

III. METHODOLOGY

The study, “**Effectiveness of Developmentally Appropriate Practice-based Curriculum Framework on Emergent Literacy and Numeracy Skills of Preschoolers,**” focuses on the foundational years of early childhood (ages 3–6), a period critical for developing emergent literacy and numeracy skills. As highlighted in policy frameworks such as the National Education Policy (NEP, 2020), these competencies are essential for long-term academic success and lifelong learning.

Despite the known benefits of early literacy and numeracy, a key challenge persists: many Early Childhood Care and Education (ECCE) curricula in India remain inconsistent and unstandardised. Existing frameworks often fail to align with established learning standards. As discussed in the preceding section, Developmentally Appropriate Practices (DAP) offer a globally recognised approach to address these shortcomings in preschool pedagogy.

Against this backdrop, the present study investigates the effectiveness of a DAP-based curriculum framework in enhancing Emergent Literacy and Numeracy Skills. Specifically, the study addresses the following research questions:

1. To what extent do preschoolers demonstrate Emergent Literacy and Numeracy skills with exposure to the existing pedagogical framework?
2. Will a DAP-based curriculum framework significantly improve these skills among preschoolers?

To answer these questions, the study adopted a **mixed-method research design** and was conducted in two phases, aligned with the following objectives:

- To understand the extent of acquisition of Emergent Literacy and Numeracy Skills of the selected preschoolers with the existing pedagogical framework.
- To examine the influence of socio-demographic factors on the existing levels of Emergent Literacy and Numeracy Skills of the selected preschoolers and
- To implement and evaluate a Developmentally Appropriate Practice (DAP)-based curriculum framework focused on enhancing the Emergent Literacy and Numeracy Skills of the selected preschoolers

Accordingly, the study was structured as follows:

Phase I: Assessing current levels of Emergent Literacy and Numeracy Skills

Phase II: Formulating, Implementing, and Evaluating a DAP-based Curriculum Intervention

The methodology adopted for each phase was detailed in the sections that follow:

PHASE I: ASSESSING CURRENT LEVELS OF EMERGENT LITERACY AND NUMERACY SKILLS

A cross-sectional research design was adopted to assess the current levels of Emergent Literacy and Numeracy among selected preschoolers and examine the influence of socio-demographic factors. The subsequent section outlines the methodology for Phase I, detailing specific procedures and methods under the headings listed below:

- A. Population and sampling
- B. Construction and selection of tools
- C. Conduct of the study
- D. Analysis of the data

A. Population and Sampling

The sampling process for Phase I followed a structured three-stage approach:

Stage 1: Selection of Area: According to the 2011 census, India is home to 99 million children between 3 to 6 years, a vital period for growth. Currently, ECCE in India is a mix of various programmes funded differently and run by different types of providers with varying quality standards. The government is the biggest provider, followed by the private sector and non-profits (Singh, Gaur, & Sharma, 2022). However, only approximately two-thirds of children receive ECCE, either through government, non-profit, or private providers. As of March 2022, 28 million children in the 3 to 6-year age group were being provided preschool education in Anganwadi Centres, and 1.5 million children in government and government-aided schools, largely through the Samagra Shiksha Abhiyan (SmSA). Despite a range of ECCE service providers, around 37 million children do not avail themselves of such services found the National Sample Survey 75th round report (Kundu, 2023).

Hence, good-quality early education is not equally accessible to all. This situation needs to be addressed as a priority, as scaling up public provisioning of ECCE services can help minimise this unevenness. The launch of the National Education Policy (NEP) in 2020 marked a major advancement for Early Childhood Care and Education (ECCE) in India. This policy is likely the first to recommend integrating children aged 3 to 8 years into the formal school system. Its overarching goal is to enhance the quality and accessibility of ECCE nationwide, ensuring that every child establishes a strong foundation for lifelong learning and development (Kundu, 2023).

According to a survey by the Associated Chambers of Commerce and Industry of India, Tamil Nadu ranks first among Indian states with a nearly 100% Gross Enrolment Ratio (GER) in primary and upper primary education (Pundir, 2022). Although Tamil Nadu has one of the highest literacy rates in India, ASER (2022) reports low proficiency in reading and arithmetic among its children. According to the survey, Tamil Nadu was identified as one of the states with lower proficiency in these fundamental skills compared to both state and national levels.

Coimbatore, Tamil Nadu's second-largest city and a rapidly growing Tier II Urban hub, was selected as the study site for the following reasons. The district, bordering the states of Tamil Nadu and Kerala, was a well-developed industrial and education hub and has a large diversified multilingual population dominated by the manufacturing sector and facilitated by several schools/colleges. Also, observed to increase at a rapid rate in the number of Montessori, Kindergarten, and other franchised preschools (CCMC, 2024; Invest India, 2023).

The demographic data from the 2011 Census of India shows that Coimbatore District had a significant population of children under the age of 6 years, highlighting to children of 319,3326. In 2011, children under 6 formed 9.23% of Coimbatore District's population, compared to 10.19% in 2001, reflecting a net decrease of 0.96%. All the more, the huge number of children under 6 years highlights the urgent need for research into preschool education, making it crucial to enhance the early childhood education services in the Coimbatore district.

Coimbatore City Municipal Corporation has been divided into five zones, namely North, South, East, West, and Central zones. To ensure population homogeneity, all five zones of Coimbatore district were selected, and preschools from each of these five zones were taken into consideration as they encompass the majority of the preschoolers' population.

Stage 2: Selection of preschools: The study conceived the type of ECCE centre as one criterion in selecting preschools to maintain uniformity among the participant preschools. Accordingly, private preschools alone were included. Moreover, certain other factors were also considered, including the philosophy adopted, teaching-learning methods, curriculum approaches, teachers' roles, and assessment and evaluation methods.

In addition to maintaining homogeneity and to represent generalisation, certain other inclusion criteria were set, as explained below:

- *Located within a 5 km radius of the city centre:* This criterion was established due to the increasing concentration of preschools in and around the Coimbatore corporation limits.
- *Functioning exclusively at the kindergarten level:* The teaching pedagogy, practices, and learning resources vary greatly between the stand-alone preschools and the preschools attached to normal schools of other higher classes. Hence, the study was considered to include only stand-alone preschools.
- *Holding legal recognition or affiliation with a recognised International Preschool chain:* Due to the mushrooming culture of preschools, many centres function as day-care centres. Hence, the criteria for obtaining legal recognition were considered crucial.

Accordingly, five schools in each zone, totalling 25 preschools from all five zones of the Coimbatore District, were shortlisted. Of the 25 shortlisted preschools, only five granted permissions to participate in the study (one school in each zone). The investigator ensured the smooth conduct of the research by seeking voluntary participation and wholehearted cooperation from all five preschools.

Stage 3: Selection of sample: The study targeted preschoolers aged 3 to 6 years, a key transitional stage that prepares children for formal schooling. During this period, the

groundwork for future academic success is laid while promoting holistic development in young learners. Accordingly, all preschoolers in the age range of 3 to 6 years from the five preschools (selected in Stage 2) constituted the population sample. Consequently, 281 preschool children from all the schools who consented were associated with the investigation. Accordingly, the population sample for Phase I accounted for 281 preschoolers.

This multistage sampling ensured geographical representation, homogeneity in the type of preschool, and alignment with the study's inclusion criteria.

Ethical consideration

As a matter of ethics, the students and their parents were informed about the research through a written consent form. In addition, the higher authorities of the preschools selected and the class tutors of the identified children were informed about the study. The study also allowed voluntary choice for participants. The application form explaining the design and the protocols used in the research study was subjected to the Institutional Human Ethics Committee (IHEC), and clearance was obtained. The approval number for the research was AUW/ IHEC/HD-19-20/XPD/45. The clearance certificate issued by the Institutional Human Ethics Committee was furnished as Appendix I.

