



Numeracy Skills Of Children With And Without Hearing Impairment As Per Nipun Bharat Guidelines For Grade 1&2

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Abstract

Literacy encompasses the capacity to read, write, and handle numerical information in everyday situations. The initial phase of developing mathematical skills in young learners is essential for comprehensive growth. Numeracy, a crucial aspect of literacy, involves the capability to comprehend and manipulate numbers, as well as perform elementary mathematical operations. The development of numerical aptitude fosters logical reasoning and enhances problem-solving and decision-making abilities in children. The National Educational Policy 2020 emphasizes the importance of basic numeracy skills. It aims for all students to master these skills by grade 3, recognizing them as essential for future learning. A national objective aims to ensure that every child attain numeracy proficiency as per NIPUN Bharat guidelines under National Educational Policy 2020. It targets children aged 3 to 9, encompassing foundational literacy skills from preschool to third grade. The presents research selected 'numeracy skill' from Nipun Bharat guidelines as foundational literacy skills. The participant sample comprised two cohorts: Group A (n=30), consisting of children with hearing impairment, and Group B (n=30), consisting of children without hearing impairment and to study the aim to examine the grade I achievement levels in numeracy, and to determine if a significant difference exists between two groups. These participants, meeting specific criteria, were randomly chosen and given a researcher made test which was validated by field experts as part of the data collection process. The results were analyzed using descriptive and t-test were conducted to compare numeracy skills, as per NIPUN Bharat guidelines. The results indicated a statistically significant difference between the groups overall achievement levels.

Keywords: Foundational numeracy skills, achievement, children with hearing impairment, children without hearing impairment.

Introduction

Education is a fundamental right of all children, including those with disabilities. The National Policy for Persons with Disabilities (2006) underscores the importance of education and advocates for necessary modifications in curricula, pedagogical strategies, and school infrastructure to facilitate the learning process for children with disabilities from foundational stage. The RPWD act (2016) obligates both governmental and private educational institutions to ensure equitable, accessible, and barrier-free education for children with benchmark disabilities. The act mandates the implementation of measures to prevent discrimination in educational settings and necessitates the provision of reasonable accommodations, assistive technologies, and individualized support to facilitate age wise strong foundation from early stage. Act stipulates provisions for scholarships, guarantees free education up to the age of 18 in government and government-aided institutions. The national education programme Sarva Shiksha Abhiyan (SSA, 2002) with zero rejection policy was implemented to achieve the universalization of elementary education. The program emphasizes the importance of early reading, writing, and arithmetic, often referred to as the three 'R's, under the slogan "Padhe Bharat Badhe Bharat". This initiative seeks to strengthen foundational literacy and numeracy skills among all children, including those with disabilities.

Foundational numeracy skills are essential for a child's cognitive development and overall academic success. These basic mathematical abilities, such as number recognition, counting, addition, subtraction, and

understanding patterns, form the building blocks for advanced mathematical thinking and problem-solving. Strong numeracy skills enable children to develop logical reasoning, critical thinking, and decision-making abilities, which are crucial not only in academics but also in daily life. Whether managing finances, interpreting data, or understanding measurements, numeracy is a fundamental skill that enhances independence and confidence. Early numeracy development also plays a key role in bridging learning gaps and ensuring smooth transitions to higher education and professional careers. Research has shown that children who develop strong foundational numeracy skills in early childhood are more likely to excel in subjects like science, technology, and economics, contributing to their long-term success. Additionally, numeracy fosters creativity and innovation, as it helps individuals analyse patterns, recognize trends, and develop problem-solving strategies. In the context of a rapidly advancing digital world, where data literacy and quantitative reasoning are increasingly valuable, a strong foundation in numeracy is more important than ever. Governments and educators worldwide emphasize the need for early interventions, quality teaching methods, and engaging learning environments to strengthen numeracy skills from a young age. Without these skills, students may struggle with academic performance, face difficulties in higher education, and encounter challenges in employment and everyday life. Therefore, ensuring that every child acquires foundational numeracy skills is critical for personal empowerment, social development, and national economic growth. The initial years of a child's education are pivotal for the acquisition of

foundational numeracy skills, which are essential for comprehending various subjects and enhancing overall comprehension abilities. This is particularly significant for children with hearing impairments, who often exhibit lower levels of numeracy skills compared to their hearing peers. To address this disparity, various initiatives have been implemented at both national and state levels in India.

