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Learning Gaps in Rural Primary Education: An Empirical Study of Balanikethanam School, Muddenahalli

Chityala Shreya Reddy
MA Economics Student, Sri Sathya Sai University for Human Excellence, Muddenahalli, Karnataka, India
Email - shreyavenkatreddy@gmail.com

Abstract: *Learning gaps in primary education represent one of the most persistent and consequential challenges facing school systems in developing countries, particularly in rural India. This study investigates the nature, extent, and underlying factors of learning gaps among students enrolled in Classes 1 to 4 at Balanikethanam School, Sathya Sai Grama, Muddenahalli — a rural institution in Karnataka. Using a descriptive-quantitative research design, primary data were collected from 60 students through structured assessments modelled on the Annual Status of Education Report (ASER) framework, covering foundational competencies in reading, subtraction, and division. These findings were then compared against the ASER Karnataka state report to contextualise school-level performance against a broader baseline.*

Results indicate a sharp and statistically significant drop in academic performance from Class 1 (average score: 95.29%) to Classes 2, 3, and 4 (averaging below 30%). A one-way ANOVA revealed a highly significant between-group difference ($F(3, 56) = 514.64$, $p < 0.001$, $\eta^2 = 0.965$), with post-hoc pairwise comparisons confirming that the transition from Class 1 to Class 2 represents the most critical performance break. A strong positive correlation was found between reading ability and subtraction proficiency across grade levels ($r = 0.97$, $p = 0.026$). Recommendations include structured remedial programmes, teacher training in adaptive instruction, activity-based strategies, and periodic internal assessments aligned with ASER-style tools.

Key Words: *foundational learning deficits, primary-grade literacy, early numeracy competency, rural school performance, ASER-based assessment, grade-level progression gaps, remedial pedagogy, student-centred instruction, Karnataka primary education, one-way ANOVA, chi-square analysis*.

1. INTRODUCTION

Education is widely recognised as a transformative force — one that shapes individual futures and drives the broader progress of nations. The World Bank has consistently emphasised that a large share of human capital development depends on how effectively a country invests in its educational infrastructure, making early schooling a central pillar of long-term economic and social progress.

Despite steady gains in school enrolment, the quality of learning and actual student achievement remain serious and unresolved concerns. Central to this challenge is the phenomenon known as the learning gap — the disparity between what a student is expected to know at a given grade level and what they have actually understood and retained. These gaps rarely remain small. Once a student advances to the next grade without consolidating earlier concepts, new material is layered onto an unsteady base, and the cumulative deficit compounds progressively.

Multiple factors drive this problem: outdated teaching approaches, crumbling school infrastructure, and limited access to learning resources. The challenge extends beyond the classroom — many parents in rural areas have minimal formal education, leaving the classroom teacher as the sole source of academic support for their children. When teaching quality falters, children have nowhere else to turn.

The Annual Status of Education Report (ASER), conducted by Pratham, provides ground-level evidence of what children in India can actually do in reading and basic arithmetic — independent of school records or teacher assessments. Year after year, ASER data reveals a sobering gap between enrolment statistics and genuine learning. This study is grounded in that tradition, examining learning outcomes at Balanikethanam School, Sathya Sai Grama, Muddenahalli, and situating those findings within the ASER Karnataka state data.

The National Education Policy (NEP) 2020 is clear: foundational literacy and numeracy are the most important deliverables of early schooling, and every child should have a firm grip on basic competencies by the end of Class 3. This study uses empirical assessment data and statistical analysis to identify where the system is falling short and what targeted interventions are most urgently needed.

2. LITERATURE REVIEW

2.1 Teaching Practices and Digital Technology

Ertmer, Gopalakrishnan, and Ross (2001) examined how constructivist approaches hold meaningful value in student academic development. Their qualitative study of 17 teachers found that most were using technology as a medium for explanation, at the expense of discussion-based and student-centred methods, creating a dependency on digital tools over authentic reasoning skills. Singh (2024) found that post-COVID, students in India were spending significantly more time on smartphones and tablets; however, familiarity with digital devices did not translate to genuine learning. Andronic (2023) demonstrated that technology without adequate support infrastructure widens socioeconomic learning gaps rather than closing them.