B. Construction and Selection of Tools

Having finalised the sample, the next step involved selecting and validating appropriate assessment tools. To this end, two tools were used to get the necessary data from the respondents in Phase I, namely, a) General Background Questionnaire and b) Emergent Literacy and Numeracy Assessment Pack. Each of the tools was detailed below:

Tool A: General background Questionnaire

A self-formulated questionnaire to elicit the general profile of the selected preschoolers was devised with two subsections. The first section aided in collecting the personal profile of the selected respondents concerning class of study, gender, type of ECCE centre, type of family, birth order, and area of residence. The second section dealt with the educational and occupational details of the parents of the preschool children. This questionnaire was to be filled in by the parents of the selected 281 preschoolers. The self-formulated general background questionnaire was appended in Appendix II.

Tool B: Emergent Literacy and Numeracy Assessment Pack:

The formulation of the Emergent Literacy and Numeracy Assessment pack was a four-step process

Step 1: Tool origin and selection: A literature review identified standardised assessment tools, which were then evaluated for alignment with DAP principles. In addition, owing to the benefits of observation-based formative assessment among preschoolers, a tool that is an on-going assessment scale aiming to improve the kids' learning and guide instruction, and that includes observation, questioning, and similar tasks to monitor their understanding, was shortlisted. One tool that met these criteria was the North Carolina Common Core State Standards Assessment Pack for Kindergarten (2017). This pack includes assessment items aligned with content standards in English Language Arts, Mathematics, Science, and Social Studies. However, as the present study focused specifically on Emergent Literacy and Numeracy Skills among preschoolers, only the English Language and Mathematics content standards were considered for use. Accordingly, the standards of English Language and Mathematics, as in the North Carolina Common Core State Standards, constituted the following:

i) Standards of the English Language

- *Phonological awareness* involves recognising and manipulating sounds in spoken words, including rhyming, syllables, and onset-rime blending
- *Print concepts* focus on understanding the organisation and basic features of print, such as following words from left to right and recognising uppercase and lowercase letters
- *Phonics and Word recognition* emphasise the understanding of letter-sound relationships and decoding simple words
- *Fluency* is developed through reading emergent-reader texts with purpose and understanding.
- *Handwriting*, which involves printing uppercase and lowercase letters legibly and
- *Composition*, where children use drawing, dictating, and writing to create opinion pieces, informative texts, and narratives.

ii) Standards of Mathematics

- *Counting and Cardinality* encompass counting forward and backwards to at least 20, writing and recognising numbers up to 20, and comparing groups of objects to determine more, less, or equal
- *Operations and algebraic thinking*, covered understanding addition as putting together and subtraction as taking apart, as well as solving simple addition and subtraction problems using objects or drawings
- *Measurement and Data* include describing and comparing measurable attributes such as length and weight, as well as sorting and classifying objects, and
- *Geometry* focuses on identifying and describing 2D and 3d shapes, comparing shapes based on attributes, and building and modelling shapes using materials.

Step 2: Indicators and Item Selection: As part of the research study, a one-day expert panel discussion was conducted. The panel consisted of:

- Three academicians specialising in Human Development, with expertise in Early Childhood Care and Education (ECCE)
- One curriculum development specialist from the field of education, and
- One experienced early childhood education expert.

The panel was tasked with analysing the standards specified in the existing assessment pack based on the North Carolina Common Core, focusing on English Language and Mathematics. The goal was to evaluate and adapt these standards for relevance and suitability to the Indian context. The panel thoroughly reviewed the original items and standards and made certain modifications, namely,

- Some standards were merged, renamed, or removed
- Additional standards were created to better reflect the Indian context and
- The modified framework was reorganised into two content areas: Emergent Literacy Skills and Emergent Numeracy Skills

In this revised version, the term “*standards*” was replaced with “*indicators*” to better align with the assessment goals. The outcomes of these modifications were summarised in Table II. After finalising the indicators, the panel analysed each item under the original standards and revised them for cultural and contextual appropriateness. This included:

- Adapting item language and examples for Indian children
- Categorising items under the revised indicators and
- Retaining the original scoring and grading structure from the North Carolina pack.

The final distribution of items across the two content areas was as follows:

1. Emergent Literacy Skills (13 items total)

- Reading Skills (11 items): Phonological awareness – 8 items; Print awareness – 2 items; and Listening comprehension – 1 item
- Writing Skills (2 items): Alphabet writing – 1 item; and Number writing – 1 item

2. Emergent Numeracy Skills (9 items total): Number and operations – 4 items; Data analysis and measurement – 1 item; Algebra and pattern-making – 3 items; and Geometry and spatial awareness – 1 item

TABLE II
INDICATORS OF THE MODIFIED EMERGENT LITERACY AND NUMERACY ASSESSMENT PACK – OUTCOMES
OF THE PANEL DISCUSSION

Standards as per the North Carolina Common Core assessment pack	Modification made	Renamed indicators for the modified Literacy and Numeracy Assessment Pack (No. of items)	Components	Content areas
English Language				
Phonological Awareness	Merged and renamed	Phonological awareness (8 items)	Reading Skills (11 items)	Emergent Literacy Skills (13 items)
Phonics				
Word Recognition				
Print Concept	Renamed	Print awareness (2 items)		
Fluency	Merged and renamed	Listening comprehension (1 item)		
Composition				
Handwriting	Merged, modified and renamed	Alphabet writing (1 item)	Writing Skills (2 items)	
Number writing		Number writing (1 item)		
Mathematics				
Counting & cardinality	Merged and renamed	Number and operation (4 items)	NA	Emergent Numeracy Skills (9 items)
Operation				
Measurement & Data	Renamed and merged	Data analysis and measurement (1 item)		
Algebraic Thinking	Merged and renamed	Algebra and pattern-making (3 items)		
Geometry	Renamed	Geometry and spatial awareness (1 item)		

Step 3: Validation: As the pack was modified to the Indian context, and with the realisation that a tool was said to be valid when it measures what its prerogatives were to measure. The content validity of the modified assessment pack was evaluated using a 3-point Likert scale with the categories: Essential, Useful but not necessary, and Not necessary. This evaluation aimed to assess the relevance of each item concerning the study's objectives, the targeted skill domains, and the underlying theoretical constructs. The assessment pack was validated by 5 subject experts, namely, two from the discipline of Human Development, two professionals working for children, and one curriculum developer. They were asked to rate every item on the 3-point Likert scale.

The Content Validity Ratio (CVR) was calculated using the formula $CVR = (N_e - N/2) / (N/2)$, where N_e denotes the number of experts who rated an item as 'essential' and N represents the total number of experts consulted. The resulting average CVR for the assessment pack was 0.80, indicating a high degree of content validity and suggesting that the items were well-aligned with the intended constructs

Further, the Emergent Literacy and Numeracy Assessment Pack was subjected to a pilot study with 30 preschoolers to gain insight into the difficulty in understanding and phrasing the items. Accordingly, necessary comprehension difficulties and skill level difficulties were rectified.

Step 4: Scoring system and Interpretation: The gradations and scoring procedures were adopted as outlined by the North Carolina Common Core State Standards for Kindergarten. The gradations of each item vary as per the items, and the instructions for the assessor to administer every item among the young children were also clearly specified. Altogether, the gradations were of three types.

1. No concept, Some, Gaining, Control - 4-point scale
2. Frustration level and Mastery level - 2-point scale
3. Basic level, Approaching level, and Mastery level - 3-point scale

The pack also had the scoring of items for each of the grades and points. The points of each item were based on the number of tasks that the child can perform on a given task. Table III details the gradations and scoring of every indicator and was encapsulated within the two content areas, Emergent Literacy and Numeracy Skills, used in the pack. Altogether, the Emergent Literacy and Numeracy Assessment Pack was as provided in Appendix III.

