

Educational Welfare Schemes and Women Empowerment in India: A Study of the Pudhumai Penn Scheme as a Real Catalyst of Human Capital Development Beyond Artificial Intelligence

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ABSTRACT:

This paper examines the role of educational welfare schemes in promoting women empowerment and human capital development in India, with special reference to the Pudhumai Penn Scheme of Tamil Nadu, amid the rapid emergence of Artificial Intelligence in education. While AI-driven initiatives enhance digital learning, the study emphasizes that welfare-based educational support has a stronger and more inclusive impact on women's empowerment, particularly among socio-economically disadvantaged groups. The study assesses the scheme's influence on educational participation, social empowerment, and capability building beyond technology-centric approaches. Primary data were collected from 194 girl students pursuing higher education. Descriptive statistics, one-sample t-tests, and chi-square tests were employed to examine perceived scheme effectiveness and empowerment outcomes across demographic variables. The findings indicate significant educational and social benefits of the scheme, especially among students from low- and middle-income households. Significant associations were observed between income level, institution type, and empowerment outcomes. The study concludes that despite the expansion of AI, educational welfare schemes remain essential for inclusive women empowerment and sustainable human capital development.

Keywords: Pudhumai Penn Scheme, Women Empowerment, Educational Welfare, Human Capital Development, Financial Inclusion, Social Empowerment, Gender Equity, Inclusive Growth

1. INTRODUCTION:

Artificial Intelligence (AI) has emerged as a transformative force in education, offering innovative learning platforms, digital skill development, and improved access to information. In the context of women empowerment, AI-driven educational tools have the potential to enhance employability, digital literacy, and participation in the modern workforce. However, the benefits of AI largely remain accessible to those who already possess basic educational access, financial stability, and technological infrastructure. For many young women from socio-economically disadvantaged backgrounds in India, structural barriers such as poverty, gender bias, and discontinuation of education continue to limit the empowering potential of AI.

In this context, educational welfare schemes play a more foundational and inclusive role in women empowerment. The Pudhumai Penn Scheme of Tamil Nadu acts as a real catalyst of human capital development by providing direct financial assistance to girl students pursuing higher education. Beyond technology-centric interventions, the scheme promotes social empowerment by reducing financial dependence, encouraging continued education, enhancing self-confidence, and improving decision-making capabilities among young women. Thus, while AI supports skill enhancement, the Pudhumai Penn Scheme strengthens the social and economic foundations necessary for sustainable women empowerment beyond artificial intelligence.

2. STATEMENT OF PROBLEM:

Despite significant advancements in Artificial Intelligence and digital learning platforms aimed at enhancing educational access and skill development, women from socio-economically disadvantaged backgrounds in India continue to face persistent barriers such as financial constraints, gender bias, and limited autonomy in educational decision-making. Technology-driven interventions alone are insufficient to address these structural inequalities, as access to AI-enabled education often presupposes basic economic security and social support. In this context, educational welfare schemes play a critical role in enabling women's empowerment by ensuring sustained participation in higher education. The Pudhumai Penn Scheme of Tamil Nadu seeks to promote women empowerment through direct financial assistance to girl students; however, there is limited empirical evidence assessing its effectiveness in enhancing social empowerment and human capital development beyond technology-centric approaches. Therefore, this study seeks to examine the impact of the Pudhumai Penn Scheme on the social empowerment of girl students and to analyze how demographic factors influence empowerment outcomes, thereby evaluating the scheme's role as a catalyst of inclusive women empowerment beyond Artificial Intelligence.

3. OBJECTIVES OF THE STUDY:

- To examine the impact of the Pudhumai Penn Scheme on the social empowerment of girl students pursuing higher education in Tamil Nadu.
- To evaluate the role of the Pudhumai Penn Scheme in fostering inclusive human capital development among women from socio-economically disadvantaged backgrounds.
- To assess whether the level of social empowerment among beneficiaries is significantly higher than a neutral level, thereby establishing the effectiveness of the scheme beyond technology-driven interventions such as Artificial Intelligence.

