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FACTORS SHAPING THE GENDER DIVIDE IN DIGITAL COMPETENCE AMONG SECONDARY SCHOOL TEACHERS IN LARKANA

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Abstract

The teachers have a crucial responsibility to transform knowledge and skills to the next generation. In the digital era, the integration of digital competency among teachers is essential to effective teaching practices. The current study assessed the gender divide in digital competency among the secondary (public and mid-tier private) school teachers in the district of Larkana, Pakistan. A quantitative survey design was employed and the data were collected from 256 teachers (128 from mid-tier private schools and 128 from public sector secondary schools), and accessing an adapted Faculty Information and Communication Technology Access (FICTA) scale, consisting of 18 items on five-point Likert scale. Three digital skills i.e. operational- informational- strategic were evaluated focusing on digital competency. The regression analysis reveals a statistically significant influence of these three digital skills on the gender difference in digital competency. The study recommends investigating additional factors such as the experiences of teachers with digital skills, strategic approaches to study, and the influence of adopting technology on students' cognitive skills.

Keywords: Digital Competence, Gender Divide, ICT in Education, Secondary school teachers, Larkana

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INTRODUCTION

Information and Communication Technology (ICT) is one of the rapidly developing fields in the global society (Sarkar, 2012). Reportedly the projections to access the computer and the Internet have made drastic changes globally, amongst the different countries (Livari et al., 2020). For instance, developing countries such as Pakistan have contributed a noteworthy position in the development of ICTs, especially in mega-cities e.g. Karachi, Lahore, and Islamabad (Jamil, 2021). They advanced in ICT at the international level (Shokat, 2018) and incredible development is noticed in the field of Education. ICT is becoming a necessary part of our lives (Zubairi et al., 2021). Particularly young generation is incorporating these technologies into their daily routine (Butt et al., 2020), and universities are paying full attention to emerging these technologies in Education all over the world (Kale & Goh, 2012). It is emphasized in National Education Policy (2017) that "ICTs shall be used to strengthen the quality of teaching and educational management". This study examined the gender and Public-Private divide in digital competencies among secondary school teachers of Larkana. Since this study tries to fill this gap in the literature and differs from other studies, it is expected that it adds to the existing theory of the digital gender divide and relevant literature.

RESEARCH QUESTIONS

The study aimed to assess the factors of the gender divide in digital competency for both public and private secondary school teachers in Larkana. In nature, the study addressed the following research questions:

1. Is there a significant difference between Operational skills and male/female teachers for digital competency in public-private secondary schools in Larkana?
2. Is there a significant difference between Informational skills and male/female teachers for digital competency public-private secondary schools in Larkana?
3. Is there a significant difference between strategic skills and male/female teachers for digital competency in public-private secondary schools in Larkana?

RELEVANT LITERATURE

ICT AND DIGITAL DIVIDE

At present, we are living in an era and society of information and it is linked with the transformation and globalization of society (Yıkılmaz, 2020; Alampay, 2006). Socioeconomic progress is significantly dependent on information in such a society (Rodionov et al., 2021; Kuteesa et. al 2024). Because the economy of the world has shifted to a fast-paced economy that is grounded on information from slow-paced basic industries (Shafique & Mahmood, 2008). As a result, rapid and deep changes have occurred in the social, cultural, political, and economic aspects of our society (Bose & Jalal, 2022). Information and Communication Technology (ICT) has become unavoidable in society; and it has completely exaggerated every walk of today's life (Amutha, 2020). No doubt ICT acts as a booster of socioeconomic expansion and it is transforming the way people socialize, entertain, educate, perform jobs, and businesses (Olojo, 2021). As a common factor, the spreading of ICT in society is considered an important sign of a nation's development and success (Hanafizadeh et. al 2013). Though access to ICT itself does not assure improvement in society (Ziemba, 2019), it is the reaction of people that matters once they are given access to digital technologies (Alampay, 2006). Similar to other sections of society, the use of ICT has a progressive result for students and teachers as well as for educational organizations (Saad & Zainudin, 2022; Youssef, 2013). ICT has become an important part of education (Saif et al., 2022) and its effect on teaching-learning

