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Impact of the Digital Divide on Educational Outcomes on College Girls

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Abstract

Education plays a crucial role in fostering digital literacy and empowering individuals to navigate online platforms with confidence and skill. Higher education is greatly aided by digital resources, which have greatly expanded access to scholarly materials. They play a major role in perceiving knowledge and lowering barriers to academic resources. The low levels of digital literacy and limited infrastructure, particularly in underserved and rural communities. Digital resource access has emerged as a key component of contemporary research, education, and civic engagement. The digital divide continues to pose a major obstacle to equitable education, mainly among college women. Over the past ten years, the education sector has experienced drastic changes due to the emergence of digital technologies. Digital tools, which enable everything from interactive instruction to AI-based, tutoring, have significantly changed how students learn and how teachers teach. Modernization efforts in education must extend beyond wealthy and developed areas. The COVID-19 pandemic catalyzed a rapid shift toward digital education, exposing significant gaps in institutional preparedness. As physical classrooms closed, educators and learners turned to video conferencing tools and open platforms to maintain continuity in teaching and learning and make the gap free teaching learning processes. There are numerous studies highlight how educational technology can improve curriculum design and increase learning efficiency better. Present work deals with how digital divide affect the educational outcomes of college girls.

Keywords: digital devices, educational outcomes, college students, online class, internet, resources, sampling, convenience.

Introduction

The digital divide, defined as the disparity in access to digital devices and internet connectivity, has become a critical issue in the realm of education, particularly for college girls. College girls, especially those from marginalized communities, often face compounded challenges due to limited access to digital tools, inadequate digital literacy, and restricted exposure to online educational resources. These barriers significantly impact their academic performance, learning outcomes, and future opportunities in the digital economy. Studies indicate that women are 23% less likely than men to use mobile internet, under scoring the gender gap in digital literacy and access, which not only impacts academic performance but also restricts female students from engaging with online educational platforms, digital libraries, and virtual classrooms (Kitheriedathil and Sajitha,2023). Additionally, the Print reports that Indian women are 40% less likely than men to use mobile internet, highlighting the broader issue of digital inclusion (Bhargava and Yuthika,2023). Krupamani (2023) also explores barriers to digital

access for young women. This disparity is exacerbated by cultural norms and mobility restrictions in certain regions, which further limit girls' access to technology, reinforcing educational inequalities. The COVID-19 pandemic has highlighted the urgency of addressing the digital divide, as online education became the primary mode of learning during lock downs. Additionally, the high cost of digital devices and internet services creates financial barriers that disproportionately affect female students, who may already face economic disadvantages. College girls without reliable internet access or digital devices faced significant disruptions in their education, leading to widened gaps in academic performance and skill development. Additionally, the lack of digital literacy initiatives and inadequate infrastructure in rural areas contribute to the challenges faced by female students. Effective promotion of digital adoption by the government, private sector and civil society is one way to spread awareness about the scope and opportunities that the digital education system provides. This can empower individuals in society, irrespective of gender differences (Mariscal *et al.,* 2019). Conscious efforts must be taken by each and every individual to reduce the impact of barriers that hinder progress. Without such efforts, the country as a whole will miss the opportunity to create an empowering environment for women and girls. While digital technology is advancing rapidly, it is crucial to address the obstacles that prevent their full participation (Kitheriedathil and Sajitha,2023)This research delves into the complex effects of the digital divide on the educational achievements of college girls through digital devices, internet access, and digital competencies. Through analysis of socioeconomic determinants of the digital divide and an evaluation of challenges in accessing online learning, digital libraries, and virtual classrooms, this study has the goal of suggesting actionable recommendations empowering college girls in today's digital era. The digital divide also presents obstacles in the form of access to educational tools and resources, which disproportionately affect marginalized communities. Closing these gaps is important to ensuring equal access, given the increasing reliance on digital learning. Low access affects grades, academic performance, and overall education success, with family income and rural-urban differences further widening the divide. An understanding of these issues allows educators, policy makers, and institutions to design intervention strategies that promote inclusivity and equal opportunities so that girls are able to participate fully in the digital sphere. A greater understanding of such issues guides educational policies and interventions, helping institutions and governments close the gap, enhance access to digital education, and boost career opportunities. Finally, this research not only fills a pressing gap but also makes broader contributions to the discourse on education, gender equality, and societal attitudes towards women's empowerment.

