# Using Finger Counting Strategies in Early Childhood Education as a Basis for Culturally Responsive Teaching of Mathematics in Owerri Municipal Area of Imo State

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## ABSTRACT

*The aim of this study is to elicit responses from Early Childhood teachers on their use of counting strategies in early childhood education as a basis for cultural responsive teaching in mathematics. The study was carried out in Owerri Municipal Council Area of Imo State. Based on the purpose and objectives of the study, two research questions and one hypothesis were posited to guide the study. The population of the study comprises all the teacher in early childhood care education in Owerri municipal area of Imo State which is 450 (four hundred and fifty) teachers, out of which a sample of one hundred and fifty (150) early Childhood teaches was selected for the study through simple random sampling technique (balloting). The research instrument was questionnaire validated by three experts; data collected were analyzed using Mean, Proportion and Chi-square. The study reveals that higher population of the teachers uses beats or abacus and models more than the use of fingers in counting numbers and higher proportion of teachers used whole fingers, many do not use the finger lines in teaching counting of numbers. It also observes that the use of finger counting in teaching by teachers is significantly dependent on school location. It is therefore recommended that teaching of mathematics especially at the early child care education stage should be presented in such a way that reflects the people's culture and values.*

***Keywords:*** *Finger Counting, early childhood education, cultural responsive teaching, mathematics*

## INTRODUCTION

The National Council of Teachers of Mathematics (NCTM, 2000) suggests that teachers can make connections to children's real world of experiences by stimulating their interest in mathematics. Gay (2000) defines culturally responsive teaching as using the cultural knowledge, prior experiences, and performance styles of diverse students to make learning more appropriate and effective for them. Gay (2000) also describes culturally responsive teaching as having these characteristics (1) it acknowledges the legitimacy of the cultural heritages of different ethnic groups, both as legacies that affects students dispositions, attitudes, and approaches to learning and as worthy content to be taught in the formal

curriculum; (2) it uses a wide variety of instructional strategies that are connected to different learning styles; (3) it builds bridges of meaningfulness between home and school experiences as well as between academic abstractions and lived socio-cultural realities. According to Hartfield, Edwards, Bilter and Morrow (2000), culturally relevant teaching in mathematics provides two important aspects.

a) a recognition that mathematics has been present in every culture since societies have had recorded histories, and

b) The effect of mathematics on any culture and its people.

Culturally, relevant teaching embeds in the child the culture of the society which is reflected in the curriculum in order to validate that culture and to transcend the negative effects of the dominant culture (Ladson- Bulings, 1994). In Culturally responsive teaching, the teacher is required to incorporate element of pupil's culture in instruction, that is moving beyond cursory examples of food, festivals, and holidays (Irvine and Armenfo, 2001). Understanding how children in a given culture construct concepts of procedures for addition and subtraction may require knowing how that culture uses fingers among other objects to show numbers, as well as knowing the structure of its number – word sequence, (Bideaud, Meljac and Fischer,1992) for proper understanding of mathematics and to further eliminate phobia which characterizes the present day teaching and learning of mathematics in our schools. The teaching of basic operations in mathematics especially at the early child care education level starts with simple number counting, then goes on to the process of addition, establishes subtraction method and so on though there may be limitations to the system. Using fingers allows the teachers and pupils to explore different possibilities for learning. It would be interesting to investigate the method of finger counting, and specifically how finger counting strategies are introduced and subsequently, used with children. This work therefore seeks to elicit response from early childhood teachers on using counting strategies in early childhood education as a basis for culturally responsive teaching in kindergartens.

The purpose of this study is to elicit responses from early childhood teachers on their use of counting strategies in early childhood education as a basis for culturally responsive teaching and to ascertain the extent finger counting technique is adopted in teaching children in the kindergarten class. Specifically, the study will determine;

1. Teachers approach in teaching number counting.
2. The proportion of kindergarten teachers that use finger counting in teaching numbers in the class.
3. Whether the use of finger counting technique by teachers is significantly dependent on school location.

As a guide to the study, the hypothesis below was formulated.

