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# EXPLORING EXPERIENTIAL LEARNING PRACTICES TO IMPROVE STUDENTS' UNDERSTANDING

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## Abstract

*The addition is the first mathematics skill to which most students are introduced. The ability to add numbers gives students a framework for learning mathematics, initially in kindergarten and, subsequently in elementary school. This paper aims to examine the impact exerted by experiential learning on students' level of academic performance on addition problems. This study arises out of research in a school where students aged between seven and nine, had experienced substantial difficulty in problem-solving in mathematics. The study was designed to discover why such a large body of students had so many difficulties in solving simple arithmetic problems. In the study, 27 students were given a few simple arithmetic problems to determine and comprehend the difficulties that their teachers had indicated their students were having when learning mathematics. The problems involved stories in which a quantity was increased by or combined with a certain quantity to form a total. The quantities involved small natural numbers not exceeding 20. The findings disclosed several problems with learning mathematics. Our* *results derived that fostering experiential learning strategies favors the students' understanding of theoretical concepts and leads to the attainment of superior performance.*

**Keywords**
Addition, Experiential Learning, Mathematics, Problem-Solving

# 1. Introduction

The purpose of this study was to see how students aged seven to nine performed in arithmetic addition problems. Additionally, exploring experiential learning to increase students' comprehension of adding problems. The focus is on problems which are of the most basic kinds with which the students, as their teachers said, would still have difficulties. The problems involve stories in which a quantity is increased by or combined with a certain quantity to form a total. The problem asked can be solved just by simple addition or subtraction. The quantities involved small natural numbers not exceeding 20.

The research question will be investigated: What were the difficulties that the children had in their process of problem-solving by exploring Experiential Learning Practices on three kinds of problems, namely: simple addition, missing addend, and guessing game?

## 1.1. Background and Purpose of The Study

It is puzzled by the different levels of ability among students and, in particular, by the difficulty that many primary school students have in understanding even very basic mathematical concepts. It is not simply as a mathematician that I consider numbers to be important. Even from a very young age, we are bombarded with numbers in one form or another – for example the number 10 bus, a mother telling us we can only have three pieces of candy, the news telling us how many of this or how many of that. We buy things using money – sometimes we have enough, sometimes we don't. We have to make telephone calls through number digits, we are constantly having to count, we are always watching the time – maybe we are five minutes late, or perhaps 10 – whatever the amount – it is always expressed in numbers.

Gaining some understanding of the reasons for children's difficulties in mastering the basic mathematical concepts and their flexible use, could contribute to the funding of knowledge that would help teachers teach mathematics. It would also provide other teachers with the insights necessary to better understand and build upon the strengths of their students. Perhaps the problems may be cultural or arise out of language difficulties or, indeed, poor teaching, but within the limited time and resources of the study, delving further into all those reasons is beyond my remit. I focused on meticulously observing and trying to understand their action and thinking while solving simple problems through experiential learning.

**1.2. Significance of The Study**

One of the most problematic areas of the mathematics curriculum involves solving word problems. Many students experience considerable difficulty with simple word problems. Previous studies in mathematics education emphasize the effectiveness of instruction, focused on teaching strategies, to overcome the students' difficulties (Jordan et. al., 2006; Henjes, 2007).

My study deals with children who are already there, 'later in life'- namely in Primary 3 and Primary 4. By this stage, I assumed that even if they had gone to kindergarten, whatever problems they had in understanding mathematics then (i.e., in kindergarten) which had not been remedied, have been compounded in primary school if their difficulties had not been identified, examined in detail and addressed. My research was to examine what those difficulties were and why they had them – then it would better help the teachers establish how to address those difficulties and improve students' understanding. In other words, the better we understand the symptoms of poor performance in detail the better we can prescribe remedial action.

Jayanthi et. al. (2008) gives valuable advice to teachers on how to teach children with disabilities and at-risk students who are struggling with mathematics, but their work does not seek to examine what I see as the fundamental issue: the 'why' of the learning difficulties before they propose the 'how'. The value of my study is that I do not pretend to seek a solution – a remedy – for the problems, but to examine the symptoms in detail. The remedy, I submit, can only be properly constructed once we understand the symptoms in full – and why the symptoms have occurred.