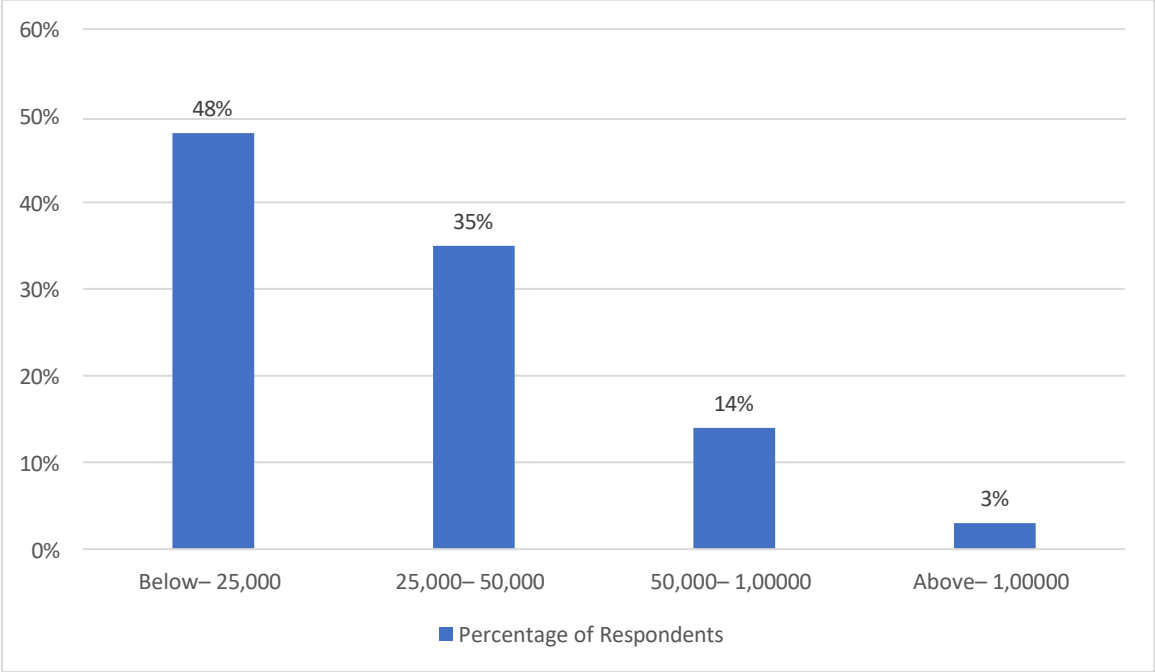
Methodology

The present study titled “Impact of The Digital Divide on Educational Outcomes on College Girls” is an attempt to elicit information regarding the impact of digital divide on educational outcomes on college girls. This study is important since it highlights the difficulties female students, especially those in rural and low-income circumstances; have without access to digital resources. The obstacles prevent them from engaging in e-learning, developing digital literacy competences and accessing educational content which are vital for academic work and employment prospects. Survey design was used in the study (Creswell,2014). Kollam Corporation was purposively chosen for the study as there are many colleges in and around Kollam Corporation. Convenience of data collection was the main reason for choosing this location (Fowler ,2013). A convenience sampling approach was used to pick twenty-five samples from Quilon Poor Home,in Mundakkal ward within Kollam Corporation. A convenience sampling was

employed to select hundred samples from four arts and science colleges (Sree Narayana College-25 samples, Sree Narayana College for Women- 25 samples, Fatima Mata National College - 25 students and T.K.M College of Arts and Science -25 students).Interview was the data collection method employed in this study(Kothari,2006).It efficiently obtained useful information even from respondents who would have been occupied or reluctant to fill a questionnaire.

Result and Discussion

The age of majority of the respondents were below 19 years old and a smaller proportion fall within the age range of 21-23years. In the case of locality of residence distribution among respondents showed that majority was from urban areas, and others were from rural areas**.** The main results were as follows**.** Figure.1. represents the socio-economic status of respondents reveals that a majority of 48% respondents have an income below ₹25,000. Thirty five percent of the respondents **(**35%) fall within the ₹25,000–₹50,000 per month range and 14% of the respondents earn between₹50,000– ₹1, 00,000 per month and only 3% have an income above ₹1, 00,000 per month. This indicates that a significant portion of respondents (83%) belong to lower and middle-income groups, which may influence their access to education, digital resources, and overall living conditions. The small percentage (3%) earning above ₹1, 00,000 suggests limited representation of higher-income individuals in the sample.



Figure–1. Socio–economic status access to digital resources.

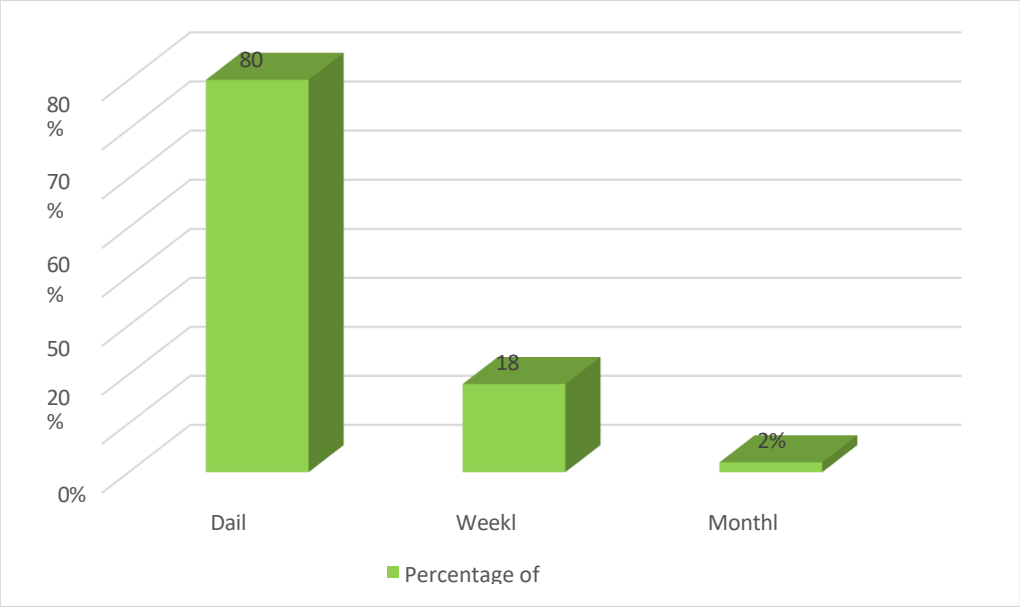
The place of internet access among respondents reveals that majority of the respondents **(**87%) access the internet from home, indicating a strong reliance on personal or household connections(Table.1).73% access it from college, which is notably low and may suggest limited institutional internet availability. Ten percent use the library, showing minimal dependence on public resources for connectivity and only 9% rely on friends' internet access, highlighting a segment of respondents who may not have stable personal connections.

