Foundational Literacy and Numeracy National Achievement Survey-2022

ASSESSMENT FRAMEWORK

शिक्षा मंत्रालय
भारत सरकार
सत्यमेव जयते

विद्यया ऽमृतमश्नुते

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NCERT

**Foundational Literacy and Numeracy
National Achievement Survey 2022**

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FRAMEWORK

Preface

Education is the cornerstone of progress and prosperity for any nation. It is through education that we empower individuals to unlock their full potential and contribute meaningfully to society. Recognizing the transformative power of education, the Government of India launched the National Initiative for Proficiency in Reading with Understanding and Numeracy (NIPUN) Bharat in July 2021. This visionary initiative, aimed at ensuring that all children attain foundational skills by the academic year 2026-2027, underscores our commitment to providing quality education for every child, regardless of their background or circumstances.

At the heart of the NIPUN Bharat initiative lies the Foundational Learning Study (FLS), a comprehensive assessment conducted by National Council of Educational Research and Training (NCERT) across India. The Foundational Learning Study, undertaken in March 2022, represents a crucial step towards understanding and addressing the learning needs of Grade 3 students across India.

The primary aim of the Foundational Learning Study was to draw a first-hand understanding of students' learning levels at the foundational stage, with a specific focus on two key goals: effective communication and informed learning. Through a series of tasks designed to assess foundational literacy and numeracy, the study sought to identify areas of strength and areas for improvement, thereby informing targeted interventions and policy reforms.

One of the defining features of the Foundational Learning Study was its inclusive approach, with assessments conducted in 20 languages to ensure representation and accessibility for all learners. This commitment to linguistic diversity reflects our belief in the importance of providing education in the language of the learner, thus fostering greater inclusivity and cultural relevance.

Following the administration of the study, a comprehensive benchmarking exercise was undertaken to contextualize students' performance levels and set language-specific benchmarks for oral language fluency and reading comprehension. These benchmarks, informed by empirical data and best practices, serve as essential reference points for educators, policymakers, and researchers as they work towards improving educational outcomes.

The dissemination of the Foundational Learning Study findings at both the National and State levels mark the beginning of a new phase in our educational journey. This report offers detailed

insights into the nuances of foundational learning, providing a roadmap for targeted interventions and policy reforms.

This prodigious task could not have been achieved without the active partnership and association from all the SCERTs, SIEs and the SPDs office of the different States and UTs. The completion of this astounding work also entailed a dynamic technical collaboration with UNICEF, India. I would like to express my gratefulness to Mr. Terry Durnnian, Chief, Education, Mr. Ramchandra Rao Begur, Education Specialist, Mr. Ganesh Kumar Nigam, Education Specialist and Ms. Sunisha Ahuja, Education Specialist.

As we embark on the next leg of our journey towards educational equity and excellence, let us remain steadfast in our commitment to providing every child with the opportunity to realize their full potential. Together, we can build a future where education is not just a privilege but a fundamental right for all

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INTRODUCTION

Foundational or early years of life is the stage when children achieve key learning milestones in in different domains. The time duration spanning a period of initial 8-9 years is very crucial for the development of cognitive and socio-emotional skills of the child. The brain malleability shows a sharp decrease after the age of seven years and therefore it is important to maximise children learning during this period. Learning at the foundational stage is crucial as early development and learning are consistently linked with education attainment in school and in adulthood, physical and mental health, social outcomes, employment, earnings, socio-economic status, civic engagement and self-reported happiness[1]. Foundational Literacy and Numeracy (FLN) skills are not only foundational for learning but are correlated with greater quality of life and personal wellbeing is critical for better educational outcomes in later years.[2] Overall, focusing on 'learning achievement' in the foundational years is pertinent in order to provide the learners with background capabilities to make their subsequent learning experiences more meaningful and absorbing.

While the dimensions of learning can be manifold, the basic ability of reading with comprehension, writing and an understanding of the basic mathematical concepts (such as numbers, patterns etc.) relate to core learning goals at the foundational stage. Therefore, it is crucial to provide appropriate care and learning opportunities to the child in the early/foundational years enabling them to achieve the learning levels pertaining to Foundational Literacy and Numeracy.

