Progression in the learning of addition and subtraction education essay

Introduction

This assignment will look into the progression in the teaching and learning of addition and subtraction from nursery to year 4 considering the " understanding diagram", models for addition and subtraction, oral/mental and written methods, resources used, learning facts and the using and applying/problem solving method.

One way that children learn about addition is through practical experience. In everyday life people are adding by combining two or more sets of objects. The same can be said for subtraction. Children learn that by removing a particular number of objects from a group it always leaves the same number of objects eg. 4-1 is always 3. This is the way children first learn about addition and subtraction. For many children, they begin to understand the concept of adding when learn number songs in their early education. It is very important to provide children with good practical experiences in order to help them learn. It is also vital to model the correct language so the children themselves are able to acquire it. This gives them a good foundation as they move further through the education system.

Whilst children are in a Nursery setting or a Reception class they will be following the Early Years Foundation Stage (EYFS) document. Within this document there are 6 areas of learning. The area of learning focussing on the development of mathematical skills is called Problem Solving, Reasoning and Numeracy. Within that area there are specific areas regarding addition and subtraction. Once children enter Year 1 they will be following the National Curriculum. Although this is the statutory document teachers often

use the Primary National Strategies document to plan and deliver lessons. This document breaks down the objectives of the National Curriculum to offer a more focussed approach to teaching and learning.

Early Years

The teaching of addition and subtraction in a nursery setting is based on everyday situations and practical activities. Counting songs is a common way of reinforcing numbers and introducing simple addition and subtraction. For example, five little ducks. This is a good example of a way that simple addition and subtraction is introduced and reinforced in a nursery setting. The children soon learn that 5 take away 1 is 4, that 4 take away 1 is 3 etc and that 0 add 5 is 5. The correct language can be modelled so the children learn what language to use when they do activities for themselves. Games are also a good way of introducing or reinforcing addition and subtraction. Some games are not necessarily made for addition and subtraction but it can be encouraged. When asking the children to compare the amount of numbers each of them has, by asking the children questions, ‘ How many more do you have?’, ‘ How many less do you have?’. The children will be working with small numbers and will soon be able to say how many less they have just by hearing the two numbers instead of having to count them. Simple boundaries within the classroom are another way of encouraging the use of addition and subtraction. Where only a certain amount of children are allowed in each area at a time and the children have to keep track of how many there should be, how many less or how many more?

The foundation stage introductory pack offers ideas for activities for the different areas of learning set out in the EYFS. When looking at addition and

subtraction in a Nursery setting the document offers activities for comparing two groups of objects, showing that when you split a group of four the total is the same and finding the total number of objects in two groups. Each of these activities uses physical objects in order to demonstrate the mathematical rule. They use resources such as the number line, plastic coins and snakes. For young children in particular good resources are essential in order to engage the children and effectively teach them about addition and subtraction.

In the reception document activities for looking at posing problems such as ‘ how many will there be when one more…..?’, encouraging the children to say the number that is one more than a given number and giving opportunities for children to find one more or less than a number up to ten are offered. Again, just as in the nursery, each of these activities involves physical experiences and the activities are games to teach and reinforce the mathematical rules for these aspects of addition and subtraction.

Although the main document for Nursery settings and Reception is the EYFS the Primary Framework wants to encourage the aspect of using and applying mathematics. The using and applying mathematics strand has five themes with progression being built into each theme from the foundation stage right up to year 6. The three subdivisions of ‘ using and applying’ in the National Curriculum programmes of study are directly related. Within the foundation stage, within the solving problems section it states that children will be using their developing mathematical ideas and methods so they can to solve practical problems. Therefore, any problems they are given related to

addition and subtraction they will be able to solve given their prior knowledge.

Year 1- Year 4

From Year 1 to year 4 it becomes more in depth and mentions addition and subtraction specifically. For Year 1 children they will be looking at various problems to do with adding and subtracting and solving problems in the theme of money and measurements. This means that a lot of the concrete experiences they have will be based around shops in their role play area in order to give the children a more real experience of counting money and having to do addition or subtraction within those scenarios. Year two is much the same only with the addition of having to multiply and divide using the subject of money and measurements. Year three is a slight step up from this with the children having to choose which calculations to use and to carry them out themselves. Therefore they must decide whether it is right to add, subtract, divide or multiply. Year 4 is not too different only they will be learning how to use calculator methods where appropriate.

When children have to solve problems or they are asked to follow a ‘ line of enquiry’, they will be showing their ideas, using numbers, symbols or diagrams. They will also be involved in reasoning and predicting and communicating those results, either orally or in writing.

