Journal of Interdisciplinary Studies in Education

Volume 13, Issue S1 (2024), pp. 147-
Journal of Interdisciplinary Studies in Education
ISSN: 2166-2681Print 2690-0408 Online | https://ojed.org/jise

Breaking Barriers: The Digital Revolution in Girls Education Across India

Abhisek Panda
Sidho-Kanho-Birsha University, West Bengal, India

Laxmiram Gope
Sidho-Kanho-Birsha University, West Bengal, India

ABSTRACT

This theoretical research article delves into the necessity of embracing digital pedagogy as a transformative force for girls' education in contemporary India. This study is grounded in three main objectives: (1) assessing the current state of girls' education in India, (2) exploring the potential benefits of digital pedagogy, and (3) understanding the challenges in implementing digital pedagogy. This study aims to unravel the unique dynamics surrounding the educational landscape for girls. Through a comprehensive analysis of the literature and theoretical frameworks, this article seeks to illuminate how digital pedagogy can catalyze girls' empowerment, addressing the multifaceted challenges that hinder their educational advancement.

Keywords: Breaking Barriers, Digital, Pedagogy, Digital Pedagogy, Education, Girl Education.

INTRODUCTION

Education is a cornerstone of societal progress, and ensuring equal access to quality education for all is a critical goal. In India, despite significant progress in education, gender gaps persist, particularly affecting girls. Societal norms,

economic considerations, and traditional expectations often limit girls' access, enrollment, and retention in the education system. In India, gender discrimination and high dropout rates persist, with girls' literacy rates consistently lower than boys' across all states **(**Meena & Hazarika, 2024). The impact of these disparities is felt in rural areas, where infrastructural deficiencies exacerbate challenges for aspiring girls (Aurora, 2012; Aslam & Kingdon, 2008; Azam & Kingdon, 2013; Bhatkal, 2012; Delelegn, 2007; Jenkins et al., 2019; Saikia, 2022). Educated girls are more likely to avoid early marriage, have better maternal and child health outcomes, and find competitive employment; thus, investing in girls' education in India needs to be emphasized (Rees et al., 2012). Improving girls' education must require multi-faceted approaches, including policy interventions, community engagement, and curriculum reforms to promote inclusivity and challenge gender biases (Kuteesa et al., 2024). The digital revolution has broken down traditional barriers that hinder girls' access to education. Cultural norms, societal expectations, and economic constraints have limited girls' educational prospects in many parts of the world. However, with digital tools and platforms, girls can overcome these obstacles and pursue their educational aspirations.

The Digital Revolution in Education:

Quality education is a core aspect of the UN's 2030 agenda for sustainable development, striving for inclusive and equitable education (Haleem et al., 2022*)*. Digital technologies are pivotal in realizing this objective by providing accessible and innovative learning solutions, bridging gaps, and ensuring quality education for all, regardless of geographical or socioeconomic constraints. India is increasingly steering toward online technology-based education to address girls' unique challenges in accessing quality education. These technologies had substantial impacts on the education system. The recent coronavirus disease 2019 (COVID-19) pandemic has further institutionalized the application of digital technologies in education. These digital technologies have brought about a paradigm shift in the entire education system. The digital shift is pivotal in overcoming geographical barriers, especially in remote areas with limited traditional educational infrastructure. Online platforms facilitate the delivery of educational content directly to girls, fostering inclusivity, eliminating the need for physical proximity to schools, and integrating world-class learning experiences (Keengwe & Bhargava, 2014; Dreimane & Upenieks, 2020).

Digital education also provides flexibility, allowing girls to learn at their own pace and on their terms (Zain, 2021). This is particularly significant in a societal context where girls might encounter cultural or social restrictions that limit their participation in traditional classrooms. The interactive and engaging nature of online learning resources contributes to sustaining girls' interest and motivation, which are crucial factors in ensuring continued participation in education.

The following tables (Tables 1 & 2) show many government initiatives regarding education at the national and state levels.

Table 1
National Digital Initiatives in School Education

Name of the Initiatives	Year	Objectives
PM evidya	2020	A nationwide digital platform and a television channel named "One Class One Channel" will be accessible to students from classes 2 to 12.
DIKSHA	2017	DIKSHA serves as India's 'One nation: One digital platform' for school education, acting as a repository for a vast collection of eBooks and e-contents generated by States/UTs and national-level organizations.
National Digital Library	2016	Repository of digital educational resources
e-Pathshala	2015	Access to e-books and e-resources for students
Rashtriya Avishkar Abhiyan (RAA)	2015	Encourages digital and hands-on learning in schools through various initiatives, fostering scientific temper.
NISHTHA (National Initiative for School Heads' and Teachers' Holistic Advancement)	2019	It focuses on capacity building and professional development of teachers through digital means.

Table 2:
State-wise Digital Initiatives in School Education

Name of the state	Digital Initiatives	Focus/ Objectives
Maharashtra	Maha IT - Online Education Platform	Facilitating digital learning through an online education portal.
Karnataka	Prerana - Digital Learning Program	Introducing digital tools for interactive and inclusive learning.
Gujarat	Gyankunj - Digital Classrooms Initiative	Enhancing classroom teaching with the integration of digital tools.
Tamil Nadu	Samacheer Kalvi e-Content	Implementing a state-wide e-learning platform for students and teachers.
Rajasthan	RAJ-EVOLVE - E-learning Portal	Implementing a state-wide e-learning platform for students and teachers.
Telangana	Mana TV - Digital Lessons Broadcast	Broadcasting educational content through TV for wider accessibility.
Odisha	Odia Virtual Academy	It Promotes virtual learning in the Odia language for students across the state.
Kerala	Hi-Tech School Project	Infusing technology into classrooms to enhance the learning experience.
Uttar Pradesh	Diksha UP - Digital Learning Platform	It is Leveraging the Diksha platform for digital resources and teacher training.
West Bengal	Kanyashree Prakalpa Digital Multimodal Hub	Integrate digital technology to support the Kanyashree Prakalpa initiative for girls' education and empowerment.

The move toward online education aligns with the broader digital initiatives in India, capitalizing on the increasing availability of digital devices and internet connectivity. By leveraging technology, the education system can create a more accessible, equitable, and empowering environment, breaking down barriers and contributing to advancing girls' education across the country's diverse landscape.

Digital Pedagogy:

Digital pedagogy is a transformative outcome of the broader digital revolution, representing a paradigm shift in how education is conceived, delivered, and experienced. The digital revolution, characterized by the pervasive integration of digital technologies across various aspects of society, has significantly impacted education. Digital pedagogy involves not merely only the incorporation of technology into classrooms but also a fundamental reimagining of teaching and learning processes in the context of the rapidly evolving digital landscape.