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progressions is widely acknowledged (Ait Tali & Belhaj, 2025). The utmost reliable characteristic of evolving technologies is their usage as a common tool, which supports education to become a dynamic and developing practice (Tsikala Vafea et al., 2020). A new surge of emergent technologies is Web 2.0 which can enable student's education through sharing information and thoughts and practicing collaborative writing (Goh & Kale, 2015). However, access to the notable implements for communication and collaboration is virtually a non-issue (Lacy et al., 2022), and if students-teachers have internet connection and computers, subsequently the teachers and institutes no longer need to pay for expensive hardware to offer their learners digital content or server-based applications (Ertmer, 2012). In classrooms technologies can be used in both manners: student-centered and teacher-centered (Kuteesa et. al 2024).

DIGITAL DIVIDE ON GENDER BASE

Women living in developing countries are facing a major problem of gender discrimination (Ali et al., 2022; Vossenberg, 2013). As a result, most of the females are unemployed due to no or less access to internet and communication technologies (United Nations, 2016). According to Thomas (2014), 25% of women in Middle Eastern countries and 45% of women in Sub-Saharan African countries lack internet access and due to this reason they are more spoilt in completing their household tasks. According to UN data statistics, more than 60% of women are unemployed (Acilar & Sæbø, 2023). Isolation from technology awareness, support for men as compared to women, and financial concerns are shown as the main problems in the way technology usage (Kulkarni & Ghosh, 2021).

The use of digital technology influences the efficiency of socio-economic status (Sanina, Balashov & Rubtcova, 2023), making the teachers more competent to transform the instructional behavior in the classrooms (Zabolotska et al., 2021). This helps the students be more engaged, motivated, and determined in the learning process.

Digital skills connect teachers globally (Gisbert Cervera & Caena, 2022), accessing online resources, learning forums, and online teaching processes (Ferri, Grifoni & Guzzo, 2020). Due to gender imbalances, female' teachers face issues in getting more skilled in digital technology and transforming in line with current digital teaching and learning mechanisms (West, Kraut & Ei Chew, 2019). The perceptions towards digital literacy and teaching are positive among the teachers, and students' development (Pratolo & Solikhati, 2021) for development and to have a career, digital literacy and skills are most important. It increases the chance of employment in most institutions and industries (Acilar & Saebe, 2023). In developing countries like Pakistan, the gender disparity is higher, where equipping teachers, especially females (Jamal et al., 2023), can enhance their pedagogical ability and motivate them to have higher courses and training, such as online teaching courses via different websites are easily accessible, improve teacher teaching methodologies and digital competencies (Rafiq et al., 20)

Teachers with digital capacity can enhance the content for teaching with the use of digital skills (Beardsley et al., 2021), but the gender gap affects the learning of digital skills, due to gender gender-based digital divide (Falloon, 2020). However, in rural and urban region schools, often girls' schools' teachers lack the skills, due to gender differences (Sáinz, et al., 2021). In this AI-based digital teaching era, where chatbots and machine learning brought a new digital platform (Gill et al., 2024), female teachers lack to operate a personal computer, while skills in AI-based tools and digital technology seem to be a dream in majority of public schools of Sindh province of Pakistan (Khurshid, Khurshid & Toor, 2024), similar status is with private school but a little improvement and digital trainings and

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awareness (Jamil, 2021). Developed countries such as Japan, Finland, and Germany have transformed into smart classrooms, using a flip system of learning (Saini & Goel, 2019) whereas in Pakistan it is yet a dream come true (Jan, Sultana & Adnan, 2020). However, few elite private schools have successfully adopted this digitally equipped classroom model (Ali, Ashraf & Yasmin, 2020), with high fees where only high-income families can enroll their children (Abbasi & Hussain, 2024), and the female teachers in such schools are fully equipped with digital skills and teaching (Khoso, Nisa & Shah 2019). Such as in Karachi many such schools such as the city school system (Mehmood & Taresh, 2024), Beacon House system, and many more, where gender disparity is hardly observed, as both male and female faculty are equally equipped with digital literacy and skill in adopting digital pedagogical skills (Raza, Gilani & Waheed, 2021).

