

# Early Grade Children Procedural and Conceptual Knowledge in Number Pattern Concept at Halaba

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## Abstract

Having an adequate knowledge and skill in mathematics at early grade level is basic for children in their daily life activities and future life successes. Assessing procedural and conceptual knowledge of children can help us to check whether they are getting the required knowledge and skill at the respective grade level because learning mathematics involves both conceptual and procedural knowledge (JICA, 2012). Number pattern is one of the fundamental skill in numeracy that early grade children have to learn and their performance in strategic and effective counting is basic for their future success in arithmetic (Gersten, Clarke, Haymond, & Jordan, 2011). This study examined early grade children procedural and conceptual knowledge level in number pattern, and the association between children's procedural and conceptual knowledge. The subjects of this study were 24 grade 2 & 3 students in Halaba Kulito primary School at Halaba Zone. The results of this study revealed that early grade children procedural knowledge is average (56.7%) and their conceptual knowledge level is poor (44.4%), and females' knowledge in both concept and procedure is lower than their male counterpart, 44.2 vs 69.2 & 34.72 vs 55.56. In addition, the finding underlined the significant association between procedural knowledge and conceptual knowledge, and children who score higher in conceptual knowledge items had superior score in procedural knowledge items than the converse. Considering these results as a base line, further studies are required, especially, on quality of early grade mathematics curriculum and its implementation, and the contributing factors of children low performance in learning mathematics, with special focus on female students at early grade levels.

**Keywords:** Procedural knowledge, Conceptual Knowledge, Mathematics, Number pattern, Performance

**DOI:** 10.7176/DCS/10-12-01

**Publication date:** December 31<sup>st</sup> 2020

## 1. Introduction

Having an adequate knowledge and skills in mathematics at early grades is basic for children in their daily life activities and is a basic foundation for their future mathematics learning. These mathematical knowledge and skills contain a number of attributing issues one being the fundamental relationship of conceptual and procedural knowledge (Hibert & Lefevre, 1986) that are defined by different scholars differently. According to Hibert and Lefevre (1986), conceptual knowledge is a relationship between pieces of knowledge, whereas procedural knowledge is having a sequential nature that includes knowledge of formal language or the symbol representation system. Haapasalo (2003), in his part defined conceptual knowledge as a skillful effort along particular networks and procedural knowledge as dynamic and successful utilization of particular rules and applying appropriate procedures within relevant representation form. Despite the different views, conceptual knowledge helps to develop the meaning for symbols, recalling procedures, and using procedure, whereas procedural knowledge helps to enhance concept and apply concepts to solve problems (Hibert & Lefevre, 1986). Hence, conceptual knowledge focuses on the ability of comprehending mathematical concepts, operations and relations, and on the other hand procedural knowledge gives emphasize for children's ability to carry out procedures of an activity flexibly, accurately and efficiently.

Should there no be connection between conceptual and procedural knowledge, children may get an answer for a given problem or task but they would likely not understand what they are doing or, they could learn mathematical concepts or procedures interestingly but may not be good in problem solving, and hence they may not be entirely capable in their mathematics learning. Consequently, both conceptual knowledge and procedural knowledge are equally important for learning mathematics (Hibert & Lefevre, 1986) because understanding of mathematics require both conceptual and procedural knowledge (JICA, 2012). These two forms of knowledge are crucial for children's learning development because one knowledge supports the development of the other (Rittle-Johnson & Alibali, 1999). The extent and depth of relationship between conceptual and procedural knowledge, however, depends on the level and depth of the content and the age of learners. The collinearity or concurrence of the two forms of knowledge is also another concern. Some scholars convicted that one precedes the other such as Gelman & Williams (1997) while others indicated that they do not develop independently (Rittle-Johnson & Alibali, 1999). But most important is the nature of the content they learn or whether it is cognitive or skill. For example, at early grade levels, before children learn adding numbers, they need to understand the rules of addition, and in this situation conceptual knowledge supports the development of

procedural knowledge. In other way, when primary children multiply natural numbers by two, they can understand the principle of equality of the result with the sum of the number and itself (e.g.,  $2 \times 4 = 4 + 4$ ), here we can say procedural knowledge supports the development of conceptual knowledge. At times, both could concurrently happen. Hence, for effective learning of mathematics both conceptual and procedural knowledge need to get equal emphasis. In early grades there are foundational concepts and procedures children need to acquire. One of these is number related concepts and procedures.