National Education Policy (2020) highlights "the ability to read and write, and perform basic operations with numbers, is a necessary foundation and an indispensable prerequisite for all future schooling and lifelong learning". While as a country we have successfully addressed the aspect of access to education, the quality of learning is the immediate and central focus now. At various stages of school education, there is a common concern of the poor learning levels of children. NEP 2020 highlights that

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[1] https://www.oecd-ilibrary.org/education/international-early-learning-and-child-well-being-study-assessment-framework_af403e1e-en

[2] https://www.education.gov.in/sites/upload_files/mhrd/files/NIPUN_BHARAT_GUIDELINES_EN.pdf

over 5 crore children studying at the elementary stage have not achieved foundation literacy and numeracy skills. Acknowledging and highlighting this learning gap, the NEP-2020 accord special focus to FLN and mentions this as 'the highest priority area for the school education system'.

Following the policy mandate, the programme to focus on Foundational Learning and Numeracy has been initiated by the Ministry of Education (MoE) in a mission mode. The FLN Mission aims to ensure that all the children by the end of grade 3 achieve foundational learning standards by the year 2026-27. Under the FLN mission, the 'National Initiative for Proficiency in Reading with Understanding and Numeracy' (NIPUN- BHARAT) guidelines provide the roadmap for strengthening the domain of foundational learning at the national level.

Foundational learning comprises of integrated and holistic development of the child. The three development goals (as also explained in the NIPUN BHARAT Mission document) that are crucial for this stage relate to - children maintaining good health and wellbeing, children becoming effective communicators and children becoming involved learners and connecting with their immediate environment. This understanding forms the background of the assessment framework for the foundational learning stage.

As a crucial step in this direction, a large-scale assessment & benchmarking study for foundational learning has been undertaken by NCERT and will be administered in the year 2022. The study aims to draw a first-hand understanding of the learning levels of the students at the foundational learning stage (Grade 2 and Grade 3). Assessing foundational literacy and numeracy skills through a large scale achievement survey provides the opportunity to assess the process and functioning of the education system at the foundation stage in terms of students' learning levels. It also provides a generalised understanding of the long-term ability of our young learners to learn and progress in the subsequent years. The data and understanding thus obtained is critical as the success of the efforts aimed at school education is actually a derivative of the how well our education system is doing in terms of helping the children achieve foundational skills of language, literacy and numeracy. Understanding the foundational learning levels also propel the advocacy of the learning during initial

years. This not only benefits individual learners but their families and society as a whole. Overall, FLN-ORF 2022 study is envisioned to be positioned as a subsystem study under the main National Achievement Survey (NAS)- 2021 to extrapolate and understand the learning levels vis-à-vis the advancement in the grades. In the context of our country, it is the first large-scale assessment of learning at the foundational stage.

The fundamental goal of the study is to facilitate an understanding of the learning up to grade 3 for the following two goals and to design the intervention strategies-

- Children Becoming Effective Communicators

- Children becoming involved learners and connecting with their immediate environment.

The study aims to provide reliable, valid and comparable data that can be used to monitor the performance of the system in giving children a robust foundational education. The study is conceptualised and planned to

- Establish reading proficiency benchmarks for fluency and comprehension for each of the languages being assessed under the study and establish 'numeracy' benchmarks for the foundational learning stage.

- Providing the data for SDG 4.1.1. (covering aspects of foundational language and numeracy)

SIGNIFICANCE OF ASSESSMENT FRAMEWORK

An assessment framework is a comprehensive document that provides the background rationale for the assessment, its design, and development and administration protocols. At the very basic level, an assessment framework outlines the areas considered relevant for assessment and what the assessment results mean. Further, an assessment framework captures subject/domain and grade specific core and measurable learning outcomes that are being focused in the assessment. These learning outcomes reflect the age and developmental stage appropriate learning targets or *lakshyas* for leaners in different grades.

The present framework provides a narrative description regarding the key features of the assessment survey. The framework gives a comprehensive understanding/ conceptual map of the overall targets or learning outcomes for key goals and domains (literacy and numeracy) of development at the foundational level. Also, in tandem with the core aspects of an assessment framework, this document also provides the details and rationale of design, development and implementation aspects of the 'Foundation Literacy and Numeracy' National Achievement Survey 2022. The framework includes an explanation of the

- Assessment design and structure of assessment task booklets

- Sequencing of domains of assessment in the booklets

- Distribution of focused learning outcomes across the task booklets

This documentation also facilitates the design and administration of the subsequent cycles of the survey and aids in the process of comparability of results. It is critical to understand that an assessment framework is not a closed and rigid conceptualization of a certain assessment study. Rather, it must be responsive to the changes in the domain of education.

