

V. SUMMARY AND CONCLUSION

Early childhood is a crucial period in a child's life where development occurs through various stages of evolution as the child progresses physically, kinetically, cognitively, emotionally, and socially (Sakellariou & Banou, 2020). Early Childhood Care and Education (ECCE) play a crucial role during this stage as it lays the foundation for a child's holistic development and is the period of rapid brain growth.

Though India has made commendable strides in expanding access to ECCE through public and private initiatives and non-governmental support, the system remains fragmented and uneven in quality. With a realisation that ECCE serves as a foundation to lifelong learning and development, National Education Policy (NEP) 2020 has marked a significant policy shift to address the general shortcomings of ECCE in India in terms of enhancing infrastructure, a unified curriculum, suitable training, and other inter-ministerial coordination.

The systematic review conducted at the beginning of the study by using the PRISMA model confirms the critical and persistent challenges, namely, inconsistent curricula, inadequate teacher training, poor infrastructure, overreliance on rote-based methods, and weak community involvement that hinders the quality outcomes pertinent to India's ECCE system.

The statistics of ASER, 2018 in saying that 42.7% of rural Indian children in grade 1 could not even recognise the letters of the alphabet in their medium of instruction, and 35.7% could not recognise numbers from 1-9 stands testimony of the crucial shortcoming of ECCE in India despite policy level emphasis and wide coverage. Adding to this, a study by Ambedkar University in collaboration with ASER (2017) tells us that the origins of this crisis lie even before children enter grade 1. The alarming reality is that only 1 in 10 children aged 5 could match two pictures beginning with the same letter, and only 1 in 6 could complete a simple pictorial pattern. These statistics suggest that the children in India were simply not school-ready (Dhawan & Krishana, 2019).

Consequently, NEP, 2020 has recommended an increased focus on foundational literacy and numeracy, and generally, on reading, writing, speaking, counting, arithmetic, and mathematical thinking throughout the preparatory and middle school curriculum to

avert the learning crisis. In light of this, the review of the study attempted to map the systemic barriers to contextually relevant recommendations by pointing out actionable reforms. The major recommendation was that a multi-pronged approach, rooted in Developmentally Appropriate Practices (DAP), would strengthen ECCE in India.

Developmentally Appropriate Practice (DAP) is a comprehensive, research-based framework that empowers early childhood educators to make informed, intentional decisions that support the holistic development of young children (NAEYC, 2019). Grounded in core considerations of commonality, individuality, and context, DAP emphasises the importance of aligning teaching practices with children's developmental stages, needs, and cultural backgrounds.

Since both DAP and NEP 2020 emphasise child-centric, age-appropriate, and experiential learning, the DAP-based framework could offer a practical and pedagogically sound outline for implementing the ECCE vision. Therefore, DAP is not only compatible with the ECCE goals outlined in NEP 2020, it is also a requirement to realise DAP in practice. Hence, the rationale behind the research was to frame a DAP-based curriculum framework focused on Emergent Literacy and Numeracy Skills of preschoolers and to train preschool educators on the same to implement it in preschool settings, specifically designed for the Indian context and evaluate its effectiveness in terms of enhancing the preschooler's Emergent Literacy and Numeracy Skills.

Accordingly, the study aimed to formulate, implement, and analyse a DAP-based curriculum framework designed to enhance Emergent Literacy and Numeracy Skills in preschoolers aged 3–6 years. The curriculum was planned to be implemented particularly with 4–5-year-old children, as they represent a consistent and developmentally crucial stage within the preschool system. Educators would be trained to effectively carry out the curriculum in classroom settings to ensure alignment with DAP principles.

Accordingly, the study addressed the following research questions:

- ✓ To what extent do preschoolers demonstrate Emergent Literacy and Numeracy Skills under the existing pedagogical framework?
- ✓ Will a DAP-based curriculum framework significantly improve these skills among preschoolers?

With these research questions, certain primary and secondary objectives of the study were framed as mentioned below:

Primary Objective:

To formulate a Developmentally Appropriate Practice (DAP)-based curriculum framework focused on Emergent Literacy and Numeracy Skills for 3-6-year-old children.

Secondary 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

Null hypotheses aligned with the various learning domains being measured in relation to the Developmentally Appropriate Practice (DAP)-based curriculum were framed

H₀1: The Developmentally Appropriate Practice (DAP)-based curriculum has no significant effect on preschool children's Phonological awareness.

