



CANADIAN MATHEMATICS EDUCATION STUDY GROUP  
46<sup>TH</sup> ANNUAL MEETING  
A VIRTUAL EVENT  
MAY 27<sup>TH</sup> TO MAY 29<sup>TH</sup>, 2022

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## Announcement and Program

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We are pleased to invite you to the 46th annual meeting of the CMESG, which will be held as a virtual event again this year. Although we would have liked to hold the meeting in person, we have responded to the wishes of the members who responded to a survey last November by holding the meeting online. We have chosen to adopt a format very similar to last year's meeting. You will be invited to a plenary presentation, be able to choose one working group (out of six), and have the chance to learn about the theses of ten new PhDs. Several social activities are also planned, and we have added a session for welcoming newcomers to our community (all participants welcome!).

### Virtual Conferencing Software

All sessions will be held on Zoom. We encourage everyone who attends the annual meeting to make sure they have the latest Zoom updates. You can upgrade to the latest Zoom version by visiting the [Upgrade Zoom to the latest version](#) page.

Here are some tips for using Zoom:

- Make sure everything is working before the conference starts.
- Keep your camera on if possible, as it helps make our interactions more lively and personal.
- Consider lighting the room you are in so that you can be seen clearly. Consider setting up a lamp to illuminate your beautiful face.
- When you are not speaking, mute your microphone to avoid interruptions.
- Use Zoom tools to engage: send comments and questions in the chat box, use reactions to raise your hand, clap or show emotion.
- Please do not share Zoom links of CMESG activities. We will be in charge of making these links available to the participants. This is to avoid unwanted guests.

## Social Time

Many CMESG members consider social activities at least as important as scientific activities. Although the meeting is online, we plan to have social time during breaks and other activities to share a good time together, including the new welcoming session for newcomers. The exact nature of these activities will be announced as we get closer.

## Fees

There is no charge for this 46th meeting, but to participate you must be a member. According to the constitution, membership in CMESG runs from the beginning of one meeting to the beginning of the next.

The membership fees are as follows:

- Regular - \$35.00

For registration and membership, please complete the following form: [Registration and Membership Form](#)

If you encounter technical issues using this online registration form, or if you have questions about membership fees, please contact Alayne Armstrong ([alayne.armstrong@uregina.ca](mailto:alayne.armstrong@uregina.ca)).

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## For the Learning of Mathematics [FLM] Q&A

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All members of CMESG are also members of the FLM publishing association. Please note online sessions will be held for the FLM board as well as an open session for all CMESG members. Please see below:

- May 26, 10:00-11:30 PDT (or 1:00 – 2:30 EDT) FLM Board of Directors Meeting
- May 26, 12:00–1:00 PDT (or 3:00 – 4:00 EDT) FLM Q&A (formerly Friends of FLM)  
Everyone Welcome

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## About the Conference

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CMESG is not a typical academic conference, for it is not organized around presentations and audiences. Instead, it is a conference based on *conferring*.

Its main feature is the **working group**. Each working group will meet for three full sessions to interact around a particular topic. Normally, there are two plenary speaker sessions, however this year there will only be **one plenary** who will address the whole conference. In contrast with other conferences where questions are often taken at the end of the presentation, a time slot is assigned for the audience, broken into small groups to discuss and prepare questions that will be presented to the plenary speaker in a question period. Additionally this year, we will host the **new PhD sessions**, but a bit differently. The New PhDs were invited to produce a video presenting their work. We now invite you to watch these videos before coming to discussion sessions with them. We believe that CMESG is an occasion for them not only to present their work, but also to be able to share discussions about it, so we ask that you **watch the videos in advance** for sessions you plan to attend.

Over the course of a meeting (and from meeting to meeting) various discussions and ideas emerge among CMESG members. Our program is designed with time and space for members to come together to work on their emergent ideas. In order to facilitate **Ad Hoc discussions**, there will be a zoom room left open during the one hour lunch break so that people might engage in ad hoc discussions in break out rooms. Unfortunately this year, due to the online format, there will not be a gallery walk.

Finally, many of us will be missing our meals together this year, however, we have planned for social time at the end of each day and we invite you all to use this time as you would our traditional in person meal times. Chat with those you know, chat with those you are getting to know, chat with someone you don't know – the social times are an integral part of the conferring that makes CMESG such a special conference. New to this year's meeting is an additional social session at the beginning of the conference, which aims to welcome newcomers to the community, helping to build some connections right from the start and share a little of what CMESG is all about.