Table.1.Place of access to internet.

Access to Internet*	Number of Respondents	Percentage of Respondents
Home	87	87%
College	73	73%
Library	10	10%
Friends	9	9%

Multiple responses*

Figure.2. reveals the use of digital devices for educational purpose. It reveals that majority of the respondents (80%) use digital devices daily, indicating strong integration of technology in their learning process. Eighteen percent respondents use them weekly, suggesting moderate reliance on digital tools and only 2% use them monthly, showing minimal engagement with digital learning.



Figure–2. Use of digital devices for educational purpose

The confidence levels in using digital tools for learning among respondents reveals that majority of the respondents **(61**%) are somewhat confident, meaning they have a functional understanding but may need occasional support. Thirty six percent of the respondents feel very confident, indicating strong digital literacy and ease in using technology for education and 13% are not confident, suggesting difficulties in navigating digital tools, possibly due to lack of training or access (figure.3).

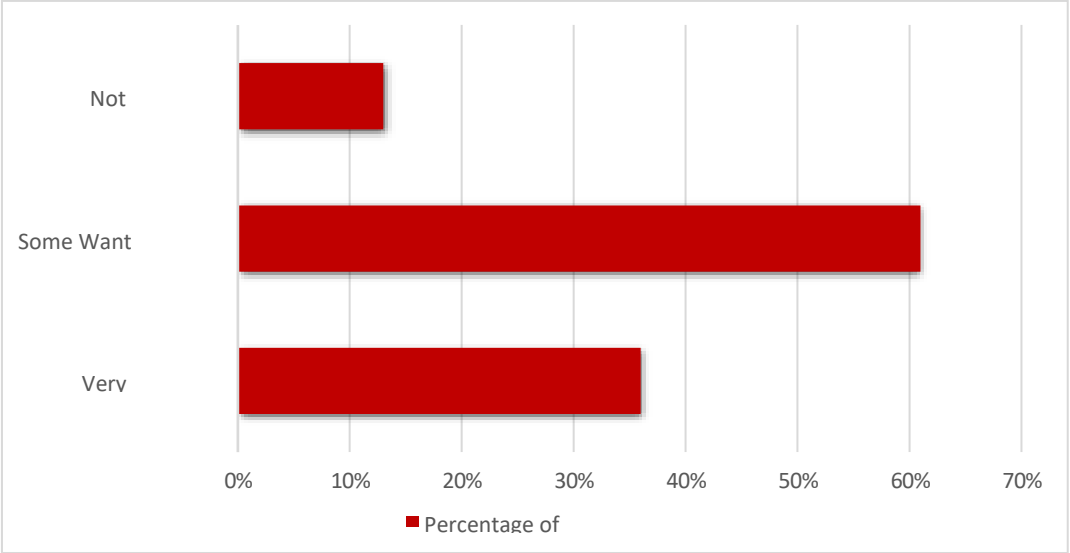


Figure.3.Confidence in using digital tools for learning

The impact of digital resources on academic performance among respondents reveals that majority (96%) had an improvement in their academic performance due to digital resources and only 4% did not experience any improvement (Table.2).

Table.2.Improvement in academic performance with use of Digital resources

Improve Academic Performance	Number of Respondents
Yes	96
No	4

The below table suggests a strong positive correlation between improved access to digital resources and academic performance. Majority of the respondents (80%) reported an improvement in their academic performance when they had better digital resource access. Whereas 20% of respondents saw no change in their academic performance despite better access to digital resources. None of the respondents (0%) reported a decline in their academic performance, reinforcing the idea that enhanced digital access does not negatively impact academic performance.

Table.3.Change in academic performance with better access of Digital resources

Academic performance And digital resources	Number of respondents
Improve	80
No change	20
Decline	0

The figure.4. Provides valuable insights into the integration of digital tools in teaching practices. Majority of the teachers (44 %) often use digital tools, showing a strong but not absolute reliance on digital methods. Some teachers (34%) always use digital tools, indicating that a significant portion of educators fully embrace technology in their teaching methods. Whereas 20% use them sometimes, suggesting a more cautious or situational approach. Only 2% teachers never use digital tools, which could indicate barriers such as lack of digital literacy, resistance to change, or insufficient access to technology.

