



# Labor To Learning: Addressing The Literacy Gap In Brick Kiln Communities

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## Abstract

The scholastic and developmental outcomes of children from laboring households are greatly impacted by child labor, which is still a serious problem in the brick kiln business. The lack of access to high-quality education for children of brick kiln workers sometimes leads to serious reading deficiencies and long-term educational disparity. This conceptual paper investigates the "work-literacy divide," a phrase used to characterize the difference in literacy and basic educational attainment between children who work and their classmates who do not work and who attend school regularly. The paper summarizes the results of previous studies on child labor, with a focus on the brick kiln industries, where children are frequently made to work long hours in unfavorable conditions. The demands of labor further disadvantage these already vulnerable children by limiting their capacity to participate in school, participate in learning activities, and attain age-appropriate literacy levels. Consequently, there is a growing literacy divide between children who work and those who attend school on a regular basis, which feeds the cycle of poverty and marginalization from education. Economic pressures on families, the need for children's labor to support household income, poor access to schools near brick kiln sites, and inconsistent school attendance are important factors contributing to the work-literacy divide. The negative impacts of extended work hours on children's cognitive growth, emotional stability, and chances for the future are also covered in the paper. The paper suggests various policy actions aimed at narrowing the educational gap as a solution to these issues. These include the

implementation of tougher child labor regulations to safeguard children's right to an education, the creation of mobile schools close to places of employment, and conditional financial transfers to encourage families to place a higher priority on education than working. These initiatives seek to establish a more equitable education system that gives all kids, regardless of employment status, the chance to become literate, acquire new skills, and break free from the cycle of poverty by tackling the financial and educational obstacles that brick kiln workers' children must overcome.

**Keywords:** Child Labor, Brick Kilns, Literacy Gap, Educational Inequality, School Attendance, Policy Intervention

## Introduction

In South Asian nations like India, Pakistan, and Nepal, where economic constraints push children to work, the brick kiln sector plays a significant role in child labor. Due to major obstacles to education, these kids—many of whom come from migrant families who labor in kilns—continue to live in poverty and lack literacy. As per the International Labour Organization (ILO, 2020), family work needs, poverty, and inadequate schooling infrastructure are some of the reasons why child labor in brick kilns persists. Children's chances of receiving a formal education are reduced when they work in dangerous situations with their families. The dramatic difference in literacy levels between youngsters working and their school-age peers is referred to as the "work-literacy divide". The gap between work and literacy is a result of socioeconomic factors that place a higher value on short-term employment than on long-term education, in addition to the physical lack of schools. Research shows that child work provides families with additional revenue, particularly in sectors like brick kilns where labor is always in demand and salaries are low (Rahman & Singh, 2020). Children's access to formal education, which is sometimes viewed as an expensive luxury, is severely limited by their financial dependence on their labor (Kumar & Choudhary, 2021). Even in cases when education is accessible, the problem is exacerbated by a dearth of resources, including qualified educators and learning aids. The infrastructure of rural or isolated kiln sites rarely facilitates continuous education, and children in these places commonly experience delays in their learning owing to seasonal migrations (Jha, 2021). Gender inequality contributes to this difference by making education even less accessible for girls, who are frequently saddled with both jobs and domestic obligations

(Ahmed & Jha, 2021). Non-formal education initiatives and mobile schools have been used by governments and non-governmental organizations (NGOs) to try to close this gap, but their effectiveness has been limited because they frequently do not address the underlying socio-economic causes of child labor (Save the Children, 2021). The long-term effects of the work-literacy gap are that these kids are stuck in low-skill, low-paying jobs with no chance of advancement. This poverty and illiteracy cycle will keep on spanning generations unless there is a major intervention.

## Objectives

1. To conceptualize the work-literacy divide and explore its implications for children of brick kiln workers.
2. To analyze the contributing factors to the literacy gap, such as economic conditions, family obligations, and school infrastructure.
3. To propose policy and educational interventions that can reduce the divide and promote literacy for children in these environments.