Digital pedagogy is a teaching and learning approach that integrates digital technologies into the educational process. It leverages digital tools, platforms, and resources to enhance and transform traditional teaching methods, making education more engaging, accessible, and practical (Dufour et al., 2010; Dudar et al.., 2021). This concept recognizes the evolving nature of technology and its impact on how information is accessed, processed, and shared.

Digital pedagogy encompasses a range of practices, including online learning platforms, interactive multimedia resources, collaborative tools, and virtual environments. It emphasizes using technology to deliver content and foster critical thinking, creativity, and collaboration among students. The goal is to create a dynamic, inclusive learning environment that adapts to diverse learning styles and prepares students for the digital age.

The digital revolution has brought forth many technological tools and platforms that have reshaped educational practices. Traditional pedagogy relies heavily on one-way communication, where educators impart knowledge to students linearly. With the advent of digital technologies, the dynamics have shifted toward interactive and collaborative learning (Akbar, 2016). Online platforms, educational apps, and virtual classrooms enable a more engaging and participatory educational experience (Hedberg, 2011).

The rationale of the Study:

This study addresses crucial aspects of the gender disparity in education in India, emphasizing the persistent challenges girls face despite recent progress. With a significant portion of India's young population, the nation strives to optimize its demographic dividend by improving educational accessibility and quality. The research focuses on shedding light on specific challenges hindering girls' education and proposes digital pedagogy as a transformative force.

In an era dominated by digitalization, the study underscores the necessity of digital literacy for personal growth and socioeconomic empowerment. Digital pedagogy is crucial to equip girls with essential skills, fostering empowerment and readiness for active participation in the digital economy. This study aims to empower girls to navigate and contribute effectively to a globalized, technology-driven society by integrating digital tools into education.

The research aligns directly with Sustainable Development Goals (SDGs), particularly Goal 4 (Quality Education) and Goal 5 (Gender Equality). By addressing challenges and leveraging the benefits of digital pedagogy, this study contributes to the global effort to ensure inclusive and equitable quality education, supporting gender equality and empowerment for all women and girls.

Beyond the educational realm, the study recognizes education as a pathway to economic opportunities. Empowering girls with digital skills enhances their prospects in the evolving job market, particularly in STEM fields, driving economic growth and positively impacting communities and the nation's economy.

Furthermore, this research offers valuable insights to inform education policies at the national and regional levels. Policymakers can utilize the findings to create targeted initiatives addressing unique challenges faced by girls in different regions. Educators can also benefit from recommendations on integrating digital tools into the curriculum, aligning pedagogical approaches with girls' diverse needs and learning styles. This study emphasizes the social role of education by promoting social inclusion and community development. Focusing on girls' education through digital pedagogy encourages communities to recognize the value of educating girls and fostering an environment that supports their learning. The research underscores communities' pivotal role in overcoming cultural resistance and fostering a collective commitment to breaking down barriers in girls' education.

LITERATURE REVIEW

Bansal et al. (2022) reported that digital tools such as interactive e-books, educational apps, and online tutoring improved girls' engagement and academic performance. Their mixed-method study of 200 girls highlighted that personalized learning experiences and access to digital resources helped bridge the gender gap in education, particularly in STEM. Khan and Sharma (2021) identified barriers to digital pedagogy in girls' education in their study, "Barriers to Digital Pedagogy in Girls' Education: A Socio-Cultural Perspective." Through focus group discussions and interviews, they found that socioeconomic factors, limited technology access, and cultural norms were significant barriers, suggesting that policies promoting affordable technology and digital literacy should be encouraged. Panda & Majee (2021) conducted a study on the Parental attitude of the Sarak Community towards girls' education in West Bengal and found that Parents show a positive interest in higher education of girls if the Government provides financial facilities, resources,

and hostel facilities. So, the researcher strongly advocates that the government pay attention to improving girls' education status in the Sarak community.
Gupta and Roy (2023) examined 'Teacher Training for Digital Pedagogy in Girls' Education' to assess the impact of professional development programs' impact programs on teachers' abilities. Using a quasi-experimental design with 100 teachers, they reported significant improvements in teachers' confidence and skills in using digital tools and gender-sensitive teaching strategies, enhancing girls' education. Mukherjee et al. (2021) explored the 'Impact of Digital Pedagogy on Girls' Self-Efficacy in STEM' through a longitudinal study of 150 girls across two academic years. Through surveys, STEM interest inventories, and academic records, they reported that interactive simulations, coding platforms, and collaborative projects increased girls' confidence and interest in STEM. Digital tools facilitate accessible and engaging learning experiences, enhance self-efficacy, and promote STEM career pursuits.

Patel and Sen (2023) investigated 'Long-term Effects of Digital Pedagogy on Girls' Educational Attainment' via a longitudinal study tracking 200 girls from primary through secondary education. They reported that girls exposed to digital learning environments demonstrated more extraordinary academic achievement, improved retention rates, and a greater inclination toward pursuing higher education than their peers in traditional settings. Early exposure to digital learning influenced girls' educational trajectories positively.

This research aims to provide insights that inform effective policies and interventions to bridge the digital divide and foster inclusive educational environments for girls in India..

RESULTS AND DISCUSSION

Objective 1: Assessing the Current State of Girls Education in India:

Gender disparities in education:

An analysis of the current educational landscape in India reveals persistent gender disparities. Girls face barriers such as societal norms, economic constraints, and a lack of infrastructure, limiting their access to education. Sixty-eight percent of girls are currently enrolled in school today because extreme racism and discrimination against them deny women justice and equality, which can be attained only through education and enlightenment (Nagar, 2021). Gender bias in school education practices, such as rules, dress codes, and classroom practices, hinders women's empowerment and gender justice. (Thasniya, 2022). In India, even though the overall gender parity index has steadily increased (Pappu et al., 2015)**,** daughters experience notably disparate treatment compared with sons in terms of the distribution of educational resources within households, contributing

to a substantial unexplained factor in the gender gap observed in schooling attainment (Kingdon et al., 2002). According to LASI (Longitudinal Aging Study in India) data (2023), men are generally far more educated than women. In particular, 62 percent of women and 31 percent of men did not complete formal education. Furthermore, women's cognition in later life was inferior. For the oldest adults in the sample and those with lower levels of education, there was a more noticeable cognitive difference between men and women. According to the Global Gender Gap Report 2021, India's gender gap has widened, ranking 140th out of 156 countries in 2020. The gender gap refers to the degree of discrimination against women in the areas of participation, health, survival, and empowerment, and the disparity in educational opportunities in India is no exception.

