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A Spatial Analysis of Scheduled Tribe Elementary Education and School Infrastructure Across Community Development Blocks in Gajapati District, Odisha

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Abstract

This study provides a micro-level spatial analysis of elementary educational disparities and school-level physical deprivation among Scheduled Tribes across the seven Community Development blocks of Gajapati District, Odisha, India. Utilizing database records from the Census of India (2011) and Samagra Shiksha (2021-22), the research investigates how geographic terrain and infrastructural deficits shape student enrolment, retention, and gender-based educational outcomes. The findings reveal a stark spatial imbalance: upland, heavily forested blocks such as Guma, Mohana, Nuagada, and Rayagada exhibit severe physical deficits in basic school amenities such as separate girls' toilets, electricity, playgrounds, and access ramps. Statistical correlation analyses demonstrate a strong positive relationship between the availability of female teachers and girls' enrolment (r=0.910), and between functional girls' toilets and their enrolment (r=0.880). However, a moderate negative association (r= -0.520) between total elementary enrolment and composite school facilities highlights a structural deficit where high-enrolment areas are systematically underserved. The study underscores the critical role of mother-tongue-based multilingual education and localized infrastructural investments in reducing high dropout rates and bridging the persistent spatial and social divide in tribal education.

Keywords: *Spatial Disparity, Scheduled Tribes, School Infrastructure, Educational Geography, Gajapati District, Multilingual Education, Student Enrolment, Regional Planning.*

1. Introduction

The spatial variation in the provision, consumption, and quality of educational resources constitutes the core domain of educational geography. Schools do not operate in a vacuum; they are physically embedded in geographical landscapes and socio-spatial milieus that directly affect how education is delivered and received. In rural, mountainous terrains, physical geography often

acts as a major barrier, creating spatial injustices that systematically disadvantage peripheral and isolated communities.

Gajapati District, situated in the southern hilly region of Odisha, presents a compelling case study of these spatial inequities. Named after Maharaja Sri Krushna Chandra Gajapati Narayan Deo-the former Raja of the Paralakhemundi estate, the first Prime Minister of Odisha State, and a key figure in the creation of Odisha as a separate province—Gajapati came into physical existence on October 2, 1992, following its administrative separation from Ganjam District. Paralakhemundi serves as the administrative headquarters of this mountainous district, which is bordered by Andhra Pradesh to the south, Kandhamal to the north, Ganjam to the east, and Rayagada to the west.

1.1 Physical and Geographic Extension

Gajapati is the 16th largest district in Odisha, covering a total geographical area of 4,325 square kilometers. It is located between longitude 84^0 32' E to 83^0 47'E and latitude 18^0 44'N to 10^0 39'N. The entire district is situated on the rugged, hilly terrain of the Eastern Ghats, near the Mahendragiri mountain peak, which rises to an elevation of 1,501 meters above sea level. This mountainous landscape is dominated by tropical deciduous forests, which cover 57.09% of the district's total area and feature species such as Sal, Teak, and Bamboo.

The district experiences a subtropical climate, with hot, humid summers from March to mid-June, where temperatures can reach 46 degrees Celsius. Winters are mild, with temperatures occasionally dropping below 9 degrees Celsius. The rainy season extends from mid-June to mid-October, bringing an annual rainfall of approximately 1,685.6 mm, which is higher than the historical normal of 1,276.2 mm. This rugged geography has fostered a highly dispersed and isolated settlement pattern.

1.2 Administrative and Demographic Profile

` Administratively, Gajapati features a highly decentralized structure. It contains one subdivision (Paralakhemundi) and is divided into seven Community Development (CD) blocks, which also serve as tehsils: Mohana, R. Udayagiri, Nuagada, Guma, Kashinagara, Gosani (Paralakhemundi), and Rayagada. These blocks encompass 128 Gram Panchayats and 1,616 villages, as well as five towns (two statutory and three census towns).

Densely forested and rocky terrains have resulted in a sparse population distribution. With a population of approximately 5.78 lakhs, Gajapati ranks as the third least populated district in Odisha, with a population density of 134 persons per square kilometer.Majority of the population (88%) resides in rural areas, where the rural population density is 118 persons per square kilometer, compared to an urban density of 1,907 persons per square kilometer in its limited municipal centers.

