



Parental digital literacy as a predictor of student academic engagement in rural India

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Abstract

The rapid spread of smartphones and mobile internet across rural India has changed the way children study, complete homework, and interact with school-related content. Yet not every household is equally prepared to use this technology in a way that supports learning. This study examines whether the digital literacy of parents — their ability to operate a smartphone, browse for information, use educational apps, and guide their children safely online — predicts the academic engagement of their school-going children in rural areas. Using a survey-based, cross-sectional design, data were collected from 400 parent-child pairs across four rural blocks in Uttar Pradesh and Bihar. Parental digital literacy was measured using a modified digital skills scale, and student academic engagement was measured across three dimensions: behavioural, emotional, and cognitive engagement. Results show a moderate positive correlation between parental digital literacy and overall student engagement ($r = 0.46$, $p < 0.01$), and regression analysis indicates that parental digital literacy significantly predicts student engagement even after controlling for household income and parental education ($\beta = 0.31$, $p < 0.01$). Mothers' digital literacy showed a slightly stronger association with student engagement than fathers' digital literacy. The findings support the idea that digital literacy among parents is not a side issue but a genuine home-based resource that shapes how involved and engaged rural children remain in their studies. The paper closes with practical suggestions for community-based digital literacy programmes, school-parent digital orientation sessions, and policy convergence with the National Education Policy 2020 and ongoing digital India initiatives.

Keywords: Parental digital literacy, academic engagement, rural India, digital divide, parental involvement, ICT in education, home learning environment

Introduction

Education in India has entered a phase where a smartphone in the home can matter almost as much as a textbook in the school bag. Over the last decade, mobile internet has reached villages that were once considered completely outside the digital map. According to the Annual Status of Education Report (ASER) 2024, close to nine out of ten rural households with children aged 14 to 16 now have a smartphone at home, and more than four out of five adolescents in this age group know how to operate one. However, the same report found that only about 57 percent of these adolescents had actually used a smartphone for any study-related purpose in the week before the survey, while a much larger share used it mainly for social media and entertainment. The Economic Survey 2025-26 repeated this concern, noting that India has built a strong base of device access in rural areas, but the real challenge now is converting that access into genuine learning behaviour rather than passive screen time.

This gap between "having a phone" and "using a phone to learn" is not only a child-side problem. A child's ability to use technology productively is shaped heavily by the adults around them — particularly parents, who decide when the phone is handed over, what apps are installed, whether homework groups on WhatsApp are monitored, and whether a child is stopped from drifting into games or reels instead of a school assignment. In urban, well-educated households, this kind of digital parenting often happens naturally. In rural India, where a large number of parents have themselves had limited formal schooling and even more limited exposure to computers or smartphones, this guidance may simply be missing, even when the device itself is present in the house.

This creates a second, quieter layer of the digital divide. The first layer is about access: who owns a device and who does not. The second layer, sometimes called the "second-level digital divide" in literature on technology and inequality, is about the skill and confidence to use the device meaningfully. This paper argues that parental digital literacy belongs to this second layer, and that it plays an important role in determining whether children in rural households stay engaged with their studies or slowly disengage despite having the same devices as their better-guided peers.

Academic engagement itself is not a single, simple idea. Researchers usually describe it as having at least three connected parts: behavioural engagement, which is about attending class, completing homework, and participating in school activities; emotional engagement, which is about a sense of belonging and interest in learning; and cognitive engagement, which is about the willingness to put in real mental effort rather than just completing tasks superficially. A child can be physically present in class and still be poorly engaged in the cognitive or emotional sense. Understanding what shapes all three dimensions is important, especially in rural contexts where dropout risk and disengagement often build up quietly over months before they become visible as absenteeism.

Against this background, the present study asks a direct research question: does parental digital literacy predict student academic engagement in rural India, and if so, how strong is this relationship once other likely explanations, such as family income and parental education, are taken into account?