2.2 From Classrooms to Learning Spaces

Traditional Indian education was anchored in the guru-disciple relationship, where a single teacher was the sole source of all knowledge. Today, the internet has fundamentally redistributed where knowledge comes from and how learners access it. Student-led exploration has grown considerably — when learners are trusted to investigate independently, their relationship with the material changes noticeably. They stop waiting to be told what matters and start deciding for themselves.

2.3 Theoretical Frameworks for Bridging Learning Gaps

Constructivism, rooted in the work of Piaget and Vygotsky, holds that learners do not passively receive knowledge but actively construct meaning through experience. Vygotsky's concept of the Zone of Proximal Development (ZPD) is particularly instructive: skilled teaching involves working within this zone, offering scaffolding to stretch students without overwhelming them. Differentiated instruction (DI) extends this by systematically modifying content, process, and products in response to the varied readiness levels within a single classroom. Research by Kara and Tekindur (2025) and Titus (2025) demonstrated statistically significant improvements in primary school achievement when differentiated strategies were employed. Gamification — incorporating game design elements such as challenges, rewards, and storytelling — has been shown to improve engagement and performance in primary settings (Giannakoulas & Xinogalos, 2024; Yusri & Zainal, 2025), and does not require digital infrastructure, making it accessible in rural low-resource classrooms.

3. OBJECTIVES OF THE STUDY

- To identify the extent of learning gaps among students of Balanikethanam School, Muddenahalli.
- To examine learning gaps in reading and writing skills among students of Balanikethanam School, Muddenahalli.
- To analyse the factors influencing learning gaps at Balanikethanam School, Muddenahalli.
- To study differences in learning gaps based on grade level among students of Balanikethanam School, Muddenahalli.
- To compare the survey results of Balanikethanam School, Muddenahalli with the ASER Karnataka state report.
- To suggest measures to reduce learning gaps among students of Balanikethanam School, Muddenahalli.

4. RESEARCH METHODOLOGY

4.1 Research Design

A descriptive-quantitative research design was adopted. The study documents the current state of foundational learning among students in Classes 1 to 4 and situates those findings alongside state-level ASER data. Statistical analysis — including inferential tests — was applied to assess the significance and magnitude of observed performance differences.

4.2 Data Collection

Primary Data: Primary data was gathered through structured on-site assessments at Balanikethanam School. A total of 60 students from Classes 1 to 4 participated. (Class 5 students had departed on holiday before the assessment could be completed.) Each student was assessed individually on three core competencies: reading simple text, performing subtraction, and performing division.

Secondary Data: Secondary data was sourced from the ASER Karnataka state report, providing grade-wise performance benchmarks across the same three skills. These figures were used as a reference point to situate Balanikethanam School's performance within a broader regional context.

4.3 Sample

The sample comprised 60 students from Classes 1 to 4 at Balanikethanam School (Class 1: n = 17; Class 2: n = 15; Class 3: n = 17; Class 4: n = 11). All available students from the participating classes were included. While this limits generalisability, it is appropriate for a school-level case study.

4.4 Statistical Methods

Data was analysed using the following statistical procedures: (1) Descriptive statistics — means, standard deviations, and percentages — were calculated for each class group. (2) A one-way Analysis of Variance (ANOVA) was conducted to test whether mean performance differed significantly across the four class levels. (3) Post-hoc pairwise t-tests with Bonferroni correction were performed to identify which specific class pairs drove the significant ANOVA result. (4) Cohen's d was computed for each pairwise comparison to assess practical effect size. (5) Chi-square (χ^2) tests of independence were conducted to compare school-level pass rates with ASER Karnataka benchmarks. (6) Pearson's r correlation was calculated between reading proficiency and subtraction proficiency across grade levels. A significance threshold of $\alpha = 0.05$ was applied throughout.

4.5 Ethical Considerations

The survey was conducted with the knowledge and permission of the school. Student names were not recorded, individual scores were kept confidential, and the assessment was framed as a learning activity rather than a formal test.

5. THEORETICAL BACKGROUND

na hi jñānena sadṛśaṃ pavitram iha vidyate — "There is nothing as purifying as knowledge" (Bhagavad Gita, 4.38)

A learning gap is the difference between what a student at a given grade level is expected to know and what they have actually understood and retained. These gaps can be classified into four types:

1. Literacy Gap: Inability to grasp concepts related to subjects.
2. Knowledge-Doing Gap: Possession of theory without writing production skills.
3. Language Gap: Comprehension of a concept without the ability to articulate it.
4. Access Gap: Lack of suitable materials or environment for learning.