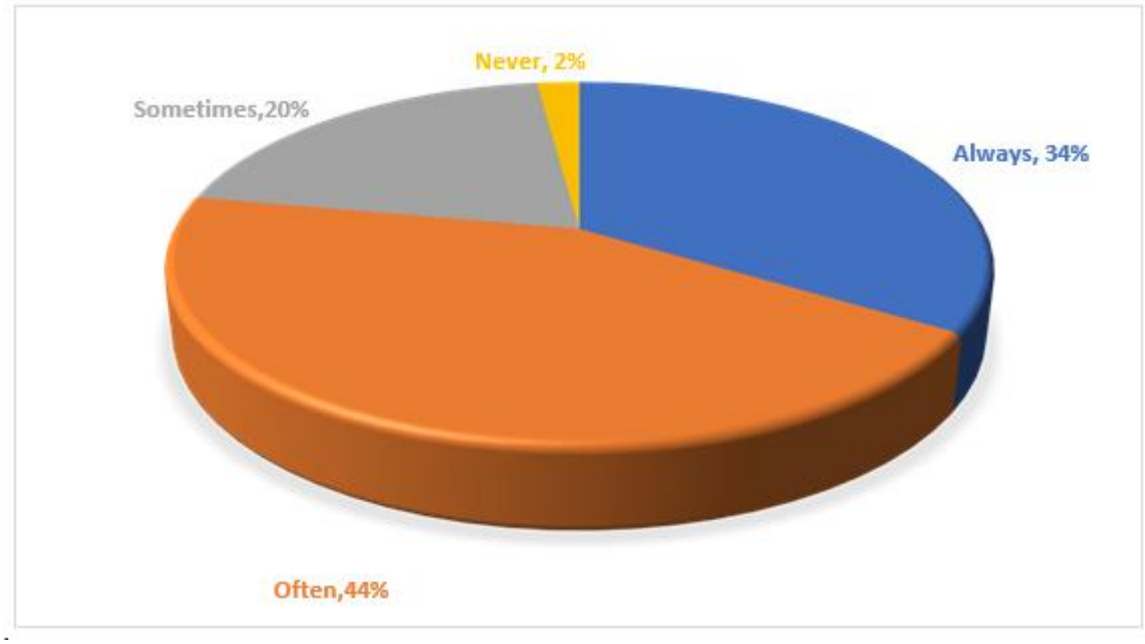


Figure.4.Teachers' use digital tools in teaching practices.

The figure.5 offers a valuable look into the most common barriers learners face when trying to access digital tools. Majority of the respondents **(65**%) cited cost of internet or internet connection as a barrier; this is clearly the most significant obstacle. A notable 37% report a lack of devices such as smart phones, tablets, or laptops.33% with lack of skill for using internet.

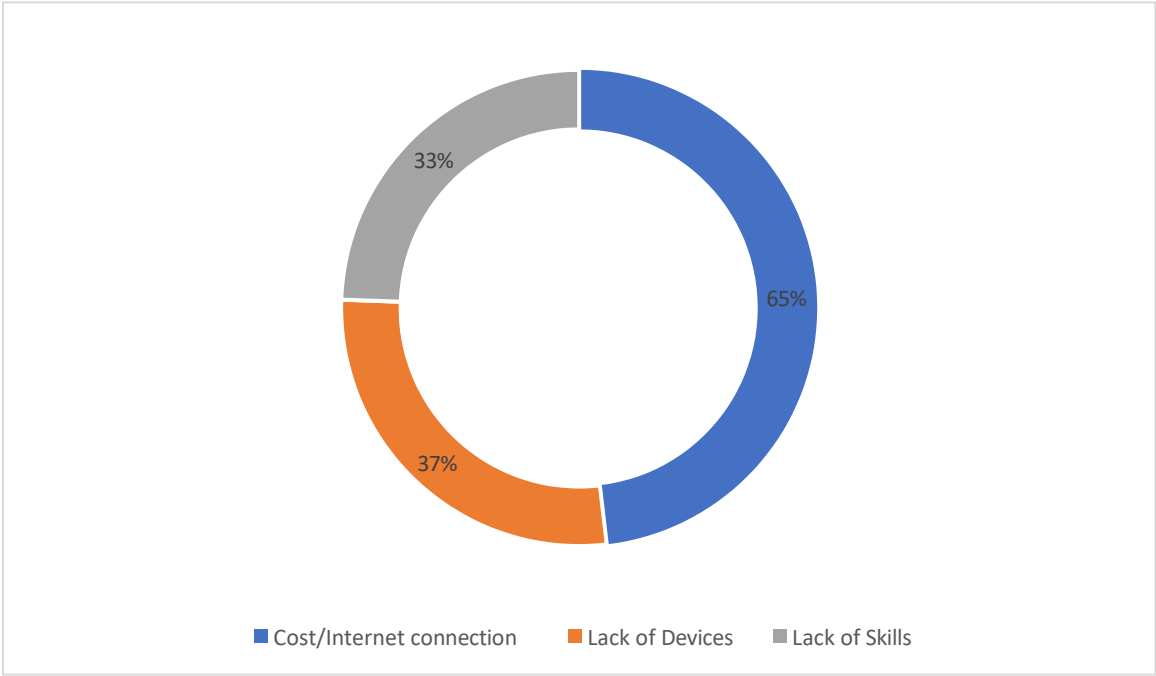


Figure.5. Barriers face in accessing digital tools.

The Table.4.outlines learner's perspectives on how to reduce the digital divide and it's quite revealing. A majority of respondents (48%) pointed to affordable devices; better internet access was reported by 44% respondents, and digital literacy training by (40%) respondents. Only 7% identified community support as a major factor.

Table.4.Solutions to overcome the digital devices

Solutions to Barriers	of Respondents (N=100)
Affordable devices	48
Better internet access	44
Digital literacy Training	40
Community Support	7

The figure.6. reveals a strong positive perception among respondents regarding the role of digital tools in enhancing learning experiences. Majority of the respondents (53%) reported having easy access to a vast amount of information and resources. Learning can happen anytime and anywhere was reported by 47% respondents. Exposure to the latest technologies and learning methods was reported by 43% respondents. Nearly 40% appreciate digital tools for improving communication. Better collaboration with peers and teachers was reported by 39% respondents. Build confidence through self-paced learning was reported by 36% respondents. Gain more motivation through games and interactivity was reported by 30% respondents. About one-third find that game-based tools and interactivity increase their enthusiasm. Easier research and note-taking was reported by 28% respondents. Personalized learning at our own pace was reported by 24% respondents. A smaller but significant group values self-paced learning.