A notable demographic feature of the district is its high sex ratio.cUnlike many developed, urbanized districts of Odisha, which exhibit sex ratios below 1,000, Gajapati ranks second in the state with a sex ratio of 1,043 females per 1,000 males, compared to the Odisha average of 979 and the national average of 943. This trend is particularly pronounced in the rural tribal areas.

1.3 Socio-Economic Profile and Tribal Dominance

Socio-demographically, Scheduled Tribes represent the dominant social group in Gajapati, accounting for 54.29% of the total population, while Scheduled Castes constitute 6.78%. The primary tribal groups are the Khond, Shabar, Saora, and Lanjia Saora. Both Lanjia Saora and Saora tribes are recognized as a Particularly Vulnerable Tribal Group, being the largest tribal group, and accounting for over 50% of the district's tribal population. These indigenous populations are largely concentrated in the rugged highlands of Guma, Rayagada, Nuagada, and R. Udayagiri.

The district's rugged terrain limits agricultural productivity, confining economic activities to primary industries such as shifting cultivation (*Podu Chasa*), terrace farming, and forestry. Among the working population, 52.12% are landless agricultural labourers, and 22.13% are cultivators. This economic vulnerability is reflected in low educational attainment: Gajapati has a low overall literacy rate of 53.43% (64.38% male and 43.07% female).

2. Review of Literature

The spatial dynamics of educational delivery and regional disparities have emerged as central themes in educational geography and sociology. Proponents of this spatial framework argue that educational outcomes are heavily influenced by local physical and social environments. In geographically remote areas, such as mountainous or forested regions, physical terrain directly constrains educational access and infrastructure development. School consolidation policies, which merge small schools to improve administrative efficiency, can inadvertently disadvantage peripheral villages, creating "educational access deserts" and increasing student dropout rates.

These geographic challenges are particularly acute for Scheduled Tribes in India, who face compounding social, economic, and physical barriers. Studies consistently show that low educational attainment among tribal populations is closely tied to land alienation, poverty, and structural neglect. Research in neighbouring Koraput District highlights that low tribal literacy (32.4%) is driven by a combination of economic hardship, domestic responsibilities, physical distance to schools, parental disinterest, and language barriers.

Similarly, investigations in Gajapati show that while policy frameworks like the Tribal Sub-Plan (TSP) aim to support tribal socioeconomic development, their impact is often limited by weak local infrastructure and economic insecurity.

Linguistic alienation is a primary driver of school dropouts among tribal children during their foundational years. When tribal students enter formal education, they are often taught in dominant regional languages (such as Odia) that are entirely foreign to them. This communication gap between non-tribal teachers and tribal children leads to low comprehension, high anxiety, and early dropout rates.

The National Education Policy (NEP) 2020 and various state initiatives have emphasized the importance of mother-tongue-based multilingual education (MTB-MLE) to support cognitive development and cultural integration. Odisha has implemented MTB-MLE programs in 21 tribal languages across 17 districts, including Gajapati, to support early comprehension and retention. Recent initiatives such as *Aame Padhibaa Aama Bhasare* seek to expand mother-tongue instruction into preschools to ease the transition to formal primary schooling.

Beyond language, school-level physical infrastructure and staffing demographics play critical roles in student retention. Gender-segregated sanitation facilities and the presence of female teachers are key factors in keeping girls in school, especially after puberty. Studies show that the lack of clean, private toilets directly contributes to high dropout rates among adolescent girls in tribal areas, underscoring the need for targeted infrastructural investments.

3. Research Gap

While state-level educational disparities have been widely documented, localized spatial analyses at the Community Development block scale in mountainous border districts remain limited. Most educational planning relies on aggregated district-level data, which obscures substantial block-level variations in topography, tribal concentration, and school infrastructure. Traditional geographic research has often overlooked the micro-spatial barriers that shape educational access in remote forest tracts. This study addresses this gap by conducting a block-level spatial analysis of school infrastructure, teacher deployment, and tribal student enrolment in Gajapati District. By investigating how physical and administrative factors interact across the district's seven CD blocks, this research provides a more nuanced understanding of the structural challenges facing tribal elementary education.

4. Objectives of the Study

The study aims to:

1. Assess the distribution of elementary educational facilities across Community Development Blocks.
2. Analyze patterns of enrolment and literacy among tribal populations.
3. Examine relationships between educational infrastructure and enrolment outcomes

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5.Research Design

This study employs a descriptive and analytical research design to examine the spatial distribution of elementary education resources and tribal student enrolment across the seven CD blocks of Gajapati District. The research is based on secondary database records, including the Census of India (2011) and block-level administrative files from the Office of the District Project Coordinator, Samagra Shiksha, Gajapati (2021-22).

