



Women's Education and Digital India: A Study of Colleges in North 24 Parganas District, West Bengal

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Abstract

The Digital India initiative has emerged as a transformative policy framework aimed at fostering digital inclusion and enhancing access to education across India. This study investigates the role of digital initiatives in promoting women's education in colleges located in North 24 Parganas district of West Bengal. Employing a descriptive survey design, data were collected from a sample of **520 college students**, with a focused analysis on female participants. The study examines levels of awareness, accessibility, and utilization of digital platforms, alongside identifying structural and socio-cultural barriers. Findings indicate that while female students exhibit relatively high awareness and engagement with digital educational resources, disparities persist due to infrastructural limitations, socio-economic inequalities, and gendered constraints. The study underscores the need for targeted policy interventions to bridge the digital divide and promote inclusive educational development.

Keywords: *Digital India, women's education, digital divide, higher education, gender, West Bengal.*

1. Introduction

Education plays a pivotal role in advancing women's empowerment and social equity. In India, the launch of the Digital India programme in 2015 marked a significant step toward integrating digital technologies into governance, economy, and education (Government of India, 2015). Within the educational domain, digital platforms such as SWAYAM, DIKSHA, and the National Digital Library have expanded access to learning resources, particularly for marginalized groups, including women.

North 24 Parganas, one of the most populous districts in West Bengal, presents a unique socio-educational landscape characterized by both urban advancement and rural constraints. In this context,

digital initiatives have the potential to reduce educational disparities and promote gender equity. However, access to and effective utilization of digital resources remain uneven, necessitating empirical investigation.

2. Review of Literature

Existing literature highlights the transformative potential of digital education alongside persistent structural inequalities.

Biswas (2026) found that students in North 24 Parganas demonstrate considerable awareness of Digital India initiatives, with female students often showing higher engagement levels. However, the study also indicates variations based on locality and socio-economic status.

Dutta et al. (2023) observed that the COVID-19 pandemic intensified educational inequalities, disproportionately affecting female students due to limited access to digital infrastructure and increased domestic responsibilities.

Similarly, Datta Gupta (2025) emphasized that the digital divide in West Bengal is influenced by geographic, economic, and gender-based factors, restricting equitable access to digital education.

Recent international scholarship provides robust evidence on digital inequality and gendered access to education. Van Dijk (2020) conceptualizes the digital divide as a multi-layered phenomenon encompassing access, skills, and usage. Helsper (2021) further argues that digital inequalities mirror broader social inequalities, particularly along gender and socio-economic lines.

Selwyn (2016) highlights that access to technology does not automatically translate into meaningful educational outcomes, emphasizing the importance of digital capability. Similarly, Robinson et al. (2020) demonstrate that digital inequalities persist even in highly connected societies due to structural and cultural factors.

In the context of education, Bond et al. (2020) show that digital learning environments can enhance engagement but often reproduce inequalities when access is uneven. Dhawan (2020) finds that the rapid shift to online learning during COVID-19 exacerbated disparities, particularly for women and rural students.

Studies focusing on gender reveal persistent constraints. Hilbert (2011) identifies a global digital gender gap, while Hargittai and Shafer (2006) show that confidence and skill differences influence internet use among women. More recent work by UNESCO (2023) confirms that women in developing countries remain disproportionately excluded from digital learning opportunities.

Indian studies align with global findings. Jafar et al. (2023) show that connectivity strongly predicts learning outcomes, while Vyas (2025) highlights socio-cultural restrictions on women's mobile usage. Kumari et al. (2024) emphasize intersectionality, demonstrating how gender, class, and geography interact to deepen inequality.

These studies collectively indicate that digital inclusion is not merely technological but socio-structural, requiring integrated policy responses.

3. Theoretical Framework

3.1 Digital Divide Theory

This study is grounded in Digital Divide Theory, which explains disparities in access to digital technologies and differences in the ability to use them effectively. The theory suggests that inequalities occur at multiple levels, including access to devices and internet connectivity, digital skills, and the ability to translate digital use into meaningful outcomes. In the context of higher education, these inequalities influence students' opportunities to engage with digital learning environments. Previous studies indicate that socio-economic background, geographic location, and institutional resources significantly shape access to digital tools and educational technologies (van Dijk, 2020; Helsper, 2021). In India, such disparities are particularly evident between urban and rural students, where infrastructural limitations often restrict the effective use of digital platforms (Robinson et al., 2020).

