



GENDER PERSPECTIVES ON DIGITAL EDUCATION: A COMPARATIVE ANALYSIS

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RESEARCH ARTICLE



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Abstract
Learning has been reshaped by the rise of digital education, providing unprecedented access and opportunities for students across the globe. However, this transformation is not uniform across all demographics and also the intersection of gender, digital education presents a complex matrix of challenges and opportunities. This study aims to conduct a comparative analysis the implications of gender in digital education. A structured survey was administered to the sample of universities students. Collected data were analysis by using SPSS (version 29). The results showed that in terms of accessibility to digital education (access to digital devices, internet connectivity, technical support and engage with digital education tools: participation rates, interaction types) male students are more accessible to digital education than female students. We found that the disparity in access to digital education was statistically significant in terms of access to digital education, with higher access observed in urban areas compared to rural areas. The disparity in access to digital education of male students from rural area experiencing lower than the male students from urban area. And also, the disparity in access to digital education of female students from rural area experiencing lower than the female students from urban area. Digital education requires targeted efforts to support across genders and areas.

Keywords: *Gender, Digital Education, Rural and Urban area, Access*

1. Introduction

Education is the most important and essential for everyone acts as a backbone to the socio-economic development of a country as a whole. Each level of education contributes to this progress, establishing the basis for an improved quality of life. A strong, solid educational base proves to be nourishing for the children while bringing them up to be responsible citizens. Digital education is a part of this modern arena of education system.

Digital education involves incorporating digital technologies and online resources into the learning-teaching process. It utilizes various tools and platforms to improve educational experiences by offering flexible, accessible, and interactive learning opportunities. Online learning platforms educational apps e-books digital textbooks interactive simulations, and learning management systems are essential components. The advantages of digital education are considerable: it enhances accessibility for learners in remote or underserved areas, provides flexible learning schedules, allows for personalized educational experiences, and boosts engagement through multimedia and interactive content. However, challenges persist, including the digital divide, digital literacy, maintaining student engagement, privacy and security issues, and ensuring the quality and credibility of digital resources. Digital education represents a transformative approach to learning that seeks to make education more inclusive, adaptable, and engaging, while tackling ongoing challenges to maximize its effectiveness.

The growth and transformation of digital education in India, within the last couple of years, have been very tremendous; which is influenced by rapid technological changes combined with the government's topmost priority of improving access to and enhancing the quality of education.

1.1. Aspects of Digital Education in India:

❖ **Government Initiatives:** India has made remarkable progress in digital education in recent years, driven by various government initiatives focused on enhancing access to quality education through technology.

Digital India Programme: Launched in 2015, this comprehensive initiative seeks to improve online infrastructure and services across multiple sectors, including education. It encompasses efforts to boost internet connectivity, promote digital literacy, and develop digital resources. SWAYAM: This online platform, created by the Ministry of Education, offers free online courses

from leading institutions throughout India. It provides a wide range of courses across different subjects and levels, including MOOCs (Massive Open Online Courses). ePathshala: Created by the National Council of Educational Research and Training (NCERT), serves as a portal that provides digital textbooks, educational resources, and audio-visual materials designed for students, teachers, and parents. DIKSHA (Digital Infrastructure for Knowledge Sharing): DIKSHA is an online platform that delivers a wide array of educational content and tools for teachers and students, featuring interactive lessons, assessments, and teaching resources.

PM eVIDYA: Launched in 2020 as part of the Atmanirbhar Bharat Abhiyan, PM eVIDYA seeks to consolidate all digital education initiatives and improve digital content along with online learning platforms. National Educational Technology Forum (NETF): NETF is a conduit for exchanging ideas and perspectives on technology and education. This is intended for the inclusion of technology in teaching and learning practices and to encourage a digital environment. Swayam Prabha: This initiative consists of 32 DTH (Direct to Home) channels that deliver educational content on a variety of subjects. This channel is only dedicated for the students who are living in rural area where internet is not good. BharatNet: The goal is broadband connectivity in the remotest area. Digital education will only be successfully implemented if there is enhanced connectivity.

