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ASSESSING THE EFFECTIVENESS OF EDUCATIONAL TECHNOLOGY IN PROMOTING GENDER EQUALITY AMONG UNIVERSITY STUDENTS: A CASE STUDY OF GOVERNMENT COLLEGE UNIVERSITY FAISALABAD

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ABSTRACT

The integration of educational technology within higher education institutions was reshaping teaching and learning processes and holds considerable potential for addressing persistent gender disparities. This study aimed to evaluate the effectiveness of educational technology in promoting gender equality among university students, with a particular focus on Government College University Faisalabad (GCUF). The objective of the study was to identify educational technologies usage among university students and to assess gender-based disparities in access to and benefits from educational technology tools. In this perception and challenges of students in using educational technology for inclusive learning also obtained. GCUF had been purposively selected as the study site. The target population comprised 753 students enrolled in bachelor's degree programs within the Faculty of Arts and Social Sciences. A sample of 156 students were equally divided between male (n=78) and female (n=78) respondents, were selected using the online sample size calculator available at www.surveysystem.com, employing a 7% confidence interval and a 95% confidence level. Data were collected through a validated and pre-tested questionnaire designed in alignment with the study objectives. It was also concluded by keeping in view the objectives of current study that educational technology, or educational technology, is a disruptive force in evolving learning settings because of its innovative approach to promoting involvement, inclusion and academic success. It was suggested that universities should improve high-speed internet availability on campus and in student residences. Universities should conduct awareness campaigns to promote gender equality in technology use. Universities should train teachers in digital pedagogy and gender-inclusive teaching strategies.

Key words: Effectiveness, Educational Technology, Gender Equality, Educational Technology

INTRODUCTION

Educational technology has significantly increased access to higher education for female students, particularly those balancing academic pursuits with domestic or professional responsibilities. (McCallum et al., 2026). The effectiveness of EdTech is often hindered by a persistent "gender digital divide" and embedded social norms. In many contexts, male students have historically reported higher confidence and more prior experience with technology, leading to a "self-efficacy gap."(García-Holgado et al., 2025). Virtual simulations and AI-driven personalized learning can be tailored to eliminate gender bias in STEM subjects, where women are traditionally underrepresented (Das et al., 2024).

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Evaluating the effects of educational technology on female students' academic performance and social mobility is also gaining traction. According to studies, digital learning platforms can improve student performance, confidence, and engagement, creating prospects for empowerment, higher education, and careers (Saleem and Zia, 2023). There is currently no empirical data on how well Educational technology is advancing gender equality in Pakistan's higher education system. The majority of research either ignores the gender component or concentrates on technology adoption in general without taking into account how it affects different genders (Rashid et al., 2023).

Increasing access to digital resources, educational technology can also be used to develop curriculum delivery, assessment strategies, and pedagogical practices that meet the needs of students with varying learning styles (Ali and Raza, 2021). Educational technology initiatives, by offering flexible, safe, and personalized learning opportunities, can substantially mitigate challenges faced by female learners such as safety risks, household responsibilities and restrictive societal expectations (Malik and Akhtar, 2021).

Objectives of the Study

1. To identify educational technologies usage among university students.
2. To assess gender-based disparities in access to and benefits from educational technology tools.
3. To explore students' perceptions, and challenges in using educational technology for inclusive learning.

Hypothesis

 Hypothesis **1:** University students frequently utilize a diverse range of educational technology tools for academic purposes.

 Hypothesis **2:** There is a significant gender-based difference in students' access to and benefits from educational technology.

 Hypothesis **3:** Perceived technical challenges significantly hinder the effective use of educational technology for inclusive learning.

Review of literature

Jardinez and Natividad (2024) posited that the deployment of educational technology (EdTech) has emerged as a primary vehicle for reforming global education systems, offering new pathways to bridge deep-seated systemic challenges and reach marginalized demographics. From a historical perspective, UNESCO (2025) reported that formal and hidden institutional curricula have actively perpetuated disparities through gender-biased learning tools, stereotypical representations, and heavily unequal classroom participation boundaries. To mitigate these structural biases, Syed (2022) demonstrated that digital learning platforms, open-source repositories, and distance education models allow vulnerable student populations—especially girls trapped in culturally conservative or remote regions—to access elite global educational coursework safely from their homes. In a related assessment, Syed (2022) further noted that this fundamental transition from physical institutions to digital infrastructure fundamentally alters classroom dynamics by

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providing balanced, interactive audio-visual components, modern application software, and customized mentorship programs that target individuals uniformly without structural discrimination.