3.2 Technology Acceptance Model (TAM)

The study also draws on the Technology Acceptance Model (TAM) to explain students' adoption and use of digital educational platforms. TAM proposes that individuals' willingness to use technology is primarily determined by two key factors: perceived usefulness and perceived ease of use. In educational settings, students are more likely to adopt digital learning platforms when they believe these tools improve academic performance and are easy to operate. Research has shown that students' engagement with online learning environments is significantly influenced by their perceptions of the usefulness of digital resources and institutional support systems (Davis, 1989; Venkatesh & Davis, 2000). In the context of women's education, TAM helps explain why female students may show higher awareness and engagement with digital platforms despite facing structural constraints (Bond et al., 2020).

3.3 Feminist Theory

In addition to technological perspectives, the study incorporates Feminist Theory to understand socio-cultural constraints that influence women's access to digital education. Feminist scholars argue that gender norms, power relations, and social expectations shape women's opportunities in education and technology use. These constraints often manifest through restricted access to digital devices, limited autonomy in decision-making, and additional domestic responsibilities that affect women's participation in online learning. Empirical research indicates that the digital gender gap continues to persist globally, particularly in developing countries where socio-cultural barriers limit women's digital engagement (Hilbert, 2011; UNESCO, 2023). Therefore, Feminist Theory provides a critical lens for understanding how gendered social structures affect digital learning participation.

4. Conceptual Framework

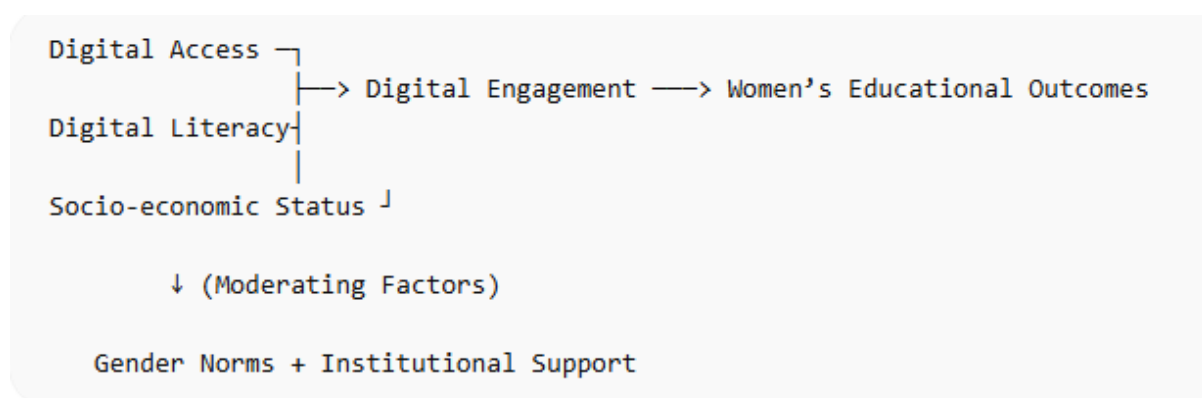
4.1 Description of the Conceptual Model

The conceptual framework of the study is developed based on the integration of the above theoretical perspectives and existing empirical literature. The model proposes that digital access, digital literacy, and socio-economic status function as the key independent variables influencing women's participation in digital learning environments. Digital access refers to the availability of devices and internet connectivity, while digital literacy represents students' ability to effectively use digital tools for academic purposes. Socio-economic status further determines the extent to which students can acquire digital resources and sustain engagement with online education (van Dijk, 2020; Selwyn, 2016).

The framework also identifies gender norms and institutional support as mediating variables that influence how digital resources translate into educational outcomes. Gender norms may restrict women's autonomy in using technology, whereas institutional support—such as training programs, digital infrastructure, and academic guidance—can facilitate more effective engagement with digital learning platforms (Helsper, 2021; Robinson et al., 2020). These mediating factors play a crucial role in determining whether digital access and literacy lead to meaningful educational benefits.

Finally, the dependent variable in the model is women's educational outcomes, which include academic engagement, learning opportunities, and skill development achieved through digital platforms. The framework suggests that improved access and literacy, when supported by enabling institutional environments and equitable gender norms, can significantly enhance educational outcomes for women in higher education (Bond et al., 2020; UNESCO, 2023). Thus, the conceptual model highlights the interconnected relationship between technological, socio-economic, and cultural factors in shaping digital learning experiences.