H₀2: The Developmentally Appropriate Practice (DAP)-based curriculum has no significant effect on preschool children's Print awareness.

H₀3: The Developmentally Appropriate Practice (DAP)-based curriculum has no significant effect on preschool children's Listening comprehension skills.

H₀4: The Developmentally Appropriate Practice (DAP)-based curriculum has no significant effect on preschool children's Alphabet writing capacity.

H₀5: The Developmentally Appropriate Practice (DAP)-based curriculum has no significant effect on preschool children's Number writing capacity.

H₀6: The Developmentally Appropriate Practice (DAP)-based curriculum has no significant effect on preschool children's Number and operation skills

H₀7: The Developmentally Appropriate Practice (DAP)-based curriculum has no significant effect on preschool children's Data analysis and measurement abilities

H₀8: The Developmentally Appropriate Practice (DAP)-based curriculum has no significant effect on preschool children's Algebra and pattern-making skills

H₀9: The Developmentally Appropriate Practice (DAP)-based curriculum has no significant effect on preschool children's Geometry and spatial awareness.

METHODOLOGY

The study was conducted in two phases, as briefed below:

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

A Cross-sectional research design was adopted for the following phase. A total of 25 private-run preschools from all five zones of the Coimbatore District of Tamil Nadu were shortlisted. Out of 25 preschools, only 5 expressed their willingness to participate, and these schools had a total of 281 preschool children for whom parental assent was procured to be associated with the study. A total of two tools were used to get the necessary data from preschoolers

- i) A self-formulated general background questionnaire to get the personal and parental profile of the preschoolers
- ii) *Emergent Literacy and Numeracy Assessment Pack*: It was a modified version of the Kindergarten Common Core State Standards of North Carolina (2017). The pack comprised specific indicators on Emergent Literacy and Numeracy Skills. The Emergent Literacy Skill has two main indicators, Reading (11 items) and Writing Skills (2 items), with a total of 13 items. The indicators of Reading Skills were - Phonological awareness, Print awareness, and Listening comprehension skill, and for Writing Skills -Alphabet writing and Number writing. The Emergent Numeracy Skills had nine items segregated within four indicators, namely- Number and operation, Data analysis and measurement, Algebra and pattern-making, and Geometry and spatial awareness. As the pack was modified to hold good in the Indian context, the content was validated, and it was pilot tested.

Percentage analysis and ANOVA were carried out to assess the current levels of Emergent Literacy and Numeracy Assessment Skills of selected preschoolers and examine the influence of socio-demographic factors on the same.

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

Before and after with Waitlist Control Group research design was adopted with four preschools that provided consent and agreed to allocate specific structured hours over three months for the implementation of the DAP-based curriculum framework. These preschools were further categorized as an experimental group and a control group, each comprising two preschools. Only 4-5 years old children of these schools were considered for this phase. Accordingly, a total of 62 preschoolers participated in the intervention process, with 31 assigned to the experimental group and the other 31 to the control group.

A DAP-based curriculum framework focused on Emergent Literacy and Numeracy Skills of preschoolers was designed for Indian preschoolers aged 3-6. However, this framework was formulated based on the globally recognised High Scope and Head Start curricula owing to their researched benefits. The blueprint of the framework was designed by identifying content areas and indicators, setting learning objectives, outlining milestones, designing learning pedagogy, and establishing methods for observation and evaluation. Each of these components of the curriculum was formulated based on the needs and context of Indian children.

After subjecting the blueprint to expert evaluation for content validity, elaborate lesson plans for each of the objectives were also developed. Although the framework was framed for children aged 3-6 years, owing to the time restrictions, the framework was planned to be tested only with children of 4-5 years, to be more specific, for children in the lower kindergarten section. The implementation process began with the training of educators for 7 days. Following this, the focused DAP-based curriculum framework was implemented in the classroom by the trained educators. This implementation took place over 70 working days, with 1 session per day (a total of 70 sessions, 70 hours), and was monitored by the researcher.

ANCOVA was computed to compare differences in mean score 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) with an overall objective of evaluating the effectiveness of the

formulated DAP based curriculum in enhancing preschoolers Emergent Literacy and Numeracy Skills.