Review of Related Literature

Parental involvement has long been recognised as one of the strongest home-based predictors of a child's academic outcomes, well before digital technology became part of the discussion. Studies on foundational literacy and numeracy in India have repeatedly found that when parents take an active interest in a child's schoolwork — asking about the school day, checking notebooks, or simply sitting with the child during homework — learning outcomes tend to improve, and problems such as irregular attendance tend to reduce. A recent field-experiment study on foundational literacy and numeracy support in India found that even simple, low-cost activities given to parents to do with their children produced measurable improvement in reading and arithmetic skills, showing that parental behaviour, not just parental education level, matters for learning. Related qualitative work examining parents from farming, small business, and daily-wage backgrounds found that the way parents support their children's learning is shaped strongly by their occupational and social context, and that regular parent-teacher communication remains an important channel for improving foundational learning outcomes even in low-resource rural households.

A separate and more recent body of work looks specifically at digital literacy in rural India. The Annual Status of Education Report has, for the first time, begun to track digital skills among older adolescents, and its 2024 findings are striking: while household smartphone availability is now nearly universal, actual use for study purposes lags far behind use for entertainment and social media, and there remains a visible gender gap, with boys more likely than girls to own a personal device and to know safety features such as blocking or reporting an unwanted contact. Analysis built on this ASER data has also pointed out that mobile device access has expanded quickly because devices have become more affordable and internet connectivity has improved, yet actual digital readiness and skill levels have not kept pace with this growth in access.

Community-based studies add further texture to this picture. A quasi-experimental digital literacy training programme conducted with adolescent girls in rural Jharkhand found that structured, in-person digital skills training improved not only technical competence but also broader outcomes such as school continuation and awareness of government schemes, suggesting that skills training for a household member can have effects that extend into the child's educational life. Similarly, work examining curriculum readiness, teacher preparedness, student engagement patterns, and community involvement are all connected dimensions of successful digital integration, and that disparities in digital competence, more than disparities in access alone, shape how much benefit a rural community draws from digital learning tools.

At the same time, several practitioner and field reports raise a caution that is directly relevant to this paper. Reports on rural digital literacy programmes have observed a rise in unsupervised gaming and social media use among rural teenagers, often linked to a lack of guidance from parents or teachers on healthy digital habits. This suggests that a device in the home, without a digitally literate adult to guide its use, may sometimes work against academic engagement rather than for it. Organisations working on rural digital literacy have also stressed that when parents themselves

participate in digital training, learn to guide children through educational apps, and enrol in local digital training programmes, the benefits tend to spread through the whole household rather than staying limited to the child. “Taken together, existing literature supports two ideas that this paper tries to connect. First, parental involvement, in its traditional non-digital form, is a well-established predictor of student engagement and learning outcomes in India. Second, digital access in rural India has expanded far faster than digital skill, creating a usage gap that is only partly about the child and substantially about the surrounding adults. What is less studied, and what this paper focuses on, is the specific and measurable relationship between how digitally literate a rural parent is and how academically engaged their child remains, treated as a distinct variable from general parental education or household income.

Theoretical Framework

This study draws on two complementary frameworks. The first is Epstein's model of parental involvement, which describes multiple overlapping ways in which families support learning, including parenting practices, home-based learning support, and communication with schools. Digital literacy can be seen as a modern extension of the "home-based learning support" dimension of this model, since a great deal of home-based learning support today happens through a phone screen rather than a printed notebook. “The second framework is the idea of the second-level digital divide, which separates the question of who has access to technology from the question of who has the skill and confidence to use it well. Applied to this study, a rural household may have crossed the first-level divide (owning a smartphone) while still remaining on the wrong side of the second-level divide (not knowing how to use it for learning purposes). The central argument of this paper is that parental digital literacy is the bridge between these two levels: it converts raw access into productive use, particularly for children who are still too young to manage a device entirely on their own.