The empirical framework evaluates several key dimensions of educational delivery:

1. *School Infrastructure:* Evaluating block-level deficits in basic amenities across the district's 827 government elementary schools, including boys' and girls' toilets, drinking water sources, electricity, playgrounds, ramps, boundary walls, and permanent buildings.
2. *Staffing Demographics:* Analyzing teacher deployment, the share of female teachers, and the occurrence of single-teacher schools to assess regional variations in educational quality and student safety.
3. *Student Enrolment and Caste Profile:* Mapping enrolment patterns across school types (government vs. private), educational levels (primary vs. upper primary), gender, and social category (General/SEBC, SC, and ST).

To identify the key factors shaping tribal educational outcomes, Pearson's correlation coefficient (r) is calculated to assess the relationship between physical amenities, teacher demographics, and student enrolment.[5] Additionally, a Composite Z-Score of school facilities is computed to normalize block-level infrastructure deficits:

$$Z_i = \frac{X_i - \mu}{\sigma}$$

where X_i is the deficit value of a block, μ is the district mean, and σ is the standard deviation. This composite index allows for a direct comparison of relative physical deprivation across the seven CD blocks, showing how geographical terrain and infrastructure quality relate to student enrolment and retention.

6. Data Analysis and Regional Disparities

6.1 Block-wise Literacy and Regional Gender Disparities

An analysis of block-level literacy data reveals substantial spatial disparities, reflecting the socio-economic divide between Gajapati's urbanizing plains and its remote, mountainous blocks.

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Table 1: Showing Block-wise Literacy Rates and Gender Disparities in Gajapati District (2011)

CD Blocks	Total Pop	Literacy	Literacy Rate (%)	Male Lit.	Male Literacy (%)	Female Lit.	Female Literacy (%)	Gender Literacy Gap (%)
Mohana	1,33,598	58,499	53.00	34,714	65.27	23,785	41.95	23.32
R. Udayagiri	64,123	26,662	50.34	15,896	61.32	10,766	39.82	21.50
Nuagada	54,696	22,648	50.00	13,916	63.37	8,732	37.31	26.06
Guma	79,520	31,910	47.27	18,948	57.88	12,962	37.27	20.61
Kashinagara	51,414	21,032	46.95	12,383	56.21	8,649	38.00	18.21
Paralakhemundi	69,447	34,995	56.52	20,473	67.48	14,522	46.00	21.48
Rayagada	70,866	29,414	49.20	17,204	61.39	12,210	39.07	22.32
Gajapati District	**5,77,817**	**2,62,537**	**53.43**	**1,53,663**	**64.38**	**1,08,874**	**43.07**	**21.31**

Source: District Census Handbook, Gajapati 2011

While Paralakhemundi block, which contains the urbanized district headquarters, exhibits the highest literacy rate at 56.52%, literacy drops below 50% in Guma (47.27%), Kashinagara (46.95%), and Rayagada (49.20%).

A persistent gender gap is visible across all blocks, averaging 21.31% district-wide.[5] The largest gap is in Nuagada block, where male literacy reaches 63.37% while female literacy is only 37.31%, creating a 26.06% disparity.

6.2 Spatial Infrastructure Deficits in Elementary Schools

The physical learning environment plays a key role in supporting school attendance, safety, and retention.

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Table 2: Showing Block Wise School Amenities in Gajapati District (2021-22)

CD Blocks	Govt. Schools	No Boys' Toilet	Boys' Deficit (%)	No Girls' Toilet	Girls' Deficit (%)	No Water Source	No Electricity	Electricity Deficit (%)	No Playground	Playground Deficit (%)
Mohana	238	71	29.83	78	32.77	0	74	31.09	122	51.26
R.U.giri	110	47	42.72	35	31.81	0	20	18.18	57	51.81
Nuagada	91	19	20.87	13	14.28	0	16	17.58	0	0.00
Gumma	120	42	35.00	25	20.83	0	10	8.33	69	57.50
Kashinagar	77	4	5.19	3	3.90	0	5	6.49	0	0.00
Paralakhemundi	93	12	12.90	6	6.45	0	2	2.15	58	62.36
Rayagada	98	8	8.16	9	9.18	0	3	3.06	61	62.24
Gajapati District	**827**	**203**	**24.54**	**169**	**20.43**	**0**	**130**	**15.72**	**367**	**44.37**

Source: Office of the District Project Coordinator, Samagra Shiksha, Gajapati, 2021-22 (Percentages recalculated from raw values to ensure precision)

While all 827 government elementary schools have a verified source of drinking water, significant deficits exist across other basic amenities. Approximately 24.54% of schools lack boys' toilets and 20.43% lack girls' toilets. These sanitation deficits are particularly high in R. Udayagiri, where 42.72% of schools lack boys' toilets, and Guma, where 35.00% are without facilities.