Rashmi et al. (2022) studied the gender gap in household educational spending among school and college-going children in India. They reported that, in states where educational advancement was comparatively slow, there was a significant gender disparity in schooling within the elementary-age group (6–10 years old). The state of West Bengal has the most significant gender disparity among children aged 11-15, with Uttaranchal, Haryana, Odisha, Tamil Nadu, and Kerala following closely behind. States such as Andhra Pradesh, Punjab, and Gujarat, which had a minor gender gap until the age of 15, became disadvantageous to girls aged 16--17. Girls surpassed boys in the northeastern states of Manipur (14.48%), Meghalaya (10.10%), and Tripura (10.04%), as well as the southern states of Kerala (4.48%), Karnataka (4.40%), and Tamil Nadu (4.14%).
If we observe the literacy rate among males and females, then a gender gap is also found.

Table 1.1
Year-wise Literacy Gap in India

Year	Male	Female	Gap
1991	64.13	39.29	24.84
2001	75.26	53.67	21.59
2011	80.88	64.63	16.25

(Source: Census of India, Office of Registrar General, India)

Table 1.1 shows that the literacy rates for males and females have generally increased, indicating educational progress. In all three years, the literacy rates for males are higher than for females. This is a common trend in many societies, where historically, there has been a gender disparity in access to education.
According to the National Sample Survey Organization report (64^{th}, $71^{s}t$, and 75^{th} rounds), the literacy rates of males and females aged seven years and above from 2007-2008, 2014, and 2017-2018 also explored the existing gender gap.

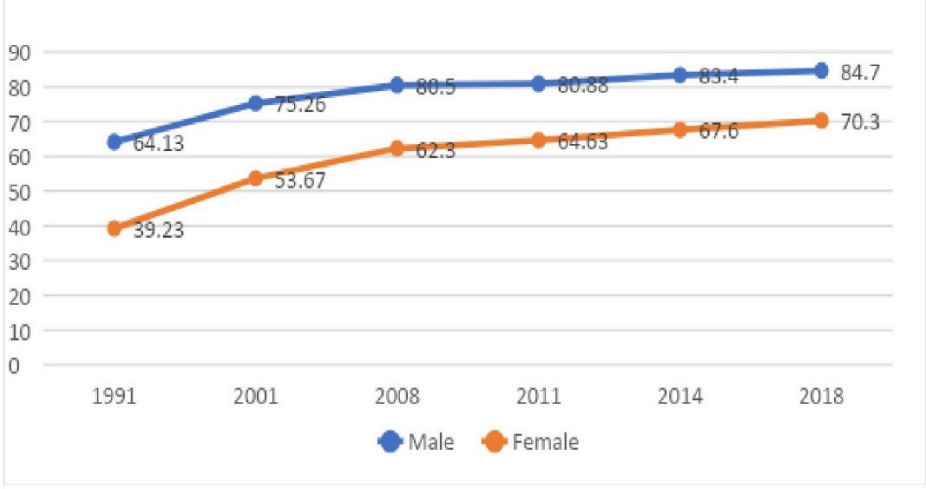
Table 1.2:
Literacy rates in 2007-2008, 2013-2014, and 2017-2018

Year	Male Literacy	Female Literacy	Literacy Gap
2007-2008	80.5	62.3	18.2
2013-2014	83.4	67.6	15.8
2017-2018	84.7	70.3	14.4

(Source: NSSO report)

Table 1.2 provides data on male and female literacy rates in India for 2007-2008, 2013-2014, and 2017--2018, along with the literacy gap between males and females. Both male and female literacy rates have shown an upward trend across the years, indicating progress in overall literacy levels in the country. In all three years, the male literacy rates are consistently higher than the female literacy rates, suggesting a persistent gender disparity in access to education.

Figure 1
Trends in male and female literacy rates



(Sources: Compiled date of Census and NSSO)

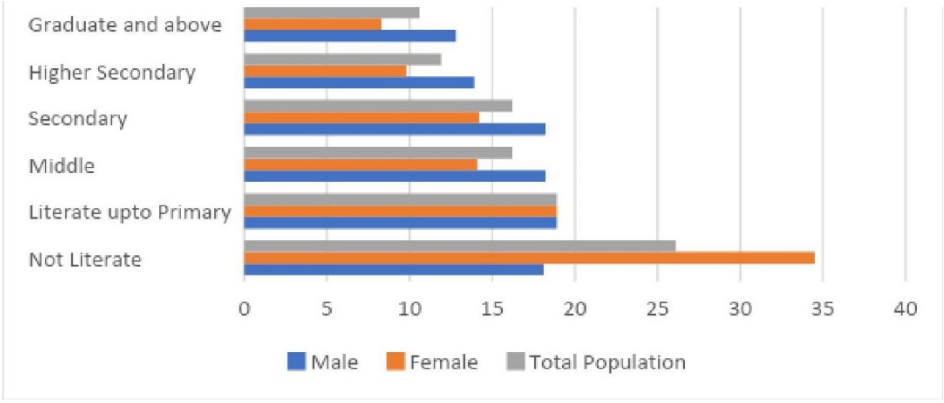
Figure 1 indicates that, over time, male literacy rates have consistently been higher than female literacy rates, indicating a persistent gender disparity in access to education. While progress has been made, gender-based barriers to education continue to exist. The male literacy rate arose from 64.13% in 1991 to 84.7% in 2017--2018, and the female literacy rate increased from 39.29% in 1991 to 70.3% in 2017--2018. Female literacy trends are much lower than male trends.

According to the NSS 75th survey (2017-2018), gender disparities have also been found in the educational levels of males and females.

Table 1.3
Percentage distribution of persons by highest level of education completed

Education Level	Male	Female	Total Population
Not Literate	18.1	***34.5***	26.1
Literate up to Primary	18.9	***18.9***	18.9
Middle	18.2	***14.1***	16.2
Secondary	18.2	***14.2***	16.2
Higher Secondary	13.9	***9.8***	11.9
Graduate and above	12.8	***8.3***	10.6

Figure 2
Percentage distribution of persons by highest level of Education Success



Source: NSS 75th survey (2017-2018)

The data show (Table 1.3 & Fig 2) notable differences in educational attainment between genders. Interestingly, more females than men (34.5% vs. 18.1%) are classified as ***'not literate'***. Moreover, females continuously fall short of men at every higher educational level, suggesting a gendered educational divide. In the

'Graduate and above' and 'Higher Secondary' categories, females make up 8.3% and 9.8% of the total, respectively, and males make up 13.9% and 12.8%, respectively. This is the most significant difference in participation.