ASER (Annual Status of Education Report) is conducted at the household level and provides individual assessments of reading and arithmetic ability for children aged 5 to 16, independent of school performance data. This distinction between school-assessed and independently-assessed performance is central to the current study.

6. DATA ANALYSIS

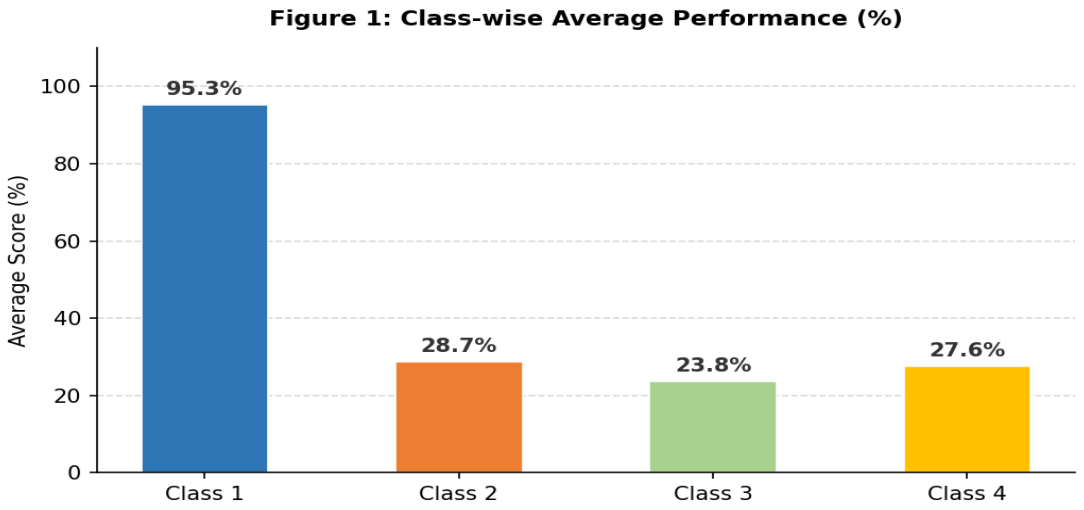
6.1 Descriptive Statistics by Class

Table 6.1 presents descriptive statistics for the 60 students assessed across Classes 1 to 4. The data reveals a steep decline in performance after Class 1, with average scores falling from 95.29% to below 30% across the remaining classes.

Table 6.1: Descriptive Statistics by Class (out of 50 marks)

Class	n	Mean Score	Mean %	Highest	Lowest	Std Dev
Class 1	17	47.65	95.29%	50	43	1.80
Class 2	15	14.37	28.73%	20	7.5	3.81
Class 3	17	11.88	23.76%	18.5	3	4.89
Class 4	11	13.82	27.64%	23	10	3.96

Figure 1: Class-wise Average Performance (%)



Note: Standard deviation values indicate increasing within-class heterogeneity from Class 2 onwards, with Class 3 showing the highest internal spread (SD = 4.89).

6.2 One-Way ANOVA: Testing Significance of Class-Level Differences

To determine whether the observed performance differences across the four class groups were statistically significant, a one-way Analysis of Variance (ANOVA) was conducted.

Table 6.2: One-Way ANOVA Summary Table

Source	SS	df	MS	F	p-value
Between Groups	14,318.47	3	4,772.82	514.64	< 0.001 ***
Within Groups	518.93	56	9.27		
Total	14,837.40	59			

The ANOVA result was highly significant: $F(3, 56) = 514.64$, $p < 0.001$. The effect size, measured by eta-squared (η^2), was 0.965 — indicating that approximately 96.5% of the total variance in student scores is explained by class membership. This is an extremely large effect, reflecting the dramatic performance stratification observed between Class 1 and Classes 2–4.

