

Supporting Mathematical Thinking through Formative Assessment Developing and Refining Strategies for Addition and Subtraction

Synopsis: To help students develop and refine the strategies they use for addition and subtraction, teachers carefully plan opportunities for investigation, conversation, sharing, practice and feedback. Through these activities, teachers are able to gather a rich body of assessment evidence that allows them to support student learning.



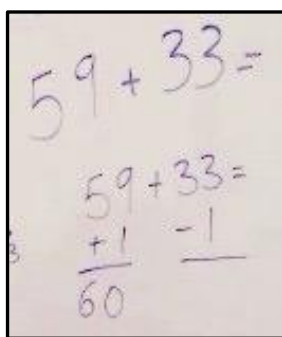
Questions for Discussion and Reflection:

As you watch this video, keep these questions in mind. You may wish to pause the video for discussion.

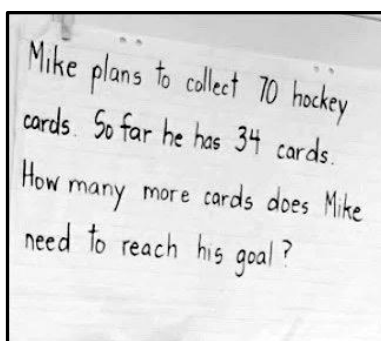
- Why is it important for students to refine an inefficient strategy, even if they understand that strategy and can use it to consistently reach a solution?
- How does your assessment change when your students are using a variety strategies?

Key Ideas:

Students in Alberta investigate a number of different strategies for addition and subtraction. It is expected that they will develop facility with **at least 1 appropriate and efficient strategy that they understand**.



Handwritten calculation showing $59 + 33 =$ followed by a compensation strategy: $59 + 33 =$ with a plus sign above the 1 in 33 and a minus sign above the 1 in 59, resulting in 60 .



Handwritten text: "Mike plans to collect 70 hockey cards. So far he has 34 cards. How many more cards does Mike need to reach his goal?"

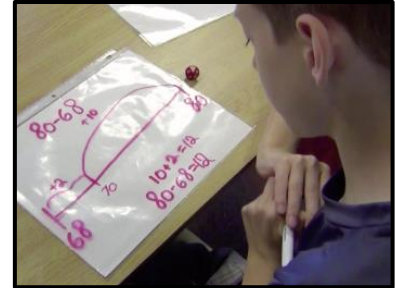
Teachers carefully choose and sequence problems to encourage students to investigate and develop flexible strategies.

Consider why the teachers in this video may have chosen these particular problems.

The first, $59 + 33$, is a calculation that would encourage students to suggest a compensation strategy like the one shown. Another efficient strategy would involve decomposing the 33 into $1 + 32$ and then adding the 1 to 59.

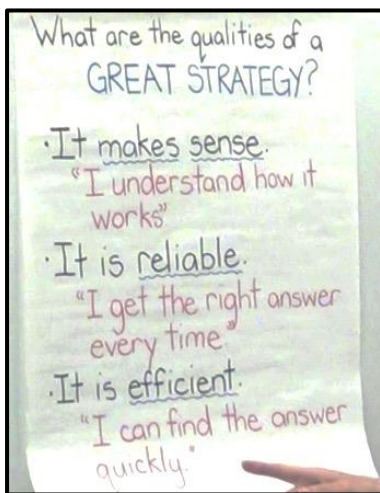
The hockey card problem is an addition situation (34 cards plus some more to get 70 cards), and might encourage an adding up strategy for subtraction. Many students find this to be a meaningful and flexible strategy.

Students use a variety of tools and models, such as hundred charts, ten frames and open numberlines, to help them think about the strategies they are investigating, represent their thinking and solidify their understanding.

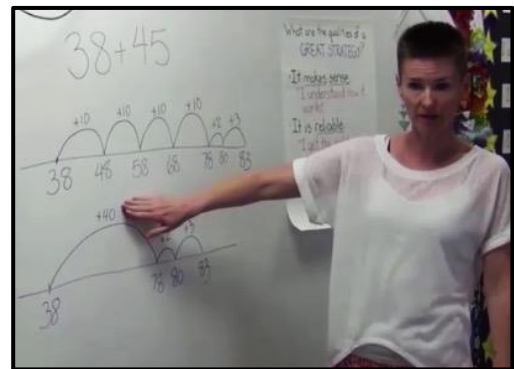


Students are expected to justify their answers and consider the strategies used by others.

Teachers and students work together to assess strategies through observation, conversation, and the examination of student work.



Helping students move from inefficient strategies to ones that are more efficient is a critical part of the teacher's responsibility. When students are encouraged to compare strategies with efficiency in mind, they build an understanding of the characteristics of an appropriate strategy. Once students understand these characteristics, they are better able to refine their own strategies through self-reflection and feedback.



Assessment in the mathematics classroom is a responsibility shared by teachers and students. It is much more than counting right and wrong answers.

★ I Like the way I added up because it's clear to me.

★ I decided to do Adding up because it's efeshint to me.

✎ I need to improve on using counting back more often.

Teachers examine student work and listen to students as they explain and reflect on the strategies they use. They collect a rich body of evidence about their students' understanding of number, and use this evidence to make adjustments to instruction.

As students reflect on their learning, they become part of the assessment process. They are able to see where they are now, and understand where to go next.

Working together as a mathematical community, teachers and students share and build on what they know to develop appropriate, efficient and flexible strategies for addition and subtraction.

Next Steps: Examining Student Work

Work samples can provide valuable insights into what students understand and are able to do, and where they may be experiencing difficulties or misconceptions. If possible, find a colleague or colleagues with whom to collaboratively examine samples of student work. Use work from your own students, or the exemplars in the Additional Resources section, and look for:

- evidence about what students understand and are able to do
- evidence that points to misconceptions and areas of challenge
- missing evidence: instances in which conversations with students may be necessary to answer questions you still have about their understanding.

What might your next steps be for each student?