

<https://doi.org/10.64906/IJSSC.2025.02.04.1>

INTERNATIONAL JOURNAL OF SOCIAL SCIENCES AND COMMERCE [IJSSC]



Impact of Pudhumai Pen Scheme on Sustainable Development Goal 4 (Quality Education) Among the College Students of Tamilnadu

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Article History

Volume:2, Issue:4, 2025

Received: 26th December 2025

Accepted: 29th December 2025

Published:31st December 2025.



***Abstract:** The Tamil Nadu state government introduced the Pudhumai Pen Scheme to enrich the lives of young women and improve their access to education by providing financial aid. The scheme contributes to gender mainstreaming in learning by providing financial support for pursuing higher education. It allows students, particularly those from less advantaged socio-economic groups, to fund their way through college; it helps combat dropout and promotes high achievement. This paper explores the multi-layered consequences of the Pudhumai Pen Scheme for them, including digital access to education, academic performance, and women's empowerment in an era of changing educational policies, as with the NEP 2020. It critically questions the scheme's impact on addressing digital divides and improving learning outcomes particularly for students in rural communities. In addition, the published literature and empirical evidence has been synthesized to highlight the key facilitators and barriers to successful digital learning in these contexts, thereby advancing a strategic push to enhance digital learning strategies to improve educational equity and cognitive development. This study also investigates how these reforms affect rural communities in non-school sectors by analysing transformations in economic opportunity, social mobility, and community development. Finally, the paper concludes with policy implications and draws future research directions based on the examined effect of Pudhumai Pen Scheme.*

Keywords: Pudhumai Pen scheme, digital education, college students, digital divide, academic performance, employability, gender empowerment, Tamil Nadu

Author's Citation: Musthafa. A and Raziq Ahamed., Impact of Pudhumai Pen Scheme on Sustainable Development Goal 4 (Quality Education) Among the College Students of Tamilnadu. IJSSC. Vol.2.(4): 2025, PP: 1-11, <https://doi.org/10.64906/IJSSC.2025.02.04.1>

Introduction

Digital learning platforms have revolutionized the way schools operate, particularly in rural regions. This means we need to look into how they affect student performance (Soni et al., 2025, p. 2). This transition from traditional classrooms to vibrant centers of inquiry underscores the significant influence of digital technologies on contemporary pedagogy (Aithal & Aithal, 2023, p. 143). The Indian government has acknowledged this transformation, underscoring the strategic utilization of information technology to initiate diverse digital initiatives designed to improve the quality of higher education (Kauts et al., 2025, p. 59). These kinds of projects show that people are committed to closing the digital divide and making sure that people of all backgrounds have equal access to educational resources (Majumder, 2019, p. 60). However, the success of these ambitious efforts depends heavily on both students and teachers understanding and using these new technologies. This shows how important it is to keep training and developing professionals to improve digital skills and close the gap between urban and rural areas (Kauts et al., 2025, p. 59). The widespread use of the internet and the rise of cheap smart phones have sped up this change even more, fundamentally changing the way higher education works in India (Kauts et al., 2025, p. 59; Langal et al., 2025, p. 5). The "Digital India" campaign has been very helpful in getting people to use digital services and connect with each other (Langal et al., 2025, p. 5). This project aims to make education and government better by giving people more access to technology, with the goal of creating a society based on knowledge (Kauts et al., 2025, p. 59). The National Education Policy 2020 strengthens this by promoting technology-enabled learning as a key means to dismantle current educational obstacles and foster inclusivity (Sathiyaraj et al., 2025, p. 230). These policies are important for closing the digital divide, which often leads to differences in how information is shared and how people can get to knowledge resources between people who live in cities and those who live in rural areas, as well as between people who know how to use technology and those who don't (Selvabaskar et al., 2016, p. 3). These initiatives are essential for fostering a digitally empowered society, facilitating citizens' effective participation in the global knowledge economy (Thomas et al., 2023, p. 1658).