- ❖ **EdTech Companies:** The development of educational technology (EdTech) companies has transformed digital education in India. Firms like Byju's, Unacademy, and Vedantu offer online courses, tutoring, and interactive learning experiences, catering to a diverse range of subjects and educational levels.
- ❖ **Remote Learning:** Digital education, especially highlighted during the COVID-19 pandemic. Platforms such as Zoom, Microsoft Teams, and Google Classroom have allowed schools and colleges to continue classes virtually.
- ❖ **Digital Literacy:** Enhancing digital literacy for students, teachers, and parents is crucial for the effectiveness of digital education. Training programs and workshops are being organized to enhance users' proficiency in utilizing digital tools for learning.
- ❖ **Content and Curriculum:** The construction of high-quality digital content and curriculum is a continuous process, with efforts focused on developing resources that are relevant, engaging, and in line with educational standards.
- ❖ **Challenges:** There are still challenges to overcome today. Challenges such as disparities in access to technology, issues with internet connectivity, and variations in digital literacy can hinder the effectiveness of digital education. They are being addressed through infrastructure improvements and targeted programs.

1.2. Disparities in access to Digital Education in India:

Disparities in access to digital education in India, influenced by gender and geographic location, highlight significant inequalities that impact educational opportunities and outcomes for various groups.

A daunting challenge looms large for India on the front of education in the digital age. A prevailing challenge among these obstacles is the gender disparity in digital classroom learning. Despite initiatives aimed at closing the gaps in both education and technology, cultural, economic and infrastructural barriers persistently affect girls and women more severely. This constraint limits their opportunities for digital learning. However, it is crucial to acknowledge the multifaceted nature of this dilemma (because tackling it necessitates a comprehensive strategy). Although advancements have been achieved, considerable effort is still required.

1.2.1. Gender Disparities:

- ❖ **Access to Technology:** Device Ownership: Boys/males tend to have greater ownership to digital devices than girls/females, especially in rural and low-income areas. This gap restricts girls'/females' chances to access digital education.
- ❖ **Internet Access:** Cultural norms, safety concerns, and limitations on movement can pose extra obstacles for girls seeking to access the internet, which in turn restricts their capability from learning through online resources.
- ❖ **Digital Literacy:** Skill Gaps: Gender biases frequently lead to a reduced emphasis on digital literacy training for girls in comparison to boys. This creates gaps in digital skills and confidence, which can adversely affect girls' participation and achievement in digital education.
- ❖ **Educational Attainment:** Dropout Rates: In some regions, girls are more prone to dropping out of school because of socio-cultural pressures, including early marriage or family duties. This impacts their ability to access and engage in digital education.
- ❖ **Safety and Security Concerns:** The apprehension surrounding cyberbullying (along with the risks of online harassment) and exposure to inappropriate content often compels numerous families to limit girls' internet access. This, in turn, perpetuates the digital divide. However, some argue that such restrictions may also hinder essential skills development. Although the intention is to protect, it raises questions about the implications of overprotection in a digital age.

1.2.2. Disparities by Demographic Area: Urban vs. Rural Areas:

- ❖ **Infrastructure:** Urban areas typically enjoy superior digital infrastructure, including faster internet and greater access to devices, in contrast to rural regions. Students in rural settings often encounter issues like slow internet connections and unreliable electricity.
- ❖ **Resource Availability:** Schools and colleges in urban areas tend to have better access to digital resources and technology, whereas rural schools and colleges often face challenges because of a shortage of essential digital tools and infrastructure.
- ❖ **Socioeconomic Status:** Economic Barriers: Families with lower income, difficult to afford digital devices and internet services, which limits their ability to engage in digital education. This issue is particularly severe in both rural and economically challenged urban areas. School Funding: Schools in economically disadvantaged regions may receive inadequate funding and resources for digital education, resulting in fewer opportunities and lower-quality digital learning experiences.
- ❖ **Regional Variations:** Language and Content: The educational content available online may not be tailored or accessible in all regional languages, which can hinder students in areas where local language resources are scarce. This limitation affects their ability to access and benefit from digital learning materials.
- ❖ **Cultural Barriers:** Cultural norms and practices in different areas can influence how well digital education tools are accepted and utilized. In some regions, there may be resistance to digital education stemming from traditional beliefs or customs.