$H_0$1: The use of finger counting technique in teaching numbers by kindergarten teachers is not significantly dependent on school location.

## Counting and the Role of Finger

Children that were taught the use of fingers by their parents at home before moving to the formal school setting do make good use of their fingers when it comes to number counting. They start with counting the fingers on one hand with the help of the other hand and then


**ISSN: 2141-6753**

the counting shifts to fingers on the other hand and even toes as the case may be. However, the counting does not end with palms of the hands facing up; the joints on each finger are also taken into account. As each finger represents a number, likewise, each line of the finger is assigned a number in the counting process. The base and tip of each finger is also assigned a number in the counting process. The base and tip of each finger is also taken into account and represents the bottom and top line, respectively as in-between the fingers there are two visible line marks. Therefore, each finger represents four lines, which involves the base, the two subsequent lines (joints), and the tip of the finger, the base and the top being the lowest and highest of the four numbers, respectively.

Number counting starts with the little finger and the thumb is usually used as the pointer. The thumb is moved (up and down) counting the lines on the rest of the four fingers. Normally, the base of the little finger is considered as number one. As the thumb (being used as the pointer) moves up, it counts two, three, and four. Next, the thumb goes to the base of the ring finger and resumes the counting process. Now, it starts with five, six, seven and eight. This continues until the thumb comes to the tip of the index finger, where the count ends. At this point, the index finger becomes the pointer and counts the four lines of the thumb, starting from the base. When finger lines of both are used, then, a total count of 40 can be achieved. This constitutes the first round of counting. Alternatively, if we are to use whole fingers only, then the maximum number that we can count is 10. In some cases this poses limitations. For example, if we give eight apples and four oranges to a child and ask the child to count the total number of apples and oranges the child may face some difficulty as he has only 10 fingers to count with. In this case number counting with finger lines is helpful, as the child can do the counting using only one hand.

Sometimes, it may be necessary to go through two or three rounds to complete the required counting. For example, if the child needs to count 60 he may use finger lines on one hand and repeat three times to reach the total count of 60. It is interesting to note that for over 1000 years some pupils in the rural communities still make use of seashells in common counting method. In fact, as history reveals, some specific seashells were used as currencies during the olden days. These shells were considered precious since it was the only means of buying and selling in the Nigerian olden days. Although the currency has changed, still in some villages the tradition of using seashells yet continues to be one of the prime elements in number counting. Such activities are also culturally relevant for children living near beaches and shores. If seashells are not available, then pebbles can be used as substitute. The use of these objects make for better retention as the concept taught relates to real life rather than being abstract.

**Finger Counting Strategies and the Learning of Mathemetics**

Over the years, experience indicates that counting strategies adopted by children are also born out of necessity, for example, it is important for people in the rural area to teach mathematics to their children at an early age, as their children assist them in cooking they have to learn the volume or quantity of water and other ingredients involved, the children accompany their parents to the market to sell goods and later get involved with record


**ISSN: 2141-6753**

keeping and other issues. Parents also give mathematical responsibilities which involved counting to these young children to handle, especially in monetary matters (like getting the balance of money, and running to the next shop to change the paper money into different denominations). Therefore, learning mathematics at an early age is essential for children. After becoming familiar with number counting, children are exposed to the next step of simple mathematical operations. This step-by-step learning prepares children to do counting mentally. These children do not depend upon external tools or any kind of mathematics apparatus like (calculators) because finger counting makes counting real and practical for them. Children brought up in this environment would use familiar objects like bottle tops, pebbles, dried orange seeds or broom sticks to learn basic counting for their own survival, whereas children brought up in urban areas would use toys or pictures and blend the traditional method of finger counting with Abacus or other manipulative objects in learning counting of numbers (Saxe, 1991).