Table 1.4

Percentage of persons by enrollment status from 2017--2018

Enrolment Status	Rural		Urban	
	Male	Female	Male	Female
Currently attending	56.5	50.1	57.1	51.8
Ever enrolled but currently not attending	37.2	38.7	39.5	43.0
Never enrolled	6.3	11.2	3.4	5.3

(Source: NSS 75th survey; 2017-2018)

The enrollment data (Table 1.4) highlight notable gender disparities, particularly in female education. While a significant percentage of females in both rural and urban areas are currently attending school (50.1% in rural areas and 51.8% in urban areas), a more significant proportion of females fall into the category of "Ever enrolled but currently not attending" than males in both settings (38.7% in rural areas and 43.0% in urban areas for females, whereas 37.2% and 39.5% for males, respectively). In the never-enrolled category, the gender gap is more pronounced in rural areas, with 11.2% of females never enrolled compared with 6.3% of males. The gap is narrower in urban areas, but females still show a higher percentage (5.3%) of never enrolled than males (3.4%).

Gender Roles and Expectations

Sociocultural Factors:

Sociocultural factors have historically played a significant role in limiting girls' education in many parts of India. Traditional norms, cultural practices, and societal expectations often significantly limit girls' access to education ***(Draboo, 2020)***. Understanding these factors is essential for designing interventions that challenge existing norms.

Gender is still the primary basis for educationally based stratification and inequality in India, and these disparities differ at different levels and depend on other factors, such as caste, class, region, and religion (Alam, 2007). Education must be used to empower women and end gender discrimination (Dhanunjaya et al., 2017). In several societies, girls have traditionally been required to perform housekeeping and childcare at the expense of education. As women are traditionally assigned the role of homemakers, education is seemingly unnecessary for girls (Nagraj et al., 2019;). Existing stereotypes foster the perception that some topics or disciplines belong only to boys, leading girls to steer clear from education in other aspects that "*should not be done by girls".* Parents aspiring for economic freedom and girls' education in India are hurting boys' education through traditional role reinforcement (Bose et al., 2020). According to Vishwakarma et al. (2015), most respondents in India did not support girls' education because they had low socioeconomic backgrounds and believed that girls' education was unnecessary. As a result of the discrepancy between boys' and girls' educational achievements, women cannot realize their purpose at work or manage housework (Ganguly et al., 2018).

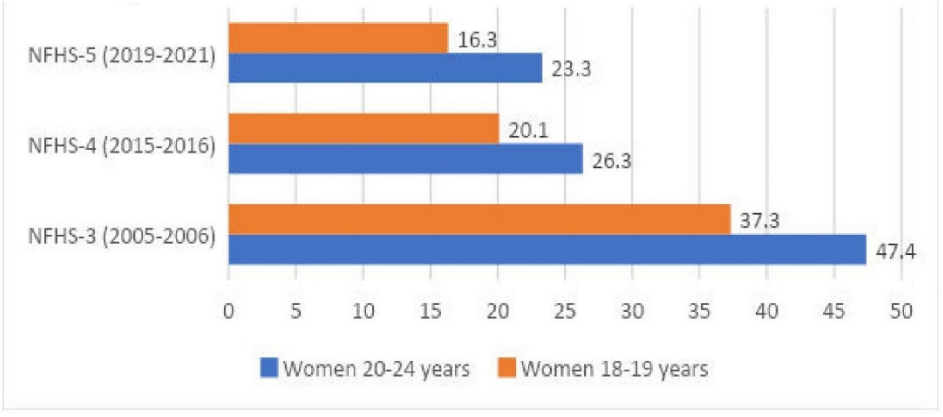


Figure 2
Women married before 18 years of age in India, NFHS 3,4 & 5 report

Early Marriage and Parenthood:

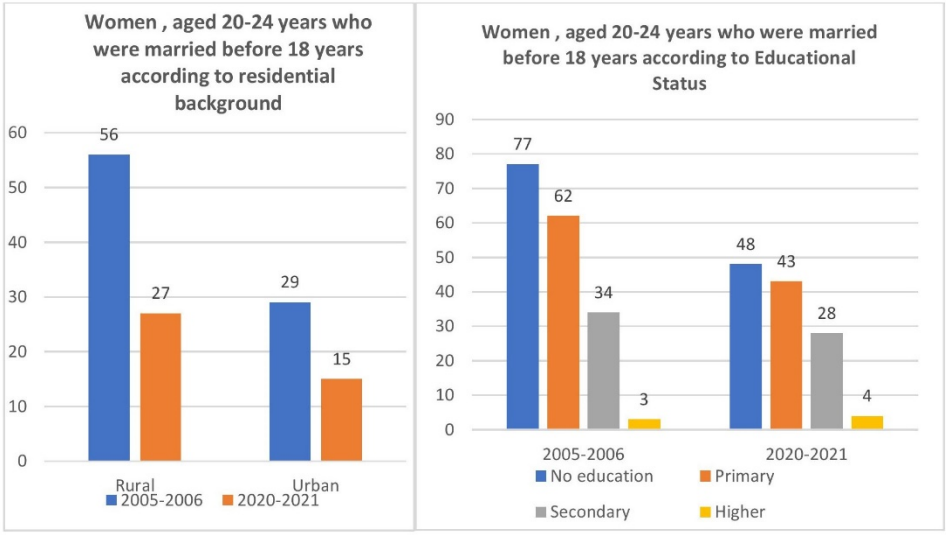
Early marriage directly affects girls' education by interrupting or completely halting their schooling. Once married, girls are expected to fulfill traditional gender roles, including becoming mothers at a tender age.

Consequently, they are forced to abandon their education, further perpetuating the cycle of poverty and a lack of empowerment. Despite legal efforts such as the Prohibition of the Child Marriage Act (2006), which prohibits child marriage, this practice continues to persist in many parts of India. According to UNICEF, India has the highest number of child brides in the world, with over 27% of girls marrying before the age of 18.

According to the National Family Health Survey report, even though we have the Child Marriage Act (2006), the government has put effort into prohibiting it; child marriage has decreased over the years, but unfortunately, we are unable to stop it, and still, it exists aggressively. Child marriage has experienced a substantial reduction in India, decreasing from 47.4% in 2005–06 to 26.8% in 2015–16, indicating a notable decline of 21 percentage points over the decade (see Figure 2). In the most recent five-year period, there was a further decrease of 3.5 percentage points, decreasing the prevalence to 23.3%.

Fig 3

Child Marriage based on Residence and educational status



This source also revealed that (Fig. 3) the ratio of child marriage differs based on residential background. In rural settings, the child marriage ratio is more significant than in urban settings, which means that child marriage and educational status among girls are positively associated with parental education, blind belief,

attitudes, socioeconomic status, and other factors. However, this juncture also exists within society, violating inclusiveness in the education sector and preventing the fulfillment of sustainable development goals, especially goals 4 and 5.