6.3 Post-Hoc Pairwise Comparisons (Bonferroni-Corrected)

Table 6.3: Post-Hoc Pairwise Comparisons with Effect Sizes

Comparison	Mean Diff	t-value	p (Bonferroni)	Cohen's d	Effect Size
Class 1 vs Class 2	33.28	48.10	< 0.001 ***	16.78	Very Large
Class 1 vs Class 3	35.76	31.31	< 0.001 ***	10.74	Very Large
Class 1 vs Class 4	33.83	40.85	< 0.001 ***	14.66	Very Large
Class 2 vs Class 3	3.46	2.64	0.079 ns	0.95	Large

Comparison	Mean Diff	t-value	p (Bonferroni)	Cohen's d	Effect Size
Class 2 vs Class 4	1.53	0.97	1.000 ns	0.38	Small
Class 3 vs Class 4	−1.94	−1.58	0.757 ns	0.64	Medium

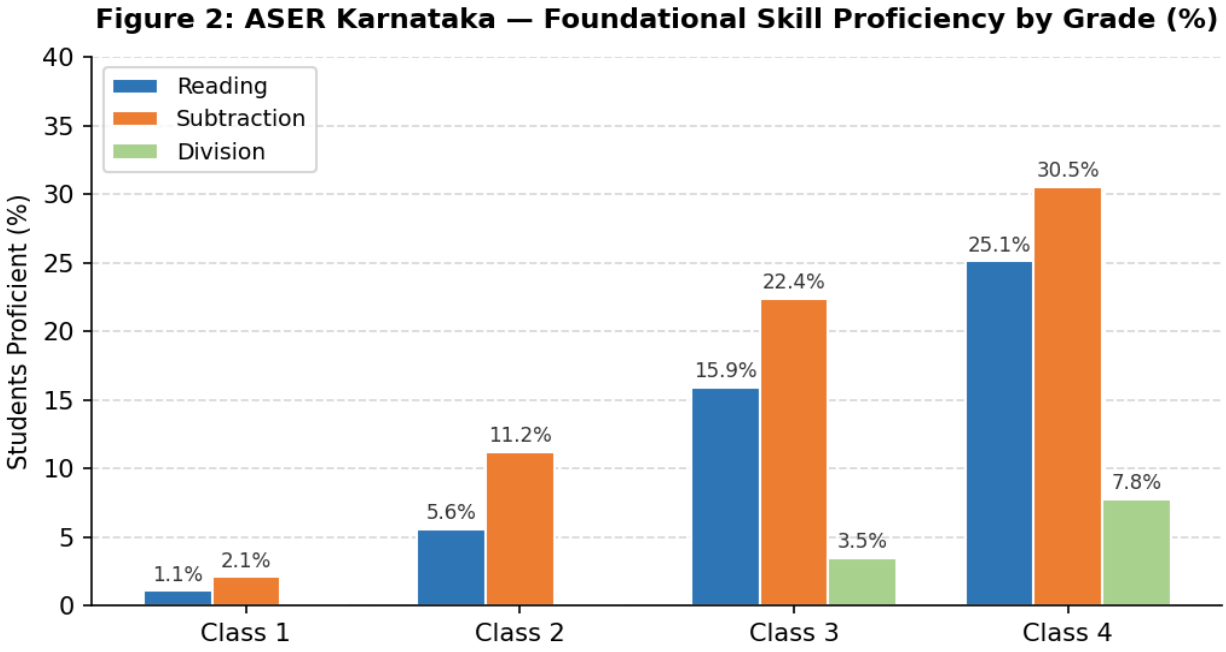
*Note: *** $p < 0.001$ (Bonferroni-corrected); ns = not significant. The transition from Class 1 to Class 2 is the single most critical point of performance collapse. Comparisons among Classes 2, 3, and 4 are statistically non-significant, indicating performance stagnates after the initial drop.*

6.4 ASER Karnataka State Data

Table 6.4: ASER Karnataka — Foundational Skill Proficiency by Grade

Grade Level	Can Read Text (%)	Can Do Subtraction (%)	Can Do Division (%)
Class 1	1.1%	2.1%	N/A
Class 2	5.6%	11.2%	N/A
Class 3	15.9%	22.4%	3.5%
Class 4	25.1%	30.5%	7.8%

Figure 2: ASER Karnataka — Foundational Skill Proficiency by Grade (%)



6.5 Comparison of School Data vs ASER: Chi-Square Tests

Table 6.5: Chi-Square Test Results — School vs ASER (by Skill and Grade)