4. REVIEW OF LITERATURE:

Jayasathya et al. (2023) investigates the impact of the Pudhumai Penn Scheme on female students' access to higher education in Tamil Nadu. Surveying 150 beneficiaries in Coimbatore, the authors found that financial assistance was the most valued feature, followed by career support and ease of access. While demographic factors showed no significant influence, institutional type affected scheme access. The scheme was perceived as promoting literacy, reducing dropout rates, and enhancing empowerment. The authors recommend increased awareness, simplified processes, and mentorship to strengthen the scheme's role in human capital development.

Hepzibah Mercy et al. (2025) conceptually explores Tamil Nadu's government schemes aimed at reducing educational inequalities in alignment with SDG Goal 10. It highlights initiatives like the Mid-Day Meal Scheme, Pudhumai Penn (Smart Tablet), free textbooks, health insurance, and scholarships for marginalized groups. These programs have improved enrolment, digital access, and retention, especially among SC, ST, OBC, and rural students. However, challenges persist in infrastructure, teacher training, and awareness. The authors emphasize inclusive reforms and sustained investment to ensure equitable education and human capital development across socio-economic divides.

Yoganandham and Kalaivani (2024) provides a study on comprehensive assessment of government initiatives in India focusing on education, gender equality, public health, financial inclusion, and economic empowerment as pillars of sustainable development. It highlights how educational reforms such as the Right to Education Act, Samagra Shiksha, and NEP 2020 have improved access, infrastructure, and female enrolment, particularly among marginalized communities. The article emphasizes women's education as a catalyst for empowerment and human capital formation, arguing that welfare-driven educational interventions create long-term socio-economic transformation beyond technology-led solutions such as artificial intelligence.

Kabeer (2011) critically examines in this article the concept and measurement of women's empowerment within development discourse, emphasizing education as a foundational capability for enhancing women's agency and well-being. Drawing on the capabilities approach, the study highlights how educational access expands women's choices, awareness, and participation in economic and social spheres. It critiques composite indices like the Gender Empowerment Measure for their urban and elite bias, arguing for more inclusive frameworks that capture informal work and care roles. The paper provides strong theoretical support for welfare-oriented educational schemes as long-term drivers of human capital development beyond technology-led solutions.

Shetty and Hans (2015) examine in this paper the role of education as a central instrument for women empowerment and development in India, highlighting education as both an input and outcome of human development. Using secondary data, the authors analyze literacy trends, policy initiatives, and institutional interventions aimed at reducing gender disparities. The study emphasizes that education enhances women's economic independence, decision-making power, and social status while addressing persistent challenges such as gender inequality, early marriage, and limited access. The paper strongly supports educational welfare schemes as sustainable catalysts of women empowerment and human capital formation beyond technology-centric approaches.

5. RESEARCH METHODOLOGY:

The present study adopts a descriptive and analytical research design to examine the impact of the Pudhumai Penn Scheme on women empowerment and human capital development beyond technology-driven interventions such as Artificial Intelligence. The research is based entirely on primary data collected from 194 girl students pursuing higher education in Tamil Nadu who are beneficiaries of the Pudhumai Penn Scheme. A structured questionnaire was used to gather detailed information on demographic characteristics and indicators of social empowerment, including self-confidence, decision-making ability, family support, and educational freedom. Convenience sampling was employed to select participants from government, government-aided, and private colleges, ensuring representation across different types of institutions. The collected data were analysed using descriptive statistics to summarize demographic profiles and empowerment levels. Inferential statistical techniques, including one-sample t-tests, were applied to assess whether social empowerment significantly differed from a neutral benchmark, while chi-square tests were used to examine associations between demographic variables and empowerment outcomes. Statistical analyses were conducted using standard tools, and the findings were interpreted to evaluate the effectiveness of the Pudhumai Penn Scheme in fostering women empowerment and enhancing human capital development beyond conventional and technology-mediated interventions.