1.2.2.1. Tribal and Remote Regions:

The tribal and remote regions of India are amongst the most severely affected in accessing digital education:

- ❖ **Geographical Isolation:**
Tribal regions are often hilly or forested with minimal infrastructure. In addition, poor connectivity in roads makes it difficult to reach digital devices and services.
- ❖ **Cultural and Language Barrier:**
Digital education content is rarely available in regional or tribal languages. Tribal students, who may not be strong in mainstream languages, are cut off from such digital education content.
- ❖ **Low Awareness:**
There is a lack of awareness among the tribals about the use of technology and the concept of a kind of ability needed to work in the digital landscape.
- ❖ **Higher Dropout Rate:**
With limited access to quality digital education, the student in tribal areas is likely to drop out and thus maintain the cycle of educational and economic deprivation.

1.2.2.2. Disparities within urban areas:

While urban areas are better equipped for digital education, disparities exist within them:

- ❖ **Socio-Economic Divide:**
Children from higher economic backgrounds have access to elite online learning portals, private tutors, and the latest gadgets. Government school students, on the other hand, have more chances of using poorly equipped digitalized classrooms.
- ❖ **Slum Dwellers:**
Students in urban slums face the same challenges as those in rural areas, such as sharing devices, no internet connectivity, and cramped living spaces that are not conducive to online learning.

2. Objectives

1. To analyse differences in access to digital education between male and female students.
2. To compare the disparities in access to digital education in urban and rural areas.
3. To compare the disparities in access to digital education of male students between urban and rural area.
4. To compare the disparities in access to digital education of female students between urban and rural area.

3. Hypotheses

H₀1: There is no significant difference in access to digital education between male and female students.

H₀2: There is no significant difference in access to digital education between urban and rural area.

H₀3: There is no significant difference in access to digital education of male students between urban and rural area.

H₀4: There is no significant difference in access to digital education of female students between urban and rural area.

4. Research Methodology

Method: Quantitative research: descriptive survey method was assimilated by the researcher.

Population and sample of the study: The population of present study was consisting of 336 universities students in West Bengal.

Sampling Technique: Random sampling method.

Tools used: Tools (questionnaire) developed by the researcher was used.

Data collection: Accordance to the tools data was collected.

Data Analysis (Statistics used): Data analysis was done by using SPSS (version 29). Mean and Independent t-test were computed to get the results.

5. Data Analysis, Interpretation, Results and Discussion

Following findings were drawn on the basis of analysis of data:

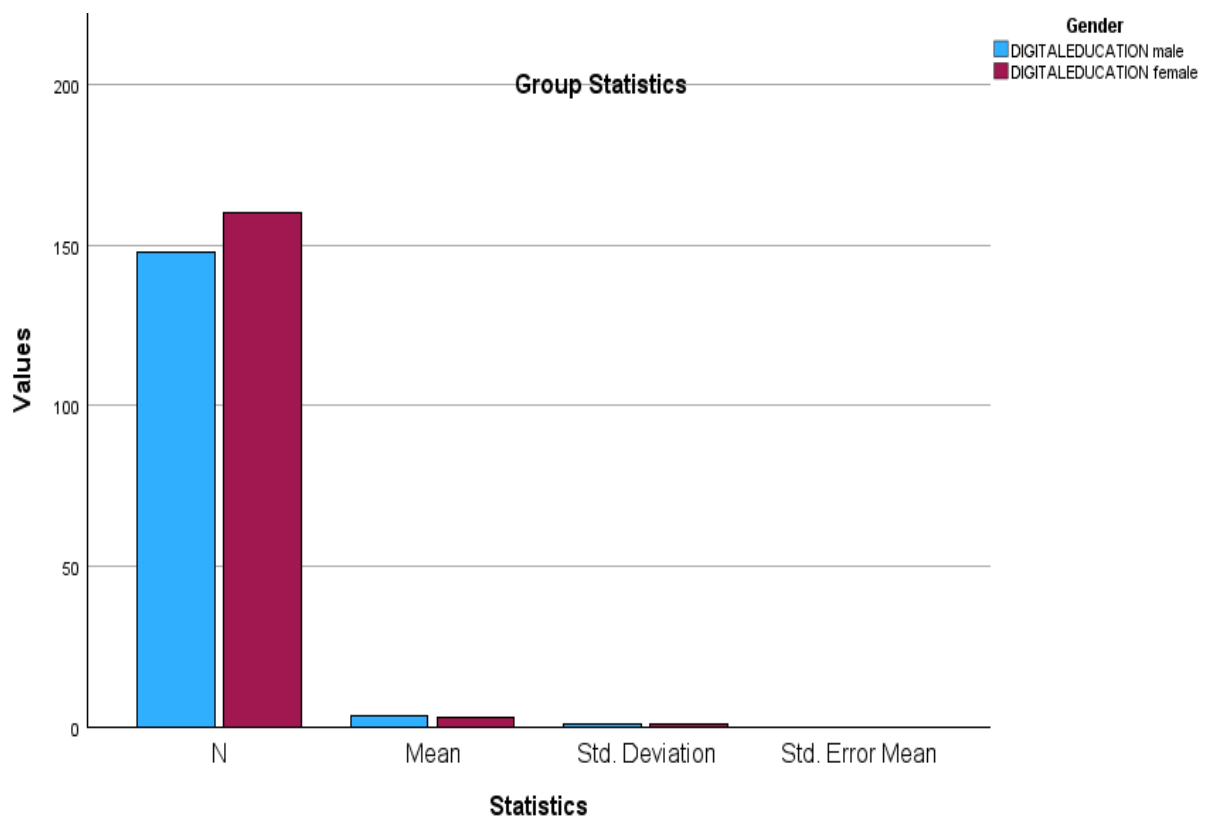
5.1. Objective wise analysis of data and interpretation

5.1.1. Following hypothesis related to objective 1

H₀₁: There is no significant difference in access to digital education between male and female.

Table 1: Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Digital Education	Male	148	3.4061	.96152	.07904
	Female	160	2.8175	1.14774	.09074



Graph: 1

Table 2: Independent t – Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
Digital Education	Equal variances assumed	8.029	.005	4.858	306	<.001	<.001	.58858	.12116	.35017	.82699
	Equal variances not assumed			4.891	303.087	<.001	<.001	.58858	.12033	.35179	.82537

Interpretation:

From Table 1 - Group Statistics, there were 148 Males and 160 Females. The mean for male was 3.4061, and the mean for Female was 2.8175.