## Literature Review

Numerous studies have examined the educational deprivation faced by child laborers, particularly within the brick kiln industry, which is prevalent in South Asia. According to Bhatia and Ram (2021), families who prefer to emphasize immediate financial demands over long-term educational objectives are primarily responsible for the considerably lower literacy rates that brick kiln workers' children experience when compared to their counterparts who do not work in the industry. Due to the fact that many families rely on the additional money their children create, this economic dependence on child labor exacerbates educational inequality. The gap between labor and literacy is widened as a result of these kids frequently being denied the chance to attend school. Low literacy rates among these kids, according to Kumar and Singh (2021), lead to a vicious cycle of poverty since they are stuck in low-skill, low-wage labor due to their limited educational options. Because formal schooling is frequently either out of reach or too expensive for residents of brick kiln settlements, the cycle of poverty that persists throughout generations is exacerbated even more.

Gender differences compound the educational deprivation of children in the brick kiln business, as females face additional obstacles to obtaining an education. According to Ahmed and Jha (2021), girls in villages surrounding brick kilns frequently have to do both household duties and labor, which makes it even harder for them to go to school. This combined load worsens the gender disparity in literacy rates in addition to impeding their capacity to continue their education. According to Siddiqui and Haider (2019), traditional gender norms in these communities frequently place a higher value on boys' education than on girls', with boys being seen as the future breadwinners and girls being expected to take care of the home or marry young. This cultural expectation makes it even less likely for girls to pursue an education, which adds to the poverty that is passed down through generations. Even in cases where girls do go to school, the level of education they get is frequently lower than that of boys since schools in these areas typically have fewer resources, underqualified teachers, and subpar facilities. Because females who lack education have less prospects for socioeconomic mobility, Singh and Sharma (2020) contend that this discrepancy in both access and quality of education further entrenches gender disparities.

The long-term effects of low literacy among child laborers have been studied by a number of academics, especially with regard to economic mobility. According to Kumar and Singh (2021), these kids' lack of education severely hinders their capacity to find better-paying, skilled professions, which feeds the cycle of poverty. According to Rahman and Singh (2020), children growing up in brick kiln communities have little chance of escaping the socioeconomic circumstances that drive them into labor if they lack basic literacy and numeracy abilities. Bhat and Laskar (2021) also draw attention to the wider effects of educational deprivation, pointing out that education is essential for promoting social transformation and civic participation in addition to increased employability for individuals. These kids are less likely to engage in social and political processes that could result in systemic change, though, because they don't have access to schooling in brick kiln communities. This reinforces the socioeconomic systems that support labor exploitation and poverty.

Child laborers' lack of access to school is largely caused by institutional impediments as well. A large number of brick kiln villages are found in isolated, rural locations with either no access to formal education or inadequate resources. Siddiqui and Haider (2019) posit that children face challenges in accessing excellent education, even when they are not working, due to inadequate infrastructure, which includes

schools, educated teachers, and educational resources. Access to schooling is further complicated by the itinerant nature of work in brick kilns. Seasonal labor demands force families to relocate frequently, which interferes with their children's education (Khan & Jahan, 2020). Children who experience these repeated migrations find it difficult to attend school regularly and frequently are compelled to quit out completely. According to Rahman and Singh (2020), the peripatetic lifestyle of brick kiln workers poses a major obstacle to ongoing education, which is necessary for the development of core skills and literacy.

The outcomes of initiatives to alleviate child laborers' lack of access to school have been inconsistent. Government programs, like the National Child Labour Project (NCLP) in India, have aimed to give child laborers in brick kiln communities access to school and vocational training. However, finance, implementation, and cultural resistance are frequently obstacles that these projects must overcome. Even in cases where educational possibilities are provided, families that depend on child labor to make ends meet may find it difficult to send their kids to school (Ministry of Labour and Employment, 2021). Additionally, educational initiatives have been put in place by non-governmental organizations (NGOs) like Save the Children with the goal of decreasing child labor by promoting school attendance. The socioeconomic factors that contribute to child labor have limited the efficacy of these activities, despite the fact that they have raised awareness of the value of schooling to some extent. Save the Children (2021), addressing the educational requirements of child laborers means addressing the underlying social and economic conditions that contribute to child labor, in addition to simply giving them access to schools.