National Education Policy (NEP) 2020 underscores the critical importance of foundational literacy and numeracy. The policy aims to ensure that all students achieve proficiency in these fundamental skills by grade III, recognizing them as prerequisites for future learning and holistic development. Evaluating the foundational numeracy skills of children who have completed grade I is vital for several reasons. It offers insights into the prevailing achievement levels of both hearing and hearing-impaired children, facilitating the identification of discrepancies between anticipated and actual performance. Such evaluations are crucial in guiding the formulation and execution of targeted remedial interventions, ensuring that children who have not yet achieved mastery receive the requisite support prior to advancing to higher grades. On July 5, 2021, the Ministry of Education (MoE) launched the National Initiative for Proficiency in Reading with Understanding and Numeracy (NIPUN Bharat), aiming to ensure that every child attains foundational literacy and numeracy by the end of grade III. The overarching goal is to create an environment conducive to the universal attainment of fundamental literacy and numeracy skills by 2026–2027, ensuring that all children achieve the desired learning outcomes in reading, writing,

and numeracy by the end of third grade, and no later than fifth grade. As per the guidelines, the skill development should be age and grade-wise appropriate. The indicators included under numeracy skill for grade- I are – (i) Counting up to 20; (ii) Read and write numbers up to 99; (iii) Using addition and subtraction numbers up to 9 in daily life situations; (iv) Observe and describe the physical properties of 3D shapes; (v) Estimates and verifies the length using non-standard non-uniform units; (vi) Creates and recites short poems and stories using shapes and numbers.

Manchishi (2015), reported strong evidence that CwHI encounter a variety of math-related challenges both before and during their time in formal education and these challenges may be the cause of these students' ongoing low achievement in numeracy and problem-solving and recommended a positive and encouraging learning environment, and efficient teaching techniques, which will have a solid and thorough base upon which to build their future mathematical education. Assessing the foundational numeracy skills of children who have completed grade I is essential for several reasons. It establishes a baseline to evaluate the achievement levels of both hearing and hearing-impaired students, facilitating the identification of discrepancies between expected and actual performance. This assessment is crucial for informing the design and implementation of remedial interventions to support students who have not yet achieved mastery, thereby preventing future academic challenges.

These findings underscore the critical need for early and targeted interventions to address the widening academic disparities experienced by

students with hearing impairments. Hence, a survey was undertaken with the objective of studying and comparing the achievement levels of grade-I children with and without hearing impairment in 'Numeracy' as per Nipun Bharat guidelines.

Methodology

Descriptive survey approach was considered to study and compare the achievement of Group-A & B in 'Numeracy' based on the NIPUN Bharat guidelines for grade-I. Best and Kahn (2006) observed that a descriptive survey as a research design that aims at describing, recording, analyzing, and interpreting existing conditions that yield valid and reliable education research results. Hence, a descriptive survey was followed for the present study.

Participants

In order to study and compare the foundational literacy skill of 'Numeracy' of children with and without hearing impairment of grade- I, 30 students with hearing impairment from special schools (Group-A) and 30 without hearing impairment from mainstream schools (Group-B) were randomly selected using lottery method as participants for the present study. All of them had completed grade-I and are enrolled in grade-II during the current academic year. The researchers took permission from the principals of both special and mainstream schools in Mumbai prior to the selection of participants. Group -A had hearing loss of 60 dB or more in the better ear, while Group-B had hearing within the normal limits.

Tool

A teacher-made test was developed based on guidelines given by NIPUN Bharat for grade-I for data collection. The below table shows the foundational numeracy skill, subskills included as a part of tool development.

Table 1. Planning of the test

Subskills	Marks Items	No. of
Counting up to 20	6	12
Read and write numbers up to 99	6	12
Using addition and subtraction numbers up to 9 in daily life situations	6	12
Observe and describe the physical properties of 3D shapes	6	6
Estimates and verifies the length using non-standard non-uniform units	3	2
Creates and recites short poems and stories using shapes and numbers	3	3
Total	30	47

Initially, a total of 67 items were developed for tool validation. The draft tool was validated with the support of 5 subject experts. From the items marked as 'relevant' by the majority of the judges, 47 items were finalised. Pilot study was carried out on two children with and without hearing impairment. The feedback received was reviewed

and incorporated while finalising the test in Hindi and English. Thus, the final test was ready for use. The sample items are given in table 2

Table 2. Sample items in the developed test

Sample items with subskills

Subskill -1: Counting up to 20

Items:

Section- I: Count and tick mark the correct number

1. 