Nkomo et al. (2021) observed that evaluating the actual success of EdTech in establishing total gender parity requires analyzing a complex matrix of psychological, geographical, and functional indicators, emphasizing that female students often manifest depressed baselines of digital media self-efficacy and initial technology acceptance compared to their male counterparts. This psychological barrier heavily restricts their baseline engagement with novel software tools. To analyze these underlying adoption dynamics, Oladele (2024) utilized the Extended Educational Technology Acceptance Model (EETAM) to reveal that female digital integration depends immensely on specialized socio-cognitive variables, proving that a platform's perceived ease of use, technical backend support, peer influence, and total accessibility act as strict gatekeepers for female user onboarding. Conversely, García et al. (2024) conducted multi-group digital analyses across diverse educational frameworks and discovered that under equitable and secure digital learning environments, female trainees frequently outpace males in demonstrating autonomous, self-directed online behaviors and proactive application engagement.

George (2024) argued that the success of EdTech is not merely localized to student intake but acts as a macro-level equalizer through targeted teacher training and inclusive infrastructure development. Equipping female teacher trainees with sophisticated technical fluencies turns them into community-level mediators who dismantle historical Science, Technology, Engineering, and Mathematics (STEM) biases and model advanced technical leadership for young girls locally. Focusing on the technical architecture, Heemskerk et al. (2009) established that software design itself is a critical variable, showing that when software designers explicitly practice gender-responsive co-creation integrating strong instructional feedback loops and specific adjustments for varying cognitive learning styles female users report substantial increases in academic enthusiasm and overall self-esteem.

To foster gender equality in higher education, the use of educational technology has been acknowledged as a crucial way to enhance learners' access to learning materials, to support the digital participation of all learners, and to mitigate the traditional challenges of female students. Gender bias and stereotyped attitudes in Pakistani Universities still affect students' academic decisions, particularly in STEM fields, with significant impacts on self-efficacy shaping participation and career aspirations (Bukhari et al., 2025). Hence, digital literacy is crucial as students with better technological skills will be able to gain more from various online learning platforms, digital resources and technology-assisted learning environments (Rafiq-uz-Zaman, 2023). Assistive technology and inclusive education can enable equity in learning by making learning accessible and flexible to the needs of diverse learners such as female learners and other marginalized groups (Rafiq-uz-Zaman, 2025). Additionally, data from Punjab suggests that there are gender disparities in the adoption of breakthrough technologies within the scope of higher education, with implications of varying access, confidence, and challenges faced by male and female students in relation to educational technology (Rafiq-uz-Zaman et al., 2025a). Furthermore, distance education systems in SAARC countries such as Pakistan emphasize the potentials and constraints associated with creating access to higher education services via technology, and technology, if properly equipped with infrastructure and policy planning, is a vital tool for

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inclusion (Rafiq-uz-Zaman et al., 2025b). Women's empowerment through skill-based education also exemplifies that educational opportunities need to be associated with the development of skills, confidence and the participation of both men and women to minimize gender differences in education and professional life (Rafiq-uz-Zaman et al., 2024). Likewise, AI in higher education has the potential to enhance student engagement, personalization, and well-being, though it demands responsible policies and practices from the institutions to create a fair and inclusive environment for all students (Rafiq-uz-Zaman, et al., 2026). In summary, the literature indicates that the application of educational technology can contribute to gender equality among university students provided it is linked to developing digital literacy skills, ensuring inclusive access, implementing gender-sensitive practices, supporting skill development, and having appropriate policies in place.

On the other hand, UNICEF EAPRO (2021) warned that ignoring these user dynamics during the research and development pipeline leaves digital products systemically structured around male baselines, which isolates women from active digital co-creation and product validation. At the macro-policy level, myScheme (2023) highlighted that implementing comprehensive programs like the *Pradhan Mantri Gramin Digital Saksharta Abhiyan* showcases the critical importance of localized digital literacy schemes targeting adult, non-smartphone, and marginalized households to systematically address global economic and systemic gender imbalances.