## 2. Number Pattern for Early Grade Children

Scholars disclose the influence of children early knowledge of numerical concept in their later life as early knowledge of numeracy lay the base for their later learning of mathematics (Ginsburg & Allardice, 1984; Griffin, Case, & Siegler, 1994; JICA, n.d). If an individual has a good knowledge and understanding of number concept, then s/he can develop mental number line on which s/he represents and operates numerical quantities and this in turn helps in easing solving of different mathematical problems (Berch, 2005; Gersten et al., 2011; Griffin et al., 1994). Moreover, efficiency in learning early numerical concept affects children's interest and confidence to learn new concepts in mathematics (Jordan, 1995), then if it is not properly conveyed, it may cause negative attitude on children towards learning of mathematics.

Number pattern is one of the fundamental skills in numeracy that early grade children need to learn (Gersten et al., 2011; LM, L, Aarnout, & Yasmin, 2014; Siegler & Robinson, 1982) because it helps them to learn later concepts in mathematics like; multiplying numbers (Geary, 1994), thinking algebraically (Sarama & Clements, 2009), and it lays a base for advanced mathematical thinking (Gersten et al., 2011). It is the process of finding regularities and structure, and arranging orders of numbers in correct and acceptable way (Sarama & Clements, 2009). Identifying missing number in a given sequence is important concept in number pattern and in the process of identifying missing numbers children count strategically: by one, two, three, or more both forward and backward. As underlined in EdData (2009), early grades children should identify missing numbers by counting forward and backward by the given amount of numbers. Being able to recognize number pattern lays the foundation for other mathematical concepts; like basic operations and algebra (Kochetkova & Brombacher, 2014). Clarke and Shinn (2004) It is also put that early grade children have to be able in identifying missing number and showing their knowledge of the numbers purposefully (Clarke and Shinn, 2004). Moreover, children's performance in strategic and effective counting is basic for their future success in arithmetic (Gersten et al., 2011).

## 3. Conceptual and Procedural Knowledge in Number Pattern

Even if conceptual knowledge and procedural knowledge are interrelated, they have their own features too. Hibert and Lefevre (1986), put a way for distinguishing these two forms of knowledge: conceptual knowledge can be identified by relationships between pieces of knowledge and procedural knowledge can be differentiated by the presence of a sequential nature. For example, the sequence 2, 6, 10, 14 or 2, 2+4, 2+4+4, 2+4+4+4 or 2, 2+4, 6+4, 10+4 shows procedural knowledge approach and the explanations; the sequence is in increasing order, the difference between two consecutive numbers in the sequence is 4, the second number in the sequence is four more than the first, the third number in the sequence is four more than the second show conceptual knowledge as they indicate relationship among bits of knowledge (operation, sequence and order concepts). Therefore, conceptual knowledge can be developed by constructing relationships among pieces of knowledge or by making connection between prior knowledge with the new knowledge (Long, 2005), and procedural knowledge can be developed by applying flexible, accurate, appropriate and efficient strategies for solving problems (Gersten et al., 2011). Children's conceptual knowledge of basic mathematical rules and principles will be developed when they are efficient in applying accurate and appropriate counting techniques to compute basic operations, and this is crucial for their future attainment in arithmetic (Gersten et al., 2011).

Conceptual knowledge in number pattern (missing number) needs understanding of properties of number pattern (sequence/order of numbers, magnitude between numbers of the sequence, operations) and procedural knowledge in number pattern (missing number) needs fluency in ordering numbers (ascending or descending), and identify the missing number(s) by applying accurate and efficient strategies (determining magnitude between two consecutive numbers in the sequence, applying appropriate operation to get the missing number(s), and putting the missing number(s) of the given sequence.

## 4. Measuring Children Proficiency in Number Pattern

Many tools of measuring early grade children focus on getting the correct answer for the given item, they focus on general performance of children in the specific area of mathematics. These measures hardly show the level of children conceptual and procedural knowledge. Receiving adequate evidence of children's performance in number sense needs a measurement tool that can give detail and valuable evidence about their performance in the area.