DIGITAL DIVIDE ON AREA BASE

It is detected that only gender and age are not the hitches that are generating the digital gap. But there is a leading imperative element which is an area of an individual. Several causes are stressed in a study carried out in the US and all over the world. Some of the major problems are identified as; the less or no frequent use of technological tools in the classrooms (Kuteesa et. al 2024). Unavailability of technology, and inadequate bandwidth in rural areas (Dugdale, 2013).

Studies such as (Kutessa et al., 2024) argued that the digital divide in context to gender disparity is alarming, where area often matters such as disparity in rural and urban areas. The young teachers consider the digital divide in the urban region of Pakistan, such as the province of Sindh for the growth in technological implications and ICT efficiency. Perhaps Dugdale (2013) in contrast argues that senior teachers have less digital competency in mega cities i.e. Karachi and Hyderabad. Larkana City faces a lack of digital competency among senior teachers in public secondary schools, while the case is different with the private sector where the majority of the teachers belong to the young generation (Abbasi & Hussain, 2024).

DIGITAL IMMIGRANTS

In teaching development, skills in pedagogy the digital immigrants, those teachers' experiences, and old age groups lack digital capabilities (Jan, Sultana & Adnan, 2020), while the younger generation teachers are digitally equipped with more digital pedagogical skills (Asad, Gul & Lashari, 2020). The digital immigrant has old teaching practices (Channa et al., 2025), while the current era has transformed into smart classrooms and flip teaching practices (Venkatraman et al., 2022), the use of digital tools makes effectiveness in teaching, and the use of AI in current modes of teaching (Artal-Sevil, Romero & Artacho, 2019). This is one of the disparities between old passion teachers and young generation teachers' skills in digital technology (Jafri, 2024). It is usually considered that young teachers are more competent, all because of digital skills and pedagogical techniques with the application of digital technology and AI-driven tools (Jan, Sultana & Adnan, 2020).

The age group disparity is a matter of concern in this research paper, age disparity shows that digital immigrants have potential, and knowledge (Waqar et al., 2024) whereas they lack digital competency makes it hard to survive in the current trends of teaching and learning process (Muslim et al., 2025). The young generation has more opportunities, who be connected to AI-driven tools, knowledge of digital technology, and online teaching and learning (Ghani et al., 2024).

The COVID-19 pandemic has transformed teaching more online and virtual, here lack of digital literacy brings challenges to those school teachers who have fewer digital skills and

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knowledge (Soomro & Niaz, 2023). The lockdown has made education more digital, online degree enrolment, learning via the use of internet services, and new learning applications and forums (Portillo et al., 2020), such as HEC initiatives of E-courses for the teachers and students via the use of Coursera platform made effectively mode, reducing the gender-based competency, letting digital immigrants have digital knowledge and skills (Alqahtani & Mohammed, 2020).

METHODS

Based on the research paper objectives, the quantitative research methodology was used, adopting survey research measuring the factors of the Gender Divide in Digital Competence among Public and Private Secondary School Teachers of Larkana. Two out of four Talukas (Ratodero and Larkano) were selected through the Convenience sampling technique schools were selected via stratified sample technique and participants were selected using purposive sampling based on the availability of teachers. The questionnaires were distributed among 270 participants out of which 256 participants returned with their opinions. Dr Kamal Ahmed Soomro's Faculty Information and Communication Technology Access (FICTA) Scale containing 18 items on Operational skills (7 items), Informational skills (5 items), and Strategic skills (6 items) was adopted for the study. Scale reliability was 0.856 Chronbach's alpha. According to Creswell (2012), if the Alpha value is greater than 0.7, it shows the acceptability of the tool. For ethical considerations permission was taken from Dr Kamal Ahmed Soomro to use his developed Scale for this study and every individual was asked for his / her willingness to participate. Data was collected through personal visits, this procedure ensured and clarified to respondents about language ambiguity.

DATA ANALYSIS

Data was analyzed using SPSS software, based on the value of Cronbach's alpha 0.856, measured to indicate the scale reliability was acceptable. Further demographic analysis and use of linear regression were carried out to test the hypotheses measuring the three different factors of digital competencies on both male and female teachers, in the secondary school teachers of district Larkana, Sindh province.