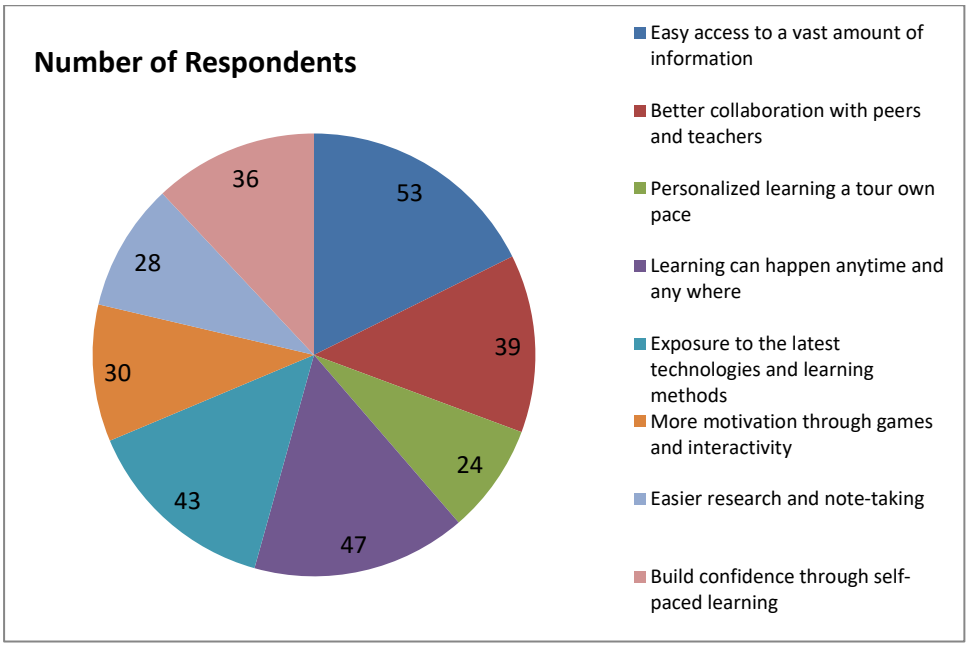


Figure.6.Impact of digital tools and multimedia in making learning more engaging.

The table.5. reveals the impact of limited digital access on learners' motivation. A significant portion of respondents (51%) feel that the absence of digital tools limits their ability to engage with dynamic and interactive learning materials. Almost half (48%) struggle with inefficient research and organization methods due to limited digital access, making learning more labor-intensive. Many respondents (44%) feel constrained by traditional learning methods that require physical presence and scheduled sessions, reducing flexibility and accessibility. A substantial portion (44%) feels less confident in managing their own learning without digital tools, which can affect their ability to study independently. About 30% of

respondents indicate that reliance on conventional teaching approaches makes learning less engaging and interactive. The absence of digital engagement tools, such as gasification and interactive learning, negatively impacts motivation form early a third of respondents (29%). Nearly one third of respondents (29%) experience fewer chances to engage in discussions and collaborative activities with peers and educators, potentially affecting their learning experience and motivation. smaller but notable group (23%) find sit challenging to tailor their learning to their personal pace and preferences, which can hinder motivation and effectiveness.

Table.5. Impact of limited access to digital tools on learning Motivation

Not Access to Digital tools affect motivation to learn*	**Number of Respondents**
Reduced interaction with multimedia and Interactive content	51
Reduced opportunities for collaboration between Students and instructors	29
Difficulty in customizing learning experiences to Individual needs	23
Learning is restricted to specific times and locations	44
Dependence on traditional, less dynamic learning methods	30
Lower motivation due to lack of interactive and gamified elements	29
More time-consuming processes for research, Note taking and organization	48
Lower confidence in self-paced and self-directed learning	44

Multiple responses*

The Table.6. reveals the impact of the digital divide on learners' ability to communicate with teachers and classmates. The highest percentage (45%) indicates that the lack of instant communication tools slows down interactions, making discussions and feedback less efficient. A large percentage (43%) report experiencing stress due to technical barriers, which can hinder learning and communication. Nearly 39% of respondents find it challenging to engage in collaborative learning activities, affecting teamwork and peer interaction. A significant portion (39%) experiences a sense of isolation due to limited digital access, which can negatively impact engagement and motivation. About 29% of respondents struggle with restricted access to essential learning materials, affecting their ability to stay informed and complete assignments effectively. About 27% of respondents indicate that limited digital access leads to decreased involvement in online learning sessions. A similar percentage (27%) acknowledges that restricted digital access may negatively affect their academic success and overall learning experience. Over a quarter (26%) feel that the digital divide reduces their ability to engage in teamwork and collaborative learning experiences. A notable portion of respondents (23%) struggle with unreliable or no access to digital tools, limiting their ability to engage in online communication. Overall,

the data suggests that the digital divide.