The students' performance was observed in attempting to solve the carefully-chosen problems by using experiential learning practice, I was able to identify problems that were specific to each child and which seemed to be common to the vast majority of them. Thus, I do not pretend to have revealed all the fundamental issues that my students might have faced but, is that my study focused on some of the fundamental problems inhibiting the learning of mathematics. I focused on the extent to which my students displayed difficulties in procedural and conceptual knowledge (Jitendra et. al., 2002). Fundamental to the learning of mathematics is having a wide range of procedures available to a child, as is the ability to use those procedures well. As important, is the ability to choose the appropriate procedure in the circumstances. I also consider it to be of fundamental importance that students have conceptual knowledge – in particular as regards an understanding of the part-whole relationship – both in theory (at school) and in practice (in the students' day-to-day lives).

## 2. Literature Review

The experiential learning methods developed by Kolb and Rogers are built on psychologist John Dewey's concept of "learning by doing." Rogers (1969) emphasized the significance of experiential learning, which involves putting information into practice. Sternberg and Zhang (2000) stated knowledge learning is created through the transformation of experience. Individual desires and aspirations are addressed through the experiential learning principles outlined below, which are linked to personal growth and advancement (Kolb & Kolb,1999).

Experiential Learning Principles:

1. Learning is more efficient when the subject matter is connected to the students' specific interests.
2. Learning that is dangerous to the self (e.g., new attitudes or perspectives) is more easily internalized and faster when external threats are limited.
3. Self-initiated learning is the most lasting and widespread kind of learning.
4. Students should have complete control over the type and direction of their education.
5. Self-evaluation should be the major method of assessment.

### 2.1. Experience of The Learner

The process of learning is one by which, having undergone certain experiences, learners become able to do something (Marton et. al., 2004) and that way of doing depends very much on the learners' way of seeing the phenomenon. Different experiences of the world may result in people seeing things in different ways. As Marton and Booth (1997) say, experiences constitute an internal relationship between the world and the subject. People's way of acting very much depends on the way how they perceive the world. In studying the different ways people can see or experience the same phenomenon, Marton and Booth (1997) identify a relationship between the ways of experiencing certain phenomena and people's structure of awareness. This marked the founding of phenomenography and the theory of variation in learning.

Variation theory is a theory of experiential learning and is described by Marton and Booth (1997), Bowden and Marton (1998), Runesson and Marton (2002), and Marton et al. (2004). The theory attempts to explain differences in learning items of discernment and structure of awareness, and describes the conditions required for learning. It developed from empirical studies of learning within the phenomenographic research approach (Marton, 1981; Pang 2003). Variation theory involves learners differentiating instances of the phenomenon along critical dimensions separately or together at different stages in the learning. Some aspects will vary whilst others won't. As Marton puts it: 'Learners can discern the certain aspects of learning with variation and these aspects will go to their focal awareness so that they can learn in a certain way.'

### 2.2. Structure of Awareness

The way a person experiences a phenomenon is related to the person's awareness of it (Marton and Booth, 1997; Bowden and Marton, 1998; Pang, 2002; Lo and Pong, 2005). Gurtwistch (1964) states that human awareness is 'a totality of all our experiences but differentiated so that some things are in the forefront of the awareness, whereas others are at the margins'. No one can be simultaneously aware of everything at the same time; thus, some aspects will be at the forefront and others will stay in the background. This is the 'figure-ground relationship' (Bowden and Marton, 1998). Thus, learning is 40 seen as 'discerning something that has not been discerned before and keeping it in one's focal awareness' (Lo and Pong, 2005). A way of experiencing can be defined as how critical features of a phenomenon are discerned from and related to the context - what features can be discerned and focused on simultaneously and the dynamic switching attending to any of them without losing the whole (Svensson, 1989). Learning implies that learners can experience a new world using a change in the structure of their awareness (Pramling, 1996).