TABLE III
EMERGENT LITERACY AND NUMERACY ASSESSMENT PACK- GRADATIONS AND SCORES

Content areas	Components	Indicators	Items	Minimum to maximum score			
				Frustration level		Mastery level	
Emergent Literacy Skills	Reading Skills	Phonological awareness	Rhyme recognition	3		6	
			Rhyme production	3		6	
			Syllable blending	3		6	
			Syllable segmentation	3		6	
			Phoneme isolation of initial sounds	3		6	
			Phoneme isolation of final sounds	3		6	
			Phoneme blending- onset and rhyme	3		6	
			Phoneme blending-all phonemes	3		6	
	Print awareness	Print awareness – 1	No concept	Some	Gaining	Control	
			0-2	3-5	6-7	8	
			0-2	3-5	6-7	8	
	Listening comprehension	Listening comprehension	Frustration level		Mastery level		
			3		6		
	Writing Skills	Writing	Number writing	Basic	Approaching		Master
10				20		30	
6				7		8	
Numeracy Skill	-	Number and operation	Counting forward	4		5	
			Compare number of objects	3		4	
			Compare numbers	4		5	
			Number and operations in base ten	3		4	
		Data analysis and measurement	Data analysis and measurement	6		7	
		Geometry and spatial awareness	Geometry and spatial awareness	6		7	
		Algebra and pattern-making	Addition and subtraction	4		5	
			Making 10	4		5	
Decomposing numbers	6		7				

C. Conduct of the Study

Once the tools were finalised and validated, the study proceeded with data collection, as described below.

- a) **Permission from the higher authorities:** Certain inclusion and exclusion criteria were established to identify suitable preschools for the study. Once the preschools were identified, criteria for selecting the sample of preschoolers were also defined. All preschoolers within the age range of 3-6 years constituted the sample. Hence, the investigator attempted to personally meet the higher authorities of all the preschools and explained the importance of the study.
- b) **Assent from the parents of the preschoolers:** Following the permission of the school authorities, the parents of the preschoolers selected were oriented on the benefits of the study, and an assent form seeking their willingness to allow their child to be part of the study was procured.
- c) **Building up rapport for collecting preliminary data:** To ensure the success of the study, establishing rapport with the participants was paramount. The researcher built rapport with administrators, teachers, and children to foster trust and ensure a comfortable assessment environment. By prioritising rapport-building, the aim was to enhance the validity of responses and facilitate smooth, cooperative engagement throughout the study.
- d) **Administration of the tools:** Parents of the 281 selected preschoolers completed the general background questionnaire. As a next step, the Emergent Literacy and Numeracy Assessment Pack that was modified and validated was administered among the selected 281 preschoolers enrolled in the five chosen preschools. The educators of these children were oriented on the procedure of administration, after which, the activities related to the items in the tool were filled in one by one by the educators. However, the filling up of the tool by the educator was closely monitored by the researcher. The assessment process took around 2 months, as each assessment took at least 15 minutes for a child. The assessment process was carried out for 2 hours each day.

D. Analysis of Data

The collected data were analysed using both descriptive and inferential statistical methods as outlined below.

Percentage analysis was computed to depict the socio-demographic markers of the selected preschoolers and also to understand the level of Emergent Literacy and Numeracy Skills of the selected preschoolers. The acquired data was also statistically analysed. The Shapiro-Wilks test for normality was computed to determine whether the data were normally distributed. The test results revealed that the dependent variables of Phase I – the mean scores of Emergent Literacy and Numeracy Skills followed a normal distribution with a non-significant Shapiro-Wilk test ($p = 0.134$). Therefore, ANOVA was computed to evaluate the influence of socio-demographic factors such as age, gender, birth order, type of preschools, class of study, type of family, educational and occupational status of parents on preschoolers' Emergent Literacy and Numeracy Skills.

A flowchart of the methodology adopted in Phase I is outlined in Figure 2.