6. DATA ANALYSIS AND INTERPRETATIONS:

Demographic Insights and Scheme Reach

The respondent profile underscores the scheme's alignment with inclusive human capital objectives. It captures 194 girl students primarily aged 17 to 20 (89.7 percent), pursuing undergraduate programs (92.8 percent), and hailing from low-income households (78.1 percent with family earnings below Rs 25,000 monthly). This distribution reflects effective targeting of socio-economically vulnerable groups in government-aided (51.5 percent) and government colleges (14.4 percent). It spans diverse districts and academic streams like arts (70.1 percent) and science (23.7 percent), thereby broadening access to higher education and countering traditional barriers without reliance on digital tools. Such representation validates the first objective by demonstrating the scheme's capacity to elevate women from marginalized segments into sustained educational pathways

Social Empowerment Metrics and Statistical Validation

Responses to social empowerment indicators reveal robust affirmative trends. For example, self-confidence, family respect, and decision-making autonomy show over 85 percent of participants strongly agreeing or agreeing across seven items. This signals profound shifts in gender dynamics and familial support structures. A one-sample t-test further substantiates the third objective. It reports a mean score of 4.36, well above the neutral benchmark of 3.00 ($t=21.56$, $df=193$, $p<0.001$). Thus, it establishes statistically significant empowerment levels that affirm the scheme's efficacy as a non-technological catalyst. Chi-square analyses deepen this interpretation. Institution type shows significant variation ($\chi^2=6.598$, $df=2$, $p=0.037$), with government colleges yielding higher empowerment proportions (71.4 percent high versus 71 percent in aided and 29 percent in private). Family income exhibits strong association ($\chi^2=35.420$, $df=5$, $p=0.001$), favouring low/middle-income groups (for example, 70.5 percent high empowerment below Rs 10,000). Yet study level remains non-significant ($\chi^2=0.240$, $df=1$, $p=0.624$),

indicating uniform benefits across undergraduates and postgraduates. These results collectively fulfil the second objective. They illustrate how financial incentives translate into tangible human capital gains, independent of AI-driven mechanisms.

7. FINDINGS AND SUGGESTIONS:

Empirical data confirms the Pudhumai Penn Scheme as a genuine driver of social empowerment, with high empowerment prevailing among 77.3 percent of beneficiaries, particularly those in public institutions and lower-income brackets, thereby dismantling socio-economic hurdles and nurturing inclusive human capital development. The scheme's success in elevating confidence, autonomy, and educational persistence among disadvantaged girls positions it as a model for welfare interventions that prioritize direct economic support over algorithmic or tech-based solutions, directly addressing all study objectives, while uniform outcomes across study levels highlight its scalability in fostering long-term gender equity in higher education. To amplify its catalytic role, authorities should extend stipends and awareness campaigns to private colleges where empowerment lags for pan-institutional equity, implement targeted interventions like counseling on non-monetary empowerment for higher-income beneficiaries to bridge perceptual gaps, conduct longitudinal tracking of alumni outcomes to quantify sustained human capital contributions, and explore hybrid models integrating scheme data with basic analytics (avoiding heavy AI dependence) alongside inter-state replications to advance national women empowerment agendas.

8. CONCLUSION:

In summary, the Pudhumai Penn Scheme stands out as a powerful driver for women's empowerment and building human skills in Tamil Nadu. It meets the study's goals head-on, lifting social confidence, family backing, and independence for girl students which is backed by solid statistics like a mean score of 4.36 well above neutral while reaching those from poorer families in state-run colleges. Unlike tech fixes such as AI, this program delivers real, proven results, especially in government schools and for lower-income groups, helping girls stay in education longer and dream bigger. The evidence points to its lasting value, calling for steps like better promotion in private colleges and follow-up studies on graduates' careers to strengthen its reach even further.

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