In some cases, in order to get the child involved in learning mathematics, two objects are used to keep the child occupied, one being the finger lines and the other being an appropriate manipulative; such as Abacus, and models. As indicated earlier, other constructive ways of adding numbers include using marbles or the cloves of an orange. It is to be noted that these objects are relevant to the children, and therefore can be used by teachers as their mathematics teaching tools. However, generally, edible objects are avoided as teaching/learning tools. To teach subtraction, teachers would use the same object and in general, the process is reversed, meaning that once children have added two things they are then taught the inverse function of subtracting them by doing the opposite action. Teachers and parents should use the finger counting method and other manipulative interchangeably so as to reaffirm mathematics learning.

While these techniques are culturally relevant to children, it can be viewed as alternative mathematics learning strategies that could be explored for possible adaptation in any primary classroom teaching. Bideaud, Meljac and Fischer (1992) citing Saxe (1991), state that counting is clearly a socially transmitted activity and that children count in very different ways in different cultures. Furthermore, Box and Scott (2004) agree that the idea of counting on fingers was extended by some cultures to reach higher numbers than 10 and this was an effective method of counting that is still used worldwide today. Wright, Martland, Strafford and Stanger (2002) note that children use of finger patterns in early number contexts is extremely widespread through fingers are used in a range of ways and with varying levels of sophistication. Gelman (1982) argues that counting contributes to later mathematical-cognitive developments. Once counting has gained a cardinal meaning, children can use it to explore the numerical effects of conservation, transformations to learn addition and subtraction in mathematics (Siegler and Shrager, 1984) also to support basic operations in problems solving (Bideaud, Meljac and Fischer, 1992).

## METHOD

The researchers adopted analytical survey research design in determining the responses from Early Childhood teachers on using finger counting strategies. The population of the


**ISSN: 2141-6753**

study consisted of all the teachers in Early Childhood Care Education in Owerri municipal council area of Imo State. The researchers used simple random sampling technique (balloting) in selecting only 150 (one hundred and fifty) teachers from a total population of 450 (four hundred and fifty) early childhood teachers in the area council. These included 75 (seven-five) teachers from early childhood care rural schools and 75 (seven -five) teachers from early childhood care urban schools. The instrument for data collection was a researchers' structured questionnaire entitled: Effective Strategies for Early Childhood Teachers in Counting of Numbers (ESETCN). The instrument was a four point likert type questionnaire, and served as a checklist to determine the approaches used by teachers. The validity of the instrument was ensured by three experts in Measurement and Evaluation for content and face validity.

The items were subjected to further scrutiny for internal consistency using the Cronbach alpha method to obtain an index of 0.83. The teachers' responses were used to determine the approaches and proportion of teachers that use finger counting. The analysis was done based on a mean response of 2.5 on a four point likert scale, whereby mean responses above 2.5 were accepted and mean responses below 2.5 were rejected. The null hypothesis was tested using chi-square statistics to ascertain any significant difference in the use of finger counting by urban and rural teachers at an error level of 0.05.

## RESULTS AND DISCUSSION

Table1 indicates that the mean response of teachers who use beads/Abacus and models/ objects in teaching counting are 3.43 and 3.70 respectively. The response shows a high positive skew above the mean response of 2.50.The teachers' response to the use of broom stick and whole fingers respectively indicates an acceptable value of 2.57 each, indicating a slight positive skew above the mean response of 2.50. However, the use of finger lines indicated a mean response of 1.94 by the teachers which is far below the acceptable mean of 2.50. The table 1 further shows that 80 teachers agreed to the use of whole fingers in teaching, representing a proportion of 0.53 while 70 teachers disagreed to the use of whole fingers, representing a proportion of 0.46. Further, for the use of finger lines, only 22 teachers agreed the use in teaching, representing a proportion of 1.46 while 128 teachers did not use finger lines representing a proportion of 0.85.