As specified in the curriculum framework for K – 12, and in the grade level mathematics syllabus, mathematics learning in early grades (grades 1 - 4) in Ethiopia has four major strands: Number – including arithmetic, Measurement including money and time, Geometry – lines, shapes and solids, and Data handling and pattern (MoE, 2009). The main objective of teaching number sense at early grades in Ethiopia is to develop children’s understanding in the area and their competence in using mental and written techniques for solving problems (MOE, 2008). Moreover, number and arithmetic operations as the main strands in the early grades mathematics is proposed with the intent that children at the level are expected to count, read, write, and order whole numbers and perform basic operations on whole numbers. To achieve these expectations, early grade (grades 1 - 4) children have to develop necessary conceptual and procedural knowledge. If children at the level fail to understand the early numerical concepts, their interest and confidence to learn new concepts in the area can be influenced (MoE, 2018), this again affects their later success in learning mathematics, and equally other subjects. Hence, assessing children understanding of numerical concept plays a great role in tackling children learning problems in time through the use of appropriate measurement tool.

A child is said to be efficient in number pattern if s/he is fluent in estimating and judging magnitude, able to recognize unreasonable results at the level, flexible when mentally computing the task, and able to move among different representations and use the most appropriate representation at the level (Singh, 2009).

## 5. Research problem

The concept of number pattern is important for early grade children to develop their knowledge in counting, operation and even for their algebraic thinking. Nevertheless, in Ethiopia, early grade children have faced difficulty in learning the concept of number pattern/missing number. The national educational assessment and examination agency (NEAEA) base line assessment report indicates that the mean of early grade children mathematics achievement in missing number sub-task is 48.5% (NEAEA, 2014), and Asfaw in his early grade curriculum study, reported that early grade children achievement was very low in missing number (Abraha, 2015). Though both studies indicate low achievement level of early grade children in number pattern, they did not identify children level of conceptual and procedural knowledge on the area, nor did they include association between them. The focus of the curricular content and delivery at schools is also important as that determines whether much emphasis is given to conceptual or procedural knowledge. It is thus, important to study the level of children’s conceptual and procedural knowledge which is basic to overcome their learning problems in number related concepts and procedures, and the association between them. Accordingly, the study focused on understanding the order of a given sequence, using appropriate operations to find the missing number(s) in a sequence, following correct procedures to find missing number(s) and reasoning for each of the steps of the procedure of solutions. It also tried to explore the association between conceptual and procedural knowledge in number pattern.

## 6. Objective

The objective of this study was to assess early grade children conceptual and procedural knowledge in number pattern.

Based on this objective the following research questions were formulated;

- What is the mastery level of early grade children conceptual and procedural knowledge in number pattern?
- Is there a significant association between procedural and conceptual knowledge of early grade children in number pattern?

## 7. Significance

Measuring early grade children proficiency in number sense helps to identify children who are at risk in learning mathematics and to provide additional support for these children (Gersten et al., 2011). It also helps to identify more critical areas that need focus in early grade mathematics learning. Consequently, the result from the assessment can help for early intervention, and this can bring lasting benefits in children learning (Fuchs, Fuchs, & Karns, 2001). Therefore, this study can benefit by providing concrete evidence on children procedural and conceptual knowledge level in number sense. This can help policy maker, curriculum designer, teacher educator and textbook authors to consider appropriate instructional practices for children number pattern learning at the level. It can also help early grade mathematics teachers to differentiate their instruction. For researchers on the area, this study can provide evidence for their further study.

## 8. Method

Since the purpose is to survey existing situation at the early grade mathematics with emphasis laid to conceptual and procedural knowledge, this study employed quantitative research design in order to get valid and reliable data. It specifically employed both exploratory and explanatory survey method.

### **8.1. Participants**

The participants in this study were 24 children from Halaba Kulito primary school at Halaba Zone. The children were selected from grades 2 and 3 by using systematic probability sampling technique to consider both sexes and grade levels. 12 children were from grade 2 and the other 12 children were from grade 3, with equal number of boys and girls considered in the selection process.