Methodology of Phase I - At a glance

Population and Sampling

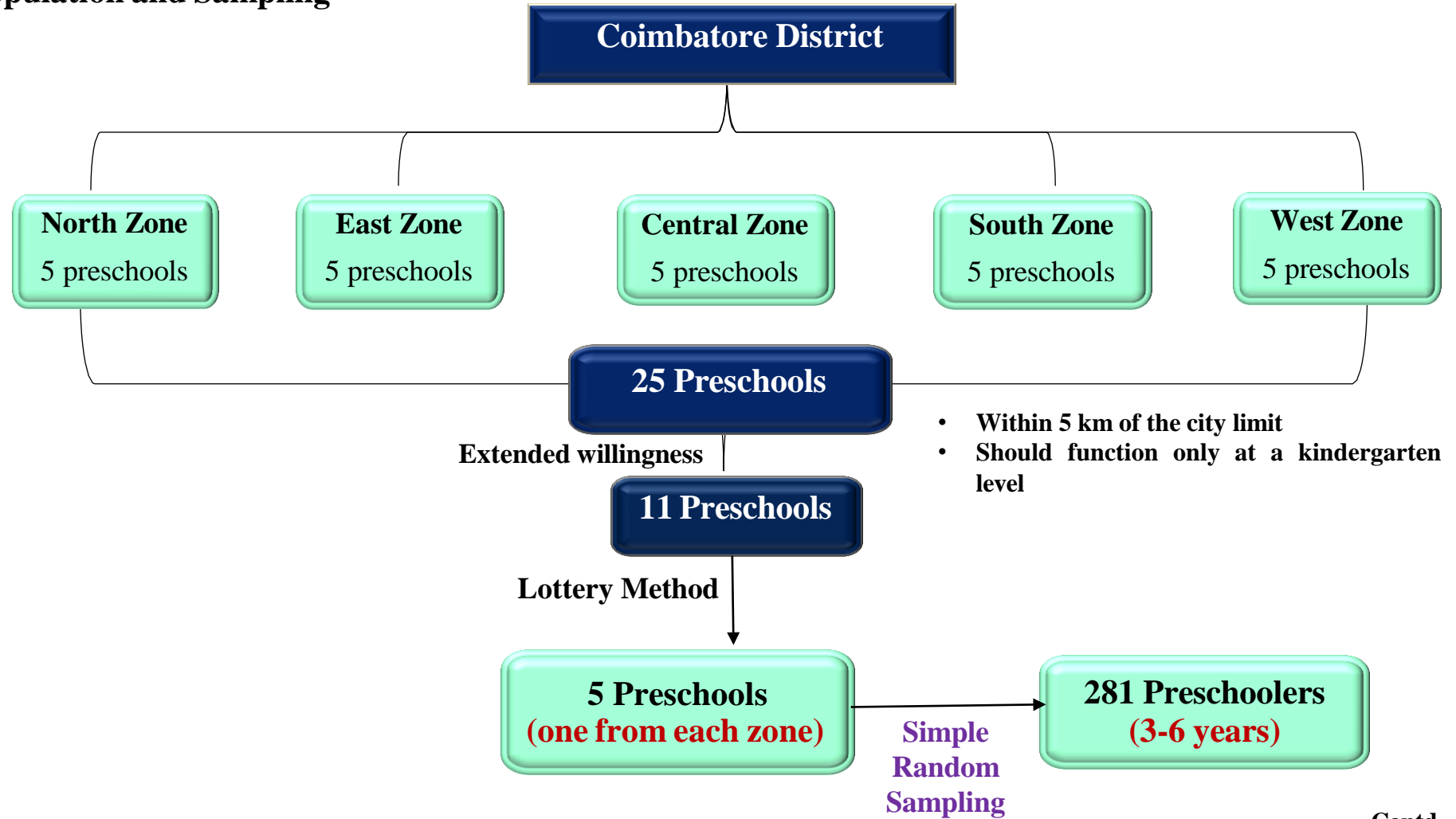


Figure 2

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Construction of Tools

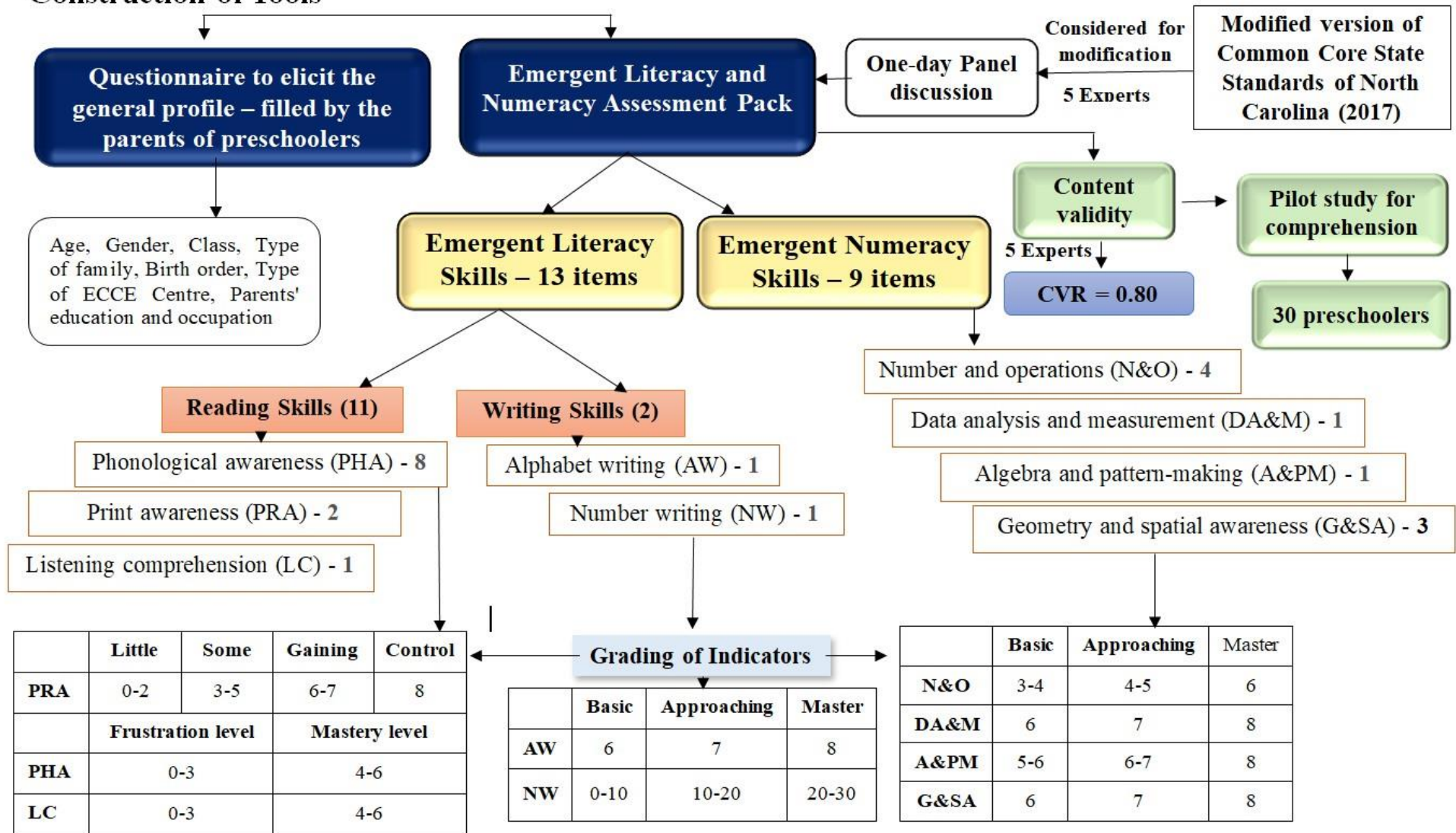
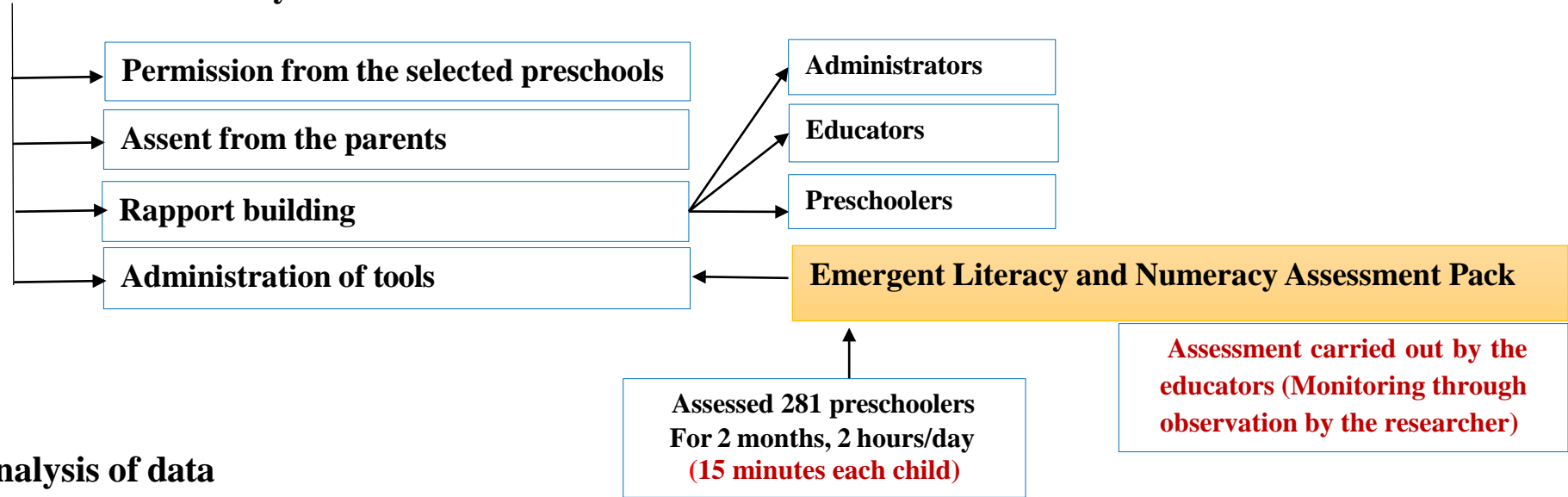


Figure 2

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Conduct of the study



Analysis of data

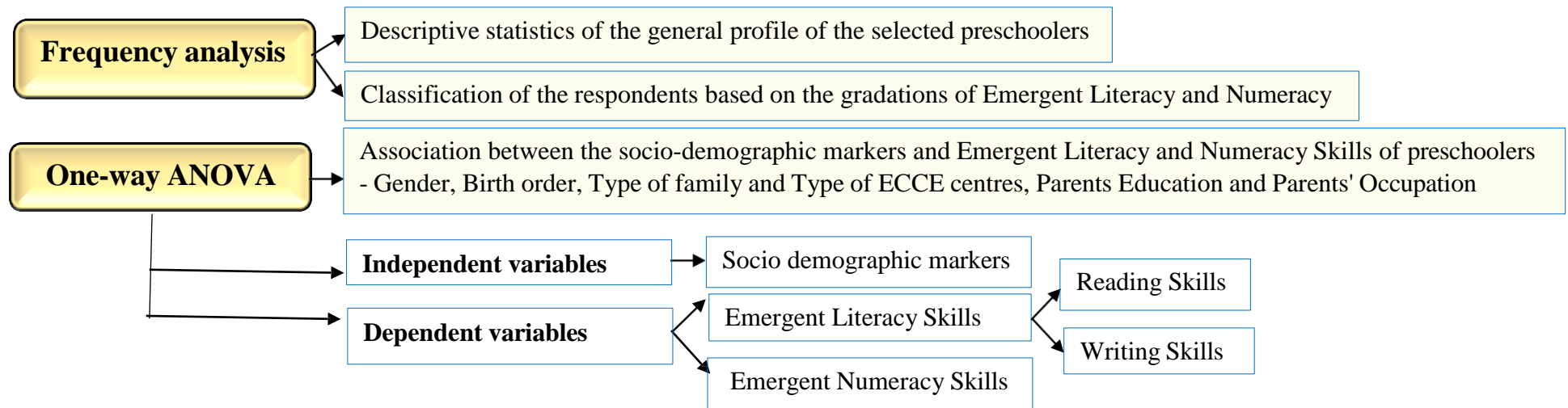


Figure 2

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PHASE II : FORMULATING, IMPLEMENTING, AND EVALUATING A DAP-BASED CURRICULUM INTERVENTION

The research design adopted for Phase II of the study was Before-and-After with a Waitlist Control Group, intending to formulate, implement, and analyse the effectiveness of the DAP-based curriculum framework focused on Emergent Literacy and Numeracy Skills of preschoolers. The methodology of this Phase was detailed under the following heads:

- A. Population and sampling
- B. Construction of tools
- C. Conduct of the study
- D. Analysis of the data

A. Population and Sampling

Phase II of the study aimed to formulate a DAP-based curriculum framework focused on Emergent Literacy and Numeracy skills of preschoolers under the age group of 3 to 6 years, implement and assess the effectiveness of the same. Accordingly, the selection of the school and the sample was a two-stage process.