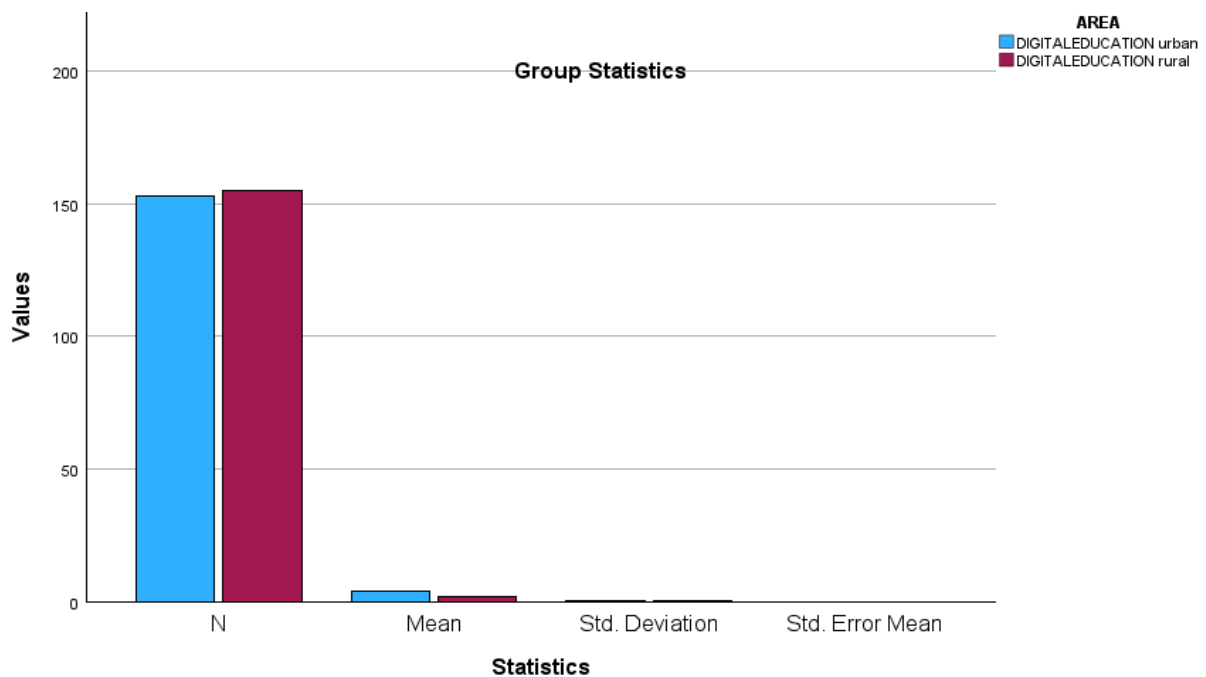
From Table 2: Independent t – Test, since $p < 0.05$, $t = 4.891$. So, the null hypothesis was rejected i.e., there was significant difference in access to digital education between male and female. The positive t value indicates that the male students have a significantly higher level of access to digital education compared to female students.

5.1.2. Following hypothesis related to objective 2

H₀2: There is no significant difference in access to digital education between urban and rural area.

Table 3: Group Statistics

Digital Education	Area	N	Mean	Std. Deviation	Std. Error Mean
Digital Education	Urban	153	4.0219	.53979	.04364
	Rural	155	2.1906	.67176	.05396



Graph: 2

Table 4: Independent t - Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
Digital Education	Equal variances assumed	19.469	<.001	26.352	306	<.001	<.001	1.83125	.06949	1.69451	1.96800
	Equal variances not assumed			26.389	293.940	<.001	<.001	1.83125	.06940	1.69467	1.96783

Interpretation:

From Table 3 - Group Statistics, there were 153 urban students and 155 rural students. The mean for urban was 4.0219, and the mean for rural was 2.1906.