Table.6. Effects of the digital divide on communication with teachers and classmates

Ability to Communicate with Teachers and Classmates*	Number of Respondents
In consistent or no access to digital devices and the internet	23
Difficulty participating in online discussions and group projects	39
Slower communication due to the absence of real- Time interaction	45
Feeling disconnected from peers and teachers	39
Limited access to online resources and learning platforms	29
Increased frustration and stress resulting from technical difficulties	43
Limited opportunities for collaborative learning and team work	26
Lower engagement and participation in virtual classes	27
Potential negative impact on academic performance and learning outcomes	27

Multiple responses*

The Table.7.Provides insights into parental involvement in digital learning activities based on responses from 100 participants. Nearly half of the respondents reported that their parents actively motivate them to engage in online learning, highlighting the importance of parental encouragement in maintaining student participation. A significant portion of parents (44%) ensure a conducive learning environment, reinforcing the role of physical space in effective digital learning. Over a third of respondents receive parental support in troubleshooting digital tools, indicating that technical barriers remain a challenge for many students. Similar percentages (36%) of parents help maintain communication with educators, suggesting that parental involvement extends beyond direct learning support to administrative engagement. A notable percent age (35%) of parents encourage breaks, reflecting awareness of the potential negative effects of prolonged screen time and foster a positive outlook on digital education can contribute to student motivation and adaptability in online learning environments respectively. Less than a third (29%) of parents assists with academic challenges, which may indicate either a reliance on external resources or limitations in parental expertise.

Table.7. Parental involvement in digital learning activities.

Parents involved digital learning activities*	No. of Respondents (N=100)
Encouraging participation in online class and activities	47
Assisting with technical issues	37
Staying in touch with teachers and school administrators	36
Creating a quiet study space	44
Providing help with difficult subject or assignments	29
Promoting breaks to reduce screen fatigue	35
Demonstrating positive attitudes towards learning and technology	35

Multiple responses*

The figure.7. highlights the significant impact of the digital divide on students' college experience and

learning perception. A substantial portion (40%) of students report reduced participation in virtual classes and activities, likely due to accessibility issues. Many students (36%) feel isolated from teachers and classmates, affecting collaboration and academic support. Thirty two percent students experience reduced interest in learning due to digital barriers. Slower communication from educators affects timely feedback and academic progress (31%). A significant number (30%) of students feel less confident using digital tools, potentially affecting their future readiness for tech-driven environments. Students with limited digital access face disadvantages compared to peers with better resources, reinforcing educational inequalities 26%). A quarter (25%) of respondents struggle to access online resources and learning materials, limiting their ability to engage fully in coursework. Technical difficulties and lack of support contribute to heightened stress levels; making learning more challenging and learning outcomes and academic performance may suffer due to restricted digital access was felt by 24% respondents respectively. Fewer opportunities for group work hinder collaborative learning experiences were felt by 23% respondents. The digital divide creates multiple obstacles for students, affecting engagement, motivation, academic performance, and social interaction. Addressing these challenges through improved digital access, technical support, and inclusive learning strategies can help bridge the gap and enhance student experiences.