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## Scientific Program

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### Plenary Lectures

<i>Lecture I</i> <i>Edith Petitfour</i>	<i>What geometry teaching for students with dyspraxia?</i>
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Using instruments to analyze a figure or make drawings is a requirement in the French school curriculum for teaching geometry in cycle 3 (students aged 9 - 11). This teaching method is expected to help students understand geometric concepts. However, it is not suitable for all students, including students with dyspraxia, who are prevented from learning when they have to manipulate material.

Our research aims at proposing an alternative way to teach geometry, accessible to all students, and in particular to those who have difficulties in manipulation rather than comprehension (which is a priori the case for students with dyspraxia).

Our approach, based on semiotics, is inspired by two approaches from cognitive science: the instrumental approach in cognitive ergonomics and the development of gesture in neuropsychology. It allows us to identify and categorize the actions required in geometric construction tasks in order to better understand their didactic potential and to address students' difficulties.

Drawing on this approach, we will present the dyadic work device that we have developed and experimented in different teaching contexts.

## Working Groups

<i>Working Group A</i> <i>Jeanne Koudogbo, Marc Husband</i>	<i>Content and practices for pre-service and in-service teacher education: A deeper look into the potentials, challenges, pitfalls, and prospects</i>
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The Working Group, WG Pre-Service and In-Service Teacher Education, focuses on the problems, issues and challenges that currently prevail in these types of training. Indeed, the world of education is in full transformation, as is research in mathematics education and practices prevailing in pre-service and in-service education. The Working Group is therefore interested in these aspects from the point of view of researchers, teacher educators, but also of teachers in training. To this end, several questions have been identified to serve as discussion points for the working days of the thematic group.

1. What are the essential elements in pre-service teacher education to develop in future teachers the professional skills to face the current challenges and issues in mathematics education?
2. How can teacher educators help preservice and in-service teachers think critically about the myriad of outside influences in the era of digital democratization (e.g., social media) so that they can distinguish between materials considered limited and those with educational potential?
3. What perspectives should be shared in pre-service and in-service teacher education to support the bridging of research and practice?

### Suggested references

Andrà, C., Rouleau, A., Liljedahl, P., & Di Martino, P. (2019). An affective lens for tensions emerging from teacher professional development. *For the Learning of Mathematics*, 39(1), 2-6.

Bednarz, N. (2012). Formation mathématique des enseignants : état des lieux, questions et perspectives. In J. Proulx, C. Corriveau, & H. Squalli (dir.), *Formation mathématique pour l'enseignement des mathématiques : pratiques, orientations et recherches* (pp. 13-54). Québec, QC : Presses de l'Université du Québec.

Davis, B., & Renert, M. (2013). Profound understanding of emergent mathematics: broadening the construct of teachers' disciplinary knowledge. *Educational Studies in Mathematics*, 82(2), 245-265. <https://doi.org/10.1007/s10649-012-9424-8>

Lajoie, C., Tempier, F. (2019). Introduction au numéro spécial sur les dispositifs de formation à l'enseignement des mathématiques. *Revue canadienne d'enseignement des mathématiques, sciences et technologies / Canadian journal of sciences, mathematics and technology education*, 19, 83–86. <https://doi.org/10.1007/s42330-019-00052-y>

Rapke T., Husband M., Bourrie H. (2020) Blurring the Border Between Teacher Education and School Classrooms: A Practical Testing Activity for Both Contexts. In: Radakovic N., Jao L. (eds), *Borders in Mathematics Pre-Service Teacher Education*. Springer, Cham. [https://doi.org/10.1007/978-3-030-44292-7\\_8](https://doi.org/10.1007/978-3-030-44292-7_8)

Seeley, C. L. (2017). Turning teaching upside down. *Educational Leadership*, 75(2), 32-36. <https://www.ascd.org/el/articles/turning-teaching-upside-down>

<b>Working Group B</b> Mahati Kopparla, Mahtab Nazemi, Gurpreet Sahmbi	<b>Critical Mathematics: Mathematics to Fit Our Whole Selves</b>
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Critical mathematics helps us to “read and write the world with mathematics” (Gutstein, 2016, p. 455). In this working group, we invite participants to reflect on their experiences teaching and learning mathematics, both as mathematicians and mathematics educators. Drawing from sociocultural theories of learning and identity and critical race theory in education, we explore the importance of counter-narratives to centre our lives and lived experiences in mathematics teaching and learning. Who we are as mathematics teachers and learners has everything to do with how we teach, learn, and relate to one another, our students, and to mathematics. Together we will explore and consider ways of nurturing students to see themselves as capable doers of mathematics, so that we can each bring our whole selves to contexts of teaching and learning. Our overall aim in this working group will be to push one another to think about how we might change mathematics (as it is commonly [mis]understood) to fit our selves, instead of changing ourselves to fit mathematics.