HOW DOES FLN-ORF DIFFER FROM NAS

1. **Age/Grade level of the students to be assessed in the study-** While NAS has its focus on class 3, 5, 8 and 10, FLN-ORF focuses on learning achievement of children in class 3. Assessing grade 1 and grade 2 students may not be appropriate as they should not be subjected to any standardised large scale learning assessment. Therefore, children studying in class 3 will participate in the survey. The focus of FLN-ORF is on assessing the foundational skills in language, literacy and cognitive skills as children would transition to primary classes thereafter.

2. **Parameters of students testing-** Similar to FLN-ORF, NAS also assesses class 3 students. However, while NAS focuses on the assessing the reading comprehension and mathematics outcomes of class 3 students, the focus in FLN-ORF is on assessing the learning levels of class 3 students in the domains of foundational literacy and numeracy. The *Lakshyas* corresponding to class 3 as detailed out in the NIPUN guidelines are the outcomes focused in the FLN-ORF study.

3. **Objective-** NAS provides decentralised systemic feedback on student achievement at different levels. In the context of FLN-ORF, the focus is on capturing a system level understanding of the foundational stage proficiencies in class 3 students. Class 3 is the important transition point for the learners and ensuring the attainment of foundational learning goals is essential by the end of class 3.

4. **Administration-** Unlike NAS which is a written assessment administered on group of students at the same time, FLN-ORF is conceptualised as a school based survey with oral and performance based test in a one on one setting. The test needs to be administered by trained Field Investigators with the assistance and participation of the teachers to help the child feel comfortable and to maintain the element of familiarity for the child.

ASSESSMENT DESIGN FOR FLN-ORF 2022

Curricular Areas to be tested

The FLN Mission focuses on key learning goals pertaining to the learning at the foundational stage. These goals relate to children becoming effective communicators and children becoming involved learners and connecting with their immediate environment. In line with the focus in the FLN Mission the learning achievement of class 3 students shall be assessed in key areas of Foundational Language and Literacy and Foundational Numeracy and Mathematical Skills. Assessing a balanced set of early skills will yield better understanding of overall learning and development trends among young children. The measurable focused learning outcomes of the FLN study as derived from the *lakshyas* and codified learning outcomes (NIPUN guidelines) have been presented in the subsequent sections for each of the two goals and domains. The table presents the goals, sub-domains and number of learning outcomes to be assessed across goals for class 3 in FLN-ORF 2022.

Table 1: Goals, sub-domains and Learning Outcomes to be assessed in FLN-ORF 2022

CLASS - 3		
Developmental Goal	**Sub domain**	**No. of learning outcomes**
1: Children Become Effective Communicators- *Foundational Language and Literacy*	Oral Language	8
	Decoding	
	Reading comprehension	
	Listening comprehension	
	Writing	
2: Children become involved learners and connect with their immediate environment- *Foundational Numeracy and Mathematical Skills*	Number and Operation	8
	Measurement	
	Shapes and spatial understanding	
	Data Handling	
	Patterns	

In large-scale assessments, each domain of interest includes a wide range of content and skills to be assessed. However, it is important that the test is not too long so as to lead to **student testing load**.

In the context of the FLN study, student testing load refers to the total number of tasks the students will perform and the number of items they will respond to. As young children have relatively shorter attention span and may get distracted more easily, it is important to design immersive and engaging tasks/items.

Another important consideration is – the set of items that each student takes should provide a *valid, reliable, and interpretable measure* of student learning. To ensure **validity**, the items/tasks should be developed in consonance with the sub-domains and focused learning outcomes charted out for the particular class. To ensure **reliability**, there should be a sufficient number of observations from which a student score is derived. And finally, to ensure **interpretability and meaningfulness,** a student score is being matched with performance standards to enable its evaluation in terms of the performance levels. There are comprehensive descriptions of performance levels that are attributed to students' scores classified into these levels, which assumes that each student's score represents sufficient evidence that can justify this attribution.

