Alberta Curriculum Analysis

Comments on Draft Mathematics Curriculum in Alberta*

by Richelle Marynowski, PhD / April 25, 2021 / Mathematics

Let me say first, different isn't always bad nor is it always better, sometimes it is just different and we have to get used to it. And sure, there are issues with the current curriculum and some ambiguities, but nothing like is present in the proposed draft curriculum.

The mathematics curriculum in Alberta has gone through several changes and revisions since I started teaching in 1994. In 1994, the high school math program was Math 10-20-30, Math 13-23-33, Math 14-24, and Math 31 (calculus). I taught each of those. In 1994, Math 30 had a provincial diploma exam worth 50% of the grade. Math 33 did not have a provincial diploma exam. Also, written into the curriculum was an optional 20% of time that was identified as optional topics that could be explored by the teacher and the students.

We then went through the Pure 10-20-30 and Applied 10-20-30 (plus calculus) curriculum to the current Math 10C – Math 20-1/20-2 – Math 30-1/30-2 (plus calculus) curriculum that was introduced starting in 2010 with Math 10C.

With each of these changes to the high school math program, there were also associated changes to the K-9 math program. What I appreciate about the previous/current mathematics curricula is that there were clearly outlined basic beliefs about mathematics and specific topics and competencies in mathematics that were articulated in the 'front matter' of the curriculum. The front matter was written for the teacher to situate mathematics as a discipline of study that integrated specific goals for learners, ways students can make sense of mathematics, and the specific topics of study throughout the curriculum. In the Draft K-6 Mathematics subject introduction, there is a major focus on procedures and skills with a token nod to mathematical understanding: procedures, "foundational skills", and "standard algorithms" are the focus.

In the current and previous curricula, specific learner outcomes were stated clearly and identified what students were supposed to demonstrate. In the Draft K-6 curriculum overall, I appreciate the structure of the curriculum and that the curriculum for each discipline follows the same structure. Organizing Ideas and Guiding Questions are a nice way to frame the broader goals for

Knowledge, Understanding, and Skills and Procedures stated do not always fit the verb in the outcomes they are associated with.

This is not intended as an overarching review of the Draft Math K-6 curriculum but my intent is to point out mathematical inaccuracies and oddities in the draft curriculum that make me worried and that contradict current theories in mathematics teaching and learning. I do not believe the whole of the Draft Math K-6 curriculum is bad, however, this curriculum needs to be read closely and carefully to ensure that the what students are being asked to learn is mathematically correct and does not contradict itself from one year to the next.

Specific examples

Geometry

Looking at some indicated knowledge for students at the Grade 4 level (p. 21) a knowledge statement says “Two or more angles that compose 90° are complementary angles.” This is not a correct mathematical definition. Two angles that that make 90° are complimentary, not 2 or more. The same goes for the definition of supplementary angles “Two or more angles that compose 180° are supplementary angles.” is incorrect.

Additionally, on page 21 there is a statement that “Triangles can be classified according to side length as: equilateral; isosceles.” Which in itself is not wrong, but what about scalene triangles? Do they not count as triangles? In the Skills and Procedures section, the curriculum states “Classify triangles as equilateral, isosceles, or neither using geometric properties related to sides.” Well the ‘neither’ has a name: it is scalene. And why be so wordy – why can’t it be written “Classify triangles as equilateral, isosceles, or scalene according to side length” as this is the only geometric property that is used to classify triangles using these descriptors.

Patterns

In Grade 2, “Pascal’s triangle is a triangular arrangement of numbers that illustrates multiple repeating, growing, and symmetrical patterns” (p. 10) is stated under knowledge. Currently the notion of Pascal’s triangle is addressed in high school. Having this specific notion of a pattern at this level is completely inappropriate. Arithmetic and geometric sequences are developed in fractions and the different interpretations of fractions (part–whole, ratio, quotient, measure, and operator) before performing operations with fractions. Charalambous and Pitta-Pantazi (2005) commented that "teachers need to scaffold students to develop a profound understanding of the different interpretations of fractions, since such an understanding could also offer to uplift students' performance in tasks related to the operations of fractions" (p. 239). Having a more complete sense of fractions and their uses conceptually before "rushing to provide students with different algorithms to execute operations on fractions" (p. 239) is the opposite of what this draft curriculum proposes.

Pantziara and Philippou (2012) identified that a focus on the part-whole as the primary representation and use of fractions inhibited student development of conceptual understanding of operations with fractions, particularly in problem solving contexts. Ensuring that teachers spend time of the other four ways that fractions are used will help students interpret applications of fractions in context.

On page 33 (Grade 6) of the Draft K-6 math curriculum, it states "Division by a fraction can be computed using the formula abcd=abdc." First of all, this is not a formula, it is a procedure. Using this as the way for students to learn division of fractions is very limited and does not develop understanding of what is happening in the process, why it works, and when to use it. The related understanding statement "Division of fractions can be interpreted using multiplication." is also so limited. Sure, it can be, but it can be interpreted using division too.

One final example

This statement: "Multiplication is repeated addition." (p. 33) makes me lose my mind. This statement is written as fact. A more appropriate way to state this is "Multiplication of rational numbers can be represented through repeated addition." Please, someone, show me how (x-3)(x+4)(x+17) can be represented using repeated addition…please I truly want to know. When we use statements like "multiplication is always bigger" or "subtraction always makes

Grades 7 – 12 content that has been moved to K-6 in the Draft curriculum, I worry about what is left for the rest of the grades to learn. Developing conceptual and procedural mathematical understanding takes time, rushing to introduce concepts earlier does not allow for the time needed for students to wrestle with ideas and pushes students towards relying on tricks to get through. That is not what I want for the future of mathematics learning in this province.

*Some of these comments were posted as part of a Twitter thread by @rmarynow on April 11, 2021.

References

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