Specifically, in this working group we will explore the following big questions:

1. What are the turning points in your personal mathematics story, and why/how have you continued to do mathematics?
2. How do you identify, and how does this manifest in your engagement with mathematics?
3. What do you bring to the field of mathematics teaching and learning, and what does mathematics offer you?

Participants from all mathematics education contexts (early childhood, elementary, secondary, post-secondary, and beyond!) are welcome!

#### Suggested Readings and Preparation Materials

Gutstein, E. (2016). “Our issues, our people – math as our weapon”: Critical mathematics in a Chicago neighborhood high school. *Journal for Research in Mathematics Education*, 47(5), 454-504.

Zavala, M. (Host). (2019-present). (2020, April 2020). What is Luis Leyva doing in Nashville? (No. 9) [Audio podcast episode]. In TODOS.

[https://www.podomatic.com/podcasts/todosmath/episodes/2020-04-09T16\\_31\\_51-07\\_00](https://www.podomatic.com/podcasts/todosmath/episodes/2020-04-09T16_31_51-07_00)

<i>Working Group C</i> <i>Olga Fellus, Steven Khan,</i> <i>Stephanie LaFrance</i>	<i>Weaving Identity in Mathematics Education: Fads,</i> <i>Fictions, Fibers, and Freedoms</i>
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“Identity is worthy of being more than a fad, so long as we ensure we are clear of which conversation we are a part. There is certainly evidence in our writing that we are not always talking about the same thing when we talk about identity...” (Darragh, 2016, p.29).

“The United Kingdom is still one of the few advanced nations where it is socially acceptable – fashionable even – to profess an inability to cope with mathematics”. (Epstein, Mendick & Moreau, 2010)

What does the concept of identity in mathematics education mean? Why is the concept of identity relevant to the future of the field of mathematics in general and mathematics education in particular? How might we harness the concept of identity in our work as researchers,

practitioners, learners, parents, and policy makers? How are mathematical identities socioculturally and discursively co-constructed? What shared vision and values inform our judgments of who can do and who cannot do mathematics? How are mathematical identities privileged and/or marginalized and what might be the implications of these processes? How does understanding math identity—through experiences and their interpretation, discourse, authorship, socioculturally available identities, intersectionalities, and imagination—provide an avenue of possibilities and hope for mathematics learning and futures in mathematics? Where might we boldly go next? These questions and others that participants bring, will guide the exploration over the 3 sessions.

References

Epstein, D., Mendick, H. & Moreau, M.-P. (2010). Imagining the mathematician: young people talking about popular representations of maths. *Discourse: Studies in the Cultural Politics of Education*, 31(1), 45-60, DOI: 10.1080/01596300903465419

Lisa Darragh (2016). Identity research in mathematics education. *Educational Studies in Mathematics*, 93(1), 19-33. DOI:10.1007/s10649-016-9696-5

<p><b>Working Group D</b>  <i>Analia Bergé, Lauren DeDieu</i></p>	<p><b>Assessment in Undergraduate Mathematics</b></p>
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"Will this be on the test?" Assessments play a central role in post-secondary mathematics courses. We probably agree that well-designed assessments motivate students to master core content and dive deeper into course material. That leads us to reflect on the characteristics of a well-designed assessment and the variables that influence its design (course content, large class sizes, an institution's ways of doing things, resources, etc.).

In this working group, we will discuss assessment in undergraduate mathematics and explore questions such as:

- Do we aim for our exams to emphasize the execution of known operations and procedures, their application to new situations, or a combination of both?
- Do we include theoretical questions on our exams (e.g., theorems and proofs)? Why?
- Besides learning the necessary mathematical content, what do we hope students take away from our courses? What assessments support these learning objectives?



- How can we ensure consistency in grading assessments?
- What would be the characteristics of an “ideal” exam?
- How can we use assessments to foster the development of metacognitive skills in our students?
- Can we use assessments as a tool to actively engage students in the course and boost motivation? How?
- To what extent should mathematical communication be emphasized in assessments? How can we help students cultivate this skill?

### Suggested Readings

Benjamin Braun (2014) Personal, Expository, Critical, and Creative: Using Writing in Mathematics Courses, *PRIMUS*, 24:6, 447-464, DOI: 10.1080/10511970.2013.843626

Coppé, S. (2018). Évaluation et didactique des mathématiques : vers de nouvelles questions, de nouveaux travaux. *Mesure et évaluation en éducation*, 41(1), 7–39. <https://doi.org/10.7202/1055895ar>

Gueudet G., Lebaud, M-P. Quelle évaluation à l’université en mathématiques? Questions de pédagogie dans l’enseignement supérieur 2008, 2008, Brest, France. Pp 289-299. Hal-00460363 mathématiques <https://core.ac.uk/download/pdf/52855595.pdf>

Gueudet G. (2008). Investigating the secondary-tertiary transition. *Educational Studies in Mathematics*, 67: 237-254.