Electricity is unavailable in 15.72% of schools district-wide, with the highest deficit in Mohana block (31.09%). Additionally, 44.37% of schools lack functional playgrounds, peaking in Paralakhemundi (62.36%) and Rayagada (62.24%) blocks. Physical safety and accessibility structures also vary significantly by block.

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Table 3: Showing Block Wise Accessibility and Physical Deficits in Gajapati District (2021-22)

CD Blocks	Govt. Schools	No Ramp	Ramp Deficit (%)	No Boundary Wall	BW Deficit (%)	No Buildings	Building Deficit (%)
Mohana	238	41	17.22	27	11.34	5	2.10
R.U.giri	110	57	51.81	14	12.72	3	2.73
Nuagada	91	0	0.00	20	21.97	1	1.10
Guma	120	28	23.33	44	36.66	1	0.83
Kashinagar	77	0	0.00	10	12.99	0	0.00
Paralakhemundi	93	7	7.53	16	17.20	0	0.00
Rayagada	98	37	37.76	13	13.27	0	0.00
Gajapati District	**827**	**170**	**20.56**	**148**	**17.89**	**10**	**1.21**

Source: Office of the District Project Coordinator, Samagra Shiksha, Gajapati, 2021-22 (Percentages recalculated from raw values to ensure precision)

Across the district, 20.56% of schools lack access ramps, which are required for physically challenged students.[5] This deficit is highest in R. Udayagiri, where 51.81% of schools lack ramps. Boundary walls, essential for student safety and preventing school property encroachment, are missing in 17.89% of schools district-wide, with the highest deficit in Guma block (36.66%).

6.3 Spatial Variation in Teacher Deployment and Single-Teacher Schools

The deployment of school staff shows a strong spatial imbalance, with female teachers concentrated in less tribal, urbanized blocks.

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Table 4: Showing Block wise Total Teachers in Elementary Schools of Gajapati (2021-22)

CD Blocks	Govt. Schools	Total Teachers	Primary Teachers	UP Teachers	Female Teachers	Female Share (%)	Single Teacher Schools	Trained Teachers (%)
Mohana	238	921	415	506	325	35.29	23	100.00
R. Udayagiri	110	713	242	471	139	19.50	0	100.00
Nuagada	91	481	191	290	74	15.38	4	100.00
Guma	120	632	246	386	155	24.53	11	100.00
Kashinagar	77	472	105	367	160	33.90	6	100.00
Paralakhemundi	93	698	170	528	294	42.12	1	100.00
Rayagada	98	658	249	409	143	21.73	1	100.00
Gajapati District	**827**	**4,575**	**1,618**	**2,957**	**1,290**	**28.20**	**46**	**100.00**

Source: Office of the District Project Coordinator, Samagra Shiksha, Gajapati, 2021-22.

While all elementary school teachers in the district are fully certified and trained, female teachers represent only 28.20% of the teaching staff. This gender imbalance is particularly high in Nuagada block, where female teachers make up only 15.38% of the staff. Conversely, the more urbanized Paralakhemundi block has the highest share of female teachers at 42.12%. Additionally, the district contains 46 single-teacher managed schools, which are vulnerable to teaching disruptions during staff absences. Half of these single-teacher schools (23) are located in Mohana, with another 11 in Guma.

6.4 Enrolment Trends and Institutional Preferences

Elementary school enrolment data reflects the socio-economic characteristics of the district. Scheduled Tribe children constitute the dominant majority of enrolled students, as shown in Table 10.