Stage 1: Selection of preschools: From the five identified preschools, which include a total of 281 children, four provided consent and agreed to allocate specific structured hours for a three-month period for implementing the DAP-based curriculum framework. The lottery method was used to segregate the four preschools into two groups: the experimental group and the control group, each comprising two preschools.

Stage 2: Selection of sample: Though the preliminary assessment of Emergent Literacy and Numeracy skills was carried out with children of 3 - 6 years, Phase II had a specific purpose of choosing children within the age ambit of 4-5 years for certain reasons. The reason attributed was two-fold: Firstly, 4 to 5-year-old children attend classes more regularly compared to 3 to 4-year-old children, and secondly, they represent the foundational stage of kindergarten.

Accordingly, from the selected four preschools, a total of 62 preschoolers participated in the study under the age group of 4-5 years, more specifically within the age ambit of 48-54 months, with 31 assigned to the experimental group from two preschools and 31 to the control group from the other two preschools. As the current study is an intervention study and represents one of the initial efforts to design, implement, and evaluate a DAP-based curriculum framework for Indian Preschoolers, a smaller sample size

was appropriate to evaluate feasibility, effectiveness, and implementation fidelity before a large-scale adoption. In addition to the time, resource, and staffing limitations, and the homogeneity of the sample, the intervention was planned to be conducted with a manageable sample size to ensure close monitoring of implementation, without comparing the rigour of the intervention.

Pre-assessment of the chosen 61 preschoolers was culled out from the 281 sample of the Phase I, through the Emergent Literacy and Numeracy assessment pack, when the children were in the age range of 48-54 months. However, the post-assessment data from both the experimental and control groups were collected when the children were between 54 to 60 months of age, as the intervention was carried out within 48-60 months of the child.

B. Construction of Tool

The current study focuses on Emergent Literacy and Numeracy Skills, aligning with the guiding principles of NEP, 2020, which emphasises that achieving these foundational skills by Grade 3 should be the highest priority. Supporting this, a 2017 study by Ambedkar University in collaboration with the Annual Status of Education Report (ASER) revealed that a significant proportion of children in India, regardless of whether they attended public or private pre-primary institutions, lacked essential school readiness competencies upon entering primary school.

In response, the present study aims to promote the optimal development of Emergent Literacy and Numeracy Skills among preschool-aged children. A key component of this effort was the construction of a Developmentally Appropriate Practice (DAP)-based curriculum framework specifically designed to enhance these skills. The process of constructing this tool was outlined in the stages below:

Stage I: Identification of the reference curricula based on the concerns/needs of ECCE in India: Using the PRISMA model, the review section of the study identified key shortcomings in existing preschool programmes across India and proposed evidence-based solutions. These solutions were derived from the nine foundational principles of learning and development outlined by NAEYC and the three core considerations of DAP (as discussed in Review of Literature Sections A and D). Findings from the review emphasised the need for a DAP-aligned curriculum tailored to the Indian context to ensure the holistic development and well-being of young children.

To design this curriculum, the researcher conducted a comprehensive analysis of existing preschool programmes, with a particular focus on Emergent Literacy and Numeracy Skills following NEP 2020 priorities. The analysis examined factors such as developmental needs, curriculum content areas, instructional methods, DAP integration, learning assessments, teacher preparedness, learning environments, family involvement, and alignment with national education policies. Following this analysis, two internationally recognised early childhood curriculum models - High Scope and Head Start - were selected as reference frameworks due to their proven efficacy and relevance.

- **High Scope Curriculum:** Based on a constructivist approach, this curriculum supports the holistic development of children aged 3–5, particularly those from underprivileged backgrounds. It emphasises active learning and intentional teaching. Originating from the Perry Preschool Project in the 1960s, High Scope has been widely implemented across global early learning settings. It includes six indicators for reading (Vocabulary, Phonological Awareness, Alphabetic Knowledge, Reading, Concepts About Print, Book Knowledge), one writing indicator, and nine numeracy indicators (Number Words and Symbols, Counting, Part-Whole Relationships, Shapes, Spatial Awareness, Measuring, Units, Patterns, and Data Analysis).
- **Head Start Curriculum:** Initiated in 1965 as part of the U.S. Government’s War on Poverty, this curriculum serves children aged 3–5 from low-income families. It includes four reading indicators (Book Appreciation and Knowledge, Phonological Awareness, Alphabet Knowledge, Print Concepts and Conventions), one writing indicator (Early Writing), and five numeracy indicators (Number Concepts and Quantities, Number Relationships and Operations, Geometry and Spatial Sense, Patterns and Measurement, and Comparison).

Drawing from the foundational principles and strengths of these curricula, a new context-specific framework was developed to meet the unique developmental needs of Indian preschoolers.

Stage II. Identification of indicators on Emergent Literacy and Numeracy Skills: To ensure alignment between the assessment tool and the reference curricula, the conceptual definitions of indicators from High Scope and Head Start were thoroughly reviewed. Relevant indicators were either directly adopted or merged with existing indicators from the study’s assessment pack. Importantly, no components were omitted. Table IV below presents a comparative mapping of indicators from the reference curricula and the modified assessment pack.

TABLE IV

INDICATORS OF THE REFERENCE CURRICULUM (HIGH SCOPE AND HEAD START) ALIGNED WITH THE INDICATORS OF THE MODIFIED ASSESSMENT PACK

Content areas	Components	Indicators of the Modified Assessment Pack	Indicators of High Scope	Indicators of Head Start
Emergent Literacy Skills	Reading Skills	Phonological awareness	Phonological Awareness	Phonological Awareness
			Alphabet Knowledge	Alphabet Knowledge
		Print awareness	Concepts about Print	Alphabet Knowledge
			Book Knowledge	Print concepts
			Alphabet Knowledge	
		Listening comprehension	Vocabulary	Book Appreciation and Knowledge
	Reading			
Writing Skills	Alphabet writing	Writing	Early writing	
	Number writing			
Emergent Numeracy Skills	-	Number and operation	Number Words and Symbols	Number concepts and quantities
			Counting	Number relationships and operations
			Part-whole relationships	
		Data analysis and measurement	Measuring	Measurement and Comparison
			Unit	
			Data Analysis	
		Algebra and pattern-making	Patterns	Patterns
Geometry and spatial awareness	Spatial awareness	Geometry and spatial sense		

Based on this alignment, the newly developed curriculum framework included two content areas: Emergent Literacy and Numeracy Skills. Under Emergent Literacy, five indicators were selected - three for Reading Skills (Print awareness, Phonological awareness, and Listening comprehension) and two for Writing Skills (Alphabet writing and Number writing). Emergent Numeracy Skills comprised four indicators: Number and operations, Data analysis and measurement, Algebra and pattern-making, and Geometry and spatial awareness. The indicators of the content areas were retained as similar to the Assessment pack.

Stage III: Designing the blueprint for a DAP-based curriculum framework: A detailed blueprint was created for the two major content areas identified above. The development process involved three key steps:

1. *Learning Objectives:* Specific objectives were formulated for each indicator to define the skills and knowledge children should acquire during various early learning phases. Typically, 1 to 4 objectives were identified for each indicator.
2. *Learning Milestones:* These were developed to reflect a structured developmental progression, enabling educators and caregivers to provide timely and appropriate support. Milestones were categorised across four age ranges: 36–42 months, 42–48 months, 48–54 months, and 54 months and above.
3. *Pedagogical Approaches:* The curriculum blueprint emphasised developmentally appropriate, play-based, hands-on, and experiential teaching-learning strategies consistent with DAP principles. A detailed blueprint including these elements is provided in Appendix IV.