KEY FINDINGS

The key findings of the two phases of the study were presented below:

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

A. General profile of selected preschoolers

- ✓ A great majority (55%) were within the age of 4 to 5 years, and 35% were in the age group of 5 to 6 years.
- ✓ 52% were firstborn, and 48% were later born.
- ✓ 54% of the respondents were male and 46% were female.
- ✓ 33% were in the prescribed Preschool and 67% were in practice-based centres
- ✓ 77% were from nuclear families, whereas 23% were from joint families
- ✓ Most of the respondents' fathers were graduates (43%), and very few (13%) were postgraduates
- ✓ 32% of mothers have completed their higher secondary level of education, followed by undergraduate (20%). Only a few mothers were postgraduates.
- ✓ 43% of preschoolers' fathers and 24% of preschoolers' mothers were involved in business endeavours. Moreover, 39% of the respondents' mothers were identified as homemakers. Additionally, the data indicates that 41% of fathers and 25% of mothers were employed in the private sector. On the other hand, 16% and 12% were government employees.

B. Categorization of the respondents based on the gradations of Emergent Literacy and Numeracy Skills

- ✓ Out of the 9 indicators, two indicators, namely Listening comprehension and Number writing, indicate that the practices adopted by the educator were more appropriate to foster these skills.

- ✓ Few preschoolers in age groups of 3-4 years and 4-5 years were in the gaining stage in Print awareness, mastery level in Phonological awareness, and Alphabet writing, and approaching in all indicators of Numeracy Skills.
- ✓ More than 1/4th of the preschoolers of 5-6 years were still in the initial stages of Print awareness, frustration level in Phonological awareness, basic grade in Alphabet writing, and just approaching in all indicators of Numeracy Skills

C. Association between the socio-demographic markers and the Emergent Literacy and Numeracy Skills of the selected Preschoolers

- ✓ Gender does not have a significant impact on preschoolers' Emergent Literacy and Numeracy skills
- ✓ Listening comprehension of Emergent Literacy Skills ($F(1,279)=2.804$ and $p=.095$) and the ability in Number and operation of Emergent Numeracy skills ($F(1,279)=4.751$ and $p=.031$) alone varied significantly based on birth order, with firstborn scoring higher than their counterparts
- ✓ Emergent Literacy and Numeracy Skills of preschoolers are independent of the type of family that they hail from
- ✓ Both the indicators of Writing Skills were significantly associated with the ECCE centre (Alphabet writing - $F(1,279)=4.053$ and $p=.040$; and Number writing - $F(1,279)=4.642$ and $p=.032$ respectively), with preschoolers from prescribed preschools reporting enhanced scores. Similarly, on the indicators of Emergent Numeracy Skills, the ability in Number and operation ($F(1,279) = 4.247$ and $p=.030$) alone varied significantly based on their type of preschool, with the prescribed preschool taking a better position
- ✓ Number writing of Emergent Literacy Skills ($F(4,276)=3.884$ and $p=.004$) and two indicators of Numeracy, namely, Geometry and spatial awareness ($F(4,276)=3.089$, and $p=.016$), and Algebra and pattern making ($F(4,276)=5.215$, and $p=.000$) were significantly associated with the fathers' educational status, with preschoolers of postgraduate fathers obtaining a higher score when compared to their counterparts.
- ✓ Mother's educational status was found to have a significant association with Phonological awareness ($F(4,276)=2.707$ and $p=.031$) and Listening comprehension

($F(4,276)= 3.330$ and $p=.011$) of Emergent Literacy Skills and Algebra and pattern making ($F(4,276)=2.890$, and $p=.023$) of Numeracy skills, with preschoolers whose mothers were postgraduates performing better than their counterparts

- ✓ Print awareness ($F(4,276)=3.549$, and $p=.030$) alone was significantly associated with fathers' occupational status of the selected preschoolers, with preschoolers of fathers employed in the private sector performing better than their counterparts
- ✓ Mothers' occupational status was significantly associated with only one indicator of Reading Skills, the Listening comprehension ($F(4,276)=2.926$ and $p=.034$), and two indicators of Numeracy Skills, namely, Geometry and spatial awareness ($F(4,276)= 2.994$, $p=.031$), and Algebra and pattern making ($F(4,276)= 4.380$, $p=.005$), with children of mothers working in the government sector scoring higher.