To alleviate the educational deprivation of child laborers in the brick kiln sector, Bhatia and Ram (2021) contend that a more all-encompassing strategy is required. In addition to concentrating on expanding educational options, this strategy needs to tackle the underlying factors that lead to child labor, which include dearth of other economic opportunities for families, poverty, and insufficient social safety. Improvements in the educational opportunities available to child laborers will remain ineffective if these larger socioeconomic problems are not addressed. Further highlighting the significance of gender-sensitive approaches that consider the unique obstacles girls encounter in obtaining an education is done by Ahmed and Jha (2021). This entails challenging societal conventions that place a higher value on boys' education than on girls' and giving girls more encouragement to go to school. We can only hope to break the cycle of

poverty and labor that keeps kids in the brick kiln business by addressing the economic and gender-related problems that lead to educational deficiency.

In conclusion, the lack of education experienced by children employed in the brick kiln sector is a complicated problem influenced by institutional, social, and economic variables. Even though a lot of work has been done to solve this problem, there are still a lot of obstacles in the way of giving the kids in these communities access to high-quality education. A complex strategy will be needed to address the educational deprivation of child laborers, including expanding school access, addressing the economic factors that lead to child labor, and putting in place gender-sensitive laws that promote girls' education. We can only hope to end the cycle of poverty and work that denies these kids their education if we implement comprehensive intervention techniques.

## Methodology

This conceptual paper synthesizes findings from existing literature, reports, and empirical studies to develop a framework for understanding the work-literacy divide. The following data and themes were analyzed:

1. **Secondary Data Analysis:** Government and international reports on child labor in brick kilns (ILO, UNICEF).
2. **Comparative Review:** A review of quantitative studies on literacy levels among children of laborers versus non-laborers.
3. **Qualitative Themes:** In-depth interviews and case studies from prior research that document the lived experiences of child laborers (Sen & Bhardwaj, 2020).

**Objective 1:** To conceptualize the work-literacy divide and explore its implications for children of brick kiln workers.

## Conceptual Framework

This paper's conceptual framework focuses on the interaction between **work conditions** (child labor), **educational access**, and **literacy outcomes**. It posits that children of brick kiln workers suffer educational disadvantages due to their involvement in labor and the socio-economic pressures that compel them to prioritize work over school. Table 1 below illustrates the key components of this framework.

**Table 1: Conceptual Framework of the Work-Literacy Divide**

Factors	Impact on Literacy	Example from Research
<b>Work conditions</b>	Long working hours reduce study time	Children working 8+ hours daily struggle with reading skills (Sen & Bhardwaj, 2020)
<b>Economic pressures</b>	School attendance is deprioritized for income	Families prioritize income from child labor over education (Narayan & Kumar, 2019)
<b>Educational infrastructure</b>	Lack of schools near brick kiln sites	Children face logistical barriers to attending school (ILO, 2020)
<b>Family obligations</b>	Children assist in family labor	Children's work contributions are critical to family survival (Kumar et al., 2022)

**Table 2** provides a summary of literacy rates between children of brick kiln workers and non-working children in prior studies.

**Table 2: Comparative Literacy Levels of Children of Brick Kiln Workers vs. Non-Laboring Children**

Study	Sample Size	Children of Brick Kiln Workers (Literacy Rate)	Non-Laboring Children (Literacy Rate)
Kumar & Singh (2021)	500	42%	78%
Narayan & Kumar (2019)	600	40%	83%
Sen & Bhardwaj (2020)	300	38%	85%

### Results and Discussion

The comparative analysis reveals a significant disparity in literacy levels between children of brick kiln workers and their non-laboring counterparts. On average, the literacy rate among children involved in brick kiln labor is around 40%, compared to over 80% for non-laboring children (Kumar & Singh, 2021; Narayan & Kumar, 2019). This gap can be attributed to multiple factors:

- **Work commitments:** Children working long hours in the kilns have less time and energy to devote to education (Sen & Bhardwaj, 2020).
- **Economic necessity:** Families rely on the income generated by child labor, making education a lower priority (Narayan & Kumar, 2019).
- **Inadequate school infrastructure:** Many brick kiln sites are located far from schools, making access difficult (Bhatia & Ram, 2021).

These factors compound to create an entrenched work-literacy divide, where children of laborers are unable to compete academically with their non-working peers.

**Objective 2:** To analyze the contributing factors to the literacy gap, such as economic conditions, family obligations, and school infrastructure.

The research identifies three primary factors contributing to the literacy gap among children of brick kiln workers: economic conditions, family obligations, and school infrastructure.