## 3. Methodology

The purpose of the study is to see how experiential learning helps students learn on addition problems. The study's 27 participants were all from the same school and ranged in age from 7 to 9 years old. The students were individually interviewed with the tasks. These activities were created to demonstrate how they handled the problems through experiential learning. All interviews were recorded, and the student's actions, behavior, verbalization, interaction with one another, and visual thinking processes were observed. Icebreaking questions and practice exercises through experiential learning ensure that the students would be comfortable thinking aloud on the actual questions.

There are three kinds of problems: number problems, missing addend problems, and guessing game problems. Each interview followed the same format – whether I was interviewing a student individually, or two students together. I would present them with each of the three problems, one after the other – the first being the simple addition problem, the second being the missing addend and the third being the guessing game. Each interview was videoed, but I kept contemporaneous field notes.

The first type of problem is about 'Finding the Sum'- a simple addition problem. The second type of problem is missing addend – the children have to find the appropriate addend to combine with the given addend to reach the required sum. So, the children were given the first addend and the required sum, and they could have used either their addition or subtraction skills to find the missing addend.

The guessing game requires the student always to find two quantities that add up to the given total (e.g., 9) that the student knows has been divided between the two boxes. So, they should know that whatever their two guesses, the quantities must combine to form 9. Repeated guessing is designed to make them realize that the common feature for all their guesses, is a total of 9. In this way, it is hoped that the student, instead of focusing on the two guesses, focuses on the 9, keeping that quantity in their minds as they guess then so that eventually, they can calculate, rather than guess the two quantities. It leads them to the understanding that the whole can only be divided into a certain number of subsets.

Through experiential learning, the difficulties students encountered in reaching conceptual understanding and using procedures to help them do so and thereby solve a problem were investigated. The extent to which they could apply or gain conceptual knowledge by discerning common threads of variations within and across mathematics problems was explored. The variations in the students' understanding of each of those problems were evaluated. It was also considered whether the students constantly make sense of what they do in their representation and operation of mathematics about their world experience or see the mathematics and their world experience as two separate things.

## 4. Analysis

Following the methodology described above, the following points show an analysis of the participants' work on the three kinds of problems.

### 4.1. Understanding the Difficulty: Part-Whole Relationship

The part-whole relationship is a fundamental part of the core mathematics curriculum for primary school children. The part-whole relationship, in its various forms of addition, subtraction, multiplication, and division, is taught throughout the whole of primary school. Most schools start with simple addition. My experience of teaching in school is, however, that the part-whole relationship is not taught as a concept. Rather, children learn how to perform the individual tasks (addition, subtraction, etc.) by applying the procedures they are taught. By this I mean they are taught how to write a number sentence, the symbolism (numeric, +, -, =, ÷, and so on). But many students might have no understanding that addition, subtraction, multiplication, and division are all part and parcel of the whole number concept.

My research looks only at the problems that students in the elementary stages of primary school encountered when attempting to solve simple mathematics problems. I endeavored to thematize the part-whole relationship as a concept using three types of problems.

a. Number problems- 'Simple Addition Problem' (essentially a simple X + Y =? problem)
b. Missing addend problems ('If you have three coins and you want to buy a book for seven coins, have you got enough money? How many more coins [the missing addend] do you need?')
c. Combination problems- 'guessing game' ('I have nine coins. I have put some in box A and some in box B. Can you guess how many might be in box A? And, how many there might be in box B?')

### 4.2. Simple Addition Problems

The first stage of the interview was about the 'Simple Addition Problems'.

I look at the problems students face when attempting to find the sum when a quantity is increased by a certain amount. The problem might be expressed in different ways, (for example: 'You have two dollars and your mummy gives you seven dollars more, how many dollars do you now have now'? Mathematically, it can be reduced to 2+7=?). We take an in-depth look at the performance of some students who were interviewed and then we compare their performance with that of the remaining participating students.

#### 4.2.1. Presenting the Problem

How do the students find the sum when a quantity is increased by a certain amount?

The problems involved simple calculations within the range of 1-20. If I felt that the child did not understand the question, I would then rephrase it to make it simpler. If a child suggested an incorrect solution, I would then rephrase - either by changing the words of the question or by changing the numbers in the question and making it simpler.