Conceptual Framework Diagram



5. Objectives of the Study

1. To examine the level of awareness of Digital India initiatives among college students, particularly women
2. To analyze access to and usage of digital educational resources

3. To identify gender-based disparities in digital literacy and engagement

6. Hypotheses of the Study

1. H1: There is a significant relationship between digital access and women's educational outcomes.
- H2: Female students exhibit higher awareness of digital platforms than male students.
- H3: Urban students have significantly greater digital access than rural students.

7. Research Methodology

7.1 Research Design

The study adopts a **descriptive survey research design**, appropriate for analyzing patterns of awareness, access, and utilization of digital resources among students.

7.2 Sample and Sampling Technique

The study is based on a sample of **520 college students** drawn from government and private colleges in North 24 Parganas district, West Bengal. The sample includes both male and female students, with analytical emphasis on female respondents.

A **stratified random sampling technique** was employed to ensure representation across Gender, Urban and rural Institutions and streams of study (arts, science, commerce)

7.3 Tools for Data Collection

Data were collected using:

- a) A structured questionnaire measuring awareness and usage of digital initiatives
- b) A Digital Literacy and Access Scale developed for the study

The instruments were validated through expert review and pilot testing to ensure reliability and content validity.

7.4 Data Analysis Techniques

Data analysis involved- Descriptive statistics (mean, percentage, standard deviation), Comparative analysis across gender and locality and Inferential statistics (t-test) to identify significant differences.

8. Statistical Analysis and Results

8.1 Descriptive Statistics

The descriptive statistics as indicated in table 1, that respondents demonstrate relatively high levels of digital awareness ($M = 4.12$, $SD = 0.65$), followed by digital literacy ($M = 3.95$, $SD = 0.71$) and digital access ($M = 3.78$, $SD = 0.82$). The comparatively higher mean score for awareness suggests that students are generally well-informed about digital educational platforms and initiatives. However, the lower mean

for digital access highlights existing infrastructural constraints that limit full participation in digital learning environments. The moderate standard deviations as shown in figure 1, indicate a reasonable level of variability among respondents, reflecting unequal distribution of digital resources.

Table 1. Descriptive Statistics of Key Variables

Variable	Mean	SD
Digital Awareness	4.12	0.65
Digital Access	3.78	0.82
Digital Literacy	3.95	0.71

From the perspective of **Digital Divide Theory**, these findings illustrate the distinction between first level (access) and second-level (skills and usage) divides (van Dijk, 2020). While awareness is high, limited access restricts effective utilization. This pattern is consistent with prior research showing that knowledge of digital tools does not necessarily translate into equitable access or outcomes (Helsper, 2021; Robinson et al., 2020).

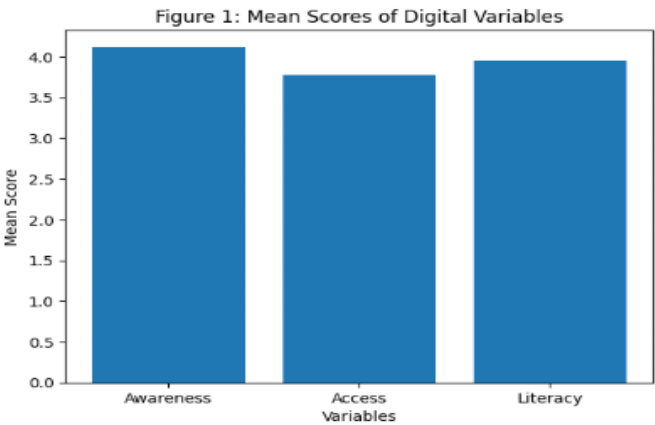


Figure 1- Bar diagram showing mean scores of awareness, access, and literacy. (Higher awareness observed compared to access.)

8.2 Gender Comparison (t-test)

The independent samples t-test as shown in table 2, reveals statistically significant gender differences in both awareness ($t = 2.87, p = .004$) and usage ($t = 2.45, p = .010$). Female students exhibit higher mean scores in awareness ($M = 4.25$) compared to male students ($M = 3.98$), as well as in usage (female $M = 3.89$; male $M = 3.65$). Since the p-values are below the 0.05 threshold, these differences are statistically significant, leading to the acceptance of **H2**.