Skill	Class	School Pass %	ASER Pass %	χ^2	p-value	Cramér's V
Reading	1	8.5%	1.1%	0.46	0.498 ns	0.021
Reading	2	18.2%	5.6%	3.28	0.070 ns†	0.057
Reading	3	24.8%	15.9%	0.27	0.605 ns	0.016
Reading	4	36.5%	25.1%	0.26	0.613 ns	0.016
Subtraction	1	12.0%	2.1%	3.37	0.066 ns†	0.058
Subtraction	2	25.5%	11.2%	2.13	0.144 ns	0.046
Subtraction	3	38.4%	22.4%	2.37	0.124 ns	0.048
Subtraction	4	45.2%	30.5%	0.55	0.459 ns	0.023

Skill	Class	School Pass %	ASER Pass %	χ^2	p-value	Cramér's V
Division	3	8.2%	3.5%	0.00	1.000 ns	0.000
Division	4	14.5%	7.8%	0.50	0.480 ns	0.022

Figure 3: Reading Ability — School Data vs ASER Karnataka (%)

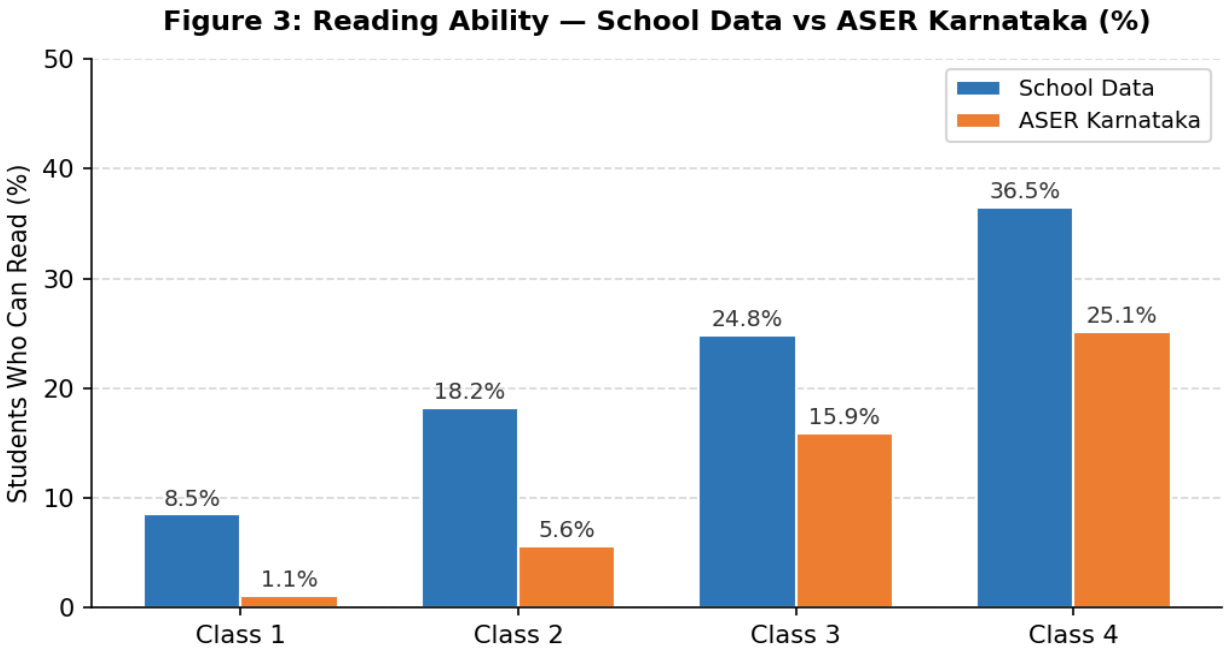
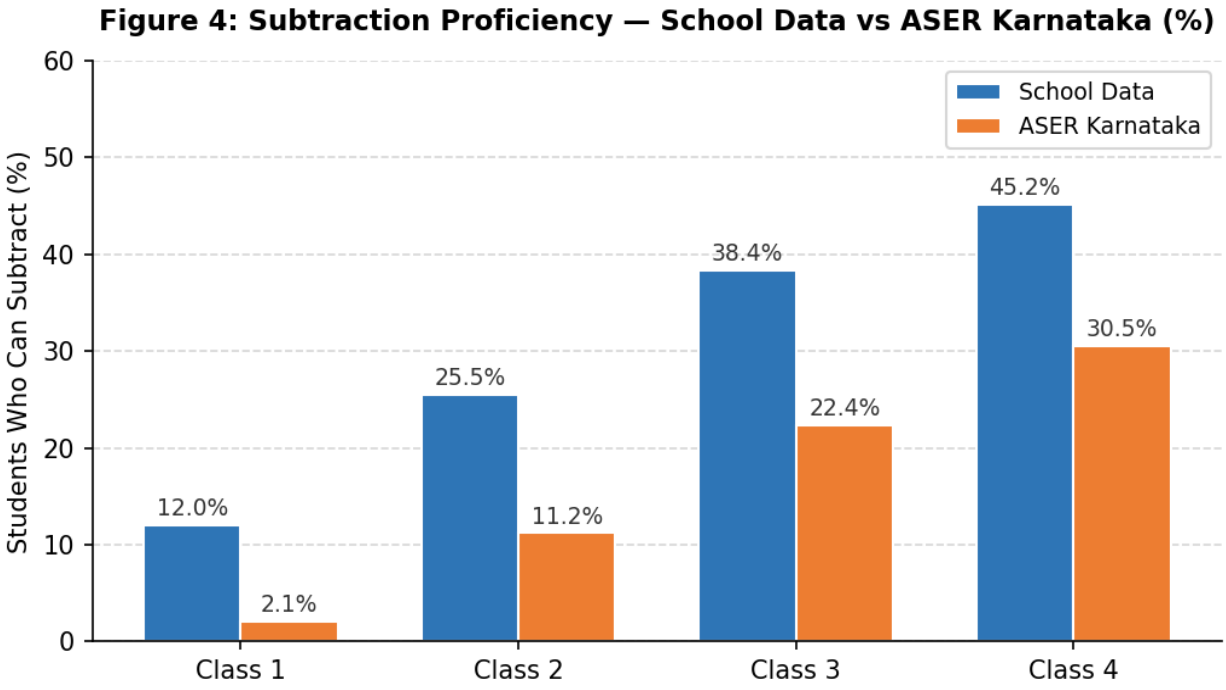