Changing the words: for example: 'you have two dollars and your mummy gives you an extra three dollars, how many do you have altogether?' Or 'you have two dollars and your mummy gives you an extra three dollars. If you combine them, how many do you have?'

Changing the numbers: for example: 'you have nine dollars and your mummy gives you five dollars, how many do you now have?" Changed to: 'you have five dollars and your mummy gives you four dollars, how many do you have altogether?'

When changing the numbers, I might keep one addend unchanged and change the other (e.g., '5+9' change to '5+4') or I might change both addends (e.g., '3+6') to keep the total fall within the range of 1-20.

I also used coins to present the problem, but not from the beginning. I would first explain the problem verbally. If it looked like the children were struggling or that they could not catch my meaning verbally, I would then supply them with something to help – perhaps coins or pencil and paper. For example, if a child was having difficulty with '2+7', I would first give them two coins. But if the child were still struggling, I would then give them a further seven coins, then see how they would combine the coins to calculate the answer. But I would not give them both the two coins and seven coins together, since all they would then have to do is count them all.

### 4.2.2. Choice of Strategy - In Solving the Simple Addition Problems

I observed a variety of counting strategies being employed. A more detailed description of the various counting strategies employed, and how each student performed are as follows:

**Different Counting Strategies**

- Counting from 1 with fingers (e.g., count by raising one finger with one number name, with five fingers raised representing 5, and so on.)
- Counting-on with fingers (e.g., seeing the first amount is 2, the child count-on from 3 with the additional objects)
- Raise all their fingers first, and then bring them down one at a time as the child counts;
- Represent the number with finger configuration. (e.g., raise 5 fingers all at the same time to represent 5, 2 fingers to represent 2, directly, without the need to count.
- Recognize directly the quantity from the finger configuration, without the need to count
- Keep the first number in mind, then count up according to the second number using fingers.

- Keep the bigger number in mind, then count up according to the smaller number using fingers.
- Count with finger parts (each finger being divided into three parts)
- Count from 1 on the fingers of one hand, using the thumb or the index finger of the other hand as a counter.

**Other Strategies of Representation**

- Use of physical objects: some students preferred to count with coins.
- Count with imaginary items using gestures: some students counted by tapping on the table as if there were some coins on the table.
- Gestures to memorize a number in a certain location; some touched a point on their chest stored a certain number of coins, and then attended to other objects.
- Using a graphical representation

### 4.3. Missing Addend Problem

The second stage of the interviews was about the missing addend problems. These problems were expressed verbally, then the strategies students adopted in tackling the problems were observed and, finally, the results of their efforts were noted.

#### 4.3.1. Presenting the Problem

How do the students find the missing part (the increase) based on information about the original amount and the sum?

We consider the difficulties students had when attempting to find the missing part (the increase) based on information about the original amount and the sum. The problem was expressed in this way (although different numbers were used from time to time): “If you have 3 coins and you want to buy a book for 7 coins, have you got enough money? How many more coins do you need?” The problems included simple calculations in which the total fell within the range of 1-20 while one of the addends was unknown. The study aimed to investigate how students used the concept of part-whole relationships on numbers. The problems were expressed verbally in the same way except that the numbers were changed from time to time. The first problem was: ‘If you have 3 coins and you want to buy a book for 7 coins, have you got enough money? How many more coins do you need?’ The other problems used 3 and 9, 3 and 12, and 2 and 11, respectively.

I noted a variety of strategies. I made available coins and pencil and paper. For each child, I would ask whether they wanted to use coins or a pencil and paper to help work the problem out.

**4.3.2. Choice of Strategy- In Solving the Missing Addend Problems**

I observed different strategies. In general, they can be split into the categories below.

**Telling an answer directly**: Some children tried to give me the answer straight away without writing anything on paper, using any coins, or writing any number sentence.

Students under this category might use

a. Number facts and, apparently, some arithmetical process in their heads (In other words, they appeared to give the matter some thought).

b. Wild guess (without any apparent thought) or giving numbers that bore no relation to the problem.

c. Making a 'guesstimate'. I say 'guesstimate' because if an incorrect guess was close to the correct number, this would suggest at least some thought.

d. Giving me an ordinal instead of a cardinal number (in which the missing addend or the whole become indistinguishable (for example: '3+9=9').