From these perspectives, FLN-ORF 2022 conceptual framework is designed to enhance validity, reliability, and interpretability of the derived measures of student learning.

Test booklets will be designed in a way that each student is only administered a fraction of all available items in the assessment. This is important in order to avoid the testing load on the child and to ensure the coverage of all the sub-domains and learning outcomes in each of the domains across booklets. A balanced incomplete block design[3] approach will be used to design test booklets and have a complete coverage of learning outcomes across the booklets. There are eight learning outcomes for each of the two goals/areas. Given the number of sub-domains to be assessed and the necessity of keeping the assessment time relatively short, the LOs for the area of foundational language and foundational numeracy have been divided into two clusters each (Annex 1).

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[3] http://edmeasurement.net/8225/Frey-Hartig-Rupp-2009-booklet-design.pdf

Table 2: *Assessment Design*

Grade 3	Set 1			Set 2			Set 3			Set 4		
	Area	New	Anchor	Area	New	Anchor	Area	New	Anchor	Area	New	Anchor
Goal	Lang (Cluster 1)	4	1	Lang (Cluster 1)	4	1	Numeracy (Cluster 1)	4	1	Numeracy (Cluster 1)	4	1
	Numeracy (Cluster 1)	4	1	Numeracy (Cluster 1)	4	1	Lang (Cluster 1)	4	1	Lang (Cluster 1)	4	1
	TOTAL	8	2	TOTAL	8	2	TOTAL	8	2	TOTAL	8	2
		10			10			10			10	

	Set 5			Set 6			Set 7			Set 8		
Goal	Lang (Cluster 2)	4	1	Lang (Cluster 2)	4	1	Numeracy (Cluster 2)	4	1	Numeracy (Cluster 2)	4	1
	Numeracy (Cluster 2)	4	1	Numeracy (Cluster 2)	4	1	Lang (Cluster 2)	4	1	Lang (Cluster 2)	4	1
	TOTAL	8	2	TOTAL	8	2	TOTAL	8	2	TOTAL	8	2
		10			10			10			10	

Following this approach, the coverage of all the outcomes will be achieved through 8 booklets. While four booklets will have the items for foundational literacy placed in the first place, the other four booklets will have foundational numeracy items placed in the beginning. Each of the LOs will be assessed by four items and anchor items will be included in all the booklets for both the areas i.e. foundational language and foundational numeracy. A sufficient number of items for the assessment of learning outcomes will ensure reliability by ensuring a number of observations from which students' scores can be derived to make inferences about performance.

Key technical aspects of booklet design based on balanced incomplete block design-

The NCME (National Council on Measurement in Education) modules specifies the following conditions that a booklet design based on balanced incomplete block designs should satisfy-

1. Every cluster (t) occurs at most once in a booklet (b). Following this each booklet have either cluster 1 or cluster 2 of foundational language and foundational numeracy.

2. Every cluster appears equally often (r) across all booklets. In sync to this condition, both cluster 1 and cluster 2 of foundational language and foundational numeracy appear four times each across the eight booklets.

3. Every booklet is of identical length, containing the same number of clusters (k). Each booklets has 10 items in total.

4. Every pair of clusters occurs together in booklets with equal frequency (λ). The pair of cluster 1 of foundational language and cluster 1 of foundational numeracy appear four times. Likewise, the pair of cluster 2 of foundational language and cluster 2 of foundational numeracy appear four times.

Item Development and Administration Guidelines

The assessment of foundational learning is designed in tandem with international best practices in large scale assessment and learning surveys. Items align with the learning outcomes/*lakshyas* given for foundational stage of learning. Item development and administration draws extensively from widely used international surveys such as Early Grade Reading Assessment (EGRA) and Early Grade Mathematics Assessment (EGRA).

There are 8 types of subtasks to assess foundational language skills of the children (Table 3) and 7 types of subtasks to assess foundational mathematics skills of the children (Table 4).