UNICEF (2021) documented that despite the rapid global expansion of these digital models, severe physical and structural bottlenecks remain, many of which were heavily magnified by the massive pedagogical disruptions of the COVID-19 pandemic. While Haleem et al. (2022) widely hailed digital infrastructure as a foundational tool for high-quality global equity, its field implementation is not without friction. Nartey et al. (2023) countered that digital deployment frequently runs directly into deeply ingrained local cultural frameworks, patriarchal religious norms, and restricted domestic resource allocations that disproportionately limit women's professional and socio-economic opportunities.

Jha and Arora (2020) emphasized that expanding digital screen-time metrics carries hidden physical costs, demonstrating that multi-method screen exposures are linked to structural compromises in cortical grey and white matter regions within the human brain.

Fullan (2007) and Wwango (2024) both maintained that achieving long-term sustainability demands that modern educational changes be actively managed by local master teachers and policy leaders who are capable of fostering deeply ethical, gender-responsive teaching resources across vulnerable communities. Ultimately, West et al. (2019) concluded that by systematically addressing the underlying digital divide, educational institutions can maximize the socio-economic returns of EdTech. This holistic alignment remains essential for driving progress toward the United Nations Sustainable Development Goals (SDGs), specifically those centered on gender empowerment, innovative industrial growth, and reduced domestic inequalities.

MATERIALS AND METHODS

The current research is descriptive in character and the researchers undertook the survey in the city of Faisalabad to investigate the effectiveness of educational technology in promoting gender equality among university students. Government College University Faisalabad (GCUF) was

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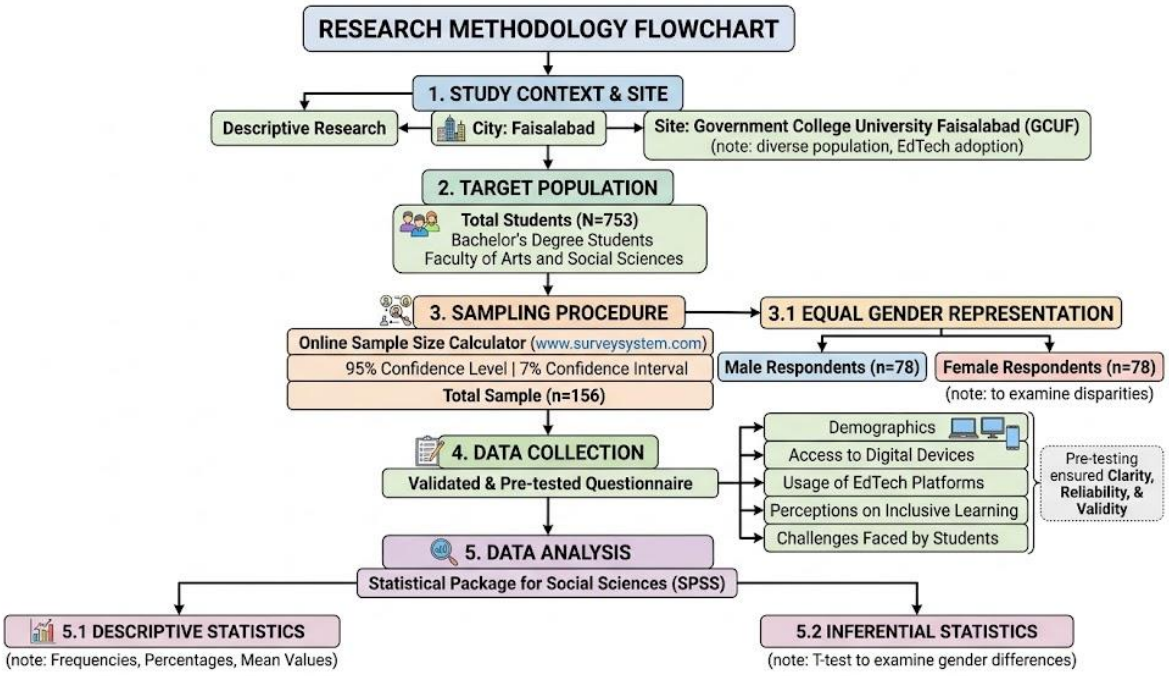
purposively selected as the study site due to its diverse student population and adoption of educational technology tools in teaching and learning processes. The target population comprised 753 students enrolled in bachelor's degree programs within the Faculty of Arts and Social Sciences.