5	1	2	3
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2. 

9	8	6	7
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Section- II: Match the number with pictures

7 



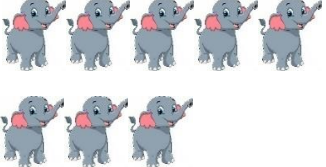


17 



Section- III: Count and write the correct number

i. 

ii. 

Subskill-2: Read and write numbers up to 99

Items:

Section I. Answer the following

1: Read the numbers given below and tick the correct number

i) 42

Four	Two	Forty-two	Twenty-four
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ii) 89

Eight	Nine	Ninety-eight	Eighty-nine
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2: Read the number word given below and write it in numerical form

i) Forty-eight

ii) Sixty-eight

3: Fill in the blanks and write the missing number

i) 60 ----- 62 ----- 64 -----

4: Counts in tens (Fill in the missing numbers in given boxes)

i) 10 ----- 30 -----

ii) 50 ----- ----- 80

Subskill-3: Using addition and subtraction number up to number 9

Items:

Section- I: Add the following

1. Add and write down the correct number.

i)  +  =

2. Add the given numbers and write

i) $9 + 4 =$

3. How many more to add?

i) $5 +$ $= 7$

4. Subtract and write the correct number

i)  -  =

5. Subtract the given numbers and write

i) $8 - 4 =$

physical properties of 3D shapes

Items:

Section I: Answer the following items

1. Look at the object and tick mark the correct shape

i) **Blackboard**



2. Color the correct shape

ii) **Rectangle**



Subskill-5: Estimates and verifies the length using nonstandard non-uniform units

Items:

Section-I: Do as directed

1. Measure the distance from the door to your seat by your footstep.

2. Measure the length of a scale with a matchstick.

Subskill-6: Creates and recites short poems and stories using shapes and numbers

Items:

Section -I: Do as directed

1. Make a Poem

i) Circle or square

ii) Numbers or addition or subtraction

Subskill-4: Observe and describe the

Data Collection

As a part of data collection, initial contact was established with special and mainstream schools, followed by obtaining formal permission from schools, followed by obtaining formal permission from school principals. A data collection scheduled was subsequently finalized. The researcher – administered test and then conducted with both Group-A (Students with hearing impairment) and Group -B (Students without hearing impairment). All 60 answers script (Group- A, 30 from students with hearing impairment and Group- B, 30 students without hearing impairment) were collected, evaluated, and subjected to descriptive statistical analysis and 't' test.

Results

Achievement of Literacy skill 'Numeracy' among Group-A & B.

The 't' test for equality of means was applied for testing the null hypothesis. The calculated value of 't' was 2.24 and the corresponding 'p' value at degree of freedom (df) 51.03 was found to be .029, which was less than the standard value of 'p'(0.05). Thus, the result obtained was that there exists a significant difference between the achievement of children with and without hearing impairment in the foundational literacy skill of 'Numeracy' of grade-I as per NIPUN Bharat guidelines.

Levels of achievement of Grade-I children with and without hearing impairment in 'Numeracy'

The researchers attempted to answer the question of what percentage of grade-I CwHI has (i) good (ii) average (iii) poor achievement in 'Numeracy'

as per NIPUN Bharat guidelines. The marks obtained by the CwHI (Group-A) on administration of the test were considered. In order to determine the levels of achievement, the researcher calculated the mean and standard deviation of Group- A from the obtained scores. The obtained value of mean was '20.65' and the standard deviation was '4.40'. The obtained value of 'Mean + 1Standard Deviation' was 25.05 (25) and 'Mean - 1Standard Deviation' was 16. 25 (16). Those who obtained a score within the range 0-16 were considered as 'poor' achievers, and those who scored within the range >16-25 were considered as an 'average' achievers, and those who scored within the range >25-30 were considered as a 'good' achievers. The percentage of CwHI and their levels of achievement are mentioned in table 3.

Table 3. Level of Achievement in Numeracy of Group- A

Parameter Sample	Level of achievement		
	30 Good (>25-30)	Average (>16-25)	Poor (0-16)
Numeracy of Group- A	3 (10%)	21 (70%)	6 (20%)

From Table 3, It can be observed that out of the total number of children with hearing impairment, the achievement of only 3 children (10%) were found to have 'good ' in Numeracy. The achievement of 21 children (70%) was found to be 'average' and the remaining 6 children (20%) was 'poor'.

