Teaching Mental Subtraction Strategies

This is the third article in a series about Teaching Mental Addition and Subtraction Strategies. There are references made to the previous two articles, ‘Teaching Mental Addition Strategies Part - 1 and 2’ throughout this written piece.

Together with learning various addition strategies in their first few years of schooling, students are also taught many mental subtraction strategies. Subtraction is the process of taking one number away from another or finding the difference. For example, if I have 8 apples and I subtract 2, I would be left with 6 apples: 8-2=6. Similar to addition, several children could calculate the same correct answer to a subtraction problem; yet utilise different mental strategies to arrive at the answer.

Initially children use concrete materials when they first start learning how to subtract. Using the example of 8-2, the child would get 8 objects, take 2 away and then count the remaining objects to arrive at the answer of 6. In these early stages of learning, it is important that the objects being ‘taken away’ are physically removed from the original group, in order to avoid confusion when counting.

‘Count back’ is the first mental subtraction strategy that children are generally taught. Often children find the ‘count back’ strategy more difficult than ‘counting on’; as it requires them to count backwards and children often find this more challenging. Use of the ‘count back’ strategy is generally most efficient, if you are subtracting 1, 2 or 3 from a number. If you wanted to calculate the answer to 18-3, you would start at (18) and ‘count back’ three times… 17, 16, 15. If the two numbers being subtracted are closer together such as 9-7, then ‘count up’ is a much more effective strategy to use.

The ‘count up’ strategy involves starting at the smaller and counting up to the larger number, whilst keeping track with your fingers. So in the example 9-7, you would start at (7) and count up… 8, 9. This would give you an answer of two. In this example, ‘count up’ is a much more efficient way of calculating the answer than ‘count back’, as you are more likely to lose track of counting back seven times than counting forwards twice. ‘Count back’ and ‘count up’ are good starting points, however, there are many more mental subtraction strategies that students can utilise, to efficiently calculate answers to a range of subtraction problems.

Students can call upon their knowledge of the mental addition strategies ‘doubles’ (5+5=10, 6+6=12, 7+7=14, etc.) and ‘10s facts’ (1+9=10, 2+8=10, 3+7=10, etc.) to help them solve related subtraction equations. If a student has gained automatic recall of their ‘doubles’ facts, they can use this knowledge when subtracting, to work out equations where halves are involved. So if a student is presented with an equation such as 16-8, they can think to themselves, “I know that 8+8=16, therefore 16-8=8.” Likewise, if a student is required to solve the problem 10-4 and have previously memorised their ’10 facts’ so they know that 4+6=10, then they can quickly work out that 10-4=6. The ability for students to utilise ‘fact families’ to solve subtraction problems, is an extension of these understandings.

‘Fact families’ involve the students being able to use their knowledge of addition and subtraction interchangeably, to solve equations. When presented with the numbers 8, 6 and 14, students can be taught that they are able to make the equations 8+6=14, 6+8=14, 14-8=6 and 14-6=8. Therefore if a child knows that 8+6=14, they can quickly work out that 14-8 equals 6 and that the missing number in 14-_=6 is 8. They are also taught that they can use addition/subtraction to check if their answers are correct. For example, to check whether 18-5=13, they can add 13+5 to see if it equals 18.

TEACHING MENTAL SUBTRACTION STRATEGIES

Knowledge of partitioning is important in subtraction and addition. An example of this is the 'make ten' strategy. If students already know their '10s facts', then it is easier for them to subtract a number from ten than from a larger number. Students can be taught that when solving the equation 12-8, eight can be partitioned into two and six. Students can then take two away from twelve to make ten (12-2=10) and are left with the simpler equation 10-6. They can then use their knowledge of '10s facts' to know that 10-6=4 because 4+6=10.

```
12   -   8   =
        / \
       2   6

12 - 2 = 10     10 - 6 = 4
```

Another mental subtraction strategy 'subtract 10', is similar to that of 'add 10' however, it requires students to be able to count backwards by 10s from any two-digit number. This necessitates students having an understanding that when using two-digit numbers to count backwards by tens, the first or 'tens' number decreases by one and the second or 'units/ones' number remains the same. An example of this is: 56, 46, 36, 26, 16, 6. Therefore when solving 47-10, a child with knowledge of this pattern would know that that 47-10=37 because the unit's/one's number (which is 7) stays the same and ten's number decreases by one from 40 to 30.

When a child can confidently 'subtract 10', they can then be taught the mental subtraction strategy 'subtract 9'. To 'subtract 9', you must first 'subtract 10' and then add one. An example of this is 32-9. First you would think 32-10=22. However, nine is one less than ten so 22+1=23. Therefore, 32-9=23.

So children can build upon previously learnt addition strategies and transfer the skills learnt to assist them in solving a range of subtraction equations ('doubles'/'halves', '10 facts', 'fact families', etc.). By learning that addition and subtraction can work closely together, children begin to understand that number facts are related, therefore making them easier to solve. This increases the strategies that can be accessed when solving a range of addition and subtraction equations, meaning that hopefully an efficient strategy can be chosen each time.