Mathematics in Vermont

The newsletter for Vermont's Mathematics Educators and supporters

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The ways you can access this newsletter:

- Request subscription by emailing **Ryan Parkman**; your name will be added to a listserv;
- The AOE *Weekly Field Memo* when issues are published; and
- AOE Website: **The Mathematics Content page.**

Greetings for the New Year

Welcome to 2022, with hopes that the year ahead of us will be better than the year behind us. Regardless of the nature of our experience, we must always try to take from it that which will make each of us a better person.

In this newsletter you will find information on providing Number Talks (or similarly related routines) in the secondary classroom, differentiating lessons for challenge in kindergarten, upcoming professional learning opportunities, and Smarter Balanced resources.

Number Talks in the Secondary Math Classroom

Number Talks have been widely used in elementary classrooms to build number sense. Many educators use these as a means to "launch" the lesson for the day. The format that is generally used is the one described by Sherry Parrish, one of the foremost authorities on the topic. She describes Number Talks as a five-to-fifteen-minute classroom conversation around purposefully crafted computation problems that are solved mentally. During number talks, students are asked to communicate their thinking when presenting and justifying solutions to problems. A key aspect of a Number Talk is that students solve a problem mentally, without using a prescribed algorithm, in a way that makes sense for them.

Some of the benefits of sharing and discussing computation strategies are that students have the opportunity to:

- **Clarify** thinking.
- **Investigate and apply** mathematical relationships.
- **Build** a repertoire of efficient strategies.
- **Make** decisions about choosing efficient strategies for specific problems.
- **Consider and test** other strategies to see if they are mathematically logical.

A quick example would be to place 16 X 25 on the board and give the students 30-60 seconds to think about how they would solve the problem. Then ask some students for their solutions and write them on the board for discussion. Suppose three responses were 230, 400, and 175. The next step would be to ask the students which solution makes sense. As students respond, ask them to justify their reasoning. Even if students agree that 400 is the correct response, how they arrive at that conclusion can vary. One student may reason that 10 X 25 is already 250 and you still need to multiply the 6 by 25. Another student may see that the problem is similar to having 16 quarters and that equals 4 dollars which would mean 400 is the correct response. While the students are

providing their rationale, the teacher should be scribing for the whole class to see.

Building numeracy and number sense is still very important at the secondary level. Secondary classrooms spend a great deal of time building the algebraic reasoning skills of their students. This is very difficult to do if some students struggle with the foundational element of numeracy. Number Talks can be used to solidify the transition from additive reasoning to multiplicative reasoning and introduce properties of algebra. This can be done by showing an image of 19 objects and asking your students how many they see and then having them justify their reasoning.

Samples showing the reasoning of the students:
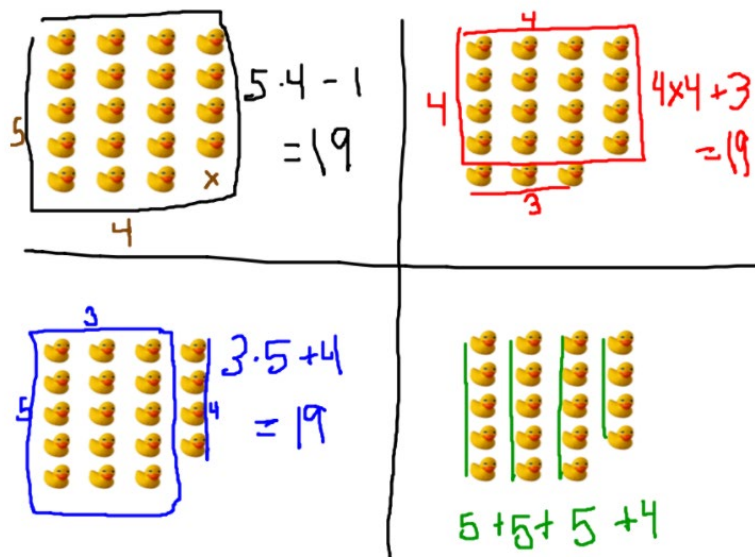
As you can see, students "saw" the 19 objects in many different ways. A student that adds the $5 + 5 + 5 + 4$, is still using additive reasoning to arrive at their conclusion. Meanwhile, students that see the array as 3 groups of 5 plus 4 or 4 groups of 4 plus 3, are using multiplicative reasoning. Discussions about how there can be different expressions that all describe the same number can provide a nice segue to properties of equality. These types of activities also help to create a more equitable environment as students at various levels of readiness have an entry point for solving the problem.