<p><b>Working Group E</b> Doris Jeannotte, Helena Osana</p>	<p><b>Manipulatives in Elementary Mathematics Teaching and Learning</b></p>
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The use of concrete objects, also known as “manipulatives,” in the teaching and learning of elementary mathematics is not new. The writings of Froebel and Montessori at the end of the 19th and start of the 20th centuries can attest to this observation. Nonetheless, recent research on the effects of manipulatives is far from conclusive (see Carbonneau et al., 2013; McNeil & Jarvin, 2007; Lafay & Osana, 2021), implying that the complexity of their role in teaching and learning is not yet fully captured by current theoretical and conceptual frameworks.

In this working group, we will focus on the use of manipulatives at the elementary level (grades 1 through 6). We will begin by exploring a variety of theories that can inform the study of manipulative use in the classroom. Second, we will investigate the interplay between teaching practice and student thinking through the notion of “affordance” (Gibson, 1986; Greeno, 1994). Finally, we will focus on generating research questions on the physical design of manipulatives that could generate deeper theoretical understandings of how concrete objects can be used in the classroom to support teaching practice and student learning.

### References

Carbonneau, K. J., Marley, S. C., & Selig, J. P. (2013). A meta-analysis of the efficacy of teaching mathematics with concrete manipulatives. *Journal of Educational Psychology*, 105(2), 380-400.

Gibson, J. J. (1986). *The ecological approach to visual perception*. Psychology Press.

Greeno, J. G. (1994). Gibson’s affordances. *Psychological Review*, 101(2), 336-342.

Jeannotte, D., & Corriveau, C. (2020). Interactions between pupils’ actions and manipulative characteristics when solving an arithmetical task. *Proceedings of the 11th Congress of the European Society for Research in Mathematics Education*. Utrecht, NL.

Lafay, A., & Osana, H. P. (2021). Manipuler des objets permet-il toujours de développer la pensée mathématique de l’enfant? *Proceedings of the the XXIème rencontres de l’Unadréo*. Paris, France.

McNeil, N., & Jarvin, L. (2007). When theories don't add up: Disentangling the manipulatives debate. *Theory Into Practice*, 46(4), 309-316.

Osana, H. P., & Pitsolantis, N. (2019). Supporting kindergarten children's meaningful use of mathematics manipulatives. In K. Robinson, H. P. Osana, & D. Kotsopoulos (Eds.), *Mathematical learning and cognition in early childhood: Integrating interdisciplinary research into practice* (pp. 91-113). Springer.

***Working Group F****Judy Larsen, Jimmy Pai &  
Mélanie Tremblay****Facilitating Learning Mathematics Online***

Mathematics Education research is robust with findings and framings around what is important when considering how to facilitate the learning of mathematics. We know learning mathematics is centered around student thinking and doing (e.g., exploring, collaborating, generalizing, justifying). And various research (e.g., Boaler & Greeno, 2000; Moss, 2020) has highlighted the importance of valuing student agency in mathematics (e.g., growth mindset, sense of belonging, etc.), which promotes positive mathematical identities and contributes to a deep understanding of mathematical concepts and problem solving abilities. These findings have been enacted in face-to-face settings for many years and in many contexts.

However, the SARS-CoV-2 pandemic conditions have thrust all of us into a fully online setting regardless of interest, experience, or appreciation for online learning environments. While there has been research on teaching and learning mathematics with technology (e.g., Drijvers, 2013; Sinclair & Yerushalmy, 2016; Hoyles, 2018) and online learning environments (e.g., Borba & Llinares, 2012; Stahl, 2009; Meyer, 2015; Taranto & Arzarello, 2020), the forced shift to online teaching has given rise to new opportunities for research. This includes investigations into the challenges and tensions faced by teachers (e.g., Huang et al, 2020; Tremblay & Delobbe, 2021), approaches taken for facilitating learning mathematics online (e.g., Liljedahl & Larsen, 2021; Trenholm & Peschke, 2020), and experiences of students in such settings (e.g., Radmer & Goodchild, 2021). However, there remains a need for exploring the nuanced facets of facilitating learning mathematics online more deeply. As such, this working group aims to address how we can build from our values, understandings, and practices in facilitating learning mathematics, and reflect on how we may approach facilitating learning mathematics online from these groundings.

