CMESG

GCEDM

NEWSLETTER / BULLETIN

The NEWSLETTER is a publication of the Canadian Mathematics Education Study Group

CMESG *is a group of mathematicians and mathematics educators who meet annually to discuss mathematics education issues at all levels of learning. The aims of the Study Group are:*

1) *to study the theories and practices of the teaching of mathematics*
2) *to promote research in mathematics education*
3) *to exchange ideas and information about all aspects of mathematics education in Canada*
4) *to disseminate the results of its work.*

Ce BULLETIN est une publication du Groupe canadien d'étude en didactique des mathématiques

*Le **GCEDM** est composé de personnes oeuvrant en mathématiques et en didactique des mathématiques et qui se réunissent une fois par année pour étudier diverses questions relatives à l'enseignement des mathématiques à tous les niveaux. Les buts du Groupe sont les suivants:*

1) *susciter une réflexion critique sur la théorie et la pratique de l'enseignement des mathématiques*
2) *encourager la recherche en didactique des mathématiques*
3) *faciliter l'échange d'idées et d'information sur tous les aspects de l'éducation mathématique au Canada*
4) *faire connaître les résultats de ses travaux.*

IN THIS ISSUE / DANS CE NUMÉRO

(in order of appearance / en ordre d'apparition)

PRESIENT'S MESSAGE DE LA PRÉSIDENTE

Malgorzata Dubiel, Simon Fraser University
(dubeil@cs.sfu.ca)

Welcome to the CMESG/GCDEM Fall 2002 Newsletter.

As always in our Fall Newsletter, you will see the first announcement of our 2003 meeting, which will be hosted by Acadia University.

Last year we celebrated our 25th meeting, with the theme "Lessons from the Past, Questions for the Future". The Acadia meeting is therefore starting the "Future". We hope that it will be sufficiently inspirational.

The setting is definitely suitable for the purpose. This will be our first meeting at Acadia, so we start at a new place. And, Acadia has been in the media recently, because of the 5th anniversary of the introduction of a program which Globe and Mail in their November 18th, 2002 article "Laptop Computers Give Advantage to Acadia" calls "The Acadia Advantage". Totally wired campus, every student and every faculty member required to have a laptop, and technology thoroughly incorporated into the teaching. We will have the opportunity to see it in May! To learn more about the meeting, read the information provided in this newsletter by David Reid, our conference coordinator and the local organizer of the Acadia meeting.

There are many questions to ask when starting our second quarter century. One of them is the role we see for our Newsletter. Do we need a Newsletter? What do we expect to see in it? How to make it more meaningful/interesting/useful/...?

If you have a strong opinion or a vision for the Newsletter, now is your chance. Doug Franks, who has been the editor of our Newsletter for the past five years, wants to step down after completing the Spring 2003 issue. If you are interested in the job, or have any questions about it, please contact me, Doug, or other members of the executive.

Bienvenue à l'édition d'automne 2002 du bulletin du GCEDM/CMESG.

Comme toujours, vous trouverez dans cette édition automnale la première annonce de la prochaine rencontre annuelle, qui se tiendra à l'université Acadia.

L'an dernier, nous avons célébré la 25ème rencontre annuelle sous le thème *Leçons du passé, questions pour l'avenir*. La rencontre d'Acadia marque ainsi notre entrée dans l'*avenir*. Nous espérons qu'il s'agit là d'une source d'inspiration importante !

Le lieu prévu pour notre rencontre est certainement fort approprié dans ce contexte. Il s'agira de notre première rencontre à Acadia, et nous découvrirons donc un nouvel endroit. De plus, Acadia a fait la manchette récemment alors qu'on y célébrait le cinquième anniversaire des débuts d'un programme que le Globe and Mail décrivait comme l'*Acadia advantage* dans un article de l'édition du 18 novembre 2002. Un campus branché, dans lequel chaque étudiant et chaque professeur doit avoir son portable, et une pédagogie tirant pleinement partie de cette omniprésence technologique. Nous aurons l'occasion de constater de visu en mai! Pour en savoir davantage, lisez l'information fournie par David Reid, organisateur local et coordonnateur de notre rencontre annuelle.

Bien sûr, on peut poser plusieurs questions lorsqu'on aborde un nouveau quart de siècle. L'une de celles-ci est quel rôle voit-on pour notre bulletin. Est-il pertinent ? Que voudrait-on y lire ?