A sample of 156 students were equally divided between male (n=78) and female (n=78) respondents, were selected using the online sample size calculator available at www.surveysystem.com, employing a 7% confidence interval and a 95% confidence level. The equal representation of male and female respondents was ensured to examine gender-based disparities in access to and benefits from educational technology tools.

Data were collected through a validated and pre-tested questionnaire designed in alignment with the study objectives. The questionnaire included items related to demographic characteristics, access to digital devices, usage of educational technology platforms, perceptions regarding inclusive learning, and challenges faced by students. Pre-testing of the instrument was conducted to ensure clarity, reliability, and validity of the items.

The collected data were subsequently analyzed by using the Statistical Package for Social Sciences (SPSS). Descriptive statistics such as frequencies, percentages, and mean values were used to summarize the data, while inferential statistics such as t-test were applied to examine gender differences in the use of educational technology tools and confidence levels among students.



RESULTS AND DISCUSSION

Table 1: Distribution of respondents according to their demographic characteristics

Age (in years)	Female		Male	
	Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)
18–20	30	38.5	28	35.9

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21–23	48	61.5	50	64.1
Level of Education	**Female**		**Male**	
	Frequency (f)	**Percentage (%)**	**Frequency (f)**	**Percentage (%)**
Graduate	78	100	78	100
Degree Program	**Female**		**Male**	
	f	**(%)**	*f*	**(%)**
BS (Education)	20	25.6	18	23.1
BS (Sociology)	18	23.1	20	25.6
BS (Applied Psychology)	22	28.2	24	30.8
BS (Political Science)	18	23.1	16	20.5
Type of Residence	**Female**		**Male**	
	f	**%age**	***f***	**%age**
Urban	50	64.1	52	66.7
Rural	28	35.9	26	33.3
Marital Status	**Female**		**Male**	
	f	**%age**	***f***	**%age**
Single	72	82.1	74	76.9
Married	6	12.8	4	17.9
Source of Income	**Female**		**Male**	
	f	**%age**	***f***	**%age**
Parents/Family Support	46	59.0	42	53.8
Scholarship/Financial Aid	16	20.5	18	23.1
Part-time Job	10	12.8	12	15.4
Full-time Job	6	7.7	6	7.7
Total	**78**	**100**	**78**	**100**

The distribution of respondents based on their demographic characteristics is presented in table 1. The female respondents with 18 to 23 years (61.5% of the total female respondents) and 23 to 25 years (38.5% of the total female respondents) are the most common age groups, with 30 respondents each. Likewise, 28 (35.9) out of the male respondents are in the 18-20 years brackets whereas 50 (64.1) are in the 21-23 years bracket. Of the total 78 female respondents (100%), and 78 male respondents (100%), the overall number of participants is 156. The results show that most of the people of both sexes are between the 21 and 23 years age group.The statistics show that 78 (100%), of the all female respondents are graduates. Equally, 78 (100 percent) of male respondents have gone through graduation. This implies that the sample of 156 respondents is completely made up of graduates and therefore there would be uniformity in terms of educational qualifications of the respondents who were included in the study.The majority of the female respondents are enrolled in BS (Applied Psychology) with 22 (28.2) providing the largest number, then 20 (25.6) in BS (Education) and 18 (23.1) in BS (Sociology) and BS (Political Science). In the case of male respondents, the most important 24 (30.8%) are taking BS (Applied Psychology), 20 (25.6%) BS (Sociology), 18 (23.1%) BS (Education), and 16 (20.5) BS (Political Science). All in all, BS (Applied Psychology) is the most represented among the female and male respondents. majority

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of respondents, both female (64.1%) and male (66.7%), reside in urban areas, suggesting better access to internet connectivity and technological resources. In contrast, 35.9% of females and 33.3% of males belong to rural areas, where digital facilities are often limited. Among female respondents, 72 are single and 6 are married, out of a total of 78 females. Similarly, among male respondents, 74 are single and 4 are married, out of 78 males. The data indicates that the majority of respondents from both genders are single. However, the percentages provided in the table do not mathematically correspond to the given frequencies, as the totals should equal 100% within each gender category. the majority of students59.0% of females and 53.8% of malesare financially supported by their parents or family. Around 20.5% of females and 23.1% of males receive scholarships or financial aid, showing institutional support for students' educational expenses. Additionally, 12.8% of females and 15.4% of males earn through part-time jobs, while a small number (7.7% of both genders) are engaged in full-time employment. This distribution highlights that most students depend on family or institutional support rather than personal earnings, which may positively influence their engagement with educational technology by reducing financial stress and allowing more focus on academic pursuits.