In order to answer the research question of what percentage of grade-I children without hearing impairment has (i) good (ii) average (iii) poor achievement in 'Numeracy' as per NIPUN Bharat guidelines, the marks obtained by the children without hearing impairment on the administration of the test were considered. The obtained values of mean (22.8) and the standard deviation (2.98) were used for calculating the levels of achievement. Those who obtained a score within the range 0-20 were considered as a 'poor' achievers, and those who scored within the range >20-26 as an 'average' achievers and those who scored within the range >26-30 will be considered as a 'good' achievers. The percentage of children without hearing impairment and their levels of achievement are mentioned in table 4.

Table 4. Levels of Achievement in Numeracy of Group-B

Parameter	Sample	Level of achievement		
	30	Good (>26 -30)	Average (>20 -26)	Poor (0-20)
Numeracy of Group- B	4 (23.33%)	20 (63.33%)	6 (13.33%)	

From Table 4, it can be observed that out of the total number of children without hearing impairment, the achievement of 4 children (23.33%) were found to be 'good' in Numeracy while achievement of 20 children (63.33%) were found to be 'average' and the remaining 6 children (13.33%) were 'poor'. Thus, the result obtained was that the achievement in Numeracy of 23.33%

of grade-I children without hearing impairment was good, 63.33 % average and the remaining 13.33% was poor.

Educational Implications

The results obtained could be analyzed in consideration of the following.

The majority of children with hearing impairment encountered difficulties in responding to word problems compared to their hearing peers. Mathematical language typically differs from conversational language. Mathematical vocabulary such as measure, distance, length, etc., is not frequently utilized, and consequently, these students may have experienced challenges in comprehending questions like 'measure the distance from the door to your seat by your footsteps' and 'measure the length of your book with a match stick'. Furthermore, some of them faced difficulties even in solving word problems based on subtraction. In contrast, the majority of children without hearing impairment demonstrated no issues in solving mathematical questions. Some of the children with hearing impairment may have also experienced difficulties in comprehending the questions while reading.

Mathematical concepts are inherently abstract rather than concrete, making them challenging for CwHI learners to grasp. According to Haynes (2012), Deaf and hard-of-hearing students often struggle with various aspects of mathematics, including number comparisons, calculations, rote counting, number facts, numeral literacy, mathematical concepts, measurement, word problems, multiplication, and fractions. This

distinction highlights the unique challenges they face in mathematical learning.

As a solution, Paul (1995) emphasized the importance of integrating mathematics text comprehension activities into teaching programs to enhance the learning experience of CwHI students.

Developing literacy is a key objective of early childhood education. School preparation programs aim to equip both children with hearing impairments (CwHI) and those without with essential numerical skills, including abstract concepts and application-based problem-solving, to strengthen their foundational numeracy abilities.

Although children with hearing impairments receive equal learning opportunities, they often require additional support. Due to their hearing loss, they may not attain full mastery of numeracy skills as easily as their hearing peers. They also face challenges in acquiring both natural and structured learning experiences that contribute to numeracy development.

The present study concludes that children with hearing impairments represent a diverse group with varying levels of achievement in numeracy. While the majority performed at an average level, children without hearing impairments generally outperformed their hearing-impaired peers. Both groups showed average scores overall, but CwHI particularly struggled with application-based questions and abstract numerical concepts. Since mathematical concepts are inherently abstract rather than concrete, CwHI often find them more difficult to comprehend. Another contributing factor may be the role of informal mathematical

learning, which typically occurs outside the classroom and lays the foundation for formal mathematical knowledge (Ginsburg et al., 1998). Deaf children tend to lag behind in mathematics at school, reinforcing the need for specialized instructional methods. Chen (2021) also emphasized that tailored teaching strategies should be employed when teaching mathematical concepts to learners with hearing impairments.

Although both groups demonstrated bit similar overall performance in numeracy, some CwHI faced significant challenges with abstract concepts and application-based questions, requiring additional teacher support. To ensure that all children develop strong foundational numeracy skills, in line with NIPUN Bharat guidelines, stakeholders must take proactive measures from the early years to support and encourage their learning.

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