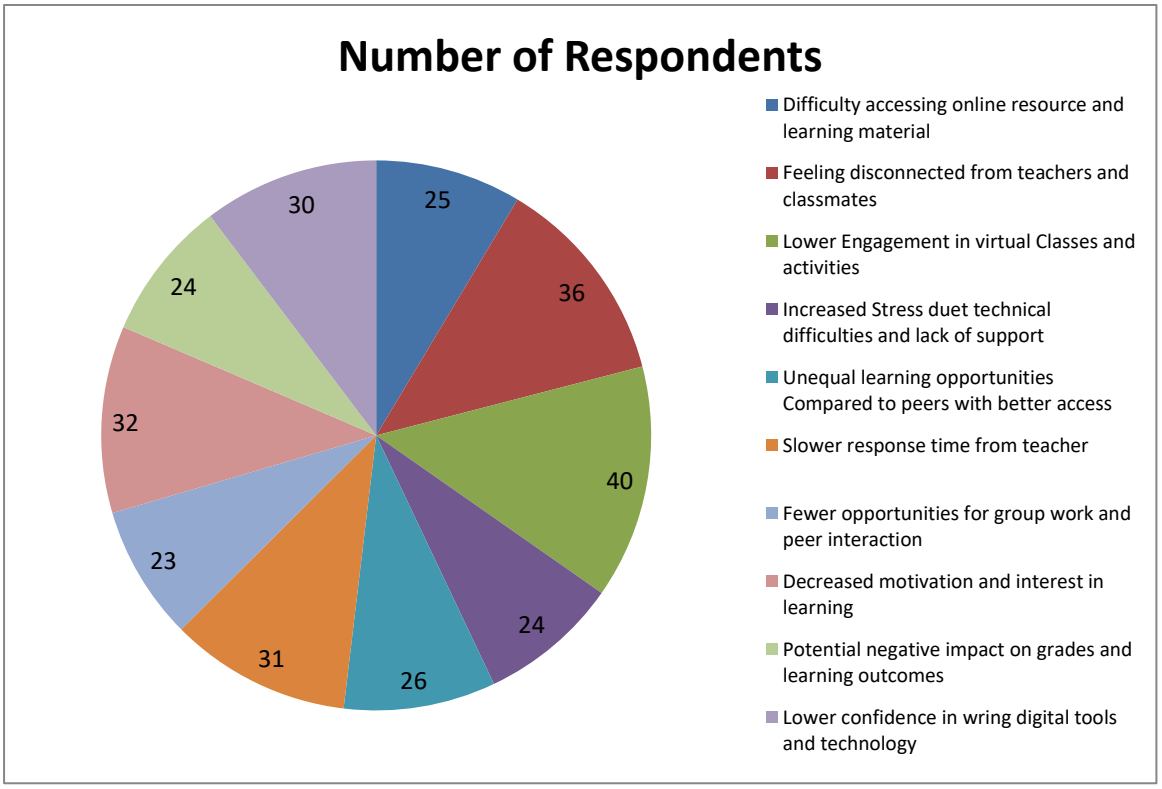
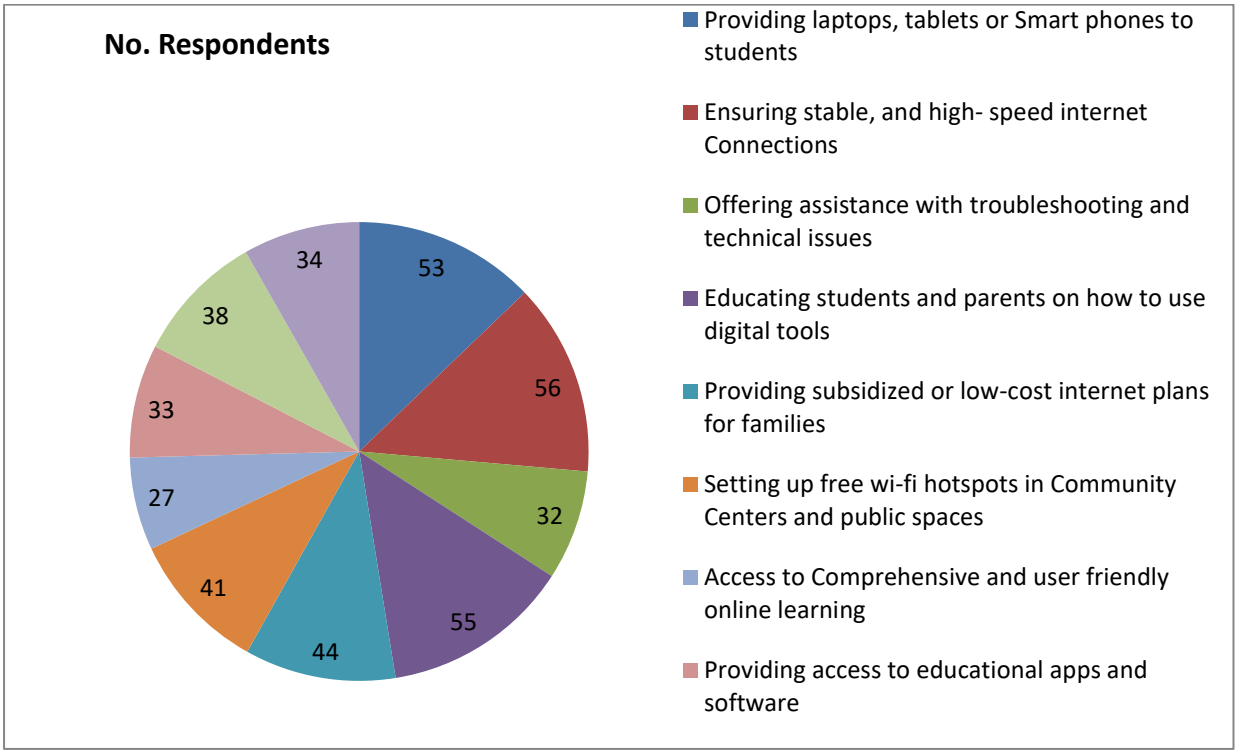


Figure.7.Impact of the digital divide on college experience and Learning perception

The figure.8..Highlights key support and resources needed to help students overcome challenges posed by the digital divide. A substantial portion (56%) of students report reliable, high-speed internet is the most requested support, emphasizing the importance of connectivity in digital learning. Many students (55%) feel that educating both students and parents on digital tools is crucial for maximizing their benefits. Around one half (53%) of the students believe providing laptops, tablets, or smart phones would significantly improve digital access. Many respondents (44%) see subsidized or low-cost internet

as a key solution to accessibility issues. Setting up free Wi-Fi in public spaces can help bridge connectivity gaps for students without home internet were felt by (41%) students. Digital access to academic resources is a priority for many (38%) students. Thirty four percent students feel that providing parents with resources to support their children's digital learning can enhance student success. Access to learning applications and software is seen as an important resource for digital education by (33%) students. A notable portion of students (32%) require troubleshooting support to navigate digital tools effectively. A smaller percentage (27%) emphasizes the need for comprehensive, accessible digital learning platforms. The most critical needs identified are stable internet access, digital literacy education, and device availability.



Multiple responses*

Figure.8. Support and resources needed to overcome digital divide Challenges

Table.8. Socio economic status.
Ho:The two attributes are independent

Socio economic status	Parents have digital skill for assessing with work		Total	rson chi–square	P–value
	Yes	No			
Below- 25000	34	14	48	4.3940	0.2219
25001 - 50000	18	16	16		
500001 - 100000	12	3	15		
Above - 100000	2	1	3		
Total	66	34	100		

Chi– square test * significant at 0.05 level

In this context, the Pearson chi square test is used to determine if there is a statistically significant

association between the socio-economic status and parents have digital skill for assessing with work.The person chi square statistic is 4.3940, and the p–value 0.2219, which is less than 0.05. There for, we conclude that there is no statistically significant relationship between socio economic status and parents have digital skill for assessing with college works.