Objectives of the Study

This study was designed to meet the following objectives:

1. To measure the current level of digital literacy among parents of school-going children in selected rural areas.
2. To measure the level of academic engagement (behavioural, emotional, and cognitive) among their children.
3. To examine the relationship between parental digital literacy and student academic engagement.
4. To determine whether parental digital literacy predicts student academic engagement after accounting for household income and parental formal education.
5. To compare the predictive strength of mothers' digital literacy versus fathers' digital literacy on student engagement.

Hypotheses

H1: There is a significant positive relationship between parental digital literacy and student academic engagement.

H2: Parental digital literacy significantly predicts student academic engagement even after controlling for household income and parental education.

H3: Mothers' digital literacy and fathers' digital literacy do not have an equally strong relationship with student engagement; one is likely to be a stronger predictor than the other.

Methodology

1 Research Design

The study used a cross-sectional, correlational survey design, which is well suited to examining the strength and direction of a relationship between two variables without manipulating either of them.

2 Sample and Setting

Data were collected from 400 parent-child pairs drawn from government upper-primary and secondary schools located in four rural blocks across Uttar Pradesh and Bihar. These two states were chosen because they combine large rural school-going populations with documented gaps in smartphone-based educational use, as reported in national surveys. A stratified random sampling method was used to ensure a reasonable spread across gender of the child, class level (Classes 6 to 10), and type of household occupation (agricultural labour, small farming, petty trade, and salaried or semi-salaried work).

3 Tools Used

Parental digital literacy was measured using a modified 20-item Parental Digital Literacy Scale, adapted for a rural Indian setting, covering four sub-areas: basic device operation, information searching, use of educational apps or content, and awareness of online safety. Responses were scored on a 5-point scale, and total scores were grouped into low, moderate, and high digital literacy categories.

Student academic engagement was measured using a shortened, translated version of a standard Student Engagement Scale, covering behavioural engagement (for example, regular homework completion and class participation), emotional engagement (for example, interest in school subjects and sense of belonging), and cognitive engagement (for example, effort put into understanding difficult topics rather than memorising them). The scale was translated into Hindi and back-translated into English to check accuracy, and it was pilot-tested with 40 parent-child pairs before the main survey.

Household income and parental formal education level were recorded as control variables, since both are already known to influence student outcomes independently of digital skills.

4 Data Collection

Trained field investigators visited households and schools between January and April 2026, administering the parent questionnaire to whichever parent was primarily responsible for the child's day-to-day schooling matters, and administering the student questionnaire separately to the child, away from the parent, to reduce the chance of the child simply repeating what the parent might expect to hear. 6.5 Data Analysis Data were analysed using descriptive statistics, Pearson correlation, and multiple linear regression. Statistical significance was set at $p < 0.05$.

Results

1 Sample Profile

Table 1 presents the demographic profile of the sample.

Table 1: Demographic Profile of the Sample (N = 400)

Variable	Category	Frequency	Percentage
Child's Gender	Boy	214	53.5%
	Girl	186	46.5%
Child's Class	Class 6-7	148	37.0%
	Class 8-9	156	39.0%
	Class 10	96	24.0%
Household Occupation	Agricultural labour	132	33.0%
	Small/marginal farming	118	29.5%
	Petty trade/self-employed	84	21.0%
	Salaried/semi-salaried	66	16.5%
Parent Respondent	Mother	236	59.0%
	Father	164	41.0%
Monthly Household Income	Below ₹10,000	168	42.0%
	₹10,000-₹20,000	152	38.0%
	Above ₹20,000	80	20.0%

2 Level of Parental Digital Literacy

Table 2 shows the distribution of parents across digital literacy categories.

Table 2: Distribution of Parental Digital Literacy Levels

Digital Literacy Level	Frequency	Percentage
Low	146	36.5%
Moderate	178	44.5%
High	76	19.0%

A little over a third of parents in the sample fell into the low digital literacy category, meaning they struggled with basic tasks such as searching for information or opening an educational app without help. This mirrors the broader national pattern in which device access has grown quickly while confident, purposeful use has lagged behind.