FINDINGS

This research study was conducted in District Larkana, involving 256 secondary school teachers (Public-private). Based on the demographic information such as gender, institution type, and teaching experience, the charts described in the following;

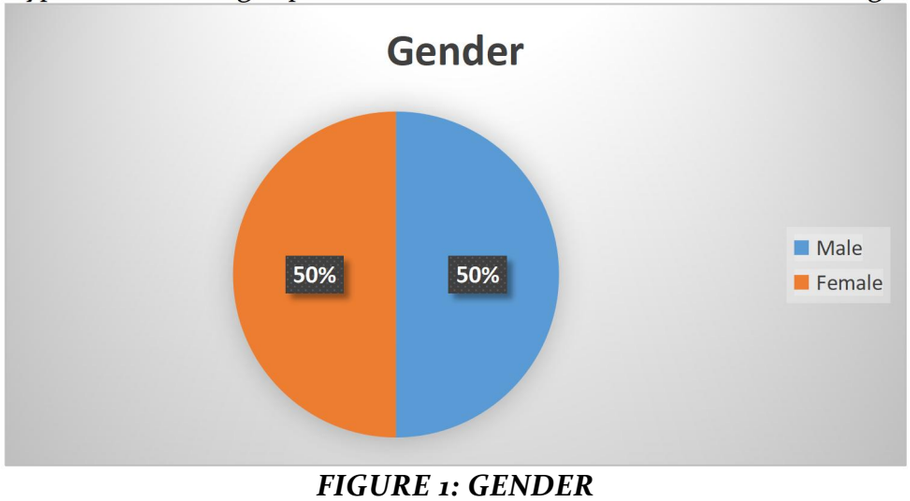

FIGURE 1: GENDER

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The chart illustrates that both male and female participation was equal, sharing a participation percentage of 50%, based on 128 males and 128 females both from the public and private sector secondary schools of Larkana.

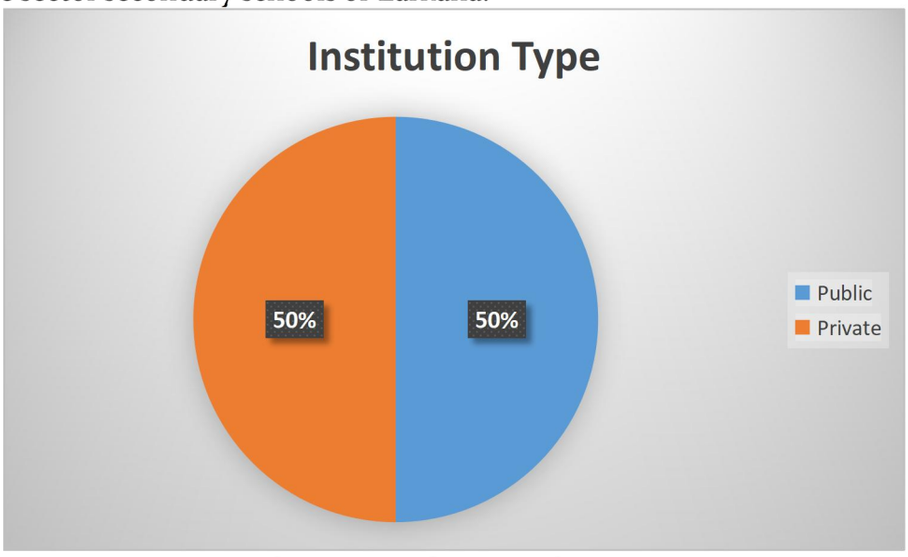

FIGURE 2: INSTITUTION TYPE

In consideration of the type of institutions, the respondents who participated in the study equally belonged to both public and private secondary schools, covering 50% each. This shows that both sectors are equally represented to indicate the digital divide and competency of the teachers.