Table 1.3
Percentage distribution of households by distance to the nearest school at different levels

Level of classes in the school	Distance in KM	Percentage			
		Rural	More than Specified KM in Rural Areas	Urban	More than the Specified KM in Urban Areas
The nearest school has primary-level classes	Less Than 1 km	92.7	7.3	87.2	12.8
The nearest school has Upper primary-level classes	Less than 3 KM	93.6	6.4	97.9	2.1
The nearest school has Secondary level classes	Less than 5 km	86.6	13.4	98.6	1.4

(Source: NSSO 75th report, 2017--2018)

Lack of Access to Resources:
Girls from marginalized communities often face barriers to accessing quality education due to poverty, a lack of infrastructure, and limited resources such as girls' standard rooms, toilets, boundary walls, water facility sanitation, health and hygiene, etc. Inadequate school infrastructure and facilities also pose obstacles to girls' education. Many schools in rural areas lack basic amenities such as proper classrooms, libraries, and toilets. The absence of these essential resources makes it challenging for girls to attend school regularly and focus on their studies (Vadhel et al., 2019). A lack of funding is undoubtedly a significant barrier to girls' education. Insufficient financial resources restrict the opportunities available to girls, limiting their access to quality education and hindering their overall

educational outcomes. Even education is the constitutional right of every student up to the age of 14, and we have made the Right to Education Act (2009) to ensure free access to quality education within the neighborhood area. However, we still cannot fulfill it for many reasons, so the universalization of elementary education goals cannot be achieved. Many girls are out of school, mainly in rural areas, due to safety security concerns, as no schools are available near her home.

The neighborhood or its bounds have been provided with the Central RTE Guidelines to consider distance norms of one kilometer for students in classes I–V and three kilometers for students in classes VI-VIII. Table 1.3 indicates that, at the primary stage, 12.8% of students in urban areas and 7.3% students of students in rural areas, and also, in the secondary stage, 13.4% of rural children do not benefit from neighboring schooling. They travel long distances for schooling, which sometimes leads to dropout.

Table: 1.4
Percentage of facilities available in government schools

Facilities	**Percentage**
Functional Wash Facilities (Toilet,	54
Lack of Boundary wall	35
Lack of Female Teacher	16.6
The proportion of female teachers to total teachers	42.9

(Source: UDISE+ report 2017-2018)

The data presented in Table 1.4 highlight significant shortcomings in government schools' facilities and resources. Alarmingly, only 54% of the schools have functional wash facilities, indicating a need for proper sanitation infrastructure. Moreover, 35% of schools lack a boundary wall, compromising the security and safety of students. The absence of female teachers is another critical issue, with 16.6% of schools facing this shortfall. Even when female teachers are present, the proportion is low, accounting for only 42.9% of the teaching staff. This imbalance not only raises concerns about gender representation but also suggests potential disparities in the quality of education and support for students.

The significant hurdle confronting the education system in India is the presence of outdated curricula. The study materials utilized in schools and colleges must frequently align with the latest technological and societal changes. This misalignment can leave students inadequately equipped to meet the demands of the contemporary workplace, potentially restricting their career opportunities in the future (Kumar, 2023).

Cultural beliefs and norms:
Some cultural beliefs consider educating girls to be unnecessary or even inappropriate. These beliefs may stem from misconceptions about women's capabilities or societal norms prioritizing male education. Such attitudes hinder girls' access to education and perpetuate gender inequality. Cultural beliefs and norms play a significant role in shaping and influencing perceptions of gender identity within societies. These cultural factors often establish expectations, roles, and behaviours associated with different genders, impacting how individuals express and identify their gender. This gender identity influences the quality of girls' education in India, and unless it is addressed, they are unlikely to receive an equitable education *(*Geetha et al., 2005). India's residential schooling schemes for girls may not effectively overcome cultural barriers, as they focus on enrollment rather than recognizing schooling norms as deeply 'gendered' (Balagopalan, 2010). Studies have shown that low social value is attached to girls' education. As they are considered secondary income earners, lower importance is given to girls' training for employment (Gupta et al., 2016).

Safety and Security Concerns:
Currently, safety and security concerns in girls' education in India are significant barriers to accessing education. These concerns include sexual violence, gender-based violence, and traditional norms that limit their freedom of movement and educational opportunities (Raj et al., 2020; Gordon, 2021; Roberts & Chittoor, 2016; Mullu, 2015). Research has shown that the main barriers to girls' education in India are security concerns, a lack of economic opportunities, and traditional values (Roberts & Chittooran, 2016). Furthermore, the prevalence of gender-based violence, including sexual assault and harassment, poses a significant threat to girls' participation in education (Leach & Sitaram, 2007). Furthermore, fear of education due to risks in respectability, social mobility, and sexuality further compounds the challenges girls face in accessing education (Nevertheless, 2010; Bandyopadhyay, 2003).

Government initiatives:
The Government of India and different state Governments have taken various developmental initiatives, like Beti Bachao Beti Padhao and Kanyashree Prakalpa, which have shown promise in increasing female enrollment in higher education *(Ankur Nandi et al., 2024)*. Table 1.5 shows the different efforts taken by the government at the national level. However, challenges remain in translating policy into effective change on the ground.

Table 1.5: Names of the Government initiatives regarding Girls Education

Name of the Initiatives	Year	Objectives
Beti Bachao, Beti Padhao (BBBP):	2015	To address gender imbalances and promote girls' education through awareness campaigns, advocacy, and outreach programs.
Sukanya Samriddhi Yojana:	2015	A savings scheme for the girl child, providing financial support for their education and marriage expenses.
Kasturba Gandhi Balika Vidyalaya (KGBV) :	2004	We are establishing residential schools for girls from disadvantaged communities, focusing on access to quality education and retention.
National Scheme of Incentives to Girls for Secondary Education:	2008	It Encourages families to educate their girls by providing a direct cash transfer to incentivize their enrollment and retention in secondary education.
Digital Gender Atlas for Advancing Girls' Education	2015	It Maps the geographical spread of girls' education and identifies areas needing intervention to improve educational outcomes for girls.
Udaan:	2011	It provides online learning and mentoring support to female students in preparation for engineering entrance exams.
Pragati Scholarship Scheme for Girl Students:	2014	It Supports meritorious female students pursuing higher education in technical courses by offering scholarships.

These government efforts collectively showcase a multifaceted approach, incorporating financial incentives, infrastructure development, awareness campaigns, and technological tools to bridge gender disparities in education. The initiatives reflect a commitment to creating an inclusive and supportive educational environment for girls across different regions of India. While progress has been made, further research is required to assess the effectiveness of current interventions and develop new strategies to promote gender equality in education (Divya Kaushik et al., 2024).