Stage IV. Formulation of a detailed curriculum for 4 to 5-year-old children

Although the overall DAP-based ECCE curriculum framework was designed for children aged 3–6 years, a detailed curriculum with lesson plans was specifically developed for 4–5-year-olds, as this group was the focus of the study’s implementation phase. The full curriculum and sample lesson plans for this age group are provided in Appendix V.

C. Conduct of the Study

The conduct of the study of Phase II encompassed two key processes:
1) Finalisation of the formulated curriculum, which involved reviewing and refining the

framework 2) Implementation of the finalised curriculum, which included training of the educators on the formulated curriculum and its application in the classroom setting by the trained educators to assess its effectiveness.

a) Finalisation of the formulated curriculum: The curriculum development process focused on two key content areas—Emergent Literacy and Numeracy Skills. A comprehensive blueprint was designed, outlining clear indicators for each area. These were expanded into specific learning objectives, developmental milestones, appropriate pedagogies, and structured evaluation methods, all aligned with the modified Emergent Literacy and Numeracy Assessment Pack.

A panel of five subject-matter experts reviewed the framework to assess its effectiveness and practical relevance. This panel included:

- Three academicians specialising in Early Childhood Care and Education (ECCE) from the field of Human Development, ensuring developmental appropriateness;
- A curriculum development specialist who evaluated pedagogical alignment and structural coherence and
- An experienced early childhood practitioner who provided practical insights into real-world classroom applicability.

Following this expert review, feedback was carefully analysed, and the framework was revised accordingly to ensure its alignment with DAP principles, sound and developmentally with best practices in ECCE appropriate pedagogy. The final product was a Developmentally Appropriate Practice (DAP)-based curriculum framework tailored for preschoolers aged 3 to 6 years.

Although the broader blueprint covered ages 3–6, a detailed curriculum was specifically developed for children aged 4–5 years, as mentioned in stage IV of tool construction. This version included well-defined learning objectives and developmental outcomes, along with flexible, child-centred lesson plans tailored to their developmental needs. The curriculum was then sent to two additional experts, an early childhood educator and an academician in Human Development, for further validation. Based on their feedback, refinements were made to ensure appropriateness and classroom feasibility.

To evaluate the practicality and effectiveness of the curriculum in an Indian preschool context, a 10-day pilot study was conducted involving five children aged 4–5 years. One key indicator from each content area was selected for evaluation. Observations focused on children’s engagement with the curriculum, the support offered by the pedagogical methods, and the suitability of the strategies to developmental milestones. Insights from the pilot study informed final modifications to improve the curriculum’s usability and effectiveness. With these enhancements, the detailed curriculum for 4–5-year-olds was finalised and prepared for classroom implementation.

b) The implementation process: The implementation process of the DAP-based curriculum framework focused on Emergent Literacy and Numeracy Skills for preschoolers was carried out in three stages as explained below.

Stage 1- Training the educators of the selected preschools

To effectively implement the formulated curriculum for children aged 4-5 years, it was essential to equip educators from the selected preschools with the necessary knowledge and skills. This required a structured training program to familiarise them with the DAP-based curriculum framework, instructional strategies, and assessment methods.

A total of two educators, one from each of the selected experimental schools, were selected for training. The training was conducted for seven days. Each day consisted of a single session lasting two hours, resulting in a total of seven sessions and 14 hours of training. The training process was systematically divided into two key steps to ensure a comprehensive understanding and smooth implementation of the curriculum.

Step 1: Orientation and Introduction (1 session, 2 hours): This session for educators aimed to ensure their familiarity with the key principles of DAP and its significance in ECCE. It included outlining what educators could expect throughout the training process and preparing them for their roles. A critical component of this session was the thorough introduction to DAP concepts. Educators gained an understanding of how DAP principles support the holistic development of young children, addressing their physical, cognitive, and emotional needs in age-appropriate ways. They learned why DAP is fundamental in creating a nurturing and effective learning environment for children in early childhood settings. By providing educators with this foundational knowledge, the orientation session aimed to empower them to effectively implement the DAP-based ECCE curriculum

throughout their training and in their future roles within ECCE. This preparation ensured that facilitators were well-equipped to support and promote the optimal growth and development of children.

Step 2: Educators' Training on formulated DAP-based ECCE curriculum (6 sessions, 12 hours): The purpose of the session was to provide educators with a comprehensive understanding of the formulated DAP-based curriculum framework and equip them with the necessary tools to implement it effectively. The session began with a detailed introduction to the indicators of all the content areas, providing educators an in-depth understanding of the specific focus areas and their key indicators. The session then moved to learning objectives, which clearly outlined the goals that the children are expected to achieve in these skill areas, ensuring that the learning process is purposeful and measurable.

Additionally, it highlighted developmental milestones, which are the typical stages of growth and learning children go through in literacy and numeracy. Understanding these milestones ensures that activities are tailored to be both achievable and appropriately challenging for young learners. The facilitators were also introduced to pedagogical approaches, focusing on effective teaching strategies designed to address the developmental needs of children. These approaches aim to make learning engaging, interactive, and supportive. Alongside theoretical knowledge, the session included practical applications, such as lesson plans and activities for each content area and the indicators, providing educators with hands-on tools to implement them in the classroom setting.

Stage 2. Implementation of the curriculum for the preschoolers of 4-5 years in the classroom set up by the trained educators (72 working days encompassing 72 sessions in 72 hours)

Stage 2 focused on educators implementing the formulated DAP-based curriculum in the actual classroom setting to assess its effectiveness. This stage was conducted in four steps, explained below:

Step 1: Trust-building session and Pre-Test Evaluation (2 sessions, 2 hours): Ice-breaking activities such as name games, animal sounds, and storytelling circles were arranged to initiate the implementation of the intervention. The data procured from the Modified

Literacy and Numeracy Assessment Pack from 281 preschoolers in Phase I of the study were culled out for the experimental and control group children and served as pre-test data.

Step 2: Implementation session (70 working days, 70 hours): The intervention was carried out for 70 working days, with daily sessions lasting one hour each. Each session was systematically divided into two equal parts: the first 30 minutes focused on developing literacy skills, specifically reading and writing, while the remaining 30 minutes were dedicated to enhancing numeracy skills. This structured approach aimed to ensure balanced exposure to both domains, aligning with the developmental objectives of the study. It accounted for a total of 70 hours. The session-wise implementation details were provided in a nutshell in Table V.

TABLE V

INDICATOR-WISE TIME FRAME OF IMPLEMENTING THE DAP-BASED ECCE CURRICULUM FRAMEWORK IN THE CLASSROOM SETTING

Content areas	Components	Indicators	Number of Sessions (half an hour a session)
Emergent Literacy Skills	Reading Skills	Phonological awareness	20 Sessions (20 days)
		Print awareness	10 Sessions (10 days)
		Listening comprehension	10 Sessions (10 days)
	Writing Skills	Alphabet writing	15 Sessions (15 days)
		Number writing	15 Sessions (15 days)
Emergent Numeracy Skills	-	Number and operation	25 Sessions (25 days)
		Data analysis and measurement	15 Sessions (15 days)
		Algebra and pattern-making	15 Sessions (15 days)
		Geometry and spatial awareness	15 Sessions (15 days)

Stage 3: Post-Test Evaluation (30 working days, 30 sessions, 30 hours): The Emergent Literacy and Numeracy Assessment Pack was administered again to the experimental and control group respondents to assess their Literacy and Numeracy Skills after the implementation of the formulated DAP-based curriculum framework. The post-test evaluation was carried out in 30 sessions, and lasted for 1 month, with 2 hours allocated each day (15 minutes per child), similar to the collection of data in Phase I.

D. ANALYSIS OF DATA

The Shapiro-Wilks test for normality was computed for the second phase of data, and the test results revealed that it was not deviating from a normal distribution. Therefore, parametric tests were performed to analyse the effectiveness of the formulated DAP-based curriculum framework focused on Emergent Literacy and Numeracy Skills of preschoolers by comparison between pre-test and post-test among the experimental and control groups.