**Formulating Number Sentence**: Whether a child successfully translated the verbal word problem to a number sentence (vertical or horizontal) and was able to operate the algorithm property.

*a. Formulating number sentence with subtraction operation*

e.g., 7-3=4 (right)

e.g., 3-7=4 (wrong number sentence but right answer)

e.g., 3-7=8 (wrong)

*b. Formulating number sentences with the addition operation*

e.g., 3+7 =7 (wrong)

e.g., 3+7=10 (wrong)

e.g., 3+7=4 (Wrong number sentence but right answer)

e.g., 3+4=7 (right)

**Adding up from the first addend progressively and recognizing directly the whole when it was reached.**

This relates to the child's ability to differentiate between addend and whole and start increasing the first addend (original amount) one at a time until the total reaches the required whole.

**Starting from The Sum and Decomposing It:** This relates to the child's ability to create a representation of the sum (the price of the book, e.g., with seven coins) – perhaps using a finger pattern, and then to take away the original amount (the three coins the student originally had) to see what was left (the change).

**Using Assisting Ways Other Than Fingers**: Use of concrete items or graphics to aid counting.

This refers to whether a child used concrete items such as buttons, coins (whether real or imaginary), and shapes or graphics such as lines or circles drawn on paper

a. Using imaginary coins
b. Using real coins
c. Drawing a picture of the objects
d. Drawing diagram (additional indication of relationship)

### 4.4. Combination Problems: Guessing Game

The third stage of the interviews introduces the students to the guessing game problem using two boxes (See Figure 1). The questions were expressed verbally and with concrete manipulatives. The strategies which the students adopted in tackling the problem were observed and reported here. The results of their learning and discoveries will also be noted.

#### 4.4.1. Presenting the Problem

How do students discern the parts in a given number?

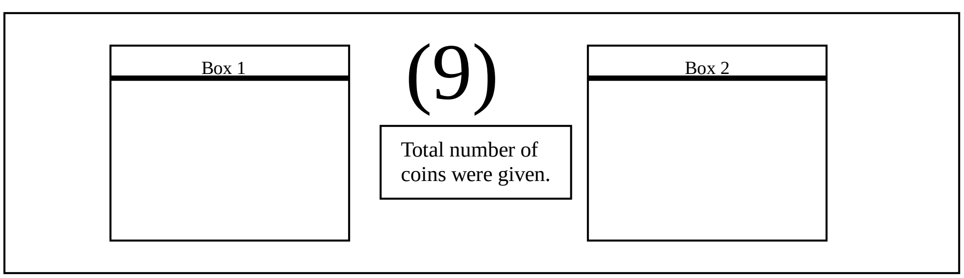


**Figure 1:** *Guessing Game Boxes*

*(Source: Self)*

We look at problems students had when they were asked to decompose a given whole number into two parts. Different numbers were used as a whole from time to time. Before posing the problem verbally, I placed the total number of coins on the table (e.g., 9 coins as given in the first question for this problem type) and asked them to count and then write down the number they found '9' (See Figure 1). I wanted the children to be clear that we were starting with nine coins. I then took the coins away. I then told them that I was putting some of those nine coins in one box and the rest in another. Both boxes had lids. I closed the lids. I then asked them to say how many coins there might be in the first box and then how many there might be in the second box.

Some of the students gave some thought before giving me their suggestions. Some did calculations, but others went straight into telling me a number without any apparent calculation. After the children had made all their suggestions, I then asked the students to check their answers after they had completed the guesses to see whether they were reasonable before I opened the boxes, because I wanted to see how many different and correct combinations students could suggest altogether. I then opened the boxes and got the students to count how many were in each box. This was an exercise in assessing their ability to decompose a whole number into two parts in different combinations. I got the children to draw a table as below and asked the student to list their guesses of the numbers of coins in each box for each guess (Table 1).