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Table 5: Showing Block wise Elementary Educational Enrolment Profile of Gajapati (2021-22)

CD Blocks	Total Enrolment	Pri. Enrolment	UP Enrolment	Govt. Enrolment	Private Enrolment	Boys Enrolled	Boys Share (%)	Girls Enrolled	Girls Share (%)
Mohana	24,072	15,322	8,750	17,116	1,761	12,380	51.43	11,692	48.57
R. Udayagiri	11,174	6,813	4,361	7,961	481	5,538	49.56	5,636	50.44
Nuagada	9,101	5,719	3,310	7,350	23	4,676	51.38	4,425	48.62
Guma	10,303	6,567	3,736	7,538	565	5,268	51.13	5,035	48.87
Kashinagar	7,556	4,757	2,799	5,626	2,474	3,943	52.18	3,613	47.82
Paralakhemundi	13,671	7,975	5,696	6,966	4,934	7,391	54.06	6,280	45.94
Rayagada	9,523	4,757	4,766	6,971	757	4,657	48.90	4,866	51.10
Gajapati District	**85,400**	**53,047**	**32,353**	**59,528**	**10,975**	**43,853**	**51.35**	**41,547**	**48.65**

Source: Office of the District Project Coordinator, Samagra Shiksha, Gajapati, 2021-22

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If we consider the 85,400 children enrolled at the elementary level, 53,047 are at the primary stage and 32,353 are at the upper primary stage. This represents a 39.01% drop in enrolment between primary and upper primary levels, indicating a high rate of dropout during this transition. Private schooling is concentrated in Paralakhemundi (4,934 students) and Kashinagar (2,474 students), whereas tribal students in Nuagada rely almost exclusively on public institutions (only 23 students in private schools).

6.5 Social Stratification of Enrolment

The social composition of enrolled elementary students reflects the district's demographic divide.

Table 6: Showing Block-wise Caste-wise Enrolment at Elementary Level in Gajapati District (2021-22)

CD Blocks	Total Enrolment	Gen & SEBC	Gen & SEBC (%)	SC Enrolment	SC Share (%)	ST Enrolment	ST Share (%)
Mohana	24,072	8,518	35.38	897	3.72	14,657	60.88
R. Udayagiri	11,174	2,369	21.20	316	2.83	8,489	75.97
Nuagada	9,101	1,747	19.19	97	1.07	7,257	79.74
Guma	10,303	1,377	13.36	281	2.73	8,645	83.91
Kashinagar	7,556	2,682	35.50	1,148	15.19	3,726	49.31
Paralakhemundi	13,671	7,222	52.83	2,173	15.89	4,276	31.28
Rayagada	9,523	1,040	10.92	165	1.73	8,318	87.34
Gajapati District	**85,400**	**24,955**	**29.22**	**5,077**	**5.94**	**55,368**	**64.83**

Source: Office of the District Project Coordinator, Samagra Shiksha, Gajapati, 2021-22.

Scheduled Tribe students represent 64.83% of total elementary school enrolment in the district.This concentration is highest in Rayagada (87.34% ST enrolment), Guma (83.91% ST enrolment), Nuagada (79.74% ST enrolment), and R. Udayagiri (75.97% ST enrolment). These figures confirm that public elementary education in Gajapati is predominantly serving tribal children, emphasizing the importance of school conditions in these specific blocks.

7. Findings

7.1 Statistical Relationships and Infrastructure Quality

To identify the key factors shaping tribal student enrolment and retention, statistical correlation analyses were conducted across several variables.

Table 7: Correlation between total number of schools and total student enrolment

Variable Category	Total Enrolment	Total Number of Schools
Total Enrolment	**1.00**	**0.942****
Total Number of Schools	**0.942****	**1.00**

Correlation is significant at the 0.01 level (2-tailed).

Source: Calculated from Samagra Shiksha database

The correlation coefficient between the total number of schools and total student enrolment is extremely strong (r= 0.942, P< 0.01). This indicates that school availability is a key factor in student registration. In a district with mountainous terrain and highly dispersed settlements, reducing travel distance through school placement is critical for securing initial enrolment.

The correlation between female teacher presence and girls' enrolment is also very high (r=0.910, P< 0.01).

Table 8: Correlation between female teachers and girls' enrolment

Variable Category	Girls' Enrolment	Number of Female Teachers
Girls' Enrolment	**1.00**	**0.910****
Number of Female Teachers	**0.910****	**1.00**

Correlation is significant at the 0.01 level (2-tailed).

Source: Calculated from Samagra Shiksha database

In many conservative tribal communities, parental concerns about safety and comfort are significant barriers to sending girls to school. The presence of female teachers helps address these concerns, creating a more welcoming environment that encourages girls' participation.