Phase II: Implementing and evaluating a DAP-based Curriculum Intervention

Key findings were as listed below

A. Effectiveness of DAP-based curriculum framework in enhancing Emergent Literacy Skills of selected Preschoolers

Reading Skills

- a. *Phonological awareness:* ANCOVA revealed a significant effect of the DAP-based intervention on Phonological awareness { $F(1,59)=210.165$, $p=.000$ }. The partial eta square showed a large effect of 78%, and the Pair-wise comparisons showed that the Experimental group of respondents procured a significantly augmented score compared to the control group of respondents, with a mean difference of 24.266 in favour of the experimental group. Hence, the $H_0 1$ was rejected, confirming that the intervention with DAP-based activities, namely, rhyming games, syllable segmentation, and phoneme manipulation, effectively strengthened the preschooler's early literacy foundation.
- b. *Print awareness:* ANCOVA showed a moderately significant effect (24.9%) of intervention on the Print awareness score { $F(1,59)=19.573$, $p=.000$ }. In addition, the Experimental group procured a better score on Print awareness compared to the control group of respondents, with a mean difference of 1.766 in favour of the experimental group. Therefore, $H_0 2$ was rejected. In other words, the DAP activities of the intervention promoted meaningful interactions for preschoolers with Print.

- c. *Listening comprehension*: The score of the experimental group was slightly augmented compared to the control group, with the pairwise comparison revealing a mean difference of 0.194 in favour of the experimental group, although not significant. Hence, the $H_0 3$ was accepted. The lack of impact might be attributed to the ceiling effect (83% mastery as given in phase I) and even the use of appropriate practices in existence. However, future interventions should provide more differentiated strategies.

Writing Skills

- a. *Alphabet writing*: ANCOVA revealed a significant effect of the DAP-based intervention on Alphabet writing $\{F(1,59) = 21.365, p = .000\}$. The partial eta square showed a low to moderate effect size (27%) in explaining the effectiveness of the intervention. Pair-wise comparisons showed that the Experimental group of respondents procured a notably higher score compared to the control group of respondents, with a mean difference of 1.138 in favour of the experimental group. Hence, the $H_0 4$ was rejected, substantiating the effectiveness of the DAP-based intervention in enhancing writing development through structured, age-appropriate activities.
- b. *Number writing*: A statistically significant effect of the intervention on Number writing scores after adjusting for pre-test performance with $F(1, 59) = 71.22, p = .001$, was noted. A variance of 54% was explained by the intervention. Pair-wise comparisons showed that preschoolers from the experimental group scored better than their cohort, with a mean difference of 10.005. The results validated the rejection of the $H_0 5$, further authenticating that the DAP-based intervention had fostered the preschoolers' numerical writing proficiency through scaffolded, hands-on, and play-based math activities.

B. Effectiveness of DAP-based curriculum framework in enhancing Emergent Numeracy Skills of selected Preschoolers

- a. *Number and operation*: ANCOVA exposed a statistically significant effect of DAP-based intervention on Number and operation $\{F(1, 59) = 45.218, p = .000\}$. The result also revealed that the partial eta square showed an effect of 43%, stating that the intervention provided a variance of 43% among the experimental group of preschoolers. The Pair-wise A significant mean difference of 3.284 in favour of the Experimental group of respondents in the pair-wise comparison demonstrates the

impact of hands-on, constructivist learning strategies grounded in theoretical principles of the DAP-based curriculum framework on the Number and operation skills, thereby rejecting H_0 6.

- b. Data Analysis and measurement:* A significant effect of DAP-based intervention on the Data Analysis and measurement $\{F(1, 59)=109.212, p = .001\}$ was observed. The partial eta square showed a high effect size of 64%, with the pair-wise comparisons showing an augmented score among the experimental group of preschoolers compared to the control, with a mean difference of 1.985. Hence, the activities like sorting, measuring, aligned with DAP principles, had helped children develop analytical thinking, thereby confirming the rejection of H_0 7.
- c. Algebra and pattern-making:* The ANCOVA analysis demonstrated a significant effect of DAP-based intervention on Algebra and pattern-making $\{F(1, 59) = 41.706, p = .000\}$. The partial eta square showed a low to moderate effect, with the intervention accounting for 41% variance. The Pair-wise comparisons show that the experimental group of respondents significantly had an augmented score compared to the control group of respondents, with a mean difference of 3.445. Henceforth, the intervention had significantly enhanced early algebraic thinking and pattern recognition of the selected preschoolers, refuting hypothesis H_0 8.
- d. Geometry and spatial awareness:* A significant effect of DAP-based intervention on Geometry and Spatial awareness $\{F(1, 59) = 36.504, p=.000\}$ was revealed. The partial eta square showed a variance of 54%, which was explained by the intervention. Pair-wise comparisons show that preschoolers from the experimental group scored better than their cohort, with a mean difference of 1.376. In light of these findings, the experimental group excelled in identifying shapes and spatial awareness through DAP activities based on observational learning and real-world object interaction. Hence, the hypothesis H_0 9 was rejected.