**Table 1:** *List the Guesses of The Numbers of Coins in Each Box*

| | **Guess 1** | **Guess 2** | **Guess 3** | **Guess 4** | **Guess 5** |
|---|---|---|---|---|---|
| **Box 1** | | | | | |
| **Box 2** | | | | | |

*(Source: Self)*

The guessing game was conducted using one or more values of the total (there could be 6, 9, 12 or 15 coins in total). Not every child was tested with all four numbers. Some children were tested with only one hidden total, others two, some three and some four. In each case, they were told that they had five guesses (although, in the event, some made fewer, and others more than the five guesses per total). Those interviewed only once had only one hidden number, namely 9.

When the total number of coins was 6, some children were not able to make the full five guesses as required, because, I thought the total number was so small. Conversely, where the number was larger (e.g., 12) some students made more than five guesses although, in a few cases, even when the number was 12, a student could think of only fewer than five guesses. In such circumstances, my inference was that the children were unable to see more possibilities after the first few guesses, or their knowledge of number facts was limited.

**4.4.2. Choice of Strategy- In Solving the Combination Problems**

The student was told that there was a certain number of coins in total and that they were divided between two boxes. They were asked to guess how many there might be in each box. All 27 children made guesses. They were asked to make five guesses for each number.

Different ways of handling the guessing games by students were noticed. The strategies can be split into the categories below.

**Commutative Pairs:** This indicates whether the student's response demonstrates that they are aware of the commutativity principle (e.g., if 4+5 is one answer, then 5+4 should also be present).

**Unique Matching Number:** Some students were puzzled by the uniqueness of the numerical combination. They tried multiple times with the same number as one component and different numbers as the second part (such as 4, 4 and 4, 3). This reflects whether a child comprehended that the second section required a unique response.

**Number Facts:** These are basic subtraction and addition facts that children should be able to recall without having to solve the problems. In short, they should know them by heart. In the context of the guessing game, this refers to a student's automatic knowledge, for example, that a certain combination would result in a certain total (for example, 6+3 = 9). Among the various combinations, the half-half combination (such as 3, 3 for a total of 6 and 4, 4 for a total of 8) seemed to be the easiest to remember.

**'Pure' Assumption:** When a child gives me a wildly inaccurate 'guess,' it indicates that no real thought has gone into it. For example, if the total number of coins divided between the two boxes was 9, and a student's guess was Box 1 had 6 and Box 2 had 19, I regarded this as a 'pure' guess. Some did not add up the total number, which was equal to the original number of coins that I gave at the start; instead, they just give any random number. Some students appeared to have no idea how to find the numbers in the two boxes. It appeared that they just guessed any number at random.

## 5. Findings and Implication

My research is an exploration of experiential learning practices to improve students' understanding. I examine in detail the difficulties the children encountered in each of the three kinds of problems, namely: simple addition, missing addend, and guessing game. I summarize those difficulties as below. Whatever the specific issues in respect of each kind of problem, the overriding difficulty for almost all of the students were the lack of conceptual knowledge as regards the part-whole relationship. This, more than anything, contributed to their difficulties.

### 5.1. Simple Addition

I observed limitations in the students' ability to subitize, to use counting strategies other than using fingers, failure to use grouping, and counting-on, and poor knowledge of number facts.

### 5.2. Missing Addend

The most striking difficulty was poor skills in translating a word problem into a number sentence. I also observed limitations in the ability, accurately, construct a number sentence. Even where a child accurately constructed a number sentence, most children encountered many difficulties in operating their number sentence. I also noted a lack of knowledge of alternative number sentence strategies (for example relying on an addition number sentence when a subtraction number sentence would have been better). I also noted a lack of knowledge of number facts.

### 5.3. Guessing Game

Lack of knowledge of number facts is also featured in this type of problem. The failure to understand part-whole was particularly evident. Most students did not understand the idea of a unique answer and there was much evidence of a failure to understand the use of (and consequences of) variation in combinations of addends. Moreover, there is a distinct lack of the use of commutation.

## 6. Discussion

In observing their processes, an insight into their conceptual knowledge was gained. The procedures the students knew were closely looked into and how they went about choosing a particular procedure to solve a particular problem. It was interesting to see if they chose the simplest and most efficient procedure. If the students did not know the simplest procedure or did but did not use it, that would suggest a lack of conceptual knowledge. The reverse would be true: if a student went straight to a subtraction number sentence when dealing, for example, with a missing addend problem, this would suggest knowledge of part-whole. All three problems I set involved an understanding of quantities and part-whole – the very foundation stones of mathematics teaching in Primary School.