Si vous avez une opinion à émettre à ce sujet ou encore une vision de ce que le bulletin pourrait être, voici votre chance: Doug Franks désire terminer son mandat après avoir complété l'édition d'avril 2003, et ce après cinq ans en tant qu'éditeur. Si vous désirez en savoir plus, contactez moi, Doug ou un des membres de l'Exécutif.

OTHER CMESG NEWS / AUTRES NOUVELLES DU GCEDM
Annonces/Announcements

Élections 2003

GCEDM Exécutif - Élections 2003

Les mandats de deux ans de la trésorière, Olive Chapman, et d'un membre de l'Exécutif, Bill Higginson, se terminent en mai 2003. Il est maintenant temps de recevoir les mises en candidature pour ces deux postes. Nous vous invitons à faire parvenir les mises en candidature d'ici au 30 janvier 2003 (inclus) à Elaine Simmt, Présidente du comité de nomination du GCEDM/CMESG:
elaine.simmt@ualberta.ca.

Elections 2003

CMESG Executive - Elections 2003

Two year terms of our Treasurer, Olive Chapman, and a member of the executive, Bill Higginson, will be ending in Spring 2003. It is time now to consider candidates for these positions. Nominations should be sent no later than January 30, 2003 to Elaine Simmt, Chair of the CMESG/GCEDM Nominating
 Committee, elaine.simmt@ualberta.ca.

CMESG Annual Meeting
David Reid
david.reid@acadiau.ca

David Reid and his team at Acadia are looking forward to welcoming you all to CMESG 2003, May 30- June 3. In addition to the usual program elements there are plans for a special session for local teachers, self guided math walks through town, hikes in the woods, and of course the events of the Apple Blossom Festival. Look for further announcements on the website and over the listserv.

New PhD presentations: As usual there will be sessions for new PhDs to share their work with us. If you have recently completed a PhD, or know of those who have, please contact the Co-Conference Co-ordinators.

Rencontre Annuelle du GCEDM
David Reid
david.reid@acadiau.ca

David Reid et son équipe à Acadia ont hâte de vous recevoir lors de la prochaine rencontre du GCEDM, du 30 mai au 3 juin 2003. En plus de notre programme habituel, on prépare une séance pour les enseignants de la région, un rallye mathématique dans les rues de la ville, une promenade en forêt et, bien sûr, on prévoit profiter du Apple Blossom Festival. Surveillez les annonces sur le site du GCEDM et par courriel.

Présentation de thèses de doctorat récentes: Comme le veut la tradition, une séance est prévue pour permettre aux nouveaux doctorants de présenter leurs travaux de thèse. Si vous avez soutenu votre thèse en 2000 ou si vous connaissez des gens qui l'ont fait, veuillez contacter l'un des coordonnateurs de la conférence.

WHAT'S HAPPENING IN MATHEMATICS EDUCATION
CE QUI SE PASSE EN DIDACTIQUE DES MATHÉMATIQUES

Getting Cognitive about Rational Numbers

Ralph Mason, University of Manitoba
masonr@ms.umanitoba.ca

This article is a request for help in framing an article about how to get students to think about repeating decimals, and what they think about them. It presents nine successive approximations of the question, "How much is 'Point nine repeating?'"

.9 How much is 0.9999999…? **It's 1.** Here are the words of a grade nine student, Anwar, after some activities that explored repeating numbers. "Like if one ninth is point one repeating, and you times it by nine, you get nine ninths. And point one repeating, times nine, it's point nine repeating, so they're the same."

.99 How much is 0.9999999…? **It's less than 1.** Here's what Anwar said before the activities. "If you're comparing two numbers, you have to look at the largest place value that's different. Like if it's 1234 and 1244, then you look at the tens place, because that's the biggest place value. And even if the next place value was like a nine compared to a zero, it wouldn't matter. So in those numbers, what comes after one compared to zero doesn't matter. One beats zero."

.999 How much is 0.999999…? **It's 1.** Paul, an educator, explained on a website to a grade seven student, "It's about the density of a number line. If there is a number between two numbers, then the numbers are different. For instance, between 0.9999 and 1 is 0.99999 so 0.9999 and 1 are different. But we can't name a number between 0.999999… and 1, so they must be the same. The rational number line is infinitely dense." "It sure is! " the student wrote in reply.

.9999 How much is 0.9999999…? **It's almost 1.** Beata, a grade seven student, explains, "They're almost the same. But not quite. Like, write 1.000000 like this and then under it write 0.9999999 right? So if we start to subtract we have to borrow nine doesn't take away from 0. So zero, 9 9 9 9 9 and then 10. So now we can subtract and this is one and all the rest are zeroes.