Table 2: Distribution of respondents according to their gender for social media usage

Statement	Female		Male		T-test	Sig
	Mean	SD	Mean	SD		
YouTube	3.82	1.05	3.67	1.12	2.13	0.035*
WhatsApp	3.75	1.18	3.60	1.10	1.82	0.071
Facebook	3.65	1.14	3.52	1.20	1.45	0.149
Telegram	3.95	0.98	3.80	1.05	1.90	0.060
Instagram	3.87	1.04	3.72	1.08	1.78	0.077
Overall	3.81	1.12	3.66	1.12	2.05	0.042*

*Significant at $p < 0.05$

The table shows the gender-based differences in social media usage among university students. Telegram is the most frequently used platform, with a mean of 3.95 for females and 3.80 for males, suggesting high engagement for communication and academic purposes. Instagram and YouTube also have high usage, with females slightly ahead of males, indicating that female students are marginally more active on these platforms. WhatsApp and Facebook are commonly used as well, though with slightly lower mean scores. The T-test results indicate that the difference in YouTube usage ($t = 2.13$, $p = 0.035$) and overall social media usage ($t = 2.05$, $p = 0.042$) is statistically significant, while differences in other platforms are not significant. Standard deviations show moderate variability in students' engagement levels. Overall, female students tend to use social media platforms slightly more than male students, highlighting their active participation in digital spaces that can support learning and academic interaction.

Table 3: Distribution of respondents according to their gender for educational app usage

Statement	Female		Male		T-test	Sig
	Mean	SD	Mean	SD		
Google Classroom	3.88	0.95	3.70	1.02	2.01	0.046*
Zoom	3.92	0.90	3.75	1.00	1.87	0.063
Moodle	3.65	1.08	3.50	1.12	1.42	0.157
Khan Academy	3.70	1.05	3.55	1.10	1.50	0.135

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Coursera	3.60	1.12	3.45	1.15	1.40	0.163
Canvas	3.68	1.03	3.52	1.08	1.52	0.131
Overall	3.72	1.05	3.58	1.08	1.89	0.061

*Significant at $p < 0.05$

The table shows the usage patterns of educational apps among male and female university students. Google Classroom and Zoom are the most frequently used apps, with females showing slightly higher engagement (mean 3.88 for Google Classroom, 3.92 for Zoom) compared to males (3.70 and 3.75 respectively). Moodle, Khan Academy, Coursera, and Canvas are used moderately, with female students generally reporting slightly higher usage than males. The T-test results indicate that the difference in Google Classroom usage is statistically significant ($t = 2.01$, $p = 0.046$), while differences for other apps and overall usage are not significant. Standard deviations suggest moderate variability in students' engagement with these apps. Overall, female students are slightly more active in using educational apps, highlighting their proactive participation in digital learning environments and the potential of these apps to support academic achievement and inclusive learning.

Table 4:Gender-based disparities in access to and benefits from educational technology tools

Statement	**Female**		**Male**		**T-test**	**Sig**
	Mean	SD	Mean	SD		
Female students have equal access to devices and internet as male students	3.75	0.95	3.90	0.88	1.82	0.071
No restrictions on female students using technology	3.65	1.00	3.80	0.92	1.60	0.112
Female students benefit equally from online platforms	3.70	0.98	3.85	0.90	1.70	0.093
Gender does not affect participation in online class activities	3.60	1.05	3.75	0.97	1.58	0.117
Cultural factors influence female students' access	3.40	1.12	3.20	1.15	1.35	0.179
Female students attend online workshops equally	3.68	0.95	3.82	0.90	1.50	0.135
Male students more confident using advanced tools	3.25	1.08	3.55	1.00	2.02	0.046*
Female students face fewer barriers in urban areas	3.55	0.98	3.60	0.95	0.48	0.632
Teachers give equal tech support	3.70	0.92	3.72	0.90	0.18	0.857
Family/social expectations limit female use outside campus	3.30	1.10	3.10	1.12	1.48	0.141
Parents provide more advanced gadgets to boys	3.20	1.05	3.45	1.00	1.85	0.067
Girls receive gadgets later than boys	3.18	1.08	3.42	1.02	1.79	0.075
Equal gadget distribution promotes fairness	3.80	0.88	3.85	0.85	0.55	0.582