Table 3: *Subtasks to assess foundational language skills*

SUBTASKS TO ASSESS FOUNDATIONAL LANGUAGE		
Subdomain	**Subtask**	**Description**
Oral Language	*Oral language/Vocabulary*	Picture based task, answering simple questions as part of the conversation with relation to the picture
Listening comprehension	*Listening Comprehension*	Listening to a 30 word poem/text and answering retrieval and inference based questions
Decoding	*Phonemic awareness*	Identifying the intial, intermediate and end sounds in grade level words word
	Letter identification: names and/or sounds Letter name and Syllable Reading	Reading aloud 100 individual (but repeated) letters and syllables presented in the form of a grid
	Familiar Word Reading	Reading aloud 50 distinct grade level words
	Nonword Reading	Reading aloud 50 distinct nonwords
Reading comprehension	*Story Reading- Oral reading fluency with comprehension*	Reading aloud a short story of around 60-70 grade-level appropriate words and answering retrieval and inference based questions
Writing	*Writing with visual prompt*	Picture based task, framing simple sentences on the basis of the given picture

Table 4: *Subtasks to assess foundational Mathematics skills*

SUBTASKS TO ASSESS FOUNDATIONAL MATHEMATICS		
Subdomain	**Subtask**	**Description**
Numbers and Operations	Number identification and Number Discrimination upto 9999	Reading aloud 24 distinct numbers presented in the form of a grid Comparing 14 pairs of numbers to identify the bigger number
Numbers and Operations	Addition and Subtraction fact grid and word problems upto 999 Applying basic operations Multiplication and division upto 999	Addition and Subtraction fact grid Word problem based on Addition Multiplication and division and Subtraction
Numbers and Operations	Pictorial prompts to identify fractions (half, one-fourth, three-fourth)	Identifying half, one-fourth, three-fourth of a whole and in a collection of upto 12 represented as objects/ pictures
Measurement	Hands-on and pictorial prompts to measure and estimate quantities	Measuring and estimating volume, length and time using non-standard and standard units
Shapes and Spatial Understanding	Hands-on and pictorial prompts of 2D and 3D shapes	Identifying and relating the 2D and 3D shapes
Patterns	Pattern extension	Recognising patterns and filling missing numbers/shapes to complete the pattern
Data Handling	Reading simple displays of data (i.e. tally charts, bar graphs, or pictographs)	Solve problems involving data displays with single unit scales and up to four categories of data

Few of the assessment items are sourced from EGRA and EGMA and are adapted following the instrument adaptation guidelines. The subtask of **Listening Comprehension, Phonemic awareness**, **Letter identification and Syllable Reading, Familiar Word Reading, Nonword Reading and Oral reading fluency with comprehension** in Foundation language have been adapted from EGRA guidelines. Similar to EGRA, the subtask of Oral reading fluency is a <u>timed task</u> wherein number of words read correctly in 60 seconds is an important input during administration. All other subtasks are untimed meaning the child can complete the task at his/her pace however, there are some nudge rules wherein the child is prompted to move to next part of the question if he/she is taking more than 5-10 seconds.

The subtask of *Number identification and Number Discrimination, Addition and Subtraction facts and word problems, Pattern identification and extension* in Foundation Mathematics have been adapted from EGMA guidelines. In terms of permissible time limit, none of the tasks under foundational numeracy assessment are timed tasks. However, similar to Foundational Language assessment tasks there are some nudge rules wherein the child is prompted to move to next part of the question if he/she is taking more than 5-10 seconds.

KEY CONSIDERATIONS – FLN-ORF 2022

Language to be focused in the assessment

Presently, the language of instruction differs from region to region, school to school and it also differs from the home language of the child most of the time. Moreover, there are multiple languages that are spoken in the tribal belts that have no representation in the formal schooling system. In the context of the Foundational learning study, it is important to consider which languages are the most appropriate ones for the learners. Essentially, the skills of reading and writing come down to the ability to associate the sounds of a language with the letters or symbols used in the written form. These skills build on the foundational and interactional skills of speaking and listening. In tandem with the overall systemic approach of using home language as the medium of instruction till at least grade 5 (NEP-2020), the test is recommended to be administered in the home language of the child. Assessments will preferably be translated into the languages in which learners are expected to be proficient. In case the child has exposure to multiple languages, the teacher will identify the language of proficiency for the learners. The child will take up the assessment in the same language after giving his/her consent.