Objective 2: Exploring the Potential Benefits of Digital Pedagogy

Digital pedagogy has emerged as a powerful tool in transforming education, particularly for girls. In many parts of the world, girls face numerous barriers to accessing quality education, such as cultural norms, geographic limitations, and gender-based discrimination. However, digital pedagogy offers a promising solution by leveraging technology to provide equal educational opportunities for

girls. By harnessing the potential of digital platforms, girls can overcome these obstacles and thrive in their educational journey.

The following table shows different digital pedagogical initiatives regarding girls' education. These findings underscore the commitment to leveraging technology to address educational challenges and empower young girls. It reflects a comprehensive approach to fostering digital literacy, providing equitable access to quality education, and promoting skill development.

Table 2.1

Name of Scheme and its objectives

Name of the Initiatives	Focus / Objectives
Project Shiksha	It Implements digital learning modules to enhance educational opportunities for girls.
Saakshar Bharat	It Promotes digital literacy and education for adolescent and adult women in rural areas.
Nanhi Kali Digital Classroom	It Provides online educational resources and support to underprivileged girls through digital means.
e-Kalpana	It Introduces digital tools for personalized learning and skill development for girls in schools.
Cyber Shikshaa	It focuses on digital education and cybersecurity awareness so girls can safely navigate online.
e-Basta	Facilitating access to digital textbooks and educational content, particularly benefiting girls in remote areas.
National Programme on Technology Enhanced Learning (NPTEL)	Providing online courses and resources to enhance girls' technical and academic skills in higher education.

These initiatives aim to bridge educational gaps, particularly in rural areas, and empower girls with the knowledge and skills to navigate the digital landscape and contribute meaningfully to society.

Geographical Diversity:

Digital platforms give girls equal access to educational resources regardless of their location. Many girls in rural areas face difficulty accessing quality education because of the lack of schools or the long distances. With digital pedagogy, girls can access online courses, educational videos, and interactive learning materials from the comfort of their homes. This increased access to education enhances their learning outcomes and bridges the educational gap. Digital platforms can influence adolescent girls' career aspirations and educational attainment (Beaman et al., *2012*). However, it is essential to note that there are challenges in recruiting racially and ethnically underserved communities, highlighting a persistent digital divide (Pratap et al., 2020). Nevertheless, using digital technologies in tertiary education involves tailoring courses to a much more diverse population spanning vast geographical areas (Thomas, 2019). Research shows that digital education

significantly increases knowledge and skills scores in intervention groups compared with traditional education (Huang et al., 2019).

Personalized Learning:

Personalized learning through digital pedagogy has gained momentum in girls' education in India, empowering them with tailored educational experiences. Digital platforms offer adaptive learning systems that analyze girls' strengths and weaknesses, providing personalized recommendations and content. This individualized approach allows girls to learn independently, ensuring comprehension and mastery of concepts. Customized resources, such as interactive videos and quizzes, cater to diverse learning preferences. Real-time feedback and assessments enable girls to track their progress and make targeted improvements. Collaboration opportunities foster peer learning and broaden perspectives. By harnessing the power of personalized learning through digital pedagogy, girls in India can overcome barriers, receive quality education, and unlock their full potential.

Skill development:

The digital revolution provides academic knowledge and equips learners with essential skills for the 21st century. With digital platforms, girls can access a wide range of educational resources, tools, and online courses that enhance their skills in communication, critical thinking, problem-solving, and digital literacy.

According to the *Women and Skills Report (2021)* by Coursera, a prominent online learning platform, the proportion of course enrollments by women in India surged from 26% in 2019 to 36% in 2021. This notable increase is attributed to the impact of the COVID-19 pandemic, which accelerated the adoption of online upskilling courses.

Diversity of Learners:

India has a diverse population with varied learning styles, languages, and cultural backgrounds. Digital pedagogy has revolutionized girls' education by embracing and celebrating the diversity of learners. Educators can create inclusive learning environments that address every girl's unique needs and backgrounds through digital platforms. These platforms offer diverse resources, adaptive tools, and personalized approaches to cater to different learning styles, abilities, and cultural contexts. By recognizing and valuing the individuality of each learner, digital pedagogy ensures equal opportunities and access to quality education. It empowers girls from all walks of life to thrive, fostering a more inclusive and equitable education system that promotes diversity and embraces every learner's strength. Multilingual online resources and adaptive learning platforms can help address language barriers and accommodate different learning preferences.

Access to Education:
Despite significant progress, access to education remains a challenge in certain parts of India. Digital pedagogy enables flexible learning schedules, allowing girls to balance their education with other responsibilities. Girls often face household chores, sibling care, or societal expectations that limit their time attending traditional schools. Online learning platforms and virtual classrooms offer flexibility, allowing girls to learn at their own pace and manage their schedules effectively.

Technological advancements:
India is experiencing rapid technological advancements and an increasing penetration of digital devices and the internet. Integrating digital pedagogy takes advantage of this technological landscape, making education more interactive, engaging, and aligned with the expectations of the tech-savvy younger generation. Online learning platforms and virtual classrooms have broken down geographic barriers, allowing girls to access educational resources from anywhere. Mobile learning has empowered girls with the flexibility to learn on their terms, using smartphones as powerful educational tools. Gamification techniques have made learning engaging and enjoyable, whereas adaptive learning systems powered by artificial intelligence ensure personalized instruction. Collaboration and global connections foster cultural exchange and a sense of global citizenship. These advancements hold immense potential in empowering girls and equipping them with the skills needed for success in the digital era.

Provide an Inclusive Learning Environment:
Digital pedagogy fosters a safe and inclusive learning environment for girls. In certain communities, girls may face cultural or social barriers restricting their access to education. Digital platforms provide a space to learn without fear of judgment or discrimination. Additionally, online learning facilitates peer interaction and collaborative learning, enabling girls to engage in discussions and share their perspectives freely.

8.0 Objective 3: Understanding the challenges in implementing digital pedagogy:

Infrastructure and Connectivity:
A significant challenge is the unequal distribution of digital infrastructure. Many girls, especially those in rural areas, lack access to reliable internet connectivity (Padhi, et al., 2021) and devices, hindering their participation in digital learning activities. The report noted that only 24% of government schools have internet connectivity in India, where some states (Odisha, Telangana, Bihar, Mizoram) have less than 10% status (TOI. Dec 7, 2023).

The data in the table shed light on the varying degrees of access to basic technological facilities in the surveyed context. While a relatively high percentage (86.9%) of schools have access to electricity, notably, not all of them utilize it effectively, with only 83.92% reporting functional electricity.