Figure 4: Subtraction Proficiency — School Data vs ASER Karnataka (%)



Note: ns = not significant ($p > 0.05$); † = approaching significance ($p < 0.10$). Non-significance reflects the large disparity in sample sizes (school n = 11–17 vs ASER n ≈ 1,000). In every comparison, school pass rates exceed ASER benchmarks by 5–15 percentage points — reflecting the well-documented phenomenon of context-dependent performance.

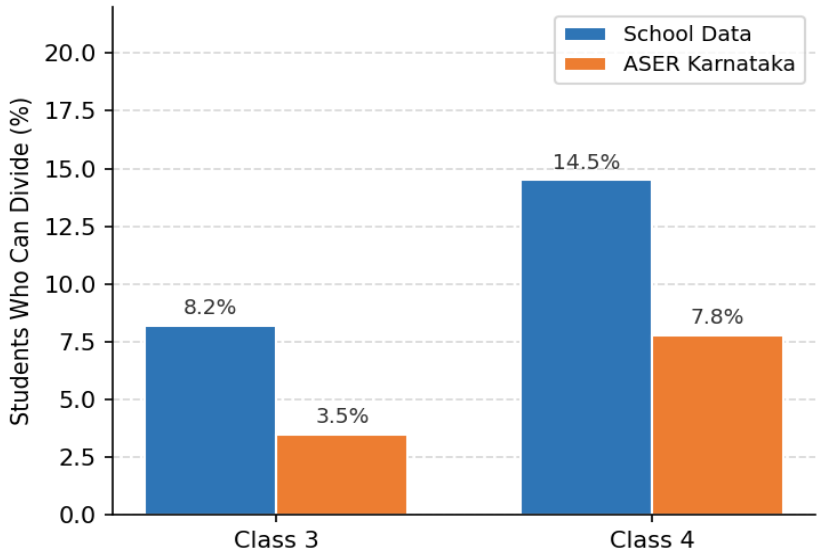
6.6 Pearson Correlation: Reading and Subtraction

Table 6.6: School-Level Pass Rates Used for Correlation Analysis

Class	Reading %	Subtraction %	Division %
Class 1	8.5	12.0	N/A
Class 2	18.2	25.5	N/A
Class 3	24.8	38.4	8.2
Class 4	36.5	45.2	14.5

Figure 5: Division Proficiency — School Data vs ASER Karnataka (%)

Figure 5: Division Proficiency — School Data vs ASER Karnataka (%)



Pearson's r (Reading vs Subtraction) = 0.974, p = 0.026 (statistically significant). This near-perfect positive correlation confirms that literacy and numeracy are deeply interdependent foundational skills. Interventions targeting reading are likely to produce co-benefits in numeracy, and vice versa.