Watching and listening to the students as they went about trying to solve a problem allowed me to observe the range of tools at their disposal and the extent to which they were able to use those tools effectively. If they found a procedure ineffective or they were uncertain whether they had got the right result, they may need to do some checking and adjustment. It also helped students' teachers to identify whether the students had made sense of the problem and whether they understood quantities and part-whole. Observing how many procedures the students had available to them, and how well they could use these procedures, helped to understand their difficulties.

To explore what world, experience the students could bring to bear when attempting classroom mathematics problems. World experience is extremely important because students can see a problem in context. It helps build their web of understanding. Without analogous world experience, students are left with attempting problem-solving simply by using the procedures they had learned in school - all theory, no practice. For a student to have a real understanding of mathematics they need the combination of conceptual knowledge and a wide range of, and the ability to use, procedures and world experience of problems analogous to the theoretical situations they face in class. Lack of conceptual understanding of the mathematical knowledge taught and their discernment of world situations with numbers would also hinder their acquisition and meaningful use of procedures (Jitendra et. al., 2002). It is the linking of all these that enables a student to learn mathematics and improve students' understanding.

## 7. Limitations of The Research

The sample size was limited by the fact that my study was conducted at just one school. Of course, I might have chosen to include other schools in my study but, as I say later, this would have meant spreading my time too far and thus being unable to go into the same sort of depth as I was able to do with the small group within that particular school. But there is a particular reason I chose this school which, for my research was exactly the sort of school I needed to study: it was one where there was a recognized problem of low performance in mathematics amongst all the students in the classes which I studied. This was not a school where there were just isolated incidents. Of course, even amongst these poor performance students, there were different levels of ability but, even the ablest within this group were performing well below the standard one would have expected for a primary school child at that age.

The sample size necessarily prevents me from attempting to generalize but it might be tempting to seek to apply my conclusions, if not to other primary schools in Hong Kong who have average results, then to other schools whose students are also equally poor performers at mathematics. Thus, although it might well be true that the results of my study could apply equally to students in a similar position, the smallness of the sample prevents me from doing so. That said, if teachers reading this recognize the sort of problems my students suffered and could identify the same or similar problems in their schools, I hope that they will benefit from my research, the conclusions I reached, and the implications which I have outlined.

## 8. Suggestions for Further Research and Practice

One of the matters covered in my research is the relationship between procedural and conceptual knowledge and how students make sense of problem situations and how those problems correspond to their learned mathematical knowledge (be conceptual or procedural knowledge). I suggest that there are interdependent – indeed, symbiotic relationships between procedural and conceptual knowledge. I have made certain interpretations concerning the various procedures and strategies employed by the students in my study and how they make sense of the problem situation. I would submit that a fruitful area for further research would be how teachers can teach the procedure to promote conceptual knowledge – in particular, an understanding of the way various procedures interact with each other and how they can promote an understanding of the part-whole relationships.

## 9. Conclusion

Experiential learning has been shown to offer several benefits that contribute to a student's development and learning. Students can have a better understanding of concepts of part-whole relationships. Students may struggle to understand concepts that have little to do with the "real world." Experiential learning allows students to apply facts and concepts in a real-world setting in which they also play an active part. The material becomes more real to the student when he or she engages with it. Students can express themselves more creatively. It is one of the most effective methods for teaching creative problem-solving. Real-world information teaches students that there are numerous answers to problems and encourages them to discover their unique approach to hands-on chores. Students are given the chance to think about their experiences. Students activate more parts of their brain and establish better connections with the content by combining actual experiences with abstract concepts and then commenting on the results. They are urged to consider how their activities influenced the issue and how their results may have differed from those of other students. This examination assists students in better understanding how the principles gained may be applied to other, more diverse situations. Experiential learning is intended to stimulate students' emotions while also improving their knowledge and abilities. Students who take an active role in the learning process may get more pleasure from their studies.

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