Our title is meant to involve both a focus on facilitating learning online, and learning mathematics online, with learning being what is favoured when engaging with mathematics at a distance. As such, our key guiding questions in this working group include:

1. What do we value when we think about creating conditions conducive for facilitating student learning? How are these values informed by our experiences in face-to-face learning settings, and how could they be adapted for an online setting?
2. What do we value when we think about learning mathematics? How are these values informed by our experiences in face-to-face learning settings, and how could they be adapted for an online setting?
3. Keeping in mind the values and goals that drive mathematics teaching and learning in our spaces, what challenges arise when moving from face-to-face to online?

Within these, we aim to pursue more specific points of interest that may arise such as:

- How do we build safe, brave, and identity-affirming learning environments online that encourages students to think and do mathematics together?
- How do we leverage tasks and feedback to support students doing, thinking, and communicating together?

#### References and Suggested Readings

Borba, M.d.C., Llinares, S (2012). Online mathematics teacher education: overview of an emergent field of research. *ZDM Mathematics Education* 44, 697–704.

Drijvers, P. (2013). Digital technology integration in mathematics education: Why it works (or doesn't). *PNA*, 8(1), 1–20.

Hoyles, C. (2018). Transforming the mathematical practices of learners and teachers through digital technology. *Research in Mathematics Education*, 20(3), 209–228.

Liljedahl, P., & Larsen, J. (2021). Building thinking classrooms online: A closer look at the types of tasks we use. *Virginia Mathematics Teacher*, 47(1), 8-14.

Meyer, D. (2015). *Functionary: Learning to communicate mathematically in online environments*. Available from ProQuest Dissertations & Theses Global. Retrieved from <https://ezproxy.uqar.ca/login?url=https://www.proquest.com/dissertations-theses/functionary-learning-communicate-mathematically/docview/2501173398/se-2?accountid=14720>

Pouliot, E., Tremblay, M., Fournier, M., et Lemieux, M-M. (2020). *COVID-19 – Favoriser l'implication des étudiants en contexte de formation à distance*. *Avis du GRIIP* [En ligne] <https://pedagogie.quebec.ca/outils/avis-du-griip-covid-19-favoriser-limplication-des-etudiants-en-contexte-de-formation>

Radmer, F., & Goodchild, S. (2021). Online mathematics teaching and learning during the COVID-19 pandemic: The perspective of lecturers and students. *Nordic Journal of STEM Education*, 5(1).

Rosa, M., & Lerman, S. (2011). Researching online mathematics education: Opening a space for virtual learner identities. *Educational Studies in Mathematics*, 78(1), 69–90.

Sinclair, N. & Yerushalmy, M. (2016). Digital Technology in Mathematics Teaching and Learning. *The Second Handbook of Research on the Psychology of Mathematics Education: The Journey Continues*. 235-274.

Stahl, G. (2009). *Studying virtual math teams*. New York, NY: Springer Press.

Taranto, E., Arzarello, F. (2020). Math MOOC UniTo: an Italian project on MOOCs for mathematics teacher education, and the development of a new theoretical framework. *ZDM Mathematics Education* 52, 843–858.

Tremblay, M. et Delobbe, A.-M. (2021). Enseignement et évaluation des mathématiques à distance durant la COVID-19. *Canadian Journal of Learning and Technology*, 47(4).

Trenholm, S., & Peschke, J. (2020). Teaching undergraduate mathematics fully online: a review from the perspective of communities of practice. *International Journal of Educational Technology in Higher Education*, 17(1), 1-18.

### New PhD Sessions

<p><b><i>Pamela Brittain</i></b> <i>Institution: OISE, University of Toronto</i> <i>Supervisor: Doug McDougall</i></p>	<p><b><i>Addressing math content knowledge and math anxiety in a teacher education program</i></b></p>
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The focus of my research was an in-depth mixed methods study of a math content knowledge (MCK) course from a large scale, urban university’s faculty of education teacher program. The study focused on the effect of this course on the math content knowledge and math anxiety levels of pre-service elementary school teacher candidates and included insights from course creators, instructors, and teacher candidates. The research found that the course had a significant effect on both improving the math content knowledge, and decreasing the math anxiety levels, of the students enrolled. It also helped the pre-service teacher candidates to improve their self-efficacy and confidence with mathematics. The work also included

suggestions for improvements to the course and how the MCK course could be applied to other faculties of education or expanded to other areas of mathematics education. This presentation will focus on the study, and its applications since completion.

