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*Education Notes bring mathematical and educational ideas forth to the CMS readership in a manner that promotes discussion of relevant topics including research, activities, issues, and noteworthy news items. Comments, suggestions, and submissions are welcome.*

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Curiously my personal experience with teaching this past spring was not jolted by the Covid-19 pandemic. Students in my courses were out on school placements aside from graduate students in a course that was an online offering from the outset. Rather the effect was felt in outreach with the cancellation of a community library math event and numerous school visits including a planned trip to northern New Brunswick. Here I share a surprise form of outreach that emerged from the circumstances and a postscript concerning some of the implications for what followed in teaching this summer.

Deanne Burton Snow teaches Grade 6 at Mary Queen of Peace in St. John's, NL. She reached out to me asking if I would be willing to be a guest in her class in May 2020. I agreed and things went well. As a result, there were two such classes about two weeks apart.

The grade 6 class met using *Google Meet* with me here in Fredericton and the 26 students in the class virtually connected from their homes with Deanne facilitating the meeting. That is noteworthy as this platform was new to me and it was helpful that Deanne called out names of people to participate through answering or asking questions in the sessions.

It became clear to me quickly that the class was keen in general, as reflected too in the full class participation at 2:30 pm local time on each occasion. The opening class featured a range of mathematical ideas and an introduction to the game *30 Scratch*. (Send me a note via [johnm@unb.ca](mailto:johnm@unb.ca) for a quick overview of the rules of the game.) The class played the game and admittedly it was harder to do virtually. I had a sheet of paper with the numbers 1 to 30 listed and began crossing them off before periodically showing the remaining numbers. Then we became a bit more focused by honing in on only those numbers left under 15 before shifting to the chat as a way of representing the list of numbers not found to that point. The chat offered a helpful way of listing numbers for everyone to see. Also, some students wrote in the chat that they had found certain numbers but I had not been looking there at the time. I realized the importance of needing to check in the chat as well as attending to verbal participation.

In addition to the game there were several other things done in that first class. Amongst the mathematical ideas was the shortcut for multiplying two digit numbers by 11, as well as the pattern associated with perfect squares and products of neighbouring numbers, as in  $+/- 1$ . In the latter case, observe that  $10 \times 10 = 100$  and  $9 \times 11 = 99$ , or  $8 \times 10 = 80$  and  $9 \times 9 = 81$ . The product of a number multiplied by itself is always one more than the product of its neighbouring numbers. Consider a small product like  $3 \times 3$  versus  $2 \times 4$  and see that this property holds. So now we can do some larger products quickly like  $19 \times 21$ . What is  $20 \times 20$ ? 400. Hence, the desired product is 399.

Some mathematical humour and challenges including rebus puzzles were incorporated into the session. Time was provided also for questions about mathematics. The teacher, Deanne Burton Snow, mentioned then that one of the things requested from any of the guest presenters is some insight into their field. I spoke about mathematical options such as actuarial science, engineering, computer science and education. Also, I shared a bit of my background including having taught at Memorial University of Newfoundland (MUN) in both the mathematics and education fields. Further, it was made clear to them that I had met Deanne about twenty years ago while she was at the Faculty of Education and though she was not in my class she had worked with me as a student. Deanne assisted with various math outreach initiatives at the time.

The opening class closed with a challenge as we counted the number of squares in small square grids. After agreeing that a  $2 \times 2$  grid actually has 5 squares, it was found by most students that the  $3 \times 3$  grid has 14 squares. I left the challenge to carefully count the number of squares in a  $4 \times 4$  grid, and several students sent along answers to Deanne subsequently.

Following the opening class there was a chance for Deanne and I to debrief about the session. We agreed that it went well and made plans for a follow-up class. Also, it was interesting to note some observations. For instance, Deanne noted that select students seemed more engaged with the mathematics than usual. I noted how it may have been helpful that unlike in classroom settings there is no evident answer except one's own, thus, allowing time to work out something. Also, the nature of *30 Scratch* helps in that it is highly likely that the number or expression one is working with from a list is not the one another is doing at the same time with a similar idea. Personally, I was extremely impressed with the focused attention and the overall quality of input over a period of a little more than an hour.

The second class began where the first one ended as an invitation was given to explain how the 30 squares were counted. That is, a student explained how there were 16 small squares, 9 of the next size ( $2 \times 2$ ), 4 more that were  $3 \times 3$ , and the 1 large square. I extended the pattern to larger grids showing that the perfect squares themselves are summed to get the new total count. For instance adding  $5 \times 5$  gets us to 55. The total number of squares in a  $5 \times 5$  grid is given by summing 1, 4, 9, 16 and 25. Continuing it was noted that we could find that there are 204 squares on an actual  $8 \times 8$  checkerboard configuration.

