Unit Overview: What's For Lunch

Summary of learning goals

This unit in the Special Topic **Mathematical Inquiry into Authentic Problems** poses the question: '*How many [sandwiches] does our class eat at school in a year*?' It develops students' ability to derive strategies for unfamiliar calculations of large numbers using known facts and strategies. Students collect data on the most common items in their lunchboxes on one day. They learn the value of categorising data to interpret it better. They use the total number of a common item (e.g. sandwiches) in their group's lunchboxes in one day to calculate the total number eaten in a week, then a term and finally a school year.

The sequence of four lessons provides opportunities for students to invent, implement and refine strategies for repeated addition with larger numbers (e.g. 5 groups of 8; 4 groups of 40) before introduction of standard algorithms. Their inventions are based on prior knowledge of addition, place value, partitioning and number sense and representation with arrays. They realise there is not only one correct way to calculate.

Students show evidence of their thinking through annotated representations and explain their processes using mathematical language, making connections between the calculations and the real-life context. They evaluate the effectiveness of their strategies and refine them.

Australian Curriculum: Mathematics (Year 2)

ACMNA027: Recognise, model, represent and order numbers to at least 1000
ACMNA028: Group, partition and rearrange collections up to 1000 in hundreds, tens and ones to facilitate more efficient counting
ACMNA030: Solve simple addition and subtraction problems using a range of efficient mental and written strategies
ACMNA031: Recognise and represent multiplication as repeated addition, groups and arrays
ACMSP049: Collect, check and classify data

Summary of lessons

Who Is This Unit For?

This sequence of lessons is for students who are building an understanding of numbers to at least 1000. They need some experience in skip counting with small numbers, and partitioning and combining numbers with tens and ones, and maybe hundreds.

Lesson 1: Discover Phase

This lesson poses the inquiry question, '*How many [sandwiches] does our class eat at school in a year*?' Students examine what is in their lunch boxes on one day. With a focus on data, students list the items in their lunch box, compare their lists within a small group and categorise the items. Each group orders their items from most to least common and selects an item common in their group to be the focus of their inquiry for the unit.

We value your feedback after these lessons via https://www.surveymonkey.com/r/CV2TXTT

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Lesson 2: Devise Phase

Students identify the mathematical knowledge they need to find how many of the selected items they eat in a school year (e.g. number of days in a school week, weeks in one term and terms in a year). Students devise a plan to calculate or otherwise demonstrate the total number, using grouping, partitioning and repeated addition strategies. They refine their plans with ideas from a Checkpoint where they share strategies and methods.

Lesson 3: Develop Phase

Students implement a range of known and invented strategies to work out how many of their selected item they eat in a year. Through sharing, discussion and feedback, students refine the calculation process. They consider and develop more flexible and efficient counting, grouping and adding methods. They reach consensus about the most efficient strategies to use. Groups begin to use a grid paper representation, to explain their chosen strategy and mathematics used.

Lesson 4: Defend Phase

The lesson begins with evaluating strategies for finding the yearly total number of [sandwiches] using the grid paper representation. These representations show the steps that students followed to calculate their answer and help them find more efficient ways to calculate totals. Students answer the inquiry question, demonstrating their mathematical evidence. They reflect on the feedback given to determine what they did well and how they could improve their presentation and models.

Reflection on this sequence

Rationale

This sequence of lessons is designed to promote the invention of effective strategies by students and provide opportunities for these strategies to be clearly articulated and shared in the classroom. Students follow a problem-solving approach to calculate the total number of [sandwiches] they eat in a year, inventing strategies based on prior knowledge of addition, including partitioning and combining numbers. This requires reasoning and flexible thinking. For students to think flexibly, they need to develop a strong, intuitive conceptual understanding of the operations and their properties, especially commutative and associative laws. Students require significant time and repeated iterations to invent, develop and share their own strategies before standard algorithms are introduced. Invented strategies become mental methods after the ideas become understood. This is valuable because in everyday calculations, mental strategies are often appropriate. Repeatedly sharing strategies, within small groups and as a class, is essential for students to provide each other with ideas to explore and it provides the teacher with evidence of student understanding and misconceptions. Modelling, representations and evidence in a series of iterations provides further consolidation.

The lessons use the 4D Guided Discovery model, progressing through stages of Discover, Devise, Develop, Defend, featuring regular Checkpoints to support students in their inquiry, and emphasising the importance of gathering mathematical evidence to justify a solution. Further information is given in the *Mathematical Inquiry into Authentic Problems Teachers' Guide*.

reSolve Mathematics is Purposeful

Understanding: This inquiry creates connections to deepen students' understanding. Students connect number calculations with counting sequences. They partition and combine numbers flexibly. Students are encouraged to model with concrete materials to make connections with the steps involved in answering the inquiry question.

Problem Solving: Students gain experience of applying mathematical ideas and practices to everyday problems in authentic ways. They make models and use number sentences to represent problem situations.

Reasoning: Students provide appropriate evidence to convince others of their strategies and answers to an inquiry.

reSolve Tasks are Challenging Yet Accessible

Students work collaboratively in mixed ability groups. Each student may use their own strategy to answer the inquiry question, but the focus is on sharing strategies and explaining thinking processes to the group. The emphasis on invented strategies provides a platform for all students to draw from their own prior understandings and/or attempt methods suggested by their peers. Through this, students' strengths, misconceptions and lack of understanding become obvious, allowing for teacher or peer guidance if necessary.

The expectation that all group members will contribute provides each student with an opportunity to demonstrate their ability to reason, justify and develop conceptual understanding. Regular class sharing allows groups to share their progress and to gather ideas they could build on for their next step. Teachers can use the opportunities presented in the sharing sessions to focus students on efficient strategies and methods of representing evidence,

reSolve Classrooms Have a Knowledge Building Culture

The inquiry addresses a knowledge building culture through requiring students to take on many roles usually undertaken by the teacher. In their groups, students collaboratively plan the strategies they will use to answer the inquiry question and negotiate between their own ideas and understandings and those of others. During the Devise Phase, students acknowledge that all ideas, including those that are unformed and un-evidenced, can be improved on through the giving and receiving of constructive feedback. Expecting all students to be active listeners and contributors who share ideas, build on others' ideas, seek clarification where required, and question or challenge ideas respectfully, ensures all students contribute towards the advancement of knowledge in the classroom and provides opportunities for them to build, reconceptualise, recreate and extend mathematical concepts. Students learn to work with messiness, diversity and complexities, and work with or move beyond these to create something organised or improved. As groups work towards a solution, the teacher's open questioning can support groups to embrace setbacks as challenges that can be overcome.