Table 3.1
Different Facilities available in Schools and its percentages

Facilities	Percentage
Electricity	86.9
Functional Electricity	83.92
Computer	41.3
Internet	24.5

(Source: UDISE report, 2020--2021)

Computers in 41.3% of the schools indicate a significant gap in technology access, potentially limiting students' exposure to essential digital skills. Moreover, the low percentage of schools with internet access (24.5%) underscores a considerable deficiency in providing students with online resources and connectivity. This digital divide may hinder students from fully engaging with modern educational tools and resources, emphasizing the need for strategic interventions to bridge these technological gaps to increase the quality of education.

Technological literacy and the digital divide:

Indeed, technological literacy and the digital divide pose significant barriers to launching digital pedagogy in girls' education in India. The digital divide refers to the gap between those with access to technology and the internet and those without access. In many parts of India, predominantly rural and marginalized areas, access to reliable internet connectivity and technology devices is limited or unavailable.

According to the 'India Inequality Report 2022: Digital Divide' released by Oxfam India (2022), compared with men, Indian women are 15% less likely to own a mobile phone and 33% less likely to use mobile internet services. In India, just one-third of internet users are women. The country's digital literacy rate is only 38% among households. In addition, only 31% of people in rural areas use the Internet, whereas 67% of people in urban areas do.

According to the National Service Scheme (NSS) (2017–18), 9% of students enrolled in any course had access to a computer with the internet, and 25% had internet access through any device.

Language barriers:

India is a linguistically diverse country, with numerous regional languages spoken across different states. Adapting digital content and resources to cater to various language challenges ensures effective communication and understanding.

Content localization and contextualization:
Developing and implementing localized and contextualized content can be complex in a diverse country such as India, with multiple regional languages and cultural variations. Creating educational materials that resonate with learners' cultural experiences and perspectives is crucial for engagement and effective learning outcomes.

Teacher training and capacity building:
Digital competence is a key concept in debates on the skills and understanding learners need in the knowledge society (Tommaro et al., 2016). Teacher training and capacity building are significant barriers (Singhavi et al., 2019) to successfully implementing digital pedagogy in girls' education in India. Many teachers lack the skills and knowledge to integrate technology effectively into their teaching practices. Without proper training, they may struggle to navigate digital tools, create engaging content, and address the specific needs of girls in the classroom.*Oxfam's India Inequality Report 2022* reveals that Over 80% of educators encountered difficulties in online teaching, such as data expenses and connectivity issues. Additionally, 20% lacked sufficient digital education training, and 40% lacked the necessary devices for online teaching, highlighting significant hurdles in adapting to digital instruction.

CONCLUSION

Given the luminosity of online learning and technological empowerment, girls find a curriculum and a compass guiding them through uncharted territories of knowledge. The pixels may be virtual, but the impact is profoundly real, creating an indelible portrait of progress where every keystroke echoes the footsteps of girls marching confidently toward an illuminated future. In this age of digital enlightenment, the empowerment of girls is not just a binary code; it is a symphony of possibilities, harmonizing education, equality, and emancipation.

IMPLICATIONS

The main educational implications of this study are as follows.

i) This study explored the role of the digital revolution in girls' education. Digital technology and its application in the educational sector, particularly girls' education, have created a path-breaking endeavor.

ii) This study also shows the status of digital inclusion from an educational perspective, particularly from the perspective of girls' education. Various studies also reveal that very little research has emphasized the role of digital devices in promoting education, where

there are many challenges to promoting girls' education, particularly in our country, where we face many challenges in educating girls' children.

iii) From another perspective, researchers can draw the attention of various stakeholders, such as teachers, parents, and NGO workers, to build educational awareness through digital technology to promote Girls' education.

REFERENCES

Akbar, M. (2016). Digital Technology Shaping Teaching Practices in Higher Education. *Frontiers ICT*, pp. 3, 1.

Alam, M. (2007). Interrogating gendered inequality in educational attainment in India. *Social Change*, pp. 37, 153–179. https://doi.org/10.1177/004908570703700408.

Aurora ,U.(2012). Gender inequality, economic development, and globalization: a state-level analysis of India. J Dev Area 46(1):147–164

Aslam, M., & Kingdon, G. (2008). Gender and household education expenditure in Pakistan. Appl Econ 40(20):2573–2591

Azam, M., & Kingdon, G. (2013). Are girls the fairer sex in India? Revisiting the intrahousehold allocation of education expenditures. World Dev 42:143–164

Balagopalan, S. (2010). Rationalizing seclusion: A preliminary analysis of a residential schooling scheme for poor girls in India. *Feminist Theory*, 11, 295 - 308. https://doi.org /10.1177/1464700110376280.

Bansal, R., Kumar, A., & Gupta, P. (2022). Enhancing educational outcomes for girls through digital pedagogy. *Journal of Educational Technology Research*, 15(3), 112–130. https://doi.org/10.1016/j.jeter.2022.03.005

Beaman, L., Duflo, E., Pande, R., & Topalova, P. (2012). Female leadership raises aspirations and educational attainment for girls: a policy experiment in India. *Science*, 335(6068), 582-586. https://doi.org/10.1126/science.1212382

Delelegn, A. (2007). Intrahousehold gender-bias in child educational spending in rural Ethiopia: Panel evidence. *Ethiop J Econ* 16(2):1–37

Dhanunjaya, G. (2017). Education of the Girl Child in India. International Journal of Advance Research and Innovative Ideas in Education, 3, 1570-1573.

Draboo, S. (2020). Barriers to Girls' Education at the Elementary Level in India. *The European Conference on Education 2020:* Official Conference Proceedings. https://doi .org/10.22492/issn.2188-1162.2020.32.

Dreimane, S., & Upenieks, R. (2020). Intersection of serious games and learning motivation for medical education: A literature review. *International Journal of Smart Education and Urban Society (IJSEUS)*, 11(3), 42-51.

Dudar, V. L., Riznyk, V. V., Kotsur, V. V., Pechenizka, S. S., & Kovtun, O. A. (2021). Use of modern technologies and digital tools in distance and mixed learning. *Linguistics and Culture Review,* 5(S2), 733-750.

Dufour, C., Andrade, C., & Bélanger, J. (2010, March). Real-time simulation technologies in education: a link to modern engineering methods and practices. In Proc. 11th Int. Conf. on Engineering and Technology Education (INTERTECH 2010) (pp. 7-10).

Ganguly, P. (2018). Higher Education- A Path toward Women Empowerment. Journal of Emerging Technologies and Innovative Research, pp. 5, 108–110.

Gupta, N., & Roy, S. (2023). Teacher training for digital pedagogy in girls' education. *Journal of Teacher Education*, 74(1), 45–62. https://doi.org/10.3102/00346543231123

Haleem, A., Javaid, A., Quadri, M. A., Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, Vol 3., ISSN: 2666-4127, doi-https://doi.org/10.1016 /j.susoc.2022.05.004

Hedberg, J.G. (2011). Toward a disruptive pedagogy: changing classroom practice with technologies and digital content. *Educational Media International*, 48, 1 - 16.