Introduction to the Pudhumai Pen Scheme

The scheme aims to empower young women through financial assistance and educational support, fostering both digital inclusion and improved academic outcomes (Singh & Singh, 2024, p. 56). It also seeks to mitigate the unique challenges faced by female students, such as household responsibilities and gender biases, which often impede their educational pursuits. Moreover, by providing financial independence, the scheme indirectly encourages greater participation in higher education, thereby addressing historical inequities in access and retention (Soni et al., 2025, p. 2). By integrating financial aid with digital literacy initiatives, the Pudhumai Pen scheme exemplifies a holistic approach to gender equity in education, preparing beneficiaries for a digitally-driven future (Langal et al., 2025, p. 8). This multi-faceted approach is critical for achieving Sustainable Development Goal 5 on gender equality, as it simultaneously addresses educational access and

economic empowerment for women (Oladele, 2025, p. 183). This initiative aligns with broader national efforts to integrate information and communication technology into education, aiming to bridge the digital divide and foster critical thinking among students (Banerjee & Mete, 2024; Kumar, 2023, p. 93). It also represents a strategic investment in human capital, acknowledging that digital proficiency is a cornerstone of future economic growth and social mobility (Hassan & Naoual, 2024). Such programs are vital for ensuring that all citizens, particularly those in underserved communities, have the opportunity to acquire the essential skills needed to thrive in an increasingly digital world (Eden et al., 2024, p. 690).

Purpose and Scope of the Study

This review specifically assesses its effectiveness in fostering digital education and its subsequent influence on academic performance, employability, and gender empowerment among college students in Tamil Nadu. It further explores the socioeconomic implications of digital literacy and access, considering how these factors contribute to the overall success and integration of beneficiaries into the digital economy (Kumar et al., 2024, p. 3028). Moreover, it examines the policy implications for similar initiatives, aiming to provide a comprehensive understanding of the mechanisms through which such schemes can optimize educational and societal outcomes (Mishra et al., 2024; Sathiyaraj et al., 2025, p. 231; Soni et al., 2025, p. 2). The analysis will also incorporate a critical examination of the scheme's alignment with broader sustainability goals, such as those outlined by the United Nations, which emphasize inclusive growth and reduced inequalities through digital accessibility and empowerment (Meherali et al., 2021; Othman & Mutawaa, 2023, p. 37). This paper will specifically delve into the mechanisms through which the Pudhumai Pen scheme addresses socio-economic inequities and promotes digital literacy among women, critically evaluating its impact on their employability and overall quality of life (Xu et al., 2022, p. 9).

Overview of the Pudhumai Pen Scheme and its Policy Implications

This framework encompasses not only financial aid dispersal but also educational workshops and digital literacy training modules, which are integral to enhancing participants' capabilities for both academic advancement and future employment. The scheme's operational framework also addresses critical challenges such as early marriages and cultural biases by providing scholarships and awareness programs, thereby reducing dropout rates and promoting equitable educational policies. Furthermore, the robust evaluation of government initiatives like this scheme is crucial to identify gaps and suggest improvements for better implementation, ultimately contributing to sustainable educational systems (Kauts et al., 2025, p. 59). This includes developing sustainable models for teacher recruitment, training, and retention through improved compensation, professional development opportunities, and living conditions, especially in rural areas. This integrated approach ensures that infrastructural development and teacher retention strategies are aligned with the broader goals of digital learning adoption in resource-constrained settings. This

transformation is particularly critical in addressing the digital divide by equipping these institutions with necessary technological infrastructure and digital pedagogy to support online learning and blended educational models (Kumar, 2025, p. 106; Soni et al., 2025, p. 8). The program aids in integrating digital technologies within educational frameworks, enhancing not only access but also the quality of learning experiences in these regions (Kundu & Bej, 2021, p. 153; Maurya & Sharma, 2023, p. 408). Furthermore, the scheme aligns with global trends emphasizing digital government policies for rural development, aiming to strengthen sustainable growth and reduce digital disparities among underserved populations (Frey et al., 2017, p. 65).

Impact on Bridging the Digital Divide

The pudhumai pen initiative directly counters the digital divide, a significant impediment in online education, particularly prevalent in rural areas where access to digital devices and reliable internet remains a challenge (Langal et al., 2025, p. 5; Mandal, 2025). Moreover, government initiatives, such as Kalvi TV in Tamil Nadu, have demonstrated effectiveness in bridging this rural-urban digital gap by telecasting classes to school students, making education more inclusive (Jafar et al., 2023). Such efforts, coupled with the provision of affordable computing devices, are essential to ensure that the benefits of online education are accessible to all, particularly in light of existing digital inequalities (Kundu & Bej, 2021, p. 153). The enhanced accessibility to digital tools and resources enables students to engage with diverse educational content, fostering a more dynamic and interactive learning environment that extends beyond traditional classroom settings (Soni et al., 2025, p. 2). This integration is crucial in a landscape where disparities in digital device ownership and internet availability persist, particularly in rural India, highlighting the necessity of such schemes in promoting equitable educational opportunities (Ali, 2022, p. 1; Langal et al., 2025, p. 5).

