed from an educational culture that did promote such classroom instruction. But, based on other cognitive research, we also know that such instruction comes at a cost to the child's attentional resources. That is, instruction that is good for memory is not necessarily good for attention and can result in boredom and other symptoms of attentional drift.

Speaking of arithmetic, much research has attempted to understand how simple arithmetic is performed in the brain. So far, it is safe to say that we still understand very little. Consider the following phenomenon related to how adults retrieve answers to single-digit arithmetic problems from memory.

No matter who you are, where you're from, what gender you are, or how smart you are, you will always say the answers to the smaller problems (such as 2 x 3) significantly faster than you will the larger problems (like 6 x 7). If you try it, you may not be able to perceive any difference. That's because this effect in reaction time occurs at the millisecond level. It's always, there, though, and it can be captured reliably through computer-based timing instruments. This phenomenon, known as the *problem-size effect*, has been studied since the early '70s, and to this day its source baffles scientists working in mathematical cognition.

I mention this not to say that cognitive science is useless (it most definitely is not!) or to minimize what we do know about the brain, because what we do know is quite fascinating. However, I do question the current zeitgeist of immediately and haphazardly trying to apply this fascinating work directly to educational practice. I work both as a mathematics educator and a cognitive psychologist. When I work in my mathematical cognition lab, I am rigorously studying cognitive phenomena (primarily memory and attention) that happen when people think about mathematics. This is not the same as mathematics education research, where I study a whole person or an educational system. These research programs have much different levels of analysis, and as such, translations between them should be approached with careful skepticism.

As much as some may try to use neuroscience as a cure-all for mathematics learning, it is still imperative that, as a mathematics education research community, we keep investigating mathematics learning at the whole-person level of teacher and learner. To ignore this type of research would result in ignoring the art of teaching, which in my opinion, would be a big mistake.

Remember that if you do not know how to play a piano, a Steinway isn't going to make you sound any better. But in the hands of a master, even a child's toy piano can make some grand music. I hope that we will continue to learn what makes our teachers masters of their craft, so that in their hands, all of our children, regardless of background, can learn some good mathematics.

ELECTION RESULTS

Thank you to everyone who ran for a position. We appreciate your willingness to serve the organization. The election results are as follows:

Secretary: Megan Che

Conference Committee Member: Bob Drake

Conference Committee Member: Keith Adolphson

They will take their positions during the Business Meeting at the RCML conference in March 2011.

INVESTIGATIONS IN MATHEMATICS LEARNING

Sheryl A. Maxwell
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The 2010 holiday season was in full bloom,
When the *Intersection Points* editor sent the e-mail.
"A progress report is due from your workroom.
How's RCML publications, won't you tell?"

Now, the subscriptions have nearly all been renewed.
The checks have been processed and off to the bank.
Looks like the sufficient amount of dollars are accrued
Investigations' account is healthy, I announce pointblank!

The Volume 3 issues are prepared in earnest,
With Issue 1 to the subscribers in the fall.
Issue 2 mailed as the eastern blizzard witnessed,
Issue 3 will come in Spring 2011, you recall.

In 2011, the future publications look bright ahead.
More and more manuscripts are trickling in.
RCML authors, from what I have proofread,
Have written for *Investigations* issues, within.

The RCML membership has recently increased.
The "reminder" to all sure did the trick.
We look forward to meeting colleagues, at least,
At the upcoming conference . . . I hope it's not slick!

As the RCML VP of Publications, I announce with glee.
The transition from *Focus* to *Investigations* was successful.
We have numerous worldwide subscribers, secured quite frankly
Through continual efforts; thus all members should be thankful.

MEMBERSHIP

We have about 40 members that are current with their renewal or new memberships to RCML as of January 15. This is great news and puts us ahead of the game from previous years – a very big thank you to those who responded to the end of the year email reminder about membership dues. We ended 2010 with 81 members - a nice growth from our 2009 number - and I expect we can break the 100 number this year with help from our current membership!

Membership is due on 1 January 2011. To renew your membership please send **$35** to Mary Swarthout. Please direct those wanting to join RCML to our website http://www.unlv.edu/RCML/memberform.html

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