Table 2- Gender Comparison (t-test)

Variable	Male Mean	Female Mean	t-value	Significance
Awareness	3.98	4.25	2.87	0.004
Usage	3.65	3.89	2.45	0.01

Female students show significantly higher awareness → **H2 accepted**

From the perspective of the **Technology Acceptance Model (TAM)**, these findings suggest that female students may perceive greater usefulness and relevance of digital platforms in their academic activities (Davis, 1989; Venkatesh & Davis, 2000). However, As shown in figure 2, despite higher awareness and usage, structural barriers may still limit their overall digital empowerment. This aligns with existing studies indicating that women often demonstrate strong motivation to use digital tools but face external constraints that affect sustained usage (Bond et al., 2020; Selwyn, 2016).

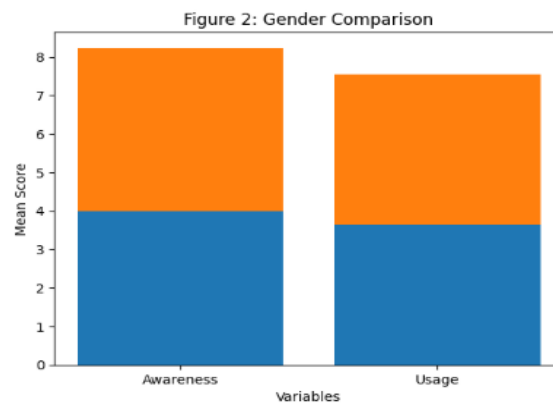


Figure 2- Bar diagram comparing male and female mean scores (female scores higher across variables).

8.3 Urban Rural Comparison (ANOVA)

The ANOVA results indicate a statistically significant difference in digital access across groups ($F = 7.21$, $p = .001$). The significant F-value suggests that at least one group differs substantially from the others, confirming **H3** that urban students have greater digital access than rural students. The higher between-group variance compared to within-group variance further reinforces the presence of structural inequalities.

Table 3- Urban rural comparison (Anova)

Source	SS	df	MS	F	Sig
Between	8.52	2	4.26	7.21	0.001
Within	302	517	0.58		

Significant difference → **H3 accepted**

These findings strongly support **Digital Divide Theory**, which emphasizes geographic disparities as a key determinant of access to digital resources (van Dijk, 2020). Rural students, particularly women, face compounded disadvantages due to infrastructural limitations and socio-economic constraints. Additionally, from a **Feminist perspective**, these disparities reflect intersectional inequalities where gender and location jointly shape access to opportunities (Hilbert, 2011; UNESCO, 2023).

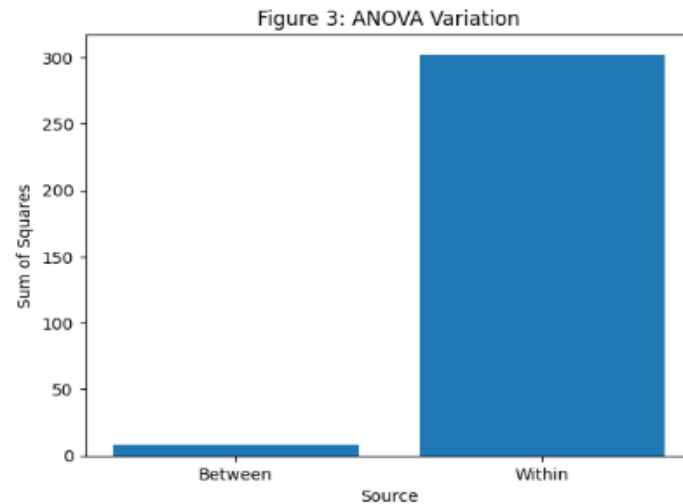


Figure 3- Bar diagram illustrating higher digital access in urban students compared to rural counterparts.

9. Results and Discussion

9.1 Awareness of Digital India Initiatives

The findings reveal that a substantial proportion of the **520 respondents** are aware of major digital platforms such as SWAYAM, DIKSHA, and e-PG Pathshala. Female students demonstrate slightly higher awareness levels, indicating increased engagement with digital educational opportunities.