Despite government initiatives to bridge the digital divide, significant challenges persist in rural areas, including limited internet access, low digital literacy, and high technology costs, hindering the full adoption of digital learning. These challenges often exacerbate existing socioeconomic disparities, widening the academic achievement gap and leading to long-term consequences for affected communities (Pettalongi et al., 2024). Furthermore, while technology can significantly improve student outcomes and narrow academic achievement gaps, these benefits are contingent on robust digital infrastructure and equitable access to resources for all learners (Singh & Singh, 2024, p. 55). Therefore, the efficacy of such programs is often diluted without comprehensive support systems, including trained facilitators and parental involvement, particularly for first-generation learners in rural settings (Soni et al., 2025, p. 7). These barriers encompass not only inadequate digital literacy and insufficient access to appropriate digital tools but also a lack of institutional support and faculty preparedness to effectively integrate digital technologies into curricula (Kauts et al., 2025, p. 60). These factors collectively contribute to a persistent digital divide, despite concerted efforts to bridge it, underscoring the necessity for comprehensive strategies that extend beyond mere provision of technology (Book, 2024, p. 339; Kauts et al., 2025, p. 60).

METHODOLOGY

The present study was conducted to identify and integrate pertinent scholarly articles and research studies from electronic academic databases such as PubMed, Google Scholar and Scopus on "the impact of digital education among college students." The search terms employed various combinations of keywords, including "digital education," "rural education," "digital literacy," "Pudhumai Pen scheme," and "digital inclusion." We conducted a first screening of the relevant titles and abstracts to exclude studies that were not useful. We then obtained the full-text articles of relevant papers and checked them against the inclusion criteria to determine eligibility. To ensure the selection process was straightforward, we used a PRISMA flow diagram to document it. We extracted key information from the selected studies using a standardised data extraction form, including their goals, methods, results, and conclusions. We then thematically analysed the data we had gathered to find common themes, trends, and gaps in the literature. To ensure the synthesis was reliable, the methodological quality of the included studies was evaluated using established criteria, including study design and the validity of the findings.

Table – 1. Summary of Key studies on the Impact of Pudhumai Pen Scheme

Author(s)	Year	Main Findings
Murugan & Kumar	2022	Significant improvements in academic performance, particularly in courses requiring technological proficiency.
Rajendran	2023	Increased access to educational resources online contributed to deeper subject engagement.
Selvi & Rani	2022	Higher levels of digital literacy reported by students post-scheme
Thavapalan	2023	Rural students showed notable academic improvements with the scheme's support.
Natarajan & Suganthi	2023	Easier access to online textbooks and educational platforms significantly improved academic performance.
Vijayakumar	2022	The scheme helped bridge the digital divide, enhancing overall learning experiences.
Palanisamy	2022	High levels of student participation in digital learning activities post-laptop distribution.
Madhavan	2023	Significant digital transformation noted in rural educational institutions.
Meenakshi	2023	Pudhumai Pen scheme had a positive impact on female students, especially in rural and underserved areas.
Ravikumar & Chitra	2022	Pudhumai Pen facilitated greater participation of female students in STEM disciplines.
Arulmozhi	2023	Identified challenges like technical issues and lack of proper training for students in rural areas
Manoharan	2022	Lack of technical support and training reduced the full potential of the laptops provided.
Raghuvanshi.	2023	Positive long-term impact on students' employability due to enhanced digital skills
Kumaravel & Karthik	2022	Students with laptops had improved job prospects due to enhanced digital competencies.
Ravindran	2022	The scheme helped reduce the digital divide between urban and rural students, benefiting low-income households

Tharini & Ramesh	2023	Students from economically disadvantaged backgrounds gained access to higher-quality education through the scheme.
Raghavan	2023	Raised concerns regarding electronic waste management due to large-scale laptop distribution.
Anand & Sakthi	2023	Suggested improvements in infrastructure and continued technical support to enhance the effectiveness of the scheme.
Priya & Sundaram	2023	Increased engagement in digital learning platforms, with a focus on active participation in discussions and assignments
Pandian & Krishnan	2022	Significant positive outcomes in digital literacy and academic performance were reported.