3 Level of Student Academic Engagement

Table 3 presents mean scores for the three dimensions of student engagement, each measured on a scale of 1 to 5.

Table 3: Mean Scores of Student Academic Engagement Dimensions

Engagement Dimension	Mean	Standard Deviation
Behavioural Engagement	3.42	0.68
Emotional Engagement	3.21	0.74
Cognitive Engagement	3.05	0.81
Overall Engagement	3.23	0.62

Cognitive engagement had both the lowest mean score and the widest spread, suggesting that while most rural students attend school and complete basic tasks reasonably well,

genuine deep effort and interest in difficult academic content is less consistent.

4 Correlation Between Parental Digital Literacy and Student Engagement

Table 4 shows the correlation coefficients between parental digital literacy and each dimension of student engagement.

Table 4: Correlation between Parental Digital Literacy and Student Engagement Dimensions

Variable Pair	Correlation (r)	p-value
Parental Digital Literacy – Behavioural Engagement	0.39	< 0.01
Parental Digital Literacy – Emotional Engagement	0.33	< 0.01
Parental Digital Literacy – Cognitive Engagement	0.44	< 0.01
Parental Digital Literacy – Overall Engagement	0.46	< 0.01

All correlations were positive and statistically significant, supporting Hypothesis 1. The strongest relationship was found between parental digital literacy and cognitive engagement, suggesting that digitally literate parents may be especially helpful in encouraging children to use online resources for deeper understanding rather than only for completing assigned tasks.

5 Regression Analysis

A multiple linear regression was carried out with overall student engagement as the outcome variable, and parental digital literacy, household income, and parental formal education as predictors. Table 5 presents the results.

Table 5: Multiple Regression Predicting Student Academic Engagement

Predictor	B	Standard Error	(Standardised)	t-value	p-value
Parental Digital Literacy	0.29	0.05	0.31	5.80	< 0.01
Parental Formal Education	0.18	0.06	0.19	3.00	< 0.01
Household Income	0.11	0.05	0.13	2.20	0.03
Constant	1.42	0.21	—	6.76	< 0.01

$R^2 = 0.29$; Adjusted $R^2 = 0.28$; $F(3, 396) = 53.4$, $p < 0.01$

The overall model was statistically significant and explained about 29 percent of the variation in student academic engagement. Parental digital literacy remained the strongest individual predictor even after household income and parental formal education were included in the model, supporting Hypothesis 2. This indicates that digital literacy is not simply standing in for general education level or family wealth; it appears to make its own independent contribution to how engaged a rural child remains in schoolwork.

6 Comparing Mothers' and Fathers' Digital Literacy

Since mothers made up a larger share of parent respondents, a separate comparison was carried out to see whether the parent's gender changed the strength of the relationship. Table 6 presents these results.

Table 6: Correlation between Digital Literacy and Student Engagement, by Parent's Gender

Respondent	Correlation (r)	p-value	n
Mother	0.49	< 0.01	236
Father	0.41	< 0.01	164

Both correlations were significant, but the relationship was somewhat stronger for mothers' digital literacy than for fathers', supporting Hypothesis 3. This is consistent with the wider literature on parental involvement in India, which has often found mothers to be more directly and continuously involved in day-to-day academic supervision, homework routines, and communication with the school, even in households where fathers hold more formal decision-making authority.

Discussion

The results of this study point to a fairly clear conclusion: parental digital literacy is a meaningful, independent predictor of student academic engagement in rural India, and its effect does not simply disappear once income and education are taken into account. This fits with what national surveys have already hinted at. The 2024 Annual Status of Education Report found that although the great majority of rural households with older adolescents now own a smartphone, a much smaller share of these teenagers actually use it for study purposes in a given week, while a larger share use it mainly for social media. The Economic Survey 2025-26 described this directly as a gap between access and outcomes, and argued that closing this gap, not simply distributing more devices, is now the central challenge in rural digital education. The present findings suggest one likely reason for this gap: children in households where the parent is comfortable with digital tools appear better placed to convert smartphone access into actual academic engagement, whereas children in households where the parent struggles with the same tools may be more likely to drift toward games, videos, and social media instead.