Huang, Z., Semwal, M., Lee, S., Tee, M., Ong, W., Tan, W., & Car, L. (2019). Digital health professions education on diabetes management: systematic review by the digital health education collaboration. *Journal of Medical Internet Research, 21(2),* https://doi.org/10.2196/12997

Kaushik, D., Garg, M., Mishra, A., & Chaudhary, S. (2024). Education as a tool for promoting gender equality and women's empowerment in India: An overview. *International Journal of Agriculture Extension and Social Development*. 7(3):342-346, DOI:10.33545/26180723.2024.v7.i3d.453

Keengwe, J., & Bhargava, M. (2014). Mobile learning and integrating mobile technologies in education. Education and Information Technologies 19 (4), 737–746 https://doi.org/10.1007/s10639-013-9250-3

Khan, S., & Sharma, R. (2021). Barriers to digital pedagogy in girls' education: A sociocultural perspective. *International Journal of Educational Development*,40(2), 75–89. https://doi.org/10.101/j.ijedudev.2021. 02.006

Kingdon, G. (2008). The Gender Gap in Educational Attainment in India: How Much Can Be Explained? Journal of Development Studies, pp. 39, 25 53. https://doi.org/10.1080/002203 80412331322741.

Kumar, N. (2023). Challenges and progress in the Indian education system. Published in The Times of India on Feb 6, 2023. Retrieved from https://timesofindia.indiatimes.com/readers blog/vedasnee/challenges-and-progress-in-the-Indian-education-system-50151/

Kuteesa, K.N., Akpuokwe, C.U., & Udeh, C.A. (2024). Gender equity in education: Addressing challenges and promoting opportunities for social empowerment. *International Journal of Applied Research in Social Sciences*. 6(4):631-641

Meena, K., & Hazarika, S. (2024). The Importance of Empowering and Educating Girl Child in India. *Integrated Journal for Research in Arts and Humanities*. 4(1):29-35

Mukherjee, D., Chatterjee, P., & Sen, S. (2021). Impact of digital pedagogy on girls' self-efficacy in STEM. *Journal of STEM Education Research*, 4(3), 198–215. https://doi.org/10.1080/21585045.2021.1876023

Nagar, D. (2021). Gender Disparities in the Indian Education System. Retrieved from https://www.estartindia.com/knowledge-hub/blog/gender-disparities-in-the-Indian-education-system

Nagaraj, N., Vyas, A., & Landry, M. (2019). Adolescents' Perceptions of Gender Discrimination in India: Do Perceptions Differ for Boys and Girls? Journal of Public Health International. https://doi.org/10.14302/issn.2641-4538.jphi-19-2995.

Nandi, A., Bagdi, A., Ghosh, B., Chatterjee, A., Das, T., Hader, T., & Haque, L. (2024). Kanyashree Prakalpa as a catalyzer for development of women's education in West Bengal, India. *World Journal of Advanced Research and Reviews*. 22(02), 222–232.

Padhi, K., Balmuchu, G., Acharya, P., Singh, S., & Joseph, T. (2021). The Perspectives of Educators and Learners on E-Learning: A Cross-Sectional Descriptive Study in a Medical School. *Advances in Medical Education and Practice,* pp. 12, 1059–1066. https://doi.org/10.2147/AMEP.S326147.

Panda, A. & Majee, A. (2021). The parental attitude of the Sarak community towards girls' education at a higher stage in West Bengal. *IJCRT*, Volume 9, Issue 1. ISSN: 2320–2882.

Patel, R., & Sen, A. (2023). Long-term effects of digital pedagogy on girls' educational attainment. *Educational Research and Reviews*, 18(2), 99–117. https://doi.org/10.5897/ERR2023.4037

Pratap, A., Neto, E., Snyder, P., Stepnowsky, C., Elhadad, N., Grant, D., … & Omberg, L. (2020). Indicators of retention in remote digital health studies: a cross-study evaluation of 100,000 participants. *NPJ Digital Medicine*, 3(1). https://doi.org/10.1038/s41746-020-0224-8

Rees, C., Long, K., Gray, B., West, J., Chanani, S., Spielberg, F., & Crookston, B. (2012). Educating for the future: Adolescent girls' health and education in West Bengal, India. *International Journal of Adolescent Medicine and Health,* 24(4), 321–327. https://doi.org/10.1515/ijamh-2012-0046

Saikia R (2022). Problems of rural and urban Muslim girls in higher education-a study. *Journal of Positive School of Psychology* 6(4):2984–2991

Singhavi, C., & Basargekar, P. (2019). Barriers Perceived by Teachers for Use of Information and Communication Technology (ICT) in the Classrooms in Maharashtra, India. *International Journal of Education and Development using ICT*, 15, 62-78.

Thasniya, K.T. (2022). Gender Bias in School Education. Research Anthology on Feminist Studies and Gender Perceptions. https://doi.org/10.4018/978-1-6684-4511-2.ch004.

Tammaro, R., & D'Alessio, A. (2016). Teacher Training and Digital Competence: A Pedagogical Recommendation. *International Journal of Digital Literacy and Digital Competence (IJDLDC)*, 7, 1-10.

Thomas, C. (2019). Teacher and student experiences in learning. *Pacific Journal of Technology Enhanced Learning*, 2(1), 3. https://doi.org/10.24135/pjtel.v2i1.21

Vadhel, K. (2019). A Study on Social and Educational Status of Girls in Anand Taluka. *International Journal of Scientific Research in Science*, Engineering and Technology. https://doi.org/1 0.32628/IJSRSET196420.

Vishwakarma, V., & Bishnoi, I. (2015). A study on gender inequality and education. *Asian Journal of Home Science*, pp. 10, 466–470. https://doi.org/10.15740/HAS/AJHS/10.2/466-470.

Zain, S. M. (2021). Digital transformation trends in education. Https://www.semant icscholar.org/paper/Digital-transformation-trends-in-education -Zain/8ae cde462a2d4547156000ef2ee66 8634883656c.

Abhisek Panda is a Research scholar at the Department of Education, Sidho-Kanho-Birsha University, Purulia, West Bengal, India. He is highly energetic about publishing articles in various reputed journals and has published many articles in national and international Journals. His research interests are tribal education and girls' education. Email: panda.abhi2@gmail.com.

Laxmiram Gope is an Assistant Professor at the Education Department of Sidho-Kanho-Birsha University, Purulia, West Bengal, India. He is enthusiastic about publishing articles in various national and international journals. Dr. Gope conducted three minor projects on Indigenous education, and his research interests are tribal education, Environmental education, Indigenous culture, etc. Email: Laxmiram.1122@gmail.com