Assessment of Children with Special Needs

The professional standards for educational assessment highlight the importance of producing standardized assessments that facilitate accessibility for all students, as far as practicable. A variety of accommodations and adaptations for making assessments more accessible to students with special education needs will be considered. Extended time for assessment can be given to the CWSN. Most importantly, schools will be asked to ensure that the specific assistive devices that the CWSN regularly use are available to them to facilitate the process of their effective participation in the assessment.

Background Questionnaires

Research shows that several factors are likely to affect student achievement. To capture the contextual information about the child, contextual questionnaires for the

pupil, teacher and head-teachers/principals will be developed as part of the study. The information collected will be used to understand the variation in students' performance. Well-defined constructs will be included in the questionnaires.

Item Format

The most common format used in FLN large scale assessments include tasks to assess reading, writing and numeracy skill administered through oral mode or on an electronic device such as tablet. It is recommended to develop items/tasks suitable for one on one administration. The items will be easy to administer and simply worded considering the age group of the students. Such assessment items and tasks will be designed in which the assessment procedure is mediated through appropriate visual and concrete material. Assessment kit will be developed to administer the test. Responses of the students will be captured by the trained Field Investigators (FI) who will administer the survey. For each of the task/item, a simple rubric will be developed that will be used as a guide to mark the response of the child on the OMR sheet by the FI.

Reporting Format

Different aspects of the study and its results will be shared with different stakeholders through appropriately developed and designed reports. Key takeaways will be clearly articulated in a comprehensible language.

DETAILS OF ASSESSMENT FRAMEWORKS FOR CLASS 3

1. Children Become Effective Communicators (EC)

In the National Achievement Survey, only reading comprehension is taken under Modern Indian Language; it does not measure the other language skills like speaking, decoding and writing. However, under FLN-ORF 2022 four skills will be measured under 'Children Become Effective Communicators' (goal-1).

There is no linear progression of language skills, but the skills develop holistically. Children do not learn how to read first and then learn how to write. Language classroom experiences of teachers have shown that the processes of reading, writing, listening, viewing, and thinking develop simultaneously as learners become literate. Development of early language and literacy in the formative years requires developing a wide range of skills, knowledge, and attitudes. This also requires developing literacy to build comprehension, writing for self-expression, vocabulary enrichment, experiences of reading with pleasure, and engaging in interesting conversation. Rich early language and literacy experiences also give opportunity for getting familiar with the aspects of language such as fluency, word recognition, letter knowledge and phonological awareness.

The key components in the goal are:

- **Oral Language:** The experiences in oral language are important for developing skills of reading and writing. This sub-domain includes the competencies of creative self-expression and conversation, word awareness, rhyme awareness and awareness of sounds within words which should emerge from their meaningful engagement with language.

- **Decoding:** This sub-domain includes competencies of print awareness, *akshara* knowledge, precision (symbol-sound/fingerspelling and/or symbol-morpheme correspondences), reading fluency (ability to read a text with accuracy, speed (automaticity) & expression) and word recognition.

- **Reading Comprehension:** This sub-domain covers the competencies of understanding texts and retrieving information from them, as well as interpreting texts. It allows children to make meaning from the text. Children need exposure to different types of print rich environment to develop the skill of comprehension.

- **Writing:** This sub-domain includes the competencies of writing *aksharas* and words as well as writing for expression.

- **Listening Comprehension:** This sub-domain focuses on the competencies to listen to and comprehend a short length text (either story/poem).

Figure 1: Proposed Structure for Children Become Effective Communicators (EC) for FLN-ORF 2022 for Class 3

GOAL	CHILDREN BECOME EFFECTIVE COMMUNICATORS (EC)
SUB-DOMAIN	• Oral Language • Decoding • Reading comprehension • Writing • Listening Comprehension
LEARNING OUTCOMES	1. EC-01 Engages in conversation to ask questions, narrate experiences, listens to others, and respond. 2. EC-02 Identifies the initial/final phoneme in words presented verbally 3. EC-03 Identifies symbol-sound correspondence (including syllable reading). 4. EC-04 Responds to and answers a variety of questions (retrieval and inference based questions) based on a story/poem after listening to a short text 5. EC-05 Accurately decodes common, isolated grade 3-level words 6. EC-06 Uses action words, naming words and punctuation marks for writing 7. EC-07 Accurately decodes phoneme/grapheme sounds to make a "nonsense word," or nonword 8. EC-08 Reads at least 60 words per minute correctly with accuracy (correct pronunciation), speed (automaticity) & expression and comprehends the text by answering a variety of questions (retrieval and inference based questions) based on a story/paragraph