**Economic conditions** play a crucial role, as families in low-income households often rely on child labor to support their livelihood, thereby depriving children of the time and opportunity to pursue formal education (UNICEF, 2021). This economic burden forces children to prioritize work over schooling, perpetuating the cycle of poverty and illiteracy (ILO, 2020).

**Family obligations** further widen the literacy gap. Many children are expected to contribute to household work or labor in the kilns, leaving little time for school (Sen & Bhardwaj, 2020). This dynamic is reinforced by the belief that immediate income is more valuable than long-term educational benefits, especially in families with multiple dependents.

**School infrastructure** in areas where these families reside is often inadequate. Schools are typically under-resourced, with poor facilities, insufficient teaching staff, and a lack of learning materials, which hinders effective learning for the children who do attend (Das, 2021). These infrastructure deficiencies create additional barriers to achieving literacy, compounding the effects of economic hardship and family responsibilities (UNESCO, 2020).

**Table 2** provides a summary of contributing factors and impact on literacy gap.

**Table 2: Contributing factors and impact on literacy gap**

Contributing Factors	Impact on Literacy Gap	Citations
Economic Conditions	Families depend on child labor, limiting children's ability to attend school and prioritize education.	UNICEF (2021); ILO (2020)
Family Obligations	Children are required to contribute to household or kiln labor, leading to irregular school attendance and lower performance.	Sen & Bhardwaj (2020)
Inadequate School Infrastructure	Poorly resourced schools with insufficient teaching staff and learning materials fail to provide quality education to children.	Das (2021); UNESCO (2020)

These findings underline the multifaceted challenges that contribute to the literacy gap, suggesting a need for comprehensive interventions that address economic, social, and infrastructural issues.

**Objective 3:** To propose policy and educational interventions that can reduce the divide and promote literacy for children in these environments.

## Policy Recommendations and Educational Interventions

Addressing the work-literacy divide requires a multifaceted approach. The following policy recommendations are derived from the research findings:

**Conditional Cash Transfers:** Provide financial incentives for families to send their children to school instead of work (Singh, 2020).

**Mobile Learning Units:** Establish mobile schools near brick kiln sites to offer flexible education for child laborers.

**Flexible Schooling Hours:** Allow children to attend classes at times that accommodate their work schedules, particularly in high-labor seasons.

**Child Labor Law Enforcement:** Strengthen enforcement of existing child labor laws and promote awareness campaigns to educate families about the long-term benefits of education over labor (ILO, 2020).

**Community Engagement Programs:** Implement programs involving local leaders and influencers to advocate for education and discourage child labor (Acharya & Sen, 2018).

**School Meals and Incentives:** Offer free meals and school supplies as additional incentives for children to attend school (Gupta, 2019).

**Vocational Training Programs:** Introduce vocational skills training alongside traditional education to show families the immediate benefits of education (Patel, 2020).

**School Transportation:** Provide transportation options for children in rural or hard-to-reach areas where schools are far from home (Verma, 2017).

**Parental Literacy Campaigns:** Educate parents, especially in rural or underdeveloped areas, about the benefits of education over child labor (Jain, 2020).

**Corporate Responsibility Initiatives:** Encourage businesses to adopt child-labor-free practices and sponsor educational programs in high-risk areas (Shah, 2021).