The ‘ understanding diagram’ put forward by Haylock and Cockburn, shows the different aspects of mathematical learning that are needed in order for a child to be competent and confident in this area. One of the major parts of the diagram is concrete experiences. The teacher needs to complete tasks

themselves and use a range of resources in their teaching. By doing such activities it enables the children to better remember what they have been taught as they are able to link it to a physical memory. It also allows the children and the teacher to engage in dialogue more easily. During these activities it is also important for the teacher to mode the language they want the children to take on and to use the correct symbols themselves to encourage the children to do the same.

Written and oral/mental methods for addition and subtraction are another two important aspects of mathematical development.

An essential part of maths work is oral and mental. Early practical, oral and mental work, that is carried out in the foundation stages, is the basis for offering children the opportunity to build on their knowledge of addition and subtraction for counting approaches and a good understanding of place value. Later on their education children must be able to recognise how these function s relate to each other and how the rules can be used and applied. Oral and mental work is not just something to be used in the beginning of education but must be continued to provide practice and consolidation of these ideas. Children must be given the opportunity to apply the information they have learned and to make the correct decisions for themselves. To be able to calculate mentally needs an understanding of number patterns and relationships that are developed through questioning, by using certain models and applying the knowledge of numbers. Children must have the ability to recall number facts instantly in order to calculate mentally. In year 2 this would be the addition and subtraction rules up to 10. For year 3 it would be ‘ sums and differences of multiples of 10’ and for year 4, ‘ the

multiplication facts up to 10×10’. There must also be an ability to use taught strategies in order to work out the calculation. For example, in year 1, to be able to understand that you can start addition sums with any number and use the information to do mental calculations of one or two-digit numbers. To be able use different methods for partitioning two-digit numbers in year 2 and in year 5, to be able to ‘ apply mental methods in special cases’. Finally the ability to use and apply the rules of mathematics. For example, to be able to perform mental calculations of addition and subtraction, of one and two-digit numbers (year 3).

The written methods for addition come in 4 stages and the aim is that children are able to use the mental methods where they can but when they can’t do calculations in their head. They can use an efficient written method accurately and with confidence. Children need to know at least one efficient written method for addition that they feel confident using if they can’t do the calculation in their head. The following stages show how the children are able to build up to use an appropriate written method for adding whole numbers by the time they finish year 4.

In order for the children to add successfully they need to know some basic skills which are; ‘ to recall all addition pairs to 9+9 and compliments in 10’, ‘ to add mentally a series of one-digit numbers’, ‘ to add multiples of ten or of 100 using the related addition fact and to be able to use different ways of partitioning two and three-digit numbers as well as their knowledge on place value.

Stage one of the written methods involve the use of the empty number line. Children need to be able to split numbers in different ways rather than always into tens and ones to help them add in steps in order to make multiples of ten. The empty number line is a way of helping them to record their steps when calculating the total.

Stage 2 involves partitioning so that mental methods can be recorded. The tens and ones are added to form partial sums and those partial sums are added together.

The third stage is the expanded method in columns where the children move on to a layout that shows the addition of the tens and the ones separately. As children become more confident they can start by adding the ones rather than the tens. This method leads children to a more compact method.

The fourth and final stage is the column method. In this method, there is even less recording to do. The carried digits are noted below the line, either in tens or in hundreds and not in ones. This can be made more challenging. The children can move on to add more complex numbers of different numbers of digits.

The written methods for subtraction come in three stages. The aim is the same as for the written methods of addition and again the stages show how the children are able to build up an efficient method for subtracting two or three-digit whole numbers by the time they finish year 4. In order to be able to subtract successfully the children should know the number facts for addition and subtraction to twenty, ‘ subtract multiples of ten using the

related subtraction fact and their knowledge of place value' and partition numbers into multiples of one, ten and one hundred in numerous ways.

Stage one, just as in addition involves the use of the empty number line, which helps the children to record and later explain the steps they haven taken in their mental subtraction. After the children have practiced this method for a while they won't need to record as much information. They will need to decide whether to count back or up. It is useful to ask the children if counting up or back is better for certain calculations. When counting up from small to large numbers mentally it can be recorded by using number lines or in columns. The children will need to be able to, when dealing with two-digit numbers, to calculate the answers mentally. If the children are able to work out the answers they don't need to perform as many steps when they are working with three-digit numbers. The counting up method is a good alternative for those children whose progress is slow.

Stage 2 involves partitioning. Partitioning can be used to write equivalent subtraction sums that can then be performed mentally.

The third and final stage is expanded layout. The column method is mirrored by partitioning the numbers into ones and tens and then writing one under the other. This parallels the method for addition rather then being directly linked to any mental methods. This also relies on secure mental skills.

Conclusion

Children build on their prior knowledge to progress with their mathematical skills. They all start with practical experiences and constant exposure to addition and subtraction. All children need to develop sound mental skills in

order to develop their written skills. They have to learn the basic rules for addition and subtraction to progress with the written methods.