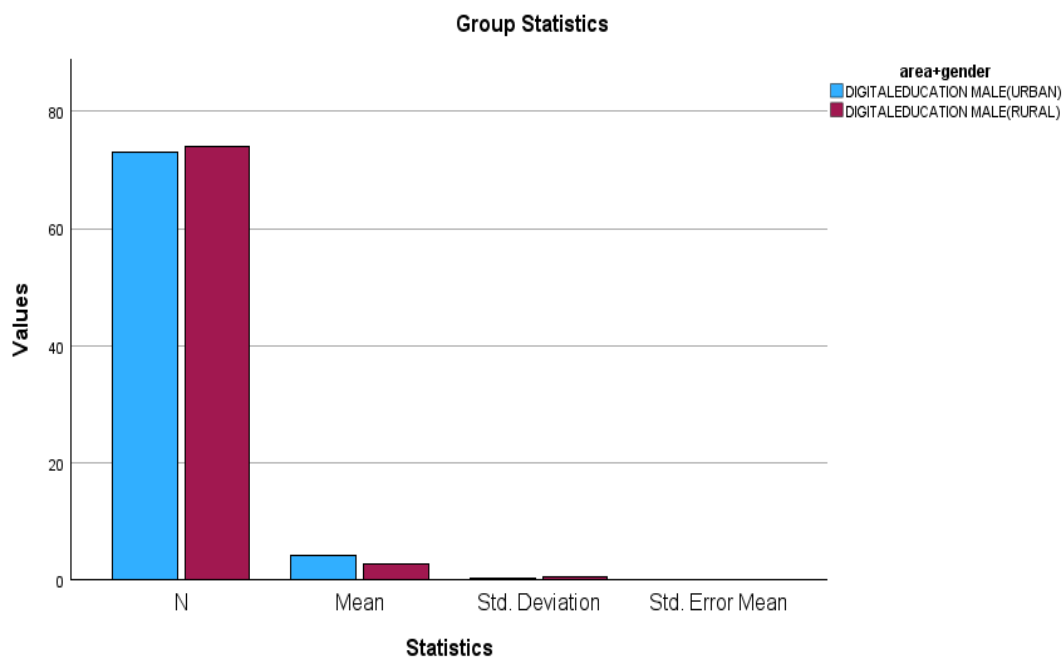
From Table 4: Independent t – Test, since $p < 0.05$, $t = 26.389$. So, the null hypothesis was rejected, and conclude that the disparity in access to digital education based on areas was found to be statistically significant. The positive t value indicates that the disparity in access to digital education rural area experiencing lower than the urban area.

5.1.3. Following hypothesis related to objective 3

H₀₃: There is no significant difference in access to digital education of male students between urban and rural area.

Table 5: Group Statistics

	Gender (Area)	N	Mean	Std. Deviation	Std. Error Mean
Digital Education	Male (Urban)	73	4.2596	.29682	.03474
	Male (Rural)	74	2.5757	.58076	.06751



Graph: 3

Table 6: Independent t - Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
Digital Education	Equal variances assumed	12.491	<.001	22.090	145	<.001	<.001	1.68391	.07623	1.53325	1.83458
	Equal variances not assumed			22.179	109.027	<.001	<.001	1.68391	.07593	1.53343	1.83439

Interpretation:

From Table 5 - Group Statistics, there were 73 male students from urban area and 74 male students from rural area. The mean for male (urban) was 4.2596, and the mean for male (rural) was 2.5757.

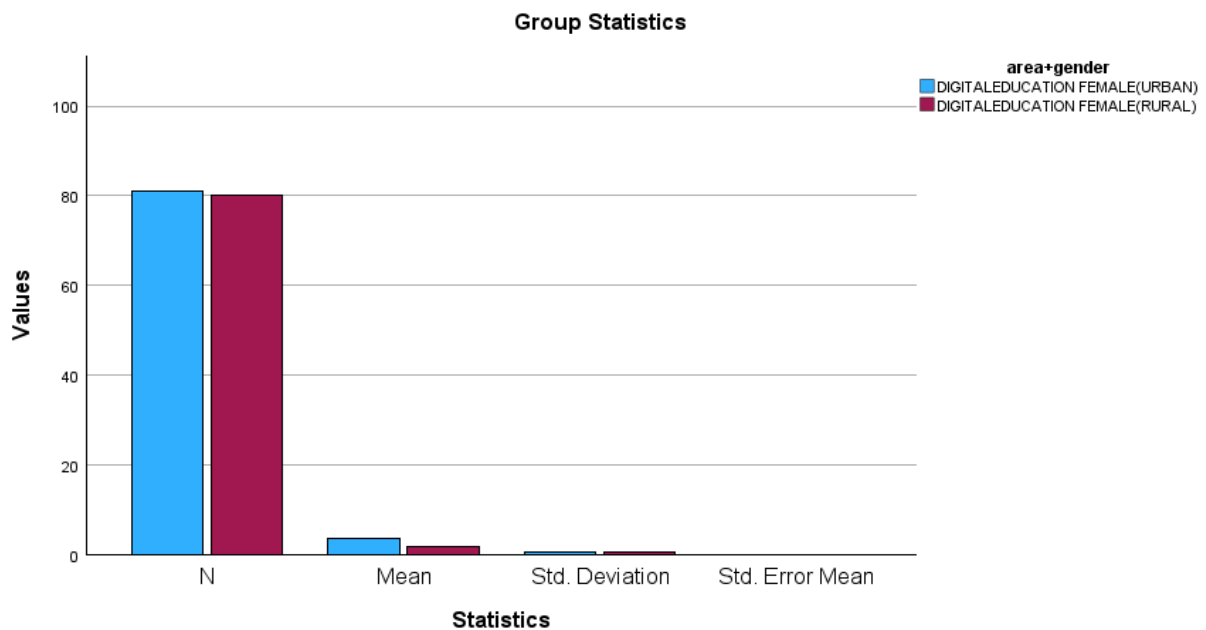
From Table 6: Independent t – Test, since $p < 0.05$, $t = 22.179$. So, the null hypothesis was rejected, and conclude that the disparity in access to digital education of male students based on areas was found to be statistically significant. The positive t value indicates that the disparity in access to digital education of male students from rural area experiencing lower than the male students from urban area.