To compare differences in mean scores on preschoolers' Emergent Literacy and Numeracy Skills between experimental and control groups of respondents and to check if the formulated DAP-based curriculum effect differs by time measures (Pre and Post) ANCOVA was computed.

The uniqueness of ANCOVA to meet the objective of the study was as three - fold. Firstly, it is a method for comparing sets of data that consist of two variables, intervention and outcomes, with the outcome variable being called the variate (post-test score) when a third variate called the covariate (pretest score) exists. Hence, the pretest score on every ability was measured but not controlled and has a definite effect on the variable of interest, the intervention. Secondly, ANCOVA allows the researcher to increase the precision of a study and remove a potential source of bias, the pretest score of the respondents. To evaluate the effect of the intervention on Emergent Literacy and Numeracy Skills of preschoolers, it should be realised that the skills enhance in proportion to the already existing skill level, the pretest score is kept as a covariate and was measured to allow for adjustment. Lastly, ANCOVA is a statistical test that is appropriate for small sample as it enhances the statistical power and increases the ability to detect the effect of the intervention with a smaller cohort.

Care was taken before using ANCOVA to ensure that the correspondence between the variate (Y) and the covariate (X) follows the assumptions given below:

1. The regression slopes of Y & X are equal from group to group
2. The relationship between X & Y is linear
3. X is measured without error
4. There are no unmeasured confounding variables
5. The errors inherent in each variable are independent of each other
6. The data are normally distributed

The bird's eye-view of the methodology adopted in Phase II is illustrated in Figure 3.

Methodology of Phase II - At a glance

Population and Sampling

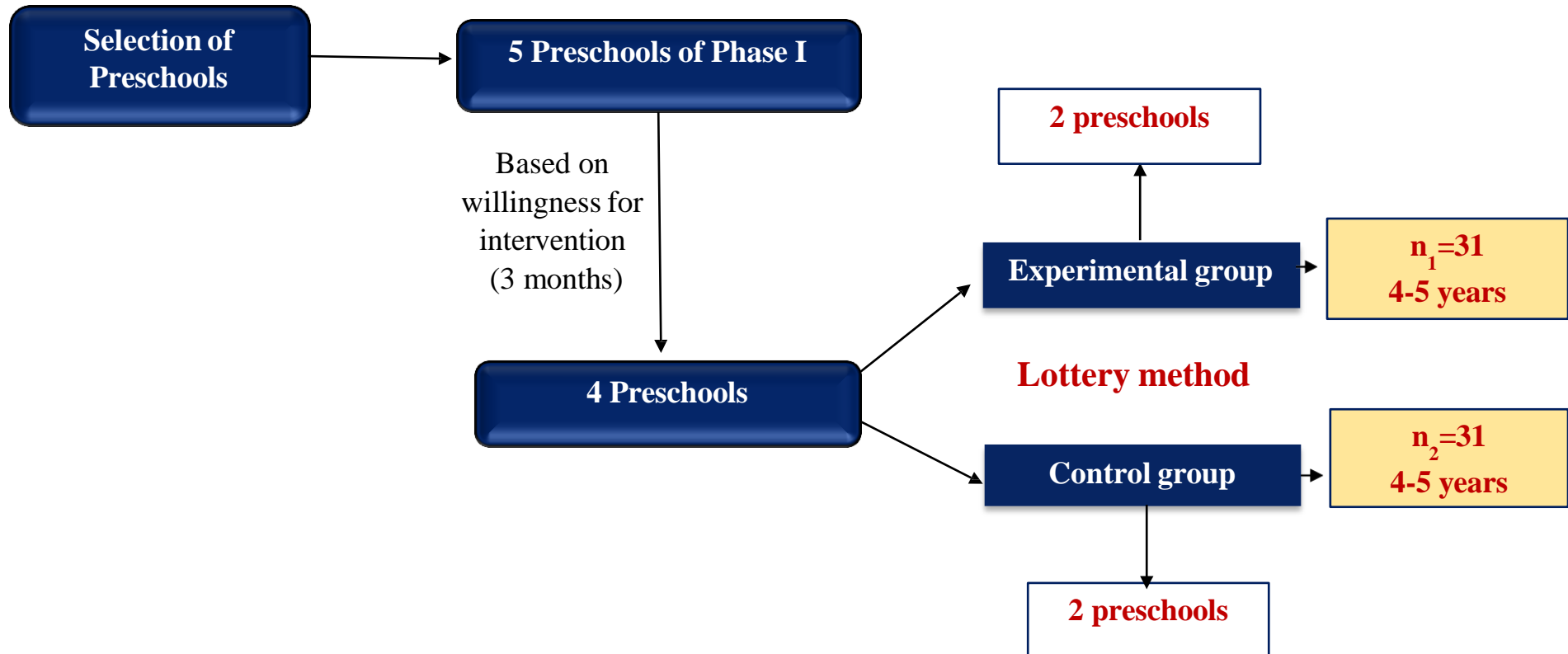


Figure 3

Contd...

Construction of Tools

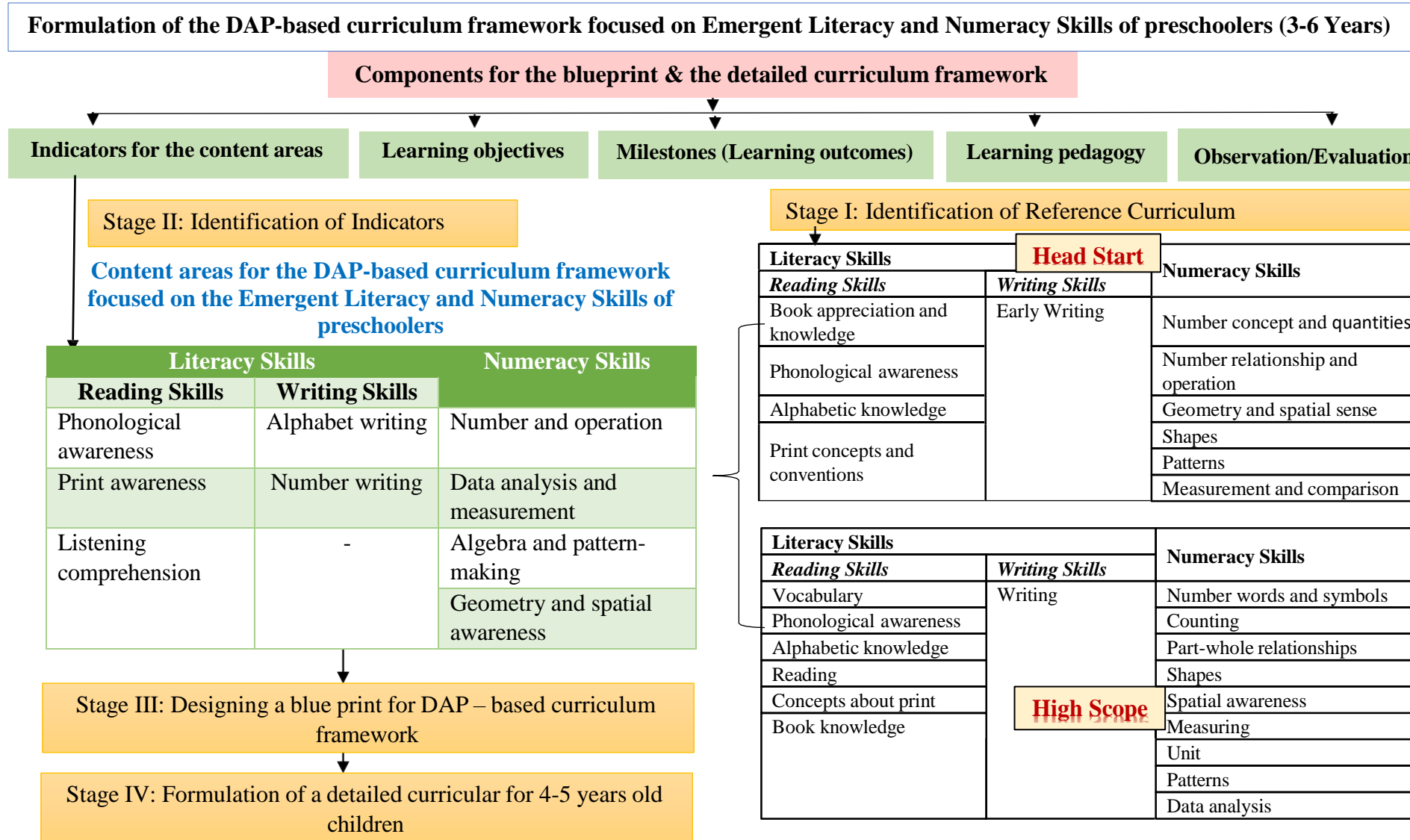


Figure 3

Contd...