### **8.2. Instrument**

To develop the instrument the researchers believed that children own construction of knowledge is critical in promoting better understanding (whether conceptual or procedural) and hence the study was guided to accept the fairness of the alternative responses of the children than seeking for a fixed approach of solving problems or getting the final correct answer. With this intent, the instrument for measuring early grade conceptual and procedural knowledge was developed by adapting from Rittle-Johnson and Alibali (1999) with addition from other sources that included Gersten et al. (2011), Haapasalo (2003) and LM et al. (2014). The measure for missing number(s) has two parts: computing missing numbers for a sequence in increasing or decreasing order (procedural) and responding questions which are related with the given sequences (conceptual). The first part of the instrument contains ten items of four order sequence with one missing number in either ends or in between of the sequence and it aimed to measure children procedural knowledge. The second part of the instrument contains twelve items that focus on order of numbers, relative position of numbers and basic operation. Therefore, the items focus on measuring children proficiency in counting whole numbers (in ascending order by 1, 2, 5, 10, ..., 100 and backward), ordering whole numbers (OR) (ascending and descending) by considering their relative position (RP), and operation utilization (OP) (adding/subtracting to get the next/earlier number in the sequence). The instrument was checked for internal consistency reliability. The internal consistency reliability test provided a Cronbach Alpha (.81) for missing number items (that include procedural and conceptual knowledge items) which in the acceptable range.

### **8.3. Procedure**

The assessment questions (missing number sub-task) were printed in A4 paper and given to the children with blank A4 papers when they were ready for the assessment. The assessment was individual and an assessor was asking each child to put all necessary steps of the solution for each item in the given blank papers and after completing solving the given items the assessor asks each child to tell the relative position of numbers in the given sequence, order and operation they used to find the missing number of the sequence, and predecessor or successor of numbers in the given sequence by using the word 'more/less' (MoLe) approach. The items ranged from lower to higher level of complexity, and this is to see children level of understanding of number pattern (determining missing numbers of a given sequence). Before starting the activity, the assessors reminded children about number pattern by giving examples of a sequence with missing number, and then they explained what to do when they solve to get the missing numbers in each number sequence.

During data collection, children own perception and explanation of the problem were not denied rather the fairness of responses for subjective procedural items were judged by two mathematics teachers and hence there was strong agreement between raters as shown in inter-rater reliability test (.985).

### **8.4. Procedural knowledge Assessment**

Appropriateness of procedures used by children to find the missing number was measured based on the steps they used (taking two consecutive numbers, determining magnitude between the consecutive numbers, use of appropriate operation by considering the magnitude to find the missing number), and accuracy is measured by observing the correctness of terms, symbols, words and operations in each steps of the procedure.

**Table 1. Procedural Knowledge Measures and Items**

Focus of the assessment	Missing number sub tasks
Appropriateness of the procedure used to find the missing number	3 — 4 — 5 — <input type="text"/>
	12 — 13 — <input type="text"/> — 15
	40 — <input type="text"/> — 60 — 70
	<input type="text"/> — 400 — 500 — 600
Accuracy	4 — 6 — 8 — <input type="text"/>
	<input type="text"/> — 218 — 219 — 220
	38 — <input type="text"/> — 34 — 32
	50 — 55 — <input type="text"/> — 65
	950 — 940 — 930 — <input type="text"/>
	2 — 7 — <input type="text"/> — 17
	<input type="text"/>
	<input type="text"/>

### 8.5. Conceptual Knowledge Assessment

Each conceptual item contains one up to two missing number questions and based on the sequence/s, an assessor asked children to respond to the questions. For measuring children knowledge on the concept of order of numbers children were asked to tell the order of each of the two given sequence; for relative position of numbers children were asked to tell the relative position of one of the terms in the given sequence; and for magnitude of numbers children were asked to tell how many more or less the number in the given sequence is from the other number in the sequence; for utilization of basic operation to get a missing number children were asked to demonstrate appropriate operation that can be applied to get the missing number from the preceding or succeeding term.

**Table 2: Conceptual Items with its Corresponding Missing Number Items**

Focus of assessment	Conceptual questions	Corresponding missing number items
Order of numbers (OR)	Is the order of the numbers descending or ascending?	1, 7
Relative position of numbers (RP)	What is the third number in the sequence?	4
	What is the third number in the sequence?	10
Relating basic operation with the concept of number pattern (OP)	What operation have you applied to get the missing number in the sequence?	5,6
	Each of the numbers in the sequence are multiples of what number?	3, 4
The concept of 'More' & "less"	The missing number comes what number before its immediate succeeding number in the sequence?	4, 7
	The missing number comes what number after its immediately preceding in the sequence?	2, 9

## 9. Results and Discussion

### 9.1. Early Grade Children Procedural and Conceptual Knowledge

#### 9.1.1. Procedural Knowledge

As indicated in Table 3, the overall accuracy (procedural knowledge) score in terms of percent of mean scores in missing number is 56.67 with minimum score of 20.8% and maximum score of 95.8%. This shows that early grade children's procedural knowledge is an average but, as the level of difficulty increases, children's performance decreased from 95.8% to 20.8% as they did not perform well in the last four items (item 7, 8, 9 & 10). Most children answered correctly the items with low level of complexity shown to be item 1 (95.8%) and item 2 (91.7). This indicates that early grade children procedural knowledge level is not as expected, and they may face difficulties in learning counting by five or others, determining numbers greater than 100 and numbers



with decreasing order.