Her partner, Renate, jumps in. "Yeah but you can't stop like that. The zeros, you have to go forever, and the same with the nines."

Beata says, "Yeah that's right. So there will be lots of zeros, zeros forever, here, and nines underneath. But when we borrow, all the zeros become nines, forever, until after forever there will be a ten. And that's where you're get a one when you subtract."

.99999 How much is 0.9999999…? **It's almost 1, an infinitesimal away.** An Advanced Placement student, Romulo, explains. "You'd have to graph it. How many nines you have, that would go along the bottom. Then graph it, with the value along the side. It's like a log function, see, point nine, point nine nine, point nine nine nine. It's always getting bigger, but by less and less. So it will always get closer to one. That's its limit, but it never reaches it."

.999999 How much is 0.9999999…? **It's 1.** A teacher in a professional development course explains. "There's a rule though. You have to teach it. You have to write 'X equals'. Can I use the board? Okay, so 'X equals point nine repeating'. We only need to write out a few of the nines. Then, on top, you'd write

'Ten X equals'. And it's 'Nine point nine' as many nines as you want. Multiply by ten, it moves the decimal one place. And then subtract. Ten X minus one X is nine X. All these nines cancel out, and you get nine. So 'Nine X equals nine', it's one. That's what you have to teach them. The rest just confuses them."

.9999999 How much is 0.999999…? **It's forever.** A tortoise trying to finish a race with a hare explains. "After a certain time I was nine tenths of the way to the finish line, and I said to myself, there's one tenth left. I asked myself, how long until there's only one tenth of that one tenth left? I realized, I can get to that point in one tenth of the time it took to get to point nine. That would be 99 hundredths of the way. When that's done, and there is 0.01 left, I could aim to cover 9/10 of what's left at that point, and get to 0.999. That would take only one tenth of the previous section. I liked that idea. Every section of the journey, I'm 90% closer to the finish. And every section of the journey would take only one tenth of the previous section. So that 's what I've been doing for three thousand years, ever since Zeno shouted "Go!"

.99999999 How much is 0.999999…?. **It's a lot!** It's more than a million. Bev, a grade 7 student, hadn't even heard the story of Zeno's tortoise, when she patiently explained. "A million is a big number, but if you're counting to a million you will stop eventually. If you're writing out the number, you only need seven, seven things, a one and six zeros. But point nine repeating goes on forever. It never stops. That's as big as it gets."

.999999999 How big is 0.999999…? **It's a big idea.**

a. Mathematically, it's big, it's small, and it's old. With her answer, Bev holds infinity in the palm of her hand, and that's about as big as it gets, in mathematics. Beata's difference is really small, as small as the infinitesimal. Romulo's ideas of finite sequences and rates of change are big. And Paul's density representation of the discrete-continuous dilemma of Zeno's tortoise, whether big or small, is old.

b. Epistemologically, Bev's answer is about the difference between a number (a quantity or measure) and a numeral (the symbol for a quantity or measure). In linguistics, that would be the difference between a sign and the signified. Gregory Bateson would say that it's a confusion of the map with the territory.

c. Pedagogically, it's about the difference between teaching the right answer, and teaching students to think. The difference between 0.9999999… and 1 is the difference between math as a set of can't-understand facts to remember, and math as a set of delightful mysteries to wonder about and learn about.

d. In curriculum theorizing, the difference between 1 and 0.9 repeating is the difference between curriculum as content on the one hand and curriculum as the subject and process of guided inquiry and discourse on the other.

How should I write about this? I have lots of student (and teacher) data, but I don't know what to write for a particular audience/journal. Send your suggestions to me, at masonrt@ms.umanitoba.ca.

Literature For Prompting Mathematical Understanding:
A Request

Elaine Simmt of the University of Alberta writes:
I will be teaching an inter-session course on using literature in the secondary school mathematics class. This is a special interest course for undergraduate and graduate students. I am interested in any pieces of literature from picture books to novels to film that may be suitable. In exchange for your suggestions I will update my literature web page which can be found at http://www.ioncmaste.ca. Link to it through projects or through associates.

elaine.simmt@ualberta.ca

Activities In Atlantic Canada

Richard Hoshino is a Ph.D. student in mathematics at Dalhousie University. He attended the CMESG/GCEDM conference in Kingston. He writes:

Currently, I run an education study group in the Dalhousie mathematics department. About 10 to 15 graduate students and faculty get together every two weeks, to exchange teaching ideas and share resources. We have given presentations on non-traditional assessment techniques, effective use of technology in the undergraduate mathematics classroom, developing a more problems-based math curriculum, active learning, and innovative teaching ideas, such as convening. For more information, please see
   http://www.mscs.dal.ca/~hoshino/studygroup.html

Over the next three years, John Grant McLoughlin (UNB) and I will be running in-service combinatorics institutes for high school teachers in Atlantic Canada. Also, this year, I will be starting a high school math league in Halifax, which is similar to a very successful league that has been running in Newfoundland for over fifteen years. My plan is to expand this league to the entire province in the next three years.

hoshino@mathstat.dal.ca

UPCOMING PROFESSIONAL MEETINGS

Mathematics Education into the 21st Century Project Conference 2003

Following successful international conferences in Egypt 1997, Jordan 2000, Poland and Australia 2001, and Sicily 2002, the Mathematics into the 21st Century Project is organizing an international conference with the title "The Decidable and Undecidable in Mathematics Education." It will be held in Brno, the regional capital of Moravia, in the Czech Republic, from Friday, September 19 to Wednesday, September 24, 2003.

Papers are invited on all innovative aspects of mathematics education including Statistics Education, Gender & Equity, Ethnomathematics, Rich Learning Tasks, Problem Solving, Applications, Research on Teaching and Learning, Technology in the Classroom, Computer Graphics and Teacher Education.

For further conference details please email arogerson@vsg.edu.au.

Seventh International History, Philosophy & Science Teaching Conference

The *International History, Philosophy & Science Teaching Group* is holding its Seventh International Conference at the University of Winnipeg in Manitoba in collaboration with the University of Manitoba, from Wednesday (evening) 30 July to Sunday (noon) 3 August 2003. The theme of the conference is "Reforming School Science through the History, Philosophy, and Sociology of Science." Full information is available at: www.ihpst.uwinnipeg.ca

Educators, historians, philosophers, teachers, scientists, and cognitive scientists from over 30 countries will engage with theoretical, curricular, and pedagogical issues in contemporary science education. Inquiries and offers of papers may be sent to Conference Chair Professor Arthur Stinner at stinner@cc.umanitoba.ca

[Ralph Mason indicates that Canadian registrants, and especially Canadian graduate students, will receive a major reduction in registration costs due to SSHRC support. He also invites anyone who might be interested in a joint presentation with him to get in touch.]

…More Conferences/Autres Rencontres

Forum canadien sur l'enseignement des mathématiques. Du 16 au 18 mai 2003, Montréal. **/Canadian School Mathematics Forum**. May 16-18, 2003, Montréal. www.cms.math.ca	**Intégration des technologies dans l'enseignement des Mathématiques.** Du 20 au 22 juin 2003. Reims, France. www.reims.iufm.fr/Recherche/Cadre_recherche.htm En lien avec **le 3ème Symposium CAME (Computer Algebra in Mathematics Education).** 23 au 24 juin 2003.
CMS. June 14-16, 2003. University of Alberta. **SMC.** Du 14 au 16 juin 2003. University de l'Alberta. www.cms.math.ca	**Integrating Technologies into Mathematics Education.** June 20-22, 2003. Reims, France. In relation with the **3rd CAME Symposium (Computer Algebra in Mathematics Education).** June 23-24, 2003.
PME. July 13-18, 2003. Honolulu./ **PME.** Du 13 au 18 juillet. Honolulu. www.hawaii.edu/pme27	http://itsn.mathstore.ac.uk/came/index.html
ICME-10. Du 4 au 11 juillet 2004, Copenhagen. **ICME-10.** July 4-11, 2004, Copenhagen.	

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I would like to thank member Frédéric Gourdeau for his major contribution as translator of all French language text. - Doug Franks

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L'EXÉCUTIF DU GCEDM/CMESG EXECUTIVE
2002-2003

The members of the executive extend an invitation to you to contact us about any item of interest. If you have something you want to suggest, if you have a concern you wish to raise, if you want more information, etc., please let one of us know. In order to be of service to the membership, we need to be aware of what your interests are.

Les membres du Comité exécutif vous invitent à leur faire part de votre point de vue concernant n"importe quel aspect de la vie du GCEDM. Que ce soit pour transmettre suggestions ou commentaires, ou encore pour être mieux informé, n'hésitez pas à entrer en contact avec l'un d'entre nous. En nous faisant connaître vos intérêts, vous nous aidez à mieux vous servir.

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