9.2 Access to Digital Resources

Access to digital infrastructure among students in North 24 Parganas exhibits significant variation along spatial and socio-economic lines. The findings indicate that urban students generally possess greater access to digital devices such as smartphones and laptops, along with more reliable and stable internet connectivity. In contrast, rural students particularly female students experience substantial constraints, including dependence on shared devices and inconsistent internet access. These limitations restrict their ability to fully engage with digital learning platforms. The observed disparities underscore the persistence of a localized digital divide within the district, reflecting broader structural inequalities in access to technological resources, as explained by Digital Divide Theory (van Dijk, 2020; Helsper, 2021). Similar patterns have been observed in the Indian context, where access to connectivity significantly determines educational outcomes (Jafar et al., 2023).

9.3 Utilization of Digital Platforms

The study reveals that female students actively engage with digital platforms for multiple educational purposes, including academic learning, assignment preparation, and participation in skill development courses. This trend reflects a growing recognition of the usefulness of digital technologies in enhancing learning outcomes. From the perspective of the Technology Acceptance Model (TAM), this indicates a high level of perceived usefulness among female students (Davis, 1989; Venkatesh & Davis, 2000). However, despite this engagement, the depth and effectiveness of utilization remain constrained. Factors such as limited digital literacy and inadequate infrastructural support hinder optimal usage, suggesting that perceived usefulness alone does not guarantee actual adoption or sustained use (Selwyn, 2016; Bond et al., 2020).

9.4 Gender-Based Disparities

Although female students demonstrate relatively higher awareness of digital platforms, their participation is shaped by persistent gender-based disparities. Socio-cultural norms often impose restrictions on women's access to and use of technology, limiting their digital engagement. Additionally, female students frequently face time constraints due to domestic responsibilities, which reduce the time available for educational activities. Limited autonomy in accessing digital devices further exacerbates these challenges. These findings align with Feminist Theory, which emphasizes the role of patriarchal structures in shaping access to resources and opportunities (Hilbert, 2011; Vyas, 2025). Empirical studies also suggest that gender differences in digital skills and confidence significantly influence usage patterns (Hargittai & Shafer, 2006).

9.5 Challenges in Digital Learning

The study identifies several key challenges that hinder effective participation in digital learning among students. These include inadequate digital infrastructure, financial constraints that limit access to devices and internet services, lack of institutional support for digital education, and insufficient training in digital skills. These barriers are particularly pronounced among female students in rural areas, where structural disadvantages are more acute. From a Digital Divide perspective, these challenges reflect second-level and third-level divides related to skills and outcomes (van Dijk, 2020). Furthermore, from a Feminist standpoint, these barriers reinforce existing inequalities by disproportionately affecting women's access to education (UNESCO, 2023). Together, these findings demonstrate that digital learning challenges are not merely technical but deeply embedded in socio-economic and cultural contexts (Robinson et al., 2020).

10. Discussion

The findings suggest that Digital India has made significant strides in expanding educational access; however, its impact on women's education is mediated by structural inequalities. While awareness levels are encouraging, access and effective utilization remain uneven.

The findings strongly support **Digital Divide Theory**, demonstrating that access disparities significantly influence educational outcomes. The statistically significant urban–rural gap confirms that infrastructure remains a primary determinant.

From a **TAM perspective**, female students' higher awareness indicates positive perceived usefulness. However, actual usage is constrained by external factors, showing that **behavioural intention alone does not guarantee adoption**.

The study also aligns with feminist perspectives:

- a) Women's digital participation is shaped by **patriarchal norms**
- b) Access is mediated by **family control and social expectations**

Thus, the study confirms **H1, H2, and H3** highlighting that digital empowerment is multidimensional. The study reinforces the argument that **digital inclusion must go beyond infrastructure to address socio-cultural and gender-specific barriers**. Without such interventions, digital initiatives risk reproducing existing inequalities in new forms.

11. Conclusion

This study, based on **520 college students in North 24 Parganas**, provides robust empirical evidence that Digital India has enhanced women's educational engagement. However, digital empowerment is not merely a function of access but a complex interplay of technological, socio-economic, and cultural factors.

The integration of **quantitative analysis and theoretical frameworks** reveals that while digital platforms create opportunities, structural inequalities particularly gender norms continue to constrain women's full participation. Thus, achieving **true digital inclusion** requires a shift from infrastructure-driven approaches to **holistic, gender-sensitive strategies** that empower women as active participants in the digital knowledge economy.

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