Number Talks, or other number sense activities as well as instructional routines, can also be used to conceptualize algebraic concepts. Contemplate and then Calculate is an instructional strategy developed by David Wees that he uses in his secondary classroom. This is a strategy that is very similar to a Number Talk, whereas the students are given a problem, asked to reflect (or contemplate), and share their ideas with peers and groups. The strategy then goes further and has the students write about their reflections and findings. One goal of Contemplate and Calculate is for students to look for and make use of mathematical structure. This builds a student's conceptual understanding and can help them to better understand algorithmic processes used to solve problems. For example, place two trinomials, such as $x^2 + 6x + 9 = 0$ and $x^2 + 6x + 8 = 0$, on the board and ask which one has more real solutions. Have

the students do this mentally for 60 seconds before calling for responses. Some students may respond that the equations have the same number of roots because they can both be factored into the product of two binomials, while others may notice that one of the trinomials can be factored into a binomial squared, thus only having one real solution while the other has two real roots. If students have already been exposed to the quadratic formula, this would be an activity to show how the discriminant can be used to determine the nature of the roots. Students are then asked to share with a peer and ultimately write a reflection as to the process for arriving at the proper solution.

Number Talks, or variations, can be found in other areas of mathematics as well. Jo Boaler of [YouCubed](#) has created a Number Talk type activity, [Data Talks](#), where students are given a set of data and asked what information they can extract. Whether the instructional strategy is a Number Talk or Data Talk, whether it is about additive, multiplicative, or algebraic reasoning, or data literacy, [facilitating mathematical discourse](#) is the underlying theme that supports and builds mathematical thinking in the classroom.

Differentiating Lessons for Challenge (A Kindergarten Example)

Recently I was asked how to enrich a kindergartner's math experience when students have already demonstrated proficiency with the current grade-level work. Some may recommend using the first-grade curriculum to supplement. While that suggestion may be valid in certain instances, it could lead to creating multiple lesson plans and result in a disjointed, segregated classroom. I would advocate for providing content within the same conceptual strand that stretches into impending skills for the next grade level or other upcoming units.

The [Coherence Map](#) from [Achieve the Core](#) can help show what impending/future standards are connected to standards being currently addressed in their math program. Teachers could enrich the student's individual math program with materials that are still connected to their current lesson that challenge the student.

If a current kindergarten lesson is focusing on [K.OA.A.3](#) (Decompose numbers less than or equal to 10 into pairs in more than one way), the Coherence Map can be used to identify those standards that not only lead up to the current standard but also those standards that the current standard leads into. This current kindergarten standard serves as a pre-requisite for the first-grade standard [1.OA.C.6](#) (Add and subtract within 20, demonstrating fluency for addition and subtraction within 10) and also to [K.NBT.A.1](#) (Compose and decompose numbers from 11 to 19 into ten ones and some further ones) and [K.OA.A.4](#) (For any number from 1 to 9, find the number that makes 10 when added to the given number). Used in this manner, the Coherence Map can help a teacher differentiate their lesson planning to accommodate those students ready for additional challenges.

Figure showing results for K.OA.A.3 using the Coherence Map:
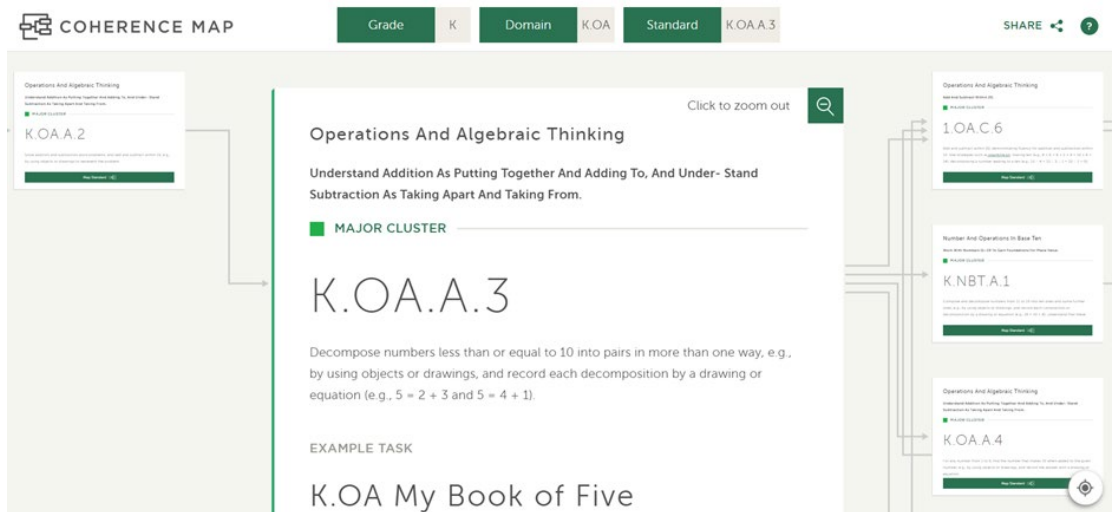
Another tool that can be used is the Math Skills Database found in the Quantile Hub. By selecting the current standard being addressed in a lesson, the teacher can select the skill that is the focus of the lesson and see the impending skills and associated standards for the current grade level and in higher grades.