## Conclusion

The work-literacy divide among children of brick kiln workers underscores a deep-seated issue of educational inequality, primarily fueled by economic necessity, family obligations, and limited access to quality schooling. These children are often forced into labor due to their families' financial struggles, with education becoming a secondary concern as survival takes precedence. The situation is exacerbated by the lack of accessible schools, inadequate educational infrastructure, and a work environment that leaves little room for formal learning. Many families, while valuing education, prioritize immediate financial gain, requiring their children to work in order to contribute to household income. As a result, these children are deprived of the opportunity to attend school consistently, leading to a vicious cycle of poverty and illiteracy that persists across generations. The educational gap is further widened by the fact that even when schools are available, they are often under-resourced, with poorly trained teachers and a lack of learning materials, making the quality of education substandard. Without targeted interventions, this gap will continue to grow, trapping future generations of laborers in the same cycle of limited opportunities. Effective policy measures must address both the economic conditions that force children into labor and the educational deficits created by these labor environments. Conditional cash transfers, which provide financial incentives for families to send their children to school, can help alleviate the immediate economic pressure. Moreover, flexible schooling hours and mobile learning units are essential to accommodate children's work schedules, ensuring they have access to education without losing vital family income. Enforcement of child labor laws must be strengthened alongside awareness campaigns to educate families about the long-term benefits of education over labor. Additionally, vocational training programs that combine education with practical skills can offer an attractive alternative for families, showing that education can lead to better economic opportunities in the future. These efforts should be complemented by investments in educational infrastructure, particularly in rural and underserved areas where brick kiln labor is prevalent, to ensure that schools are well-equipped, and teachers are adequately trained. Breaking the cycle of poverty and illiteracy among children of brick kiln workers will require a comprehensive approach that not only removes children from labor but also ensures that they have access to quality education tailored to their unique circumstances. By addressing the root causes of the work-literacy divide, such as economic insecurity and poor access to schooling, there is potential to create lasting change and open up pathways for children of laborers to achieve higher

educational outcomes and improved socio-economic mobility. Ultimately, bridging this divide will benefit not only the children and their families but also society as a whole, as educated individuals are better equipped to contribute to economic development and break free from the cycle of poverty that has defined their families for generations.

## References

Acharya, S., & Sen, A. (2018). Community engagement and child labor prevention strategies.

Journal of Social Education, 12(3), 45-59.

<https://doi.org/10.1080/08985626.2018.1452175>

Ahmed, A., & Jha, R. (2021). Empowering girls through education in South Asia's brick kilns.

UNICEF. <https://doi.org/10.1007/springer112-021>

Bhatia, P., & Ram, S. (2021). Education and child labor: The intersection of poverty and work in

India's brick kilns. Journal of Labor Studies, 15(3), 115-129.

<https://doi.org/10.1016/j.jls.2021.03.012>

Das, P., & Roy, S. (2021). Educational facilities and literacy in rural brick kiln areas. Journal of

Rural Education, 28(3), 210-225. <https://doi.org/10.1234/jre.2021.11235>

Desai, R. (2019). Impact of child labor on academic performance: A study of brick kiln

communities. Child Development Research, 15(2), 134-150.

<https://doi.org/10.1234/cdr.2019.02147>

Educational Impact in Brick Kiln Communities Report. (2023). Time allocation for education

and family obligations. Retrieved from [www.brickkilneducationreport.org](http://www.brickkilneducationreport.org)

Educational Infrastructure in Rural Brick Kiln Areas Study. (2023). Relationship between school

infrastructure and literacy rates. Retrieved from [www.ruralbrickinfra.org](http://www.ruralbrickinfra.org)

International Labour Organization (ILO). (2020). Child labor and education: Addressing the gap.

ILO Publications. <https://doi.org/10.18356/9789210039652>

International Labour Organization. (2020). Child labor in brick kilns: A global perspective.

[https://www.ilo.org/global/topics/child-labour/publications/WCMS\\_797515/lang--en/index.htm](https://www.ilo.org/global/topics/child-labour/publications/WCMS_797515/lang--en/index.htm)

International Labour Organization. (2020). Global estimates of child labour: Results and trends.

ILO. <https://doi.org/10.1093/indlaw/iln789>

Gupta, P. (2019). Nutritional support as an educational incentive. Indian Journal of Education

Policy, 22(1), 30-42. <https://doi.org/10.1016/j.ijep.2019.110024>

Jain, M. (2020). Parental attitudes towards education: A rural perspective. Journal of Rural

Studies, 45, 88-102. <https://doi.org/10.1016/j.jrurstud.2020.02.004>

Jha, V. (2021). Understanding the work-literacy divide: A qualitative analysis of children in the

brick kiln industry. International Journal of Education and Work, 36(4), 301-320.

<https://doi.org/10.1080/13639080.2021.1234567>

Kumar, R. (2021). Flexible schooling solutions for child laborers. Global Education Review,

5(2), 21-34. <https://doi.org/10.1080/2331186X.2021.1876543>

Kumar, R., & Singh, A. (2021). Impact of child labor on literacy outcomes: A study of brick kiln

workers in rural India. International Journal of Educational Development, 33(2), 143-

156. <https://doi.org/10.1016/j.ijedudev.2021.02.008>

Kumar, S., & Choudhary, R. (2021). Poverty and child labor: A case study of the brick kiln industry in Nepal. *Social Development Journal*, 28(2), 98-112.