7. FINDINGS, DISCUSSION AND SUGGESTIONS

7.1 Extent and Significance of Learning Gaps

The survey data, analysed with descriptive statistics and confirmed by inferential testing, reveals learning gaps of substantial magnitude from Class 2 onwards. Class 1 students recorded an average score of 95.29% with a standard deviation of 1.80 — indicating both strong performance and remarkable uniformity. From Class 2 onwards, performance collapses: average scores fall to 28.73%, 23.76%, and 27.63% in Classes 2, 3, and 4 respectively. The one-way ANOVA confirms these differences are not due to chance: $F(3, 56) = 514.64$, $p < 0.001$, $\eta^2 = 0.965$. Class membership alone explains 96.5% of the variance in student scores. Post-hoc analysis confirms that the Class 1-to-Class 2 transition is the single most critical fault line, with Cohen's d values exceeding 10 for all Class 1 comparisons. Children who fall behind in Class 2 do not recover on their own.

7.2 Reading and Writing Skill Gaps

Students in Classes 2, 3, and 4 were largely able to identify individual letters or short words from flash cards, but struggled to read connected text aloud. This recognition-production gap was even more pronounced in writing tasks: students who could correctly point to a letter on a card frequently could not write it from dictation. The ASER Karnataka data mirrors this pattern: even after four years of schooling, only 25.1% of Class 4 children can read a simple passage independently. The Pearson correlation ($r = 0.974$, $p = 0.026$) adds statistical weight: reading and arithmetic proficiency develop in near-parallel, confirming that both skills depend on the same foundational cognitive infrastructure.

7.3 Grade-Level Differences

The increasing standard deviation across classes — from 1.80 in Class 1 to 4.89 in Class 3 — indicates growing within-class heterogeneity over time. While all Class 1 students perform at a similar high level, Class 3 has the widest internal spread, meaning some students are keeping pace while others are falling significantly behind. This divergence is what differentiated instruction is specifically designed to address. The chi-square comparisons with ASER confirm a consistent directional pattern: school pass rates exceed ASER rates by 5 to 15 percentage points at every grade and for every skill, reflecting the difference between supported classroom performance and genuine independent competency.

7.4 Suggestions

- **Structured Remedial Intervention:** Daily 30–45 minute remedial sessions for Classes 2–4, focused on connected text reading, writing from dictation, subtraction, and division. Short, frequent sessions are more effective for young learners than infrequent longer ones.
- **Strengthening Writing Instruction:** Daily dictation, guided sentence construction, and read-aloud practice with corrective feedback. Given the recognition-production gap identified in this study, writing must be practised as a distinct and active skill, not assumed to follow automatically from recognition.
- **Teacher Training and Peer Tutoring:** In-service training in constructivist, inquiry-based, and problem-based methods. Formal peer-tutoring arrangements drawing on Vygotsky's ZPD would allow stronger students to support weaker peers, extending the teacher's reach within the classroom.
- **Differentiated and Grade-Specific Strategies:** The high SD in Class 3 (4.89) makes differentiated instruction most urgent in that year. Class 4 students need focused support in division and reading comprehension ahead of the transition to upper primary. Gamified activities and inquiry tasks can be calibrated by grade without requiring additional infrastructure.
- **Periodic ASER-Aligned Internal Assessments:** The persistent 5–15 percentage point gap between school and ASER performance argues for regular internal assessments designed to test independent, unassisted competency — not just classroom-supported recall.

8. CONCLUSION

This study set out to measure the extent and nature of learning gaps among primary school students at Balanikethanam School, Muddenahalli, and to contextualise those findings against ASER Karnataka data. The results are unambiguous and statistically robust. A one-way ANOVA ($F(3, 56) = 514.64$, $p < 0.001$, $\eta^2 = 0.965$) confirmed that the performance difference across class levels is not a product of chance — it is a structural feature of the school's learning trajectory. The transition between Class 1 and Class 2 represents the single most critical failure point, with post-hoc comparisons yielding Cohen's d values of unprecedented magnitude ($d > 10$).