<p><b><i>Mavis Okyere</i></b>  <i>Institution: University of Alberta</i>  <i>Supervisor: Elaine Simmt</i></p>	<p><b><i>Culturally responsive teaching through the Adinkra symbols of Ghana and its impact on students' mathematics proficiency</i></b></p>
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This study investigated the collaborative development and implementation of culturally responsive teaching through ethnomathematics, and how students' mathematics learning was impacted. Five mathematics teachers and I investigated mathematics concepts in printed images of Ghana's Adinkra symbols and their creation process by an Akan craftsman. The use of the Adinkra symbols, as context and as mediating tools in lessons-provided models for students to relate mathematics concepts to, as well as motivating them to stay on task as they experienced the application of mathematics within their own culture. The findings also revealed that the collaborative work of the teachers contributed to their professional development as they did mathematics, made links between the mathematics they observed in the symbols and the curriculum, imagined how the Adinkra symbols could be employed in teaching, made connections between different mathematics concepts, related the meanings of the Adinkra symbols to the aims of the mathematics curriculum, and developed culturally responsive teaching ideas.

<p><b><i>Fatima Assaf</i></b>  <i>Institution: University of Ottawa</i>  <i>Supervisor: Christine Suurtamm</i></p>	<p><b><i>Understanding multilingual learners' mathematical experiences and meaning making in a Canadian educational setting</i></b></p>
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This is an ethnographic study designed to form an in-depth description and understanding of multilingual learners' mathematical experiences and meaning making in a plurilingual educational setting in Ontario, Canada. I assumed a sociocultural perspective that views

learning and development as embedded in cultural as well as social contexts. One grade 2/3 classroom with 18 students born outside of Canada and who spoke a first language other than English at home participated in the study. Data included observations, video recordings of students working on mathematics activities, copies of students' work, and interviews with students. The results of the study revealed that multilingual students' mathematics experiences were shaped by their previous experiences learning mathematics, their interactions with one another or the teacher, their use of language as a tool to build mathematical meaning, and their teacher's pedagogical moves which appeared the strongest influence on students' mathematics experiences in the grade 2/3 classroom. This research study broadens our knowledge of multilingual learners' meaning making and experiences learning mathematics in a plurilingual setting, which may inform practice to support other multilingual learners.

<p><b><i>Tye Campbell</i></b>  <i>Institution: University of Alabama</i>  <i>Supervisor: Jeremy Zelkowski</i></p>	<p><b><i>Examining how middle grade mathematics students seize learning opportunities through conflict in small groups</i></b></p>
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Understanding how students develop learning opportunities through peer-to-peer interaction is vital for advancing research on student-centered classrooms. This study investigated the discourse practices students use to resolve conflict in ways that lead to mathematical learning opportunities while working in groups. Seventy-seven middle grade students were placed in groups of three to work on a sequence of complex mathematical tasks, and their interactions were audio/video-recorded. Instances of small group conflict were identified, and analysis centered on the discourse practices students used to resolve conflict towards mathematical learning opportunities. Seventeen discourse practices were identified that support students to develop learning opportunities in the midst of conflict, while six discourse practices were identified that limit learning opportunities. Implications for research and practice are offered.

<p><b>Mathieu Thibault</b>  <i>Institution: Université du Québec à Montréal</i>  <i>Supervisor: Caroline Lajoie</i></p>	<p><b><i>Overview of a study involving research-training sessions on teaching secondary school probability with technological tools</i></b></p>
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This doctoral research aims to document the important issues to consider in training sessions for teaching secondary school probability with technological tools. The use of three models (TPACK, Laborde, and Tapan) allows us to examine training issues from complementary angles. Three research objectives are thus posed to describe and understand training issues in a continuing education context. The research-training method allows the researcher-trainer to document continuing education from the inside. Five training sessions (in the form of work meetings) were conducted with five teachers and two consultants in secondary mathematics, who had complementary expertise. A thematic analysis identified three themes and eleven sub-themes. An analysis using conceptualizing categories identified seventeen training issues as outcomes. For this talk, an overview of the research will be presented, including an exemplification of one of the training issues: *Judging the pertinence of a technological tool to support the teaching of probability.*

<p><b>Kwesi Yaro</b>  <i>Institution: University of British Columbia, Vancouver</i>  <i>Supervisor: Ann Anderson</i></p>	<p><b><i>Understanding African immigrant families' support for their children's mathematics learning in Canada</i></b></p>
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In this presentation, I will share a small facet of a larger qualitative case study that employed cultural capital framework and Afrocentric worldviews to understand how African immigrant parents support their children's mathematics learning at the upper elementary and middle-grade levels (Grades 4 - 8) in Canada. Specifically, I will attempt to address the following questions: i) what socio-cultural strategies and understandings do African immigrant families living in a large metropolis draw upon to support their children's mathematics learning? ii) what are African immigrant families' experiences and perspectives with respect to their (10–15-year-olds) children's mathematics learning in the home, community and school settings? The underlisted findings from the study will form the focal point of my presentation.