5.1.4. Following hypothesis related to objective 4

H₀4: There is no significant difference in access to digital education of female students between urban and rural area.

Table 7: Group Statistics

Digital Education	Gender (Area)	N	Mean	Std. Deviation	Std. Error Mean
Digital Education	Female (Urban)	81	3.7895	.62863	.06985
	Female (Rural)	80	1.8300	.54387	.06081



Graph: 4

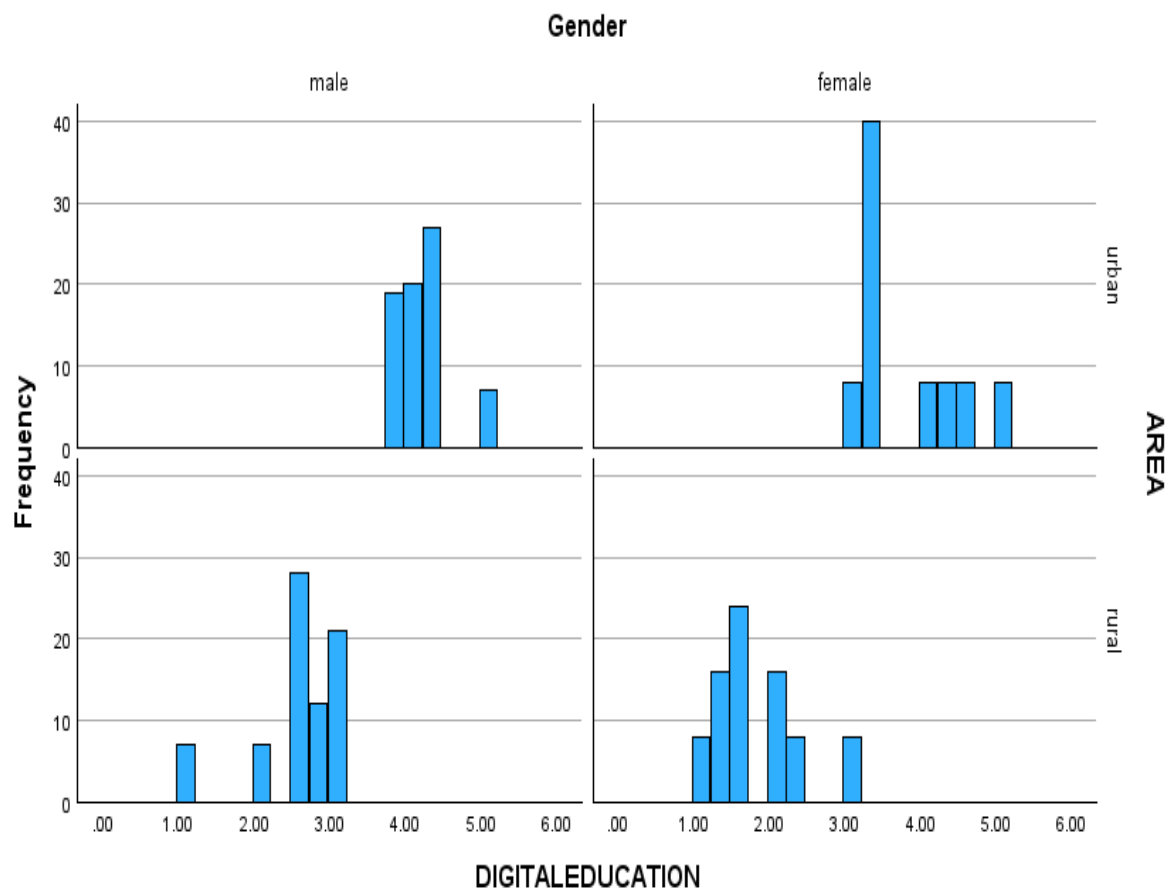
Table 8: Independent t – Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
Digital Education	Equal variances assumed	5.543	.020	21.140	159	<.001	<.001	1.95951	.09269	1.77644	2.14257
	Equal variances not assumed			21.159	156.300	<.001	<.001	1.95951	.09261	1.77658	2.14243