Conduct of the study

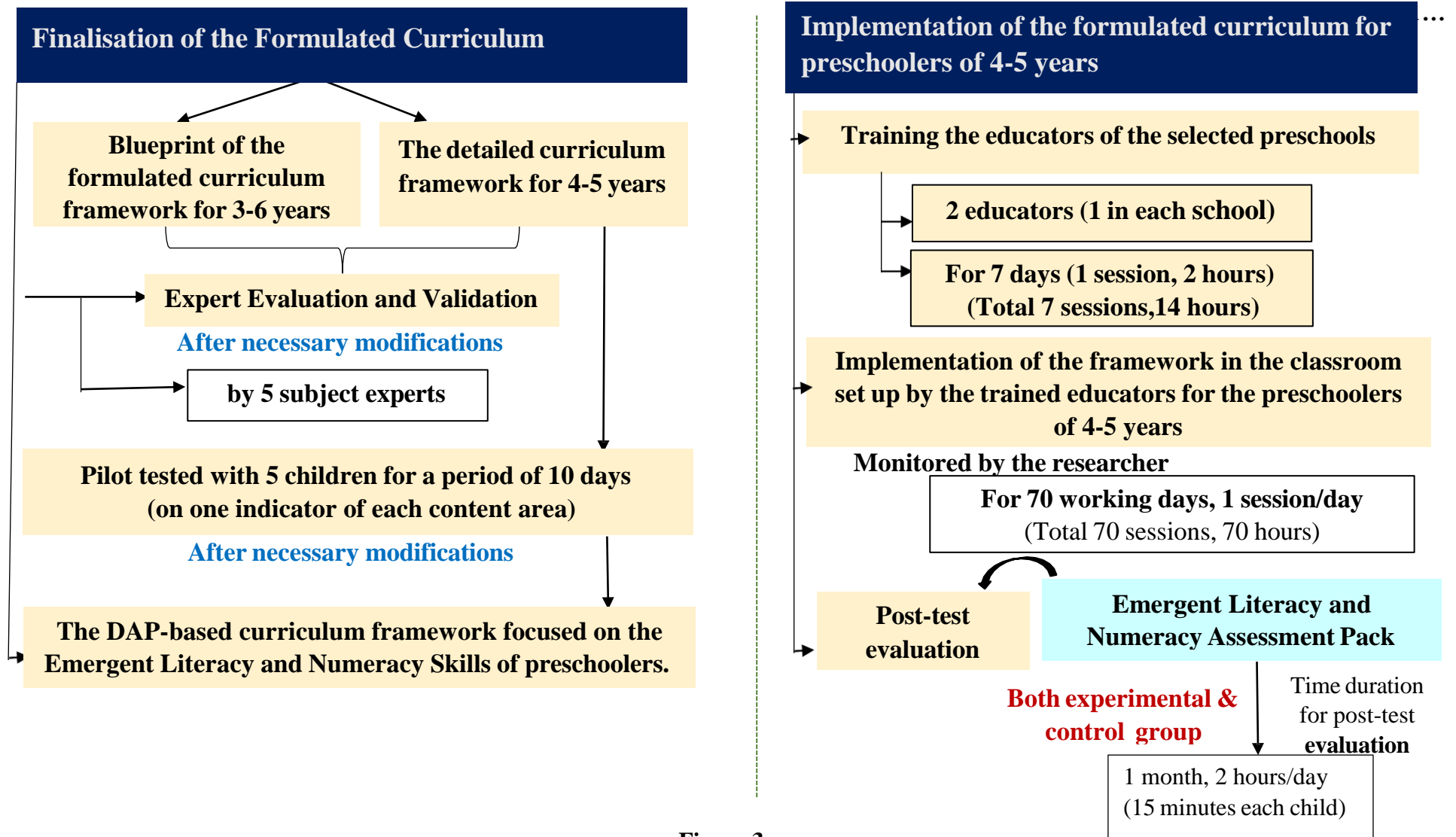


Figure 3

Contd...

Analysis of data

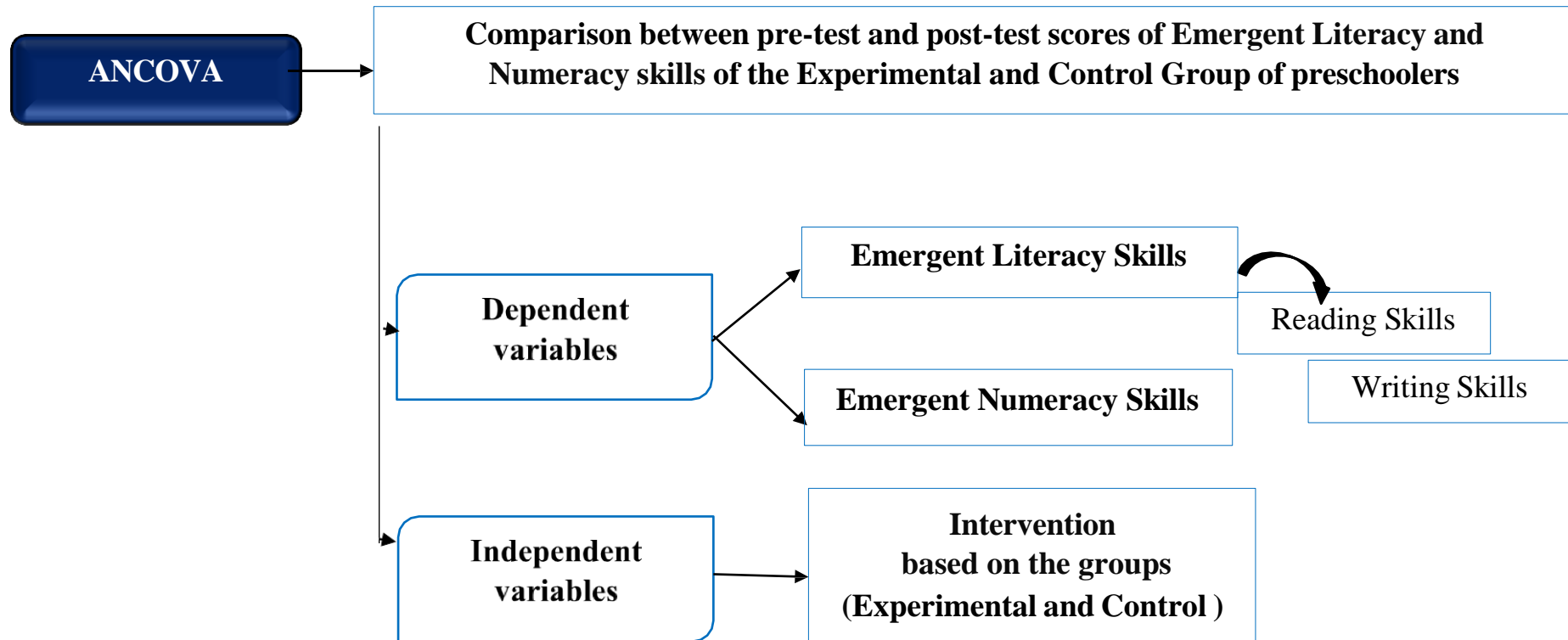


Figure 3