African immigrant parents: 1) were aware of the gatekeeping function of mathematics and its role in reproducing or disrupting race or class hierarchies 2) perceived their support for their children’s mathematics fluency as a sure way for securing a status for counterbalancing their social exclusion and positioning themselves as people of education and intellect 3) they leveraged various forms of capital in support of their children’s mathematics learning. The results of the study extend our understanding of the concept of cultural capital and provide much-needed insights into ways to build culturally responsive mathematics education informed by immigrant students’ and families’ funds of knowledge.

<p><b><i>Minnie Liu</i></b>  <i>Institution: Simon Fraser University</i>  <i>Supervisor: Peter Liljedahl</i></p>	<p><b><i>Mathematical modelling – reducing reality or reducing complexity?</i></b></p>
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Mathematical modelling is a means to prepare students for the challenges they face in the world. When describing mathematical modelling processes, researchers often emphasize the importance of extra-mathematical knowledge to highlight the relationship between reality and mathematics. In this project, I administered two rudimentary mathematics complex tasks, a special type of tasks that present a complex situation but allow the audience to apply their well-worn tools in mathematics to establish a solution, to two groups of junior secondary school students. These tasks allow me to tip the balance of between reality and mathematics in mathematical modelling to focus on *mathematical Modelling*, and therefore to closely examine students’ use of extra-mathematical knowledge when they solve such tasks. In this presentation, I discuss students’ different intentions in building a real model and these intentions’ effect on the strategies they use and therefore their modelling process and the quality of their solutions deeply.

<p><b><i>Judy Larsen</i></b>  <i>Institution: Simon Fraser University</i>  <i>Supervisor: Peter Liljedahl</i></p>	<p><b><i>Mathematics teaching and social media: An emergent space for resilient professional activity</i></b></p>
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Professional activity around mathematics teaching is vital in the improvement of mathematics education at all levels. The rise of social media allows education professionals to congregate through asynchronous communication without prompting, funding or mandate. In this study, I investigate the inner workings and nature of a particular social media collective, the Math Twitter Blogosphere (MTBoS), in which daily activity around mathematics teaching has occurred for over ten years. To this end, I draw on tenets of complexity thinking (Davis & Simmt, 2003; Davis & Sumara, 2006) and use my awareness as a MTBoS insider to enhance methodological design and analytical depth. My findings illuminate the co-acting influence of social capital and ideational capital on the resilience of ideational artefacts in the collective. The results of this research reveal not only the popular topics within MTBoS during the timeframe in which the data were collected, but also, a methodology for identifying these topics and a theoretical perspective on the features that drive ongoing and generative professional activity around mathematics teaching.

<p><b><i>Lixin Luo</i></b>  <i>Institution: University of Alberta</i>  <i>Supervisor: Elaine Simmt</i></p>	<p><b><i>Towards recursive mathematics curricula: A complexified hermeneutic journey</i></b></p>
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The present study re-conceptualizes mathematics curriculum as recursive through the lens of complexity thinking, which studies fractal-like complex systems (i.e., cognition, knowledge, learners, and etc.) that co-evolve with their environments recursively. Recursive curricula are reinterpreted as a process-oriented interplay of part and whole. Recursion is reinterpreted as re-encountering: a play with contingent equivalency that has four forms (re-linguaging, re-imaging, re-inbodying, and re-storying). This study is informed by lived re-viewing experiences, in which a learner learned something new through encountering what they had encountered before. Such texts of experiences are generated through autobiographical

reflections, teaching documents analysis, conversations with experienced high school mathematics teachers, and iterative reinterpretations of them. This study has led to a metaphorical and iconic image of recursive curricula that represents abundant mathematics curriculum possibilities rather than a fixed one. This model has implications in visualizing and engendering recursive curricula in both mathematics education and mathematics teacher education.

<i>Nathalie Bisailon</i> <i>Institution: Université de Montréal</i> <i>Supervisor: Louise Poirier</i>	<b><i>Development of number sense and numeration: Elaboration of an assessment tool and a teaching sequence</i></b>
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Number sense is a fundamental pillar of arithmetic learning. It includes, among other things, understanding our numeration system. Recent studies show that understanding this system remains a challenge for many students. Through my thesis, I first studied the development of number sense, which led to a hypothesis of a continuum of number sense from infancy to at least age 8. I then identified conditions that promote the development of number sense and the understanding of the numeration system. A development-research led to the creation of two instruments: an assessment tool and a teaching sequence. The viability of these instruments in context was verified with school professionals. The feedback helped improve these instruments and highlighted the fact that number sense is not sufficiently important in current mathematics teaching.

## Schedule and Links

On Friday, May 27, we kick off our CMESG Virtual meeting. We are excited to have well over 100 participants and we look forward to reconnecting virtually with everyone. This document contains important information about how to attend each session and what to do to prepare for our meeting.