**Table 3: Frequency Distribution of Children Score in procedural knowledge Items**

Item	Response in frequency and Percent		
	Incorrect	Correct	Total
1	1(4.4)	23(95.8)	24
2	2 (8.3)	22(91.7)	24
3	4(16.7)	20 (83.3)	24
4	9(37.5)	15(62.5)	24
5	11(45.8)	13 (54.2)	24
6	12 (50.0)	12(50.0)	24
7	17(70.8)	7(29.2)	24
8	15 (62.5)	9(37.5)	24
9	14 (58.3)	10 (41.7)	24
10	19 (79.2)	5 (20.8)	24
Total	104(43.33)	136(56.67)	240

As indicated in Table 4, 14 students scored 5 or more indicating more than half of the students got a score of 50% and more and among these 71% were boys. This shows that most high performing students in procedural knowledge items were males.

**Table 4: Score of Children in Procedural Knowledge by Sex in count and percent**

Sex/Score	0	1	2	3	4	5	6	7	8	9	10	Total
Female	0 (.0)	1 (4.2)	2 (8.3)	4 (16.7)	1 (4.2)	0 (.0)	2 (8.3)	0 (.0)	0 (.0)	0 (.0)	2 (8.3)	12 (50)
Male	1 (4.2)	0 (.0)	0 (.0)	0 (.0)	1 (4.2)	1 (4.2)	1 (4.2)	2 (8.3)	1 (4.2)	4 (16.7)	1 (4.2)	12 (50)
Total	1 (4.2)	1 (4.2)	2 (8.3)	4 (16.7)	2 (8.3)	1 (4.2)	3 (12.5)	2 (8.3)	1 (4.2)	4 (16.7)	3 (12.5)	24 (100)

In addition to this, assessors reported that some children were reluctant when they solve the problems, and hence they go directly to writing the final result rather than writing each steps of the solutions for the questions. Moreover, most of the children did not put all necessary steps and even the steps written by them are not presented neatly as observed from the solution paper. The raters report also shown that the appropriateness of procedures that children wrote in solving the given items are at moderate ability that could not be expected at the level. This is because they may not have learned in a way that providing different alternative solutions for single problems and following appropriate techniques of solving problems in the area.

### 9.1.2. Conceptual Knowledge

As shown in the table 5, the overall mean score of early grade children in conceptual knowledge items is 44.44% with minimum score of 25.0% in relative position items and maximum score of 66.7% in order of numbers in the sequence items. This shows that early grade children have poor conceptual knowledge in number pattern, especially in identifying numbers relative position. Lack of conceptual understanding of relative positions would distract learning of mathematical operations such as addition, and multiplication. This needs due emphasis both at curriculum design and instructional level.

**Table 5: Frequency Distribution of Children Score in Conceptual Knowledge Items**

Item	N	Response by count and Percent		
		Incorrect	Correct	Total
OR1	24	7(29.2)	16(33.3)	32(66.7)
OR2	24	9(37.5)	15(62.5)	24
RP1	24	19(79.2)	5(20.8)	12(25.0)
RP2	24	17(70.8)	7(29.2)	24
OP1	24	12(50.0)	55(57.3)	41(42.7)
OP2	24	16(66.7)	8(33.3)	24
OP3	24	15(62.5)	9(37.5)	24
OP4	24	12(50.0)	12(50.0)	24
MoLe1	24	13(54.2)	53(55.2)	43(44.7)
MoLe2	24	15(62.5)	9(37.5)	24
MoLe3	24	11(45.8)	13(54.2)	24
MoLe4	24	14(58.3)	10(41.7)	24
Total	288	160(55.6)	160(55.6)	128(44.4)

As indicated in table 6, 54.2% of the students perform 50% and below of the items, and in this interval the number of female students exceeds. That shows most low performed students in conceptual knowledge items are females.