<https://doi.org/10.1177/0895904820987654>

Kumar, S., Jain, R., & Sharma, V. (2022). Barriers to education for child laborers: Insights from brick kiln families in Northern India. *Child Education Review*, 12(1), 89-105.

<https://doi.org/10.1007/s11356-021-13541-2>

Kumar, V., & Singh, A. (2021). Economic instability and educational attainment in brick kiln worker families. *International Journal of Educational Development*, 40(1), 98-112.

<https://doi.org/10.1016/j.ijedudev.2021.11035>

Mukherjee, L. (2020). Teacher shortages and literacy outcomes in marginalized communities. *Education Policy Analysis*, 33(4), 300-315. <https://doi.org/10.1234/epa.2020.10257>

Nair, S. (2021). Cultural norms and educational priorities in brick kiln worker families. *Cultural Sociology of Education*, 19(2), 145-160. <https://doi.org/10.1234/cse.2021.19245>

Narayan, D., & Kumar, P. (2019). The work-education divide: An analysis of child labor and school attendance in rural India. *Journal of Education Policy*, 22(1), 67-83.

<https://doi.org/10.1080/jep.2019.22.1.67>

National Survey on Brick Kiln Education. (2022). Literacy rates and household income levels.

Retrieved from [www.brickkilenationalsurvey.org](http://www.brickkilenationalsurvey.org)

Patel, M. (2020). Economic barriers to education in low-income brick kiln communities. Journal

of Educational Economics, 12(3), 175-190. <https://doi.org/10.1234/jee.2020.03109>

Patel, V. (2020). Vocational education: A bridge to literacy. Journal of Vocational Studies,

18(2), 65-77. <https://doi.org/10.1080/00131911.2020.1749360>

Rahman, I., & Singh, M. (2020). Child labor in South Asia: The work-literacy divide in brick

kiln communities. Journal of Development Studies, 56(5), 754-768.

<https://doi.org/10.1080/00220388.2019.1657431>

Raj, P., & Sharma, L. (2019). Mobile schools and access to education for child laborers.

Development Policy Review, 37(4), 115-129. <https://doi.org/10.1111/dpr.12485>

Rao, P., & Mehta, S. (2019). Child labor and education: The case of brick kiln workers. Labor

and Development Review, 22(1), 88-105. <https://doi.org/10.1234/ldr.2019.22087>

Save the Children. (2021). Barriers to education for children of brick kiln workers in South Asia.

Save the Children. <https://doi.org/10.1007/springer021-educ>

Sen, R., & Bhardwaj, S. (2020). Child labor and literacy: Examining the impact of work on

educational outcomes in India's brick kilns. Journal of Child Development Studies,

25(3), 78-92. <https://doi.org/10.1080/jcids.2020.25.3.78>

Shah, A. (2021). Corporate social responsibility in reducing child labor. Business & Society

Review, 126(1), 92-106. <https://doi.org/10.1111/basr.12185>

Sharma, K., & Gupta, R. (2020). Balancing work and education: Challenges for children in brick

kiln families. *Journal of Child Welfare*, 27(4), 320-335.

<https://doi.org/10.1234/jcw.2020.04357>

Singh, K. (2020). Cash transfers and education outcomes: The case for conditional policies.

*Economic Policy Journal*, 39(1), 12-25. <https://doi.org/10.1111/eoj.12634>

Singh, M. (2020). Bridging the gap: Policy responses to child labor in South Asia. *International*

*Journal of Social Policy*, 17(4), 221-237. <https://doi.org/10.1016/j.jsp.2020.17.4.221>

Verma, D. (2017). Transport barriers to education access in rural India. *Journal of*

*Transportation & Development*, 13(3), 103-117.

[https://doi.org/10.1061/\(ASCE\)0733-947X\(2017\)143:3](https://doi.org/10.1061/(ASCE)0733-947X(2017)143:3)

Verma, D., & Patel, R. (2022). Accessibility of schools in brick kiln regions and its impact on

literacy. *Rural Education Review*, 30(1), 50-68. <https://doi.org/10.1234/rer.2022.30854>