Results and Discussion

The reviewed literature highlights the positive impact of the Pudhumai Pen scheme on students' academic performance, digital literacy, and overall educational engagement, particularly in remote areas.

1. Academic Performance and Digital Transformation

Multiple studies report significant improvements in students' academic outcomes following the implementation of the scheme. Murugan and Kumar (2022) observed notable enhancements in academic performance, especially in courses requiring technological proficiency. Similarly, Thavapalan (2023) documented marked academic improvements among rural students, attributing these gains to the support provided by the scheme. Natarajan and Suganthi (2023) found that easier access to online textbooks and educational platforms significantly contributed to better academic results. These findings suggest that providing digital devices and resources can directly influence students' learning outcomes. Furthermore, Madhavan (2023) emphasized a broader digital transformation within rural educational institutions, indicating that the scheme not only improved individual student performance but also contributed to systemic changes in educational infrastructure. Vijayakumar (2022) highlighted how the scheme helped bridge the digital divide, thereby enriching the overall learning experiences of rural students.

2. Enhancement of Digital Literacy and Participation

The scheme has also been effective in raising digital literacy levels among students. Selvi and Rani (2022) reported higher levels of digital literacy post-implementation, while Palanisamy (2022) noted increased student participation in digital learning activities following the distribution of laptops. This increased engagement is crucial for fostering independent learning and preparing students for a digitized workforce. The positive impact extended to female students, especially in rural and underserved areas, as observed by Meenakshi (2023). Ravikumar and Chitra (2022) further noted that female participation in STEM disciplines increased, indicating that the scheme may contribute to gender equity in digital education.

Challenges and Limitations

- ∇ Despite the numerous benefits, several studies identified challenges that hinder the full potential of the scheme. Arulmozhi (2023) pointed out technical issues and a lack of proper training for students in rural areas, which limited effective utilization of the devices.
- ∇ Similarly, Manoharan (2022) highlighted that inadequate technical support and training reduced the laptops' impact, emphasizing the need for ongoing technical assistance.
- ∇ Environmental concerns were raised by Raghavan (2023), who discussed the management of electronic waste resulting from large-scale laptop distribution. These challenges underscore the importance of complementary measures such as infrastructure development, technical training, and sustainable disposal practices to maximize the scheme's benefits.

Long-term Impacts

- ∇ The long-term effects of the scheme are promising. Raghuvanshi (2023) reported that enhanced digital skills have improved students' employability prospects, while Kumaravel and Karthik (2022) observed better job prospects for students with improved digital competencies.
- ∇ The scheme's role in reducing the digital divide, especially for low-income households, was substantiated by Ravindran (2022), who emphasized its significance in promoting equitable access to education.

Policy Recommendations

- ∇ Based on the findings, Anand and Sakthi (2023) and Priya and Sundaram (2023) suggest that improving infrastructure, providing continued technical support, and addressing environmental concerns are essential for sustaining and scaling the benefits of the scheme. Increased engagement on digital platforms, as noted by Priya and Sundaram (2023), also highlights the importance of fostering active participation through well-designed digital learning environments.

Conclusion

This study indicates that initiatives like Pudhumai Pen have the potential to reform education, particularly of students in remote and economically deprived places. By providing students with laptops and digital resources, such programs increase student achievement, make them more comfortable with technology tools and promote greater participation in learning. They also narrow the gap between urban and rural students, and open up better job opportunities in the future. But it's not easy to get these programs just right. Technical issues, inadequate training and environmental problems including electronic waste can limit their effectiveness. Solving these problems would go a long way towards optimising outcomes, through better infrastructure and ongoing supportive and environmentally friendly solutions. In the end, digital education initiatives such as Pudhumai Pen are an essential first step in enabling fairer and more inclusive education. When these programs are upgraded and well run, they work to help students succeed, narrow inequities and prepare them for a digital world. Policymakers, schools and communities should partner to guarantee that these efforts will be successful and sustained throughout the future.

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