**Table 6: Score of Children in Conceptual Knowledge by Sex in count and percent**

		n	Score										
			0	1	2	3	6	7	8	9	10	11	12
Sex	F	12	2 (8.3)	2 (8.3)	2 (8.3)	2 (8.3)	0 (.0)	2 (8.3)	0 (.0)	0 (.0)	0 (.0)	0 (.0)	2 (8.3)
	M	12	2 (8.3)	1 (4.2)	0 (.0)	0 (.0)	2 (8.3)	1 (4.2)	2 (8.3)	1 (4.2)	1 (4.2)	1 (4.2)	1 (4.2)
<b>Total</b>		24	4 (16.7)	3 (20.8)	2 (8.3)	2 (8.3)	2 (8.3)	3 (16.7)	2 (8.3)	1 (4.2)	1 (4.2)	1 (4.2)	3 (20.8)

Table 7 shows that the overall performance of early grade children in mean percent is 50%. This means early grade children performance in number pattern is average. However, children achieved below average in conceptual knowledge items 44.4%. Hence, children have low level of conceptual knowledge in number pattern. Moreover, females' achievement is low in both procedural knowledge items (44.2%) and conceptual knowledge items (34.72%). This may due to contextual factors; wrong perception of community for female students and due to they may not get equal opportunity to participate at classroom, to study at home and to communicate with their teachers and friends concerning unclear concepts in number pattern.

**Table 7: Mean (%) Score of Students in Procedural and conceptual Knowledge Items**

Category	No of Items	Sex		Overall Performance
		F	M	
PK	10	4.42 (44.2)	6.92 (69.2)	5.67 (56.7)
CK	12	4.17 (34.72)	6.67 (55.56)	5.33 (44.4)
<b>Total</b>	22	8.58 (39.02)	13.42 (60.98)	11 (50.00)

### 9.1.3. Association between Children Procedural and Conceptual Knowledge level

To investigate the relationship between early grade children procedural and conceptual knowledge level, a correlation was computed, table 8. Hence, Pearson correlation analysis indicated positive association between children procedural and conceptual knowledge level,  $r(22) = .817, p < .01$ . That means, children performed high in conceptual knowledge also had high in procedural knowledge. Moreover, children who score high in conceptual knowledge items had high score in procedural knowledge items than the converse.

**Table 8: Pearson Correlation between Children's Procedural and Conceptual Knowledge**

Variable	n	M	SD	r	P
Conceptual knowledge	24	5.33	4.31	.817	.000
Procedural knowledge	24	5.67	3.13		

## 10. Conclusion

The finding showed that early grade children procedural knowledge is average and their conceptual knowledge is poor, especially, in determining relative position of numbers. Even if most children understand the concept of ascending and descending order, they showed weak result in determining the relative position of numbers. Children procedural knowledge level is better than their conceptual knowledge level, however they did not perform well in the items that need high cognitive demand. Moreover, their procedure they have used to find the missing number was not sufficient to say they have adequate procedural knowledge. This result implies that early grade children are likely come across difficulties in learning mathematics because being not efficient in counting strategies is a key indicator for early grade children that they may have difficulty in learning mathematics (Geary, 2004). This may because the concepts may not adequately have addressed in the curriculum, especially in children textbooks and even children may not appropriately learned the concepts in classroom. As the result, there is a need of reviewing early grade mathematics curriculum in relation to the adequacy and appropriateness of contents to equip early grade children with necessary knowledge and skills at the level. Moreover, additional research should be conducted in identifying the factors that contribute for children poor performance in learning number pattern.

As observed in the analysis part children procedural knowledge is strongly associated with their conceptual knowledge. Moreover, children who score high in conceptual knowledge items had high score in procedural knowledge items than the converse. This is consistent with the finding of Rittle-Johnson and Alibali (1999) in their study of examining conceptual and procedural knowledge of grade four students, conceptual knowledge may have significant contribution for procedural knowledge than the reverse, and with Hallett, Nunes, and Bryant (2010) finding in their study of individual differences in procedural and conceptual knowledge of learning fraction that children who rely more on conceptual knowledge may have advantage than who rely on procedural knowledge in learning fraction. Moreover, less attention on teaching early grade children the important rules, principles and terms in number pattern concept and strategies of finding missing numbers in the given sequence would lead children to a superficial grasp of the concept of number pattern and this may cause difficulties in learning other concepts of mathematics at the level and even for their further level. Therefore,

giving more emphasis on improving children conceptual knowledge in addition to procedural knowledge may provide the expected result in early grade children mathematics performance.

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