Thursday May 26 Jeudi 26 mai	<b>Times / Heure (EDT)</b>	Friday May 27 Vendredi 27 mai	Saturday May 28 Samedi 28 mai	Sunday May 29 Dimanche 29 mai
<p><b>13h - 14h30 EDT</b></p> <p>FLM Board of Directors Meeting</p> <p>Rencontre du conseil d'administration de FLM</p>	<p><b>11am - 12pm 11h-12h</b></p>	<p>Session pour nouveaux membres / Newcomers Session</p>		
	<p><b>Block 1: 1pm - 3 pm 13h-15h</b></p>	<p>Plénière / Plenary - Édith Petitfour</p> <p>Présentation des groupes de travail / Working Group presentations</p> <p>Introduction</p>	<p>Groupe de Travail / Working Groups</p> <p>[WG A] [WG B] [WG C] [WG D] [WG E] [WG F]</p>	<p>Groupes de Travail / Working Groups</p> <p>[WG A] [WG B] [WG C] [WG D] [WG E] [WG F]</p>
<p><b>15h - 16h EDT</b></p> <p>FLM Q&amp;A (formally Friends of FLM) Everyone welcome</p> <p>FLM Q&amp;R (anciennement connu sous le nom Amis de FLM) Bienvenue à tous</p>	<p>1h break</p>		<p>AdHoc</p>	
	<p><b>Block 2: 4pm-6pm 16h-18h</b></p>	<p>Groupes de Travail / Working Groups</p> <p>[WG A] [WG B] [WG C] [WG D] [WG E] [WG F]</p>	<p>New PhDs / Nouvelles docteurs</p> <p>[see the schedule and the Zoom links below]</p>	<p>Petits groupes - Discussion de la plénière / Plenary small group discussions</p> <p>Q&amp;R avec la conférencière/ Plenary Q&amp;A</p> <p><i>Rapports des groupes de travail / Working group Reports</i></p>
<p><b>Following... Ensuite...</b></p>	<p>Activité sociale/ Social:</p>	<p>Activité sociale/ Social:</p>	<p>AGA/AGM</p>	

**FLM Q&A (formally Friends of FLM) / FLM Q&R (connu sous le nom Amis de FLM)**  
Everyone Welcome  
Links to come

### **Google Calendar**

We have created a google calendar that is your one point of connection for all zoom links. You can access the calendar here: to come

### **Working Groups**

Each working group will have its own zoom link and a member of our VOC will host the session, create break out rooms as needed and be available to support members with technical challenges so that working group leaders can focus on leading and not have to worry about technology.

### **AGM**

Reports and other important documents  
To come

### **AdHoc Proposals**

If you would like to propose an AdHoc follow the link below. AdHoc's will be on Sunday at 3:00 pm EDT.  
To come

### **New PhD Presentations**

All new PhD presentations have been pre-recorded and posted here:  
To come

**We invite you to watch the videos (at least those of the sessions you will attend) in advance this week.** The PhD presentation schedule is given below. Rather than presenting live, sessions for new PhDs will focus on discussion of their work and will be facilitated by one of our CMESG members. We encourage you to come with thoughtful questions for our new PhD presenters after having viewed their videos.

May 28/ le 28 mai	Room 1	Room 2	Room 3
<b>16:00 EDT</b>	Fatima Assaf Kwesi Yaro  <b>Facilitator</b> Lisa Lunney-Borden	Pamela Brittain Nathalie Bisailon  <b>Facilitator</b> Vincent Martin	Tye Campbell Minnie Liu  <b>Facilitator</b> France Caron
<b>17:00 EDT</b>	Mavis Okyere Lixin Luo  <b>Facilitator</b> Cynthia Nicol	Judy Larsen Mathieu Thibault  <b>Facilitator</b> Manon Leblanc	

Rejoignez-nous en cliquant sur un des liens ci-dessus. Nous utiliserons une salle de réunion spécifique pour chaque groupe, vous pourrez donc choisir dans quelle salle vous voulez aller.

### **Social Activities**

On **Friday morning**, we will host a session for welcoming newcomers, in which we will provide chances for people to chat and get to know each other, and give a brief introduction to CMESG. All members are welcome! Here is the link: [to come](#)

**Friday evening**, we will have a zoom social. We invite everyone to bring their favourite local beverage or snack to enjoy while we connect online. We have created a padlet where you can share what you're eating and drinking and inspire others to support your local business. Here is the link: [to come](#)

On **Saturday evening**, we will meet in "Gather Town" where we can have small group conversations and more social interaction. Here is the link: [to come](#)