Additionally, a strong positive correlation is observed between functioning girls' toilets and girls' enrolment (r= 0.880, P<0.01).

Table 9: Correlation between schools having toilet facilities for girls and girls' enrolment

Variable Category	Girls' Enrolment	Toilet Facilities for Girls
Girls' Enrolment	1.00	0.880**
Toilet Facilities for Girls	0.880**	1.00

Correlation is significant at the 0.01 level (2-tailed).

Source: Calculated from Samagra Shiksha database

The lack of private and secure sanitation facilities is a major driver of dropouts among adolescent girls' post-puberty.[8] Providing safe, private girls' toilets is therefore a direct and effective way to support gender equity and retention in schools.

The relationship between the composite Z-score of school facilities and girls' enrolment is also strong (r=0.720, P<0.01).

Table 10: Correlation between Composite Z-score of facilities and girls' enrolment

Variable Category	Girls' Enrolment	Composite Z-Score
Girls' Enrolment	1.00	0.720**
Composite Z-Score	0.720**	1.00

Correlation is significant at the 0.01 level (2-tailed).

Source: Calculated from Samagra Shiksha database

This confirms that schools with better overall infrastructure and amenities systematically achieve higher rates of female enrolment and retention. However, the correlation between composite deprivation and total elementary enrolment is moderately negative (r=-0.520, P<0.01).

Table 11: Correlation between composite deprivation Z-score and total enrolment

Variable Category	Total Enrolment	Composite Deprivation Z-Score
Total Enrolment	**1.00**	**-0.520****
Composite Deprivation Z-Score	**-0.520****	**1.00**

Correlation is significant at the 0.01 level (2-tailed).

Source: Calculated from Samagra Shiksha database [5]

This reveals a critical structural pattern: blocks with the largest, most concentrated student populations (such as Mohana and Guma) face the highest levels of school-level physical deprivation.[5] This mismatch means that where educational demand is greatest, the physical learning conditions are often most deficient, illustrating a pattern of spatial inequity.

7.2 The Dropout and Language Crisis

Despite achieving a high Gross Enrolment Ratio (GER) at the elementary level (104.01% overall; 110.34% primary and 97.69% upper primary), Gajapati District faces a severe retention crisis. The Net Enrolment Ratio (NER) drops significantly from 98.29% at the primary level to 84.00% at the upper primary level. In 2021-22, Gajapati recorded a primary-level student dropout rate of 5.28%, the highest among all 30 districts in Odisha, and an upper primary dropout rate of 9.38%, the third highest in the state.

This retention gap is driven by a combination of physical and socio-economic factors:

1. *Geographical Barriers:* The steep and rugged Eastern Ghats isolate remote tribal settlements, making daily travel to school difficult, particularly during the monsoon season.
2. *Economic Pressures:* High rates of poverty and landlessness mean that families often rely on children to assist with hill farming, forest collection, or domestic work, pulling them away from school.
3. *Linguistic Isolation:* Upon entering school, tribal children are often taught in Odia, a language they do not speak at home. This language barrier leads to cognitive difficulties, lack of engagement, and early dropouts.

Recognizing these challenges, the state has piloted mother-tongue-based multilingual initiatives like *Aame Padhibaa Aama Bhasare*. These programs are designed to provide preschool education in native languages like Saora, reducing the initial linguistic shock and helping tribal children transition more smoothly into the formal education system.

8. Conclusion

The spatial and socio-economic analysis of elementary education in Gajapati District highlights a persistent divide in educational access and infrastructure quality. While the district has achieved high initial enrolment rates, it is held back by low tribal literacy (36.08%) and high dropout rates, particularly during the transition from primary to upper primary school. The block-level findings demonstrate that physical infrastructure deficits are highly concentrated in the most tribal-populated blocks, such as R. Udayagiri, Mohana, and Guma. Basic school facilities, particularly secure girls' toilets, are strongly associated with higher student enrolment and retention (r=0.880). The presence of female teachers is also a key factor in supporting girls' enrolment in tribal areas (r=0.910), yet female teachers represent only 28.20% of the teaching staff.

Furthermore, a significant structural mismatch exists where blocks with the highest educational demand and largest student bodies face the most severe physical school deficits. this spatial inequality underscores the necessity of targeted, culturally responsive, and localized policy interventions to support tribal elementary education.

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