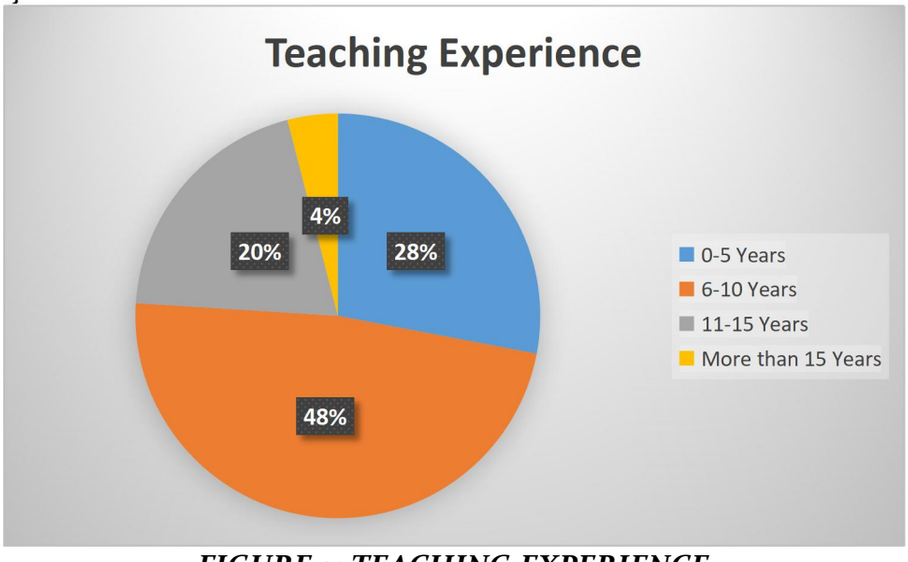

FIGURE 3: TEACHING EXPERIENCE

Referring to the chart above, the majority of the teachers n=123 (48%) have teaching experience of 6- 10 years, n=72 (28%), and n=51 (20%) have teaching experience of 0-5 years, and 11-15 years respectively. Only n=10 (4%) teachers have the teaching experience more than 15 years.

REGRESSION ANALYSIS

Regression analysis is an important tool used for statistical measurement to check the relationship between two variables and how the independent variable influences the dependent variable. In the current study, linear regression was used to evaluate the impact

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of digital technology on secondary school teachers, both male and female, based on their gender, in Larkana, Sindh province. This relationship was examined using three independent variables Operational Skills (OS), Informational Skills (IS), and Strategic Skills (SS), whereas the impact is observed on gender (both male and female teachers) in the secondary schools (private and public). The analysis was based on the following theoretical model to test the research hypotheses:

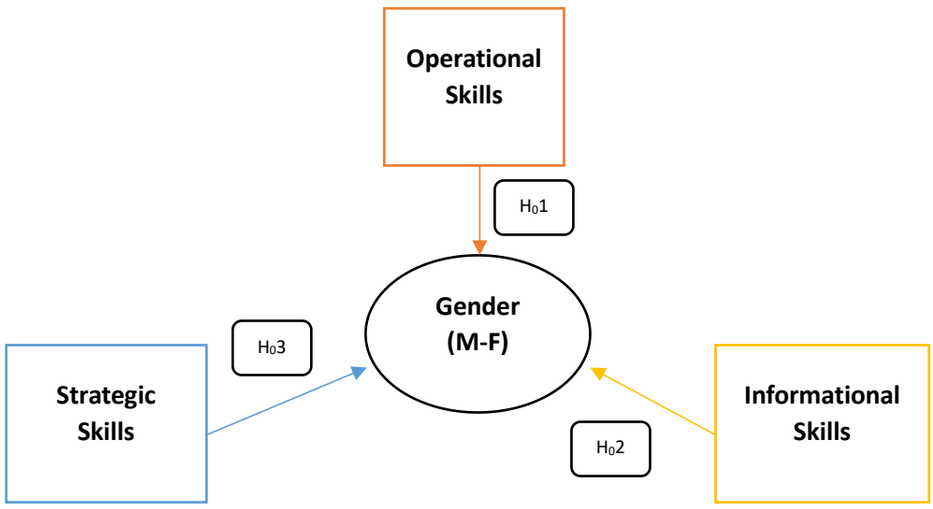

FIGURE 4: THEORETICAL MODEL
SOURCE: AUTHORS

In an analysis of these three major