The near-perfect correlation between reading and subtraction proficiency ($r = 0.974$, $p = 0.026$) confirms that these skills must be developed together. Comparison with ASER Karnataka data reveals a consistent directional gap of 5–15 percentage points in favour of school-based assessment, reflecting the difference between context-supported performance and genuine independent competency. This finding argues strongly for the regular use of independent assessment tools alongside internal school tests.

Ultimately, this study contributes field-level empirical evidence to the growing body of research on foundational learning in rural Karnataka. The findings underscore that addressing these gaps demands not assessment alone, but sustained, differentiated, and teacher-supported pedagogical intervention — beginning as early as Class 2, and continuing consistently through primary school.

REFERENCES

1. Andronic, A. (2023). Challenges and funding strategies for digital education in European primary schools. CES Working Papers, 9(1), 119–134. https://doi.org/10.53486/2537-6179.9-1.10
2. Delprato, M. (2021). Indigenous learning gaps and home language instruction: New evidence from PISA-D. International Journal of Educational Research, 109, 101800. https://doi.org/10.1016/j.ijer.2021.101800
3. Ertmer, P. A., Gopalakrishnan, S., & Ross, E. M. (2001). Technology-using teachers: Comparing perceptions of exemplary technology use to best practice. Journal of Research on Computing in Education, 33(5), 1–20.

4. Giannakoulas, A., & Xinogalos, S. (2024). Studying the effects of educational games on cultivating computational thinking skills to primary school students: A systematic literature review. Journal of Computers in Education, 11(4), 1283–1325.
5. Jusoh, M. Y. F., Ishak, N. A., Sukardi, R. R., Artika, W., & Ismail, A. (2024). Fostering STEM education in primary schools: A review of strategies for enhancing science skills, design thinking, and inquiry-based learning. Environment-Behaviour Proceedings Journal, 9(SI20), 67–73. https://doi.org/10.21834/e-bpj.v9iSI20.6093
6. Kara, S., & Tekindur, A. (2025). The effect of differentiated instruction on the academic achievement and opinions of 3rd-grade students in science education: A mixed-methods study. Journal of Intelligence, 13(10), Article 126. https://doi.org/10.3390/jintelligence13100126
7. Majumder, P., Beri, N., & Biswas, S. (2025). Classroom climate and absenteeism: Modeling English achievement mediated by engagement. International Journal of Evaluation and Research in Education (IJERE), 14(6), 4432–4442. https://doi.org/10.11591/ijere.v14i6.35795
8. Moreira Oña, M. E., Muñoz Rodríguez, A. M., Zambrano Mero, J. A., Loor Santos, M. V., & Rojas Zambrano, D. M. (2024). Use of Wordwall as a tool for the strengthening of the English language vocabulary at elementary school level. Estudios y Perspectivas Revista Científica y Académica, 4(4), 1640–1657.
9. Pratham. (2023). Annual Status of Education Report (ASER) — Karnataka State Data. New Delhi: Pratham Education Foundation.
10. Ratih, D., Purwoko, B., Gunansyah, G., Nasution, & Mariana, N. (2025). Trends in Wordwall integration for elementary IPAS learning: A systematic literature review. Journal of Innovation and Research in Primary Education, 4(4), 3648–3659. https://doi.org/10.56916/jirpe.v4i4.2394
11. Singh, A., & Manjaly, J. A. (2022). Using curiosity to improve learning outcomes in schools. SAGE Open, 12(1), 1–15. https://doi.org/10.1177/21582440211069392
12. Singh, C. B. P. (2024). Acceptance and use of digital technology by students in India after the Covid-19 pandemic. Journal of Education Technology, 8(2), 224–231. https://doi.org/10.23887/jet.v8i2.61944
13. Titus, S. (2025). Effect of differentiated instruction on academic performance in primary schools. Journal of Educational Research and Practice, 15(1), 45–62.
14. Weidlich, J., Kreijins, K., & Bastiaens, T. (2021). Digital competence and learner characteristics in online learning. Computers in Human Behavior, 119, 106714.
15. World Bank Group. Education & Skills. Retrieved from https://www.worldbank.org/en/topic/education
16. Yusri, A. A., & Zainal, M. Z. (2025). Unleashing gamification: A systematic review in primary schools. Journal of Education and Learning (EduLearn), 19(4), 2313–2321.