2. Children become involved learners and connect with their immediate environment (IL)

Foundational Numeracy means the ability to reason and to apply simple numerical concepts in daily life problem solving. In general, the numeracy skill includes solving daily life problems using four fundamental operations – addition, subtraction, multiplication, and division and relating mathematical knowledge with the surroundings; applying logic to daily life, thereby developing ability to think mathematically, and taking logical decisions with reasoning.

The major aspects and key competencies of early mathematics are

Numbers and Operations: Numbers are the mathematical tools to count and measure. Numbers are used in many forms like Cardinal numbers are used to measure and communicate the size of a group of objects, Ordinal numbers are used to describe the position of an object when they are arranged in a specific order and Nominal numbers are used as nouns/labels to identify the object in a group. The key skills that come under this category are counting, sense of order, numeral recognition, reading of symbols, writing words and symbols, comparison of numbers like bigger than/smaller than etc., fundamental operations - addition, subtraction, multiplication, division, and their applications in daily life. These mathematical skills help the child to achieve cognitive processes like visualization, generalization, problem solving, communication etc.

Measurement: Measurement is inherent part of human life, whether being used in the accomplishment of routine work or in an occupation. There are numerous situations that we encounter in our daily life which involves dealing with quantities. Children are often involved in activities like comparing their heights, refusing to lift a heavy items etc. Thus, familiarity with different contexts of measurement is important for functioning effectively. This majorly contains the understanding of the attributes like length/distance/height, weight/mass, size, volume/ capacity, time, temperature. These mathematical skills help the child to achieve cognitive processes like observation, comparison, estimation, measuring, using of tools etc.

Shapes and Spatial Understanding: Spatial understanding is the area of mathematics that involves shape, size, space, position, direction, and movement. It helps describe and classify the world we live in. Spatial sense gives children an awareness of themselves in relation to people and objects. The key concepts include 3D shapes and solids, flat and curved surfaces of solids, 2D shapes as seen on surfaces of a solid shape. These mathematical skills help the child to achieve cognitive processes like observation, identification, exploration, communication, spatial understanding, creativity etc.

Data Handling: Data refers to information in a raw form which is collected from various sources. Data collection and handling are usually thought of as a part of statistical activity and so only of interest to people specializing in statistics. But, in everyday situations, we are collecting and using data. The major components of data handling include collecting, representing, and interpreting simple data, recording data using tally marks, collecting data, and representing in terms of pictograph, choosing appropriate scale and unit for display through pictographs, drawing conclusions from the data. These mathematical skills help the child to achieve cognitive processes like interpretation, reasoning, drawing inferences, problem solving, participation in discussions, exploration, creativity etc.

Patterns: Mathematically, a pattern is an arrangement, order, sequence, or repetition. Patterns are used in almost every context of our daily lives such as decorative designs, figures, motifs, shapes etc. Patterns can be identified based on color, shape, size, etc. Identification of the patterns helps in enhancing observation and analytical skills. As while identifying patterns, one observes the similarities, dissimilarities, repetition, non repetition, growth/decay etc. These mathematical skills help the child to achieve cognitive processes like observation, identification, communication, memory, matching, logical thinking, problem solving, reasoning, curiosity, creativity etc.

Figure 2: Proposed Structure for Children become involved learners and connect with their immediate environment (IL) for FLN-ORF 2022 for Grades 3

GOAL	Children become involved learners and connect with their immediate environment (IL)

SUB-DOMAIN	• Numbers and Operations • Measurement • Shapes and Spatial Understanding • Data Handling • Patterns