This pattern also connects with earlier community-level evidence. A digital literacy training programme conducted with adolescent girls in rural Jharkhand found that structured skills training led to improvements that went beyond technical competence alone, extending into continued schooling and better awareness of available support schemes. The present findings extend this idea one step further by showing that it is not only the child's own digital training that matters, but the parent's digital literacy as well, working almost like a background support system that shapes the child's daily study habits even when the parent is not directly instructing the child at every moment. The stronger role of cognitive engagement in the correlation results is worth reflecting on. Behavioural engagement, such as attending school or turning in homework, is often shaped by rules, routines, and social pressure, and rural children generally show reasonably steady behavioural engagement regardless of the home digital environment. Cognitive engagement, which is about a child's willingness to sit with a difficult topic and actually try to understand it rather than complete the task mechanically, seems more sensitive to whether a parent can help the child search for an explanation online, find a helpful video, or simply sit alongside the child while a doubt is resolved using the phone. This is consistent with concerns raised in field

reports about rural digital literacy programmes, which have noted that without adult guidance, children's phone use can drift toward passive entertainment rather than active learning.

The finding that mothers' digital literacy showed a somewhat stronger relationship with student engagement than fathers' digital literacy deserves a careful, non-judgmental reading. It does not suggest that fathers are unimportant; rather, it likely reflects the everyday reality of many rural Indian households, where mothers tend to be more consistently present during homework time and more directly involved in daily academic routines, even when overall household decisions or device ownership rest with the father. This has a practical implication: digital literacy programmes designed for rural communities may see a stronger return on student outcomes if they specifically make space for mothers to participate, rather than assuming that training reaching the male head of household will automatically benefit the child.

Limitations

This study has some limitations that should be kept in mind while reading the results. First, the cross-sectional design means that although a statistical relationship was found, direction of cause cannot be proven with full certainty; a longitudinal design would offer stronger evidence. Second, the sample was drawn from only two states, and while these states were chosen for good reason, findings may not automatically apply to every rural region of India, given the country's considerable diversity in infrastructure, language, and local culture. Third, both digital literacy and engagement were measured through self-report and parent-report tools, which can be affected by social desirability, meaning that some respondents may present themselves slightly more favourably than an outside observer would.

Conclusion

This study set out to examine whether parental digital literacy predicts student academic engagement in rural India, at a time when smartphone ownership has spread rapidly across rural households but confident, purposeful use of these devices for learning has lagged noticeably behind. The findings offer reasonably strong support for the idea that parental digital literacy matters in its own right. Children whose parents are comfortable navigating a smartphone, searching for information, and guiding safe use of the internet tend to show stronger academic engagement, particularly in the deeper, cognitive sense of genuinely trying to understand difficult material rather than merely completing assigned work. This relationship holds even when household income and parental formal education are statistically accounted for, suggesting that digital literacy training for parents could be a genuinely useful, and currently under-used, lever for improving rural learning outcomes.

Recommendations

Based on these findings, a few practical steps are suggested. Community-level digital literacy programmes for rural parents, especially mothers, could be expanded and linked to existing school infrastructure, so that training happens close to where children study rather than in a separate, disconnected setting. Schools could consider short, simple parent-orientation sessions on educational apps already being used in the classroom, so that parents know at least the basics of what their child is expected to use at home. Given the gender gap already documented in national

surveys around device ownership and digital safety awareness among rural adolescents, digital literacy efforts should be designed carefully to reach girls and their mothers, not only boys and male heads of household. Finally, these efforts would benefit from being aligned with the broader push for digital and foundational learning already emphasised under the National Education Policy 2020 and ongoing government digital education initiatives, so that improvements in device access are matched by improvements in the human skill needed to use that access well.

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