CONCLUSION

In conclusion, the challenges faced by preschools in India, operating in diverse settings, can be effectively addressed through a well-formulated DAP-based curriculum framework. The findings highlight that 7 out of 9 key indicators were not adequately

addressed in the existing classroom setting, underscoring the need for such a framework. Additionally, certain socio-demographic factors exert a varying yet tangible influence on preschoolers' Emergent Literacy and Numeracy Skills, ranging from minimal to moderate.

Notably, the DAP-based curriculum framework demonstrated a significant impact on 8 out of 9 indicators, except Listening comprehension, reinforcing its effectiveness in fostering foundational Literacy and Numeracy Skills among preschoolers. Therefore, the formulated DAP-based curriculum framework focused on Emergent Literacy and Numeracy Skills can help bridge the gap and could significantly improve preschoolers' Emergent Literacy and Numeracy Skills.

Additionally, aligning ECCE efforts with the Sustainable Development Goals (SDGs) - particularly SDG 4 (Quality Education) - ensures that such initiatives contribute to inclusive and equitable quality education for all children, promoting lifelong learning opportunities and supporting broader social and economic development. By integrating these global goals, the curriculum framework addresses immediate educational challenges and also advances sustainable development through empowered and skilled future generations.

RECOMMENDATIONS FOR FURTHER FOLLOW-UP

- As DAP-based interventions have a significant effect on the Emergent Literacy and Numeracy Skills of children within the age group of 4-5, further research can be carried out to test the formulated curriculum for 3-4 years and 5-6 years.
- The study also necessitates the completion of in-service training programmes by the educators to get trained on the ECCE DAP-based curriculum.
- Further research can be conducted to investigate the long-term effects of formulated DAP-based curriculum on Emergent Literacy and Numeracy Skills as children transition from preschool to primary school, as it could provide valuable insights into how early DAP-based interventions influence later academic achievement and accomplishment of developmental milestones.
- A comprehensive framework can be developed to address all content areas and its relevant indicators of the Early childhood period.

IMPLICATIONS OF THE STUDY

The findings of the current research have a set of implications that were categorized based on the stakeholders' role in ECCE as a whole.

For School/Centre Administrators

- Provides a structured framework to support the Emergent Literacy and Numeracy Skills of preschoolers
- Promotes initiatives that engage families and communities in the educational process, strengthening partnerships that enhance children's learning experiences.
- Necessitates educators' training to equip them with essential skills for effectively implementing the framework

For Educators

- Helps to create engaging and developmentally appropriate learning environments to enhance the Emergent Literacy and Numeracy Skills of preschoolers
- Supports in customising DAP-based lesson plans that are tailored to the unique developmental needs and interests of young children
- Helps to schedule play-based and hands-on activities to foster children's curiosity and motivation while adapting instruction to meet diverse learning needs
- Offers guidance on assessing children's progress in a developmentally appropriate manner, allowing them to identify and support individual learning needs effectively

For Preschoolers

- Help them to build a strong foundation in Literacy and Numeracy Skills, which helps them to meet later academic expectations
- Promotes positive learning attitudes that support long-term academic success
- As it is designed to meet children's individual developmental needs, it helps reduce learning gaps and provides a more equitable foundation for preschoolers

For Community

- Helps foster collaboration between ECCE educators and community organizations, reinforcing common goals for children's educational outcomes, especially in Literacy and Numeracy.
- Helps address gaps in educational opportunities within the community, ensuring that all children have access to quality learning experiences

LIMITATIONS OF THE STUDY

- The sample size for this study was limited to 281 preschoolers, which may affect the generalisability of the findings. A larger sample might provide more reliable and effective results.
- As this study was conducted for only three months, it may not show the long-term effects of the curriculum on children's literacy and numeracy development. These early skills often take more time to develop fully and may require longer follow-up to understand their lasting impact.
- Children's development is influenced by various external factors such as parental involvement, home-provided opportunities and early experiences, nutrition, and access to learning materials. These variables were not examined in the study, which may have affected the outcomes.
- This study primarily focused on Emergent Literacy and Numeracy Skills and did not explore other areas such as Arts, Science, Social Studies, which are also essential parts of the holistic growth and development.
- The educators received training only for a week, providing a longer training period could potentially enhance their understanding and support even more effective implementation of the formulated curriculum in the classroom settings