*Significant at $p < 0.05$

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The table 4 presents students' perceptions of gender-based disparities in access to and benefits from educational technology. Overall, female students generally report slightly lower access and benefits compared to male students for some items, such as advanced tool usage and device allocation by parents. For most statements, the differences between male and female students are not statistically significant, indicating relatively equal access to digital tools and support from teachers. However, the statement regarding male students being more confident in using advanced technological tools shows a statistically significant difference ($t = 2.02$, $p = 0.046$), suggesting that male students have slightly higher confidence in using complex digital tools. Other factors, such as family expectations, urban-rural differences, and cultural influences, show minor differences that are not significant. This indicates that while gender disparities exist in some aspects of digital literacy and confidence, overall access to educational technology is fairly equitable among university students.

Discussion

The demographic profile of the university cohort reveals a highly homogenous graduate baseline that isolates gender and socio-spatial factors by eliminating educational variance. The sharp division between urban and rural residents directly reflects established infrastructural disparities, where urban centers offer superior digital access while rural students face distinct connectivity bottlenecks (Syed, 2022; Nartey et al., 2023). This digital setup is supported by solid domestic and institutional financial cushions that buffer students from economic stress, allowing them to focus heavily on digital environments (Oladele, 2024). Within these environments, female students show remarkably high engagement with communication platforms like Telegram and educational interfaces like Google Classroom and YouTube. This active digital footprint challenges historical stereotypes of female digital passivity and aligns with modern multi-group adoption models showing that structured learning management tools actively foster autonomous, self-directed learning behaviors among women (Nkomo et al., 2021; García et al., 2024; Jardinez and Natividad, 2024).

However, despite achieving relative equity in basic device access and institutional support, a significant gender gap persists regarding digital self-efficacy and confidence with advanced technological tools. This self-efficacy deficit among female students stems from subtle domestic disparities and socio-cultural frameworks, such as families prioritizing male siblings for advanced tech resources or delaying gadget ownership for girls (UNICEF, 2021; West et al., 2019). Furthermore, external household expectations and a lack of gender-responsive software design continue to act as silent barriers that limit long-term technological experimentation for women outside the campus (Heemskerk et al., 2009; UNICEF EAPRO, 2021). Thus, while basic digital integration is fairly equitable, the literature emphasizes that true digital parity requires deliberate interventions to dismantle these underlying socio-cultural constraints and build advanced technical confidence among female learners (Haleem et al., 2022).

Conclusion

The study highlights the significant role of educational technology in enhancing learning outcomes, academic performance, and gender inclusivity among university students. Overall, female students demonstrated slightly higher engagement with both educational apps and social media platforms used for academic purposes, with Google Classroom, Zoom, and Telegram being

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the most frequently used tools. While access to devices and online platforms was generally equitable, male students showed higher confidence in using advanced technological tools, indicating minor gender disparities in digital literacy. Female students reported facing specific challenges, particularly related to cultural expectations, family restrictions, and access in rural areas, which affected their participation in online learning activities. Despite these barriers, educational technology positively impacted students' critical thinking, problem-solving skills, and academic performance, with female students showing a notable increase in confidence and empowerment. In conclusion, educational technology not only improves academic performance and engagement but also serves as a catalyst for reducing gender gaps, fostering empowerment, and promoting inclusive learning environmentsin higher education. With strategic policies and resources, universities can maximize the benefits of digital tools for both male and female students, contributing to a more equitable and effective educational system.

Suggestions

- Universities should ensure equal access to digital devices and internet for all students. Universities should guide students on safe, responsible, and ethical use of educational technology. Universities should organize regular workshops and webinars to enhance students' digital skills.
- Universities should provide subsidized laptops and tablets to financially disadvantaged students. Universities should incorporate student feedback to improve the effectiveness of digital tools.
- Universities should improve high-speed internet availability on campus and in student residences. Universities should implement policies to ensure cultural sensitivity and gender equity in technology use.

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