Interpretation:

From Table 7 - Group Statistics, there were 81 female students from urban area and 80 female students from rural area. The mean for female (urban) was 3.7895, and the mean for female (rural) was 1.8300.

From Table 8: Independent t – Test, since $p < 0.05$, $t = 22.179$. So, the null hypothesis was rejected, and conclude that the disparity in access to digital education of female students based on areas was found to be statistically significant. The positive t value indicates that the disparity in access to digital education of female students from rural area experiencing lower than the female students from urban area.



Graph: 5

Graph – 5, shows the disparities in access to digital education with respect to gender and demographic areas.

6. Recommendations

- ❖ **Promote Gender Equity:** Encourage Girls' Participation: Launch Programs specifically designed to improve digital literacy and access for girls, including scholarships, mentoring, and outreach campaigns.
- ❖ **Address Cultural Barriers:** Collaborate with communities to challenge cultural norms that restrict girls' access to technology and education.
- ❖ **Improve Infrastructure:** Expand Connectivity: Invest in enhancing internet connectivity and digital infrastructure in rural and underserved regions.
- ❖ **Provide Subsidies:** Offer financial assistance or subsidies for digital devices and internet access, especially for low-income families.
- ❖ **Support Diverse Needs:** Ensure that digital educational resources are inclusive and meet the diverse needs of students from various demographic backgrounds.
- ❖ **Foster Digital Literacy:** Training Programs: Roll out digital literacy programs for both students and educators, focusing on closing gender and regional gaps.

7. Conclusion

This comparative study of digital education from a gender perspective highlights important insights into how gender disparities affect access to and experiences with digital education and how demographic areas were responsible for access to digital education in accordance with access to digital devices, internet connectivity, technical support and engage with digital education tools: participation rates, interaction types. The findings emphasize that although digital education can democratize learning opportunities, persistent gender biases and structural inequalities continue to significantly influence digital education. Female students, and those in rural areas often face systemic barriers that limit their ability to participate and succeed in these learning environments. These obstacles include unequal access to technology, due to different level of digital literacy, and gender-based expectations and biases that affect educational outcomes. Bridging the gender gap in digital education is not just a matter of fairness; it is also an essential prerequisite for sustainable development. Empowering women and girls (who have access to digital education) possesses the potential to transform their lives, enhance their economic prospects and contribute to India's growth as a knowledge-based economy. The disparities in access to digital education by demographic area of India are reflective of a broader set of socio-economic inequalities. To bridge such gaps, there is an infrastructural development approach that includes a targeted policy by the government and community-driven initiatives.

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