Learning Outcomes	1. IL-01 Counts, reads, writes and compares numbers upto 9999 (e.g. finds missing values while comparing numbers) 2. IL-02 Solves daily life problems using addition, subtraction and involving two or more operations of numbers upto 999, sum not exceeding 999 3. IL-03 Constructs and uses multiplication facts (tables) of numbers 2 to 10 and uses division facts 4. IL-04 Estimates and measures length/ distance, weight, capacity, calendar using non-standard units like hand span and standard units like m, km, g, kg, litres, etc. and identifies a particular date and corresponding day on a calendar; reads time on a clock in hours and half-hours 5. IL-05 Identifies half, one-fourth, three-fourth of a whole and in a collection of upto 12 represented as objects/ pictures 6. IL-06 Identifies the line of symmetry of 2D shapes, recognises congruence and compares basic 2D shapes (e.g. using a small number of given shapes to compose larger 2D shapes), relates 2D shapes with 3D shapes (solid shapes) and describes their properties like faces, number of edges and corners etc. 7. IL-07 Identifies, extends and communicates rules for simple patterns on numbers, events and shapes (e.g. skip count forward by 10) 8. IL-08 Solve problems involving data displays (i.e., tally charts, bar graphs, or pictographs) with single unit scales and up to four categories of data

Annex 1- Description of subdomains and Learning outcomes in cluster 1 and cluster 2 of Foundational Language and Foundational Mathematics

Cluster	Foundational Language	Cluster	Foundational Numeracy
Cluster 1 (ORF, Reading Comprehension, oral language-speaking)	1. EC-01 Engages in conversation to ask questions, narrate experiences, listens to others, and respond. 2. EC-02 Identifies the initial/final phoneme in words presented verbally 3. EC-03 Identifies symbol-sound correspondence (including syllable reading). 4. decodes phoneme/grapheme sounds to make a "nonsense word," or nonword 5. EC-08 Reads at least 60 words per minute correctly with accuracy (correct pronunciation), speed (automaticity) & expression and comprehends the text by answering a variety of questions (retrieval and inference based questions) based on a story/paragraph	**Cluster 1** (Number Identification, Number Discrimination, basic operations, Estimation and measurement, fraction)	1. IL-01 Counts, reads, writes and compares numbers upto 9999 (e.g. finds missing values while comparing numbers) 2. IL-02 Solves daily life problems using addition, subtraction and involving two or more operations of numbers upto 999, sum not exceeding 999 3. IL-03 Constructs and uses multiplication facts (tables) of numbers 2 to 10 and uses division facts 4. IL-04 Estimates and measures length/ distance, weight, capacity, calendar using non-standard units like hand span and standard units like m, km, g, kg, litres, etc. and identifies a particular date and corresponding day on a calendar; reads time on a clock in hours and half-hours 5. IL-05 Identifies half, one-fourth, three-fourth of a whole and in a collection of upto 12 represented as objects/ pictures

Cluster	Foundational Language	Cluster	Foundational Numeracy
Cluster 2 (ORF, Reading Comprehension, Listening Comprehension, writing)	1. EC-04 Responds to and answers a variety of questions (retrieval and inference based questions) based on a story/poem after listening to a short text 2. EC-05 Accurately decodes common, isolated grade 3-level words 3. EC-06 Uses action words, naming words and punctuation marks for writing 4. EC-07 Accurately decodes phoneme/grapheme sounds to make a "nonsense word," or nonword 5. EC-08 Reads at least 60 words per minute correctly with accuracy (correct pronunciation), speed (automaticity) & expression and comprehends the text by answering a variety of questions (retrieval and inference based questions) based on a story/paragraph 6.	**Cluster 2** (Number Identification, Number Discrimination, basic operations, 2D and 3D shapes, simple data display)	1. IL-01 Counts, reads, writes and compares numbers upto 9999 (e.g. finds missing values while comparing numbers) 2. IL-02 Solves daily life problems using addition, subtraction and involving two or more operations of numbers upto 999, sum not exceeding 999 3. IL-06 Identifies the line of symmetry of 2D shapes, recognises congruence and compares basic 2D shapes (e.g. using a small number of given shapes to compose larger 2D shapes), relates 2D shapes with 3D shapes (solid shapes) and describes their properties like faces, number of edges and corners etc. 4. IL-07 Identifies, extends and communicates rules for simple patterns on numbers, events and shapes (e.g. skip count forward by 10) 5. IL-08 Solve problems involving data displays (i.e., tally charts, bar graphs, or pictographs) with single unit scales and