Table.9. Barriers face in accessing digital tool vs challenges of Completing assignment.
Ho:The two attributes are independent

Barriers face in accessing digital tool	**Challenges of completing assignment**		**Total**	**Chi–square**	**P– value**
	Yes	No			
Cost/Internet connection	40	24	64	0.4059	0.9163
Lack of devices	22	16	38		
Lack of skills	24	13	37		
Total	86	53	139		

Chi– square test significant at 0.05

In the context the Pearson chi square test is used to determine if there is a statistically significant association between using digital tools for learning and effectiveness of digital tools in learning.The Pearson chi square test statistic is 3.5519, and the p – value 0.1693, which is less than 0.05.There for we conclude that there are no significant associations between the using digital tools for learning and effectiveness of digital tools in learning.

Table.10. Using digital tool for learning vs effectiveness of digital tool in learning
Ho:The two attributes are independent

digital tool for learning	**Effectiveness of digital tools in learning**		**Total**	**earson chi – square**	**P– value**
	Yes	No			
Very confident	24	12	36	3.5519	0.1693
Somewhat confident	33	28	61		
Not confident	3	0	3		
Total	60	40	100		

Chi–square test significant at0.05 level

There is no significance relationship between socioeconomic status and parents have digital skill for assessing with home work .There is no significance relationship between barriers face in accessing digital tools and challenges in completing assignments. There is no significance relationship between the using digital tools for learning and effectiveness of digital tools in learning.

Students from rural areas, low-income households, and marginalized communities frequently encounter significant obstacles including the lack of personal devices, unreliable internet connectivity, and limited digital literacy that hinder their ability to fully engage with online educational content. As Bishop *et al.* (2022) observe, such disparities are further compounded by digital redlining and inequitable infrastructure, which reinforce systemic barriers and deepen educational inequality. According to

Ghangare (2023), the National Education Policy(NEP) 2020 encourages digital learning initiatives, but there are still significant barriers to its implementation, including those related to inclusive outreach and technological readiness.Due to the global health crisis, traditional methods were altered and online platforms were widely adopted, hastening the digitization of education (Decuypere *et al.,* 2021).Numerous studies highlight how educational technology can improve curriculum design and increase learning efficiency (Morrison & Lowther, 2009; O'Neil & Perez, 2003). Disparities still exist, though. While rural schools struggled with inadequate infrastructure, urban schools had internet access,but it was often used for non-academic purposes (Galuszka, 2007). Baker (2005) questioned the accuracy of digital assessment tools in measuring performance and expressed concerns about their dependability.Teachers, on the other hand, need targeted professional development in order to use digital tools in curriculum delivery and instructional practices. Bridging digital divides and fostering a culture of lifelong digital learning at the institutional level require inclusive and flexible frameworks. Fostering critical digital illiteracies, such as medialiteracy, e-safety,and digital citizenship ,is crucial to equipping students and teachers to participate responsibly and effectively in digitally mediated environments, according to Ilomäki *et al.* (2023).The socio economic gaps that restrict access to digital tools and the acquisition of critical skills are the main cause of the digital divide, which is still a major problem. Educational and economic disparities are exacerbated when members of marginalized communities are unable to access digital resources due to a lack of infrastructure and financial resources (Krupamani, 2023).As Mubarak *et al.* (2020) affirm, income is positively correlated with the adoption of information and communication technologies (ICT) across 191 countries, highlighting how economic disadvantage translates into digital marginalization at both local and global scales.Kumari *et al.* (2024) underscore this exclusion, illustrating how limited digital access directly hampers women's ability to connect with essential government services, educational opportunities, and welfare schemes—thereby reinforcing systemic gender-based marginalization in the digital era.As Vassilakopoulou and Hustad (2023) observe, digital inequalities often reflect existing offline disparities, reinforcing geographic disadvantages and emphasizing the need for targeted interventions to promote equitable digital access across regions.As Sun and Metros (2011) note, students' technological access is strongly influenced by socio-economic background, which in turn shapes academic success. Digital proficiency is now a prerequisite for thriving in academic environments. Yet students from low-income or rural regions often lack exposure to digital tools, leading to disengagement and reduced confidence in navigating educational platforms.Kumari *et.al.,(*2024) highlight how digital illiteracy among rural Indian students impedes access to both education and government services, perpetuating systemic inequalities.The potential of marginalized communities, older adults, and rural populations to benefit from digital systems is limited by their limited exposure to technology. According to Eshet-Alkalai(2004),digital literacy is an essential "survival skill"in the contemporary world. Hargittai *et al.* (2019), meanwhile, draw attention to the glaring disparities in proficiency among older populations, which fuels their ongoing disengagement. The needs of people with visual, auditory, or motor impairments are frequently ignored in digital design. Participation is hindered by inaccessible interfaces, such as those with incompatible screen readers or missing alt text. The importance of inclusive architecture is highlighted by the fact that 44% of blind or low-vision users switch services as a result of inadequate digital accessibility, according to Silverman *et al.* (2023).

Summary and Conclusion

This study on "Impact of the Digital Divide on Educational Outcomes on College Girls" is significant as college girls' educational outcomes are greatly impacted by the digital divide, which is characterized by unequal access to technology, especially for those who live in rural and low-income areas. Their academic and professional prospects are harmed by a lack of digital resources, which also makes it difficult for them to access essential academic content, engage in e-learning, and develop their skills. To ensure that women are not left behind in the digital economy and to advance gender equality, particularly in Science, Technology, Engineering and Mathematics, this gap must be closed. Increasing workforce participation, social empowerment, and financial independence can all be facilitated by closing the gap. In order to support women's advancement and inclusion in the digital age, this study advocates for better infrastructure, accessibility, and inclusive digital education. It provides crucial insights for policy reform.

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