For example, using the same standard as in the previous example, K.OA.A.3, one of the skills listed is "represent a number in a variety of numerical ways." Selecting that skill shows that it is a pre-requisite skill to "relate standard and expanded notation to 3- and 4-digit numbers." Also provided are the related first grade standards of 1.OA.A.3 and 1.OA.C.6.

Figure showing results of Searching K.OA.A.3 in the Math Skills Database:
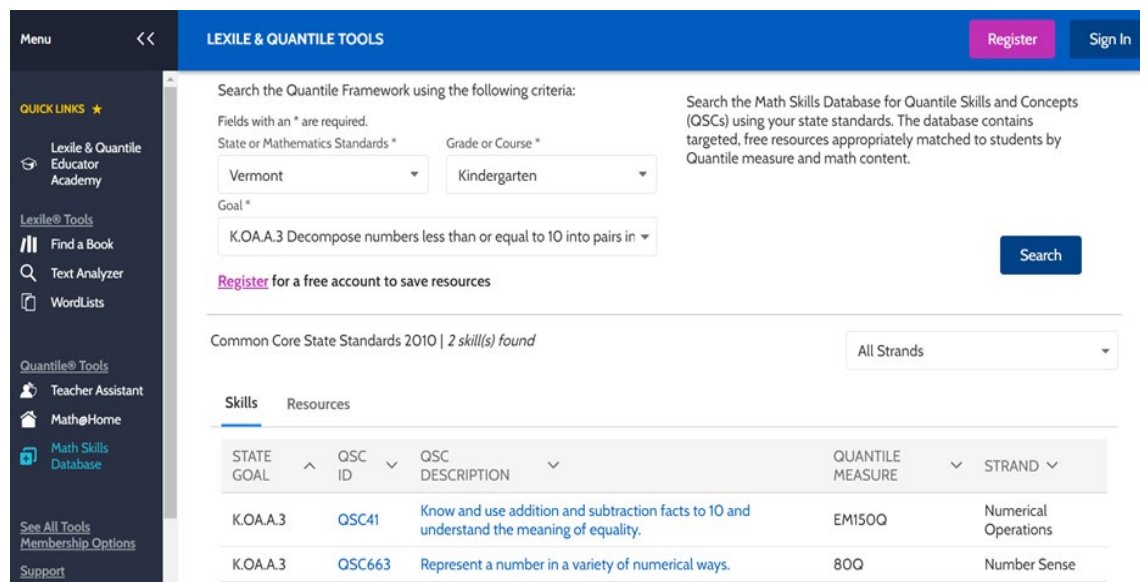
Figure showing impending skills and associated standards:

In the examples shown above, the teacher is provided with extension topics that are related to the focus standard of their current lesson. This allows for all students to receive on-grade-level instruction with their peers while providing enriching, challenging topics for those students who have demonstrated readiness.

Events, Announcements, and Resources

All Learners Network: Free Workshops for Math Educators

There is still time to register! The All Learners Network firmly believes that all students can learn math and have partnered with the Vermont Agency of Education to offer free workshops to help achieve that end. These workshops are being offered on multiple dates, both virtually and in-person, to better accommodate individual schedules. Topics for these workshops cover the following:

- Math for All Learners
- Specialized Instruction
- Improving Fact Fluency: Multiplication
- Pre-Kindergarten

Visit the All Learners Network's Events page for complete descriptions of the workshops being offered, specific dates, and registration information.

VCTM Statewide Math Fair Postponed to 2023

In case you haven't seen this announcement, the annual VT Statewide Math Fair until 2023.For more information on this decision and plans for the future, you can read the letter posted on the VCTM website.

Smarter Balanced Tools Demonstration: Using the Reporting Feature and Tools for Teachers to Inform Instruction

This slide deck from a recent presentation was part of the All Learners Network's Virtual Conference. It can also be found under Resources on the VT AOE Mathematics webpage. The main focus of this presentation is how to use the Smarter Balanced tools available through the Vermont Assessment Portal. This portal can be used to access the Reporting feature, learn about the various interim assessments available, and determine how to use the results to design intervention groups. Alignment of the Smarter Balanced Interim Assessment to a Connections Playlist, which can also be accessed via Tools for Teachers, is also explored.

Directions for Submissions

If you would like to submit an article, announcement, event, or resource for a future newsletter, please email information to ryan.parkman@vermont.gov. This newsletter will be published four times throughout the school year. Time sensitive materials may be better suited for dissemination through the AOE Math Listserv.

To subscribe or unsubscribe to the Mathematics in Vermont e-bulletin or other listserv emails, write to ryan.parkman@vermont.gov or call (802) 828-6468.

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