The calculated Chi square value is 38.84 while the table value at one degree of freedom at 0.05 is 3.841.Since the calculated value is greater than the table value, we reject the null hypothesis that the use of finger counting techniques in teaching numbers by kindergarten teachers is not significantly dependent on school location. The result indicates that most teachers use beads and Abacus, whole fingers and finger lines, broom sticks, models and objects in teaching counting. The analysis reveals that a higher population of the teachers uses beads or abacus, and models more than the use of fingers in counting. It is observed that though a higher proportion used whole fingers, many do not use the finger lines in teaching counting. Box and Scott (2004) insist that finger counting is embedded in the culture and should be considered while infusing mathematics skills to young minds, the


**ISSN: 2141-6753**

researchers are of the view that teachers non-use of fingers and finger lines may be as a result of a mind set that use of fingers are outdated and old fashioned. Wright Martland, Stafford and Stanger (2002) assert the use of fingers is very reasonable to ensure that children learn using a culturally relevant and easily manipulative approach. This they suggest would aid the children in learning process, this view is supported by the researchers. The findings also show that the use of finger counting in teaching by the sampled teachers dependent on school location. The significance dependence may not be unconnected with Saxe (1991) observation that children brought up in the rural environments are likely to make use of familiar objects like fingers, broom sticks, or orange seeds for their own survival in learning counting while children in urban environment would use toys, pictures and modern objects to blend the traditional method. This explains why teachers in the rural areas still prefer the use of fingers and broom sticks. This, according to the research, provides culturally responsive teaching whereby the teachers used what the children are already familiar with; this will engage the children meaningfully and sustain their interest.

**Table 1**: Teachers' approaches to teaching counting of numbers

| Approaches | SA(4) | A(3) | D(2) | SD(1) | Total | Mean Response | Decision |
|---|---|---|---|---|---|---|---|
| Use of beads/Abacus | 100 | 25 | 15 | 10 | 515 | 3.43 | Accepted |
| Use of broom sticks | 45 | 35 | 30 | 40 | 385 | 2.57 | Accepted |
| Use of whole fingers | 45 | 35 | 30 | 40 | 385 | 2.54 | Accepted |
| Use of finger lines | 10 | 12 | 87 | 41 | 291 | 1.94 | Rejected |
| Use of models/objects | 120 | 20 | 5 | 5 | 555 | 3.70 | Accepted |

***Source:*** Analytical Survey, 2013

**Table 2**: Chi-square table

| O | E | O – E | $(O – E)^2$ | $(O – E)^2/E$ |
|---|---|---|---|---|
| 22 | 41 | -19 | 361 | 8.80 |
| 53 | 34 | 19 | 361 | 10.62 |
| 60 | 41 | 19 | 361 | 8.80 |
| 15 | 34 | -19 | 361 | 10.62 |
| | | 0 | | 38.84 |

***Source:*** Analytical Survey, 2013

## CONCLUSION AND RECOMMENDATIONS

Culturally, relevant teaching is very important especially at this time when the young ones seem to have lost trend with cultural values and ethics following the importation of foreign values and habits. This foreign habit which is easily imbibed by youngsters has hampered effective learning of various concepts in schools. The use of fingers and finger lines as well as other strategies in teaching mathematics especially at the early childhood education serves as a basis for culturally responsive teaching. This method though have been in practice for many years irrespective of cultural orientation seem to have been abandoned by today teachers and should be revisited and effectively utilized in teaching young children so as to sustain their interest especially in mathematics. This study was therefore designed to elicit responses from early childhood teachers on their use counting strategies in early


**ISSN: 2141-6753**

childhood education as a basis for culturally responsive teaching and to ascertain the extent finger counting technique is adopted in teaching children in the kindergarten class. One hundred and fifty Early Childhood Teachers participated in the study. The null hypothesis was tested using chi-square statistics to ascertain any significant difference in the use of finger counting by urban and rural teachers at an error level of 0.05. The analysis reveals that a higher population of the teachers uses beads or abacus, and models more than the use of fingers in counting. It is observed that though a higher proportion used whole fingers, many do not use the finger lines in teaching counting. Based on the findings the following recommendations are made:

1) Teachers and parents are advised to use finger counting method for children so as to reaffirm culturally based mathematics learning.
2) Teachers of young children are advised to use other manipulative (like beads, Abacus, bottle tops, pebbles, dried seed orange) when teaching counting of numbers.
3) The teaching of mathematics especially at the early child care education stage should be presented in such a way to reflect the people's culture and values.

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**ISSN: 2141-6753**