I brought along some cards that can be used to determine a person's number from 1 to 31, through a sequence of questions about cards that the number is on or not. The volunteer is asked whether their number is on a particular card, and the response determines how that card is flipped. These cards are constructed with windows that will hide or make visible particular sets of numbers depending upon the answers given. The idea is based on binary arithmetic. I tried this number trick out on a few people and then gave some insight into how it works. Following the example, Deanne asked if there are other number tricks that I could do and explain. So I made one up on the spot and it went like this.

Pick a number. Multiply by 2. Add 6. Double your answer. Subtract 12.

What is your result? For example, suppose you say 8; then it must be that your number was 2. The result will be four times the original number.

I offered another variation once we got to a place that people were comfortable with the above example. Perhaps some have tried it out on family or friends. One thing became clear during this second class. The students were tired and the energy that was there the first time was not so present. In fact, Deanne informed them that day of news from the province that there would be only one more full week of school. The weather was getting nicer and the enthusiasm was waning for school.

We did a little more math, shared some ideas and concluded with an expression of appreciation for one another. I made a point of congratulating them as they would be off to middle school soon. Overall, it was a positive experience. I liked the idea of meeting the class again from the perspective of developing relationship and relational awareness. Such knowledge and a sense of who was who helped me along the second time, and would have continued to do so in future efforts to tap people so as to challenge or reach them.

I learned a bit more about the virtual teaching and learning world while enjoying the chance to do outreach in a different form, as work with this level interests me – particularly with a keen teacher who is enjoyable to collaborate alongside of in the class. This was a win-win situation whether looked at through the lens of professional development or mathematical learning. It suggested to me potential ways of going forward with outreach in the forthcoming school year.

### **Postscript**

#### *Summer problem solving course*

The experience helped me prepare for some of the things I would encounter in a much different context in July. Then I taught a mathematical problem solving course that was originally intended to be a one-week intensive course in Fredericton for teachers in the Master's of Education program. Instead, it was now to be offered virtually within a one week period. This raised numerous challenges as it would not be so easy to see the approaches of others. There would not be a collection of mathematical puzzles and games on hand to engage with for a change of pace. The opportunity to mingle and build relationships would be reduced considerably. Many obstacles seemed to exist. However, surprisingly working with a Grade 6 class had provided valuable experience with respect to participation and observations. It got me thinking about what may work or not.

Preliminary notices to the 22 teachers along with some feedback helped to shape planning. I modified the course plan to one that had us together as a whole group for a few hours each day ranging from four or five the opening day to as little as an hour or two. Additionally all students were in groups of their choosing that were set up to focus on elementary, middle, or secondary school mathematics. These groups met for portions of each day from Tuesday through Friday. This enabled people to discuss relevant issues related to teaching mathematics while offering me a chance to provide suitable problems for consideration. Some mathematical topics were offered knowing they would be helpful in particular levels. Further, individuals took initiative with some presentations. For example, Farzad Saeidi shared with the secondary group his experiences in the University of Waterloo's Master of Mathematics for Teachers (MMT) program from which he graduated. Ryan Jones, a math learning specialist with the provincial education department, led a session with the elementary group. Meanwhile as the instructor I made a point of facilitating sessions in specific groups on different days. The model worked effectively and ideas that seemed particularly valuable to share beyond the groups were brought back to the larger group, as were invitations that would be taken by some teachers to shift groups as they crossed levels in interests or math backgrounds.

One noteworthy component of the course emerged through timing and collaboration. The course conflicted with the virtual meeting of the CMS around COVID-19 research and educational issues. Reaching out to Brian Forrest who subsequently reached out to the CMS led to the opportunity for many of the teachers in this course to voluntarily attend a session around teaching in the schools, as we made arrangements to free them to be able to do so on the Wednesday afternoon. Such collaboration ought to be encouraged and the opportunity to participate was graciously received by many of these teachers.

#### *Looking ahead with outreach*

The experience with the class in St. John's can be shared with other learning communities. I see an opportunity to reach out beyond places that one can readily access and get back from for another class, or even work within a model of a grade level. Recognizing limitations in terms of times and energies it does seem that the year ahead may invite opportunities for outreach that broadens the range of participation. It is anticipated that teachers would welcome the supports and it may be that what seemed a large obstacle actually opens up new ways of interacting that generate different forms of participation. Perhaps there will be a piece this time next year that speaks to how this unfolded in actuality.

*Ed. Note: Some of this article appears in Unintended Professional Development through Outreach (p. 10–12) as part of a special issue of Teaching Matters edited by David Creelman and Rebecca McKay at UNB in Saint John. This issue features submissions from faculty in various disciplines concerning teaching and the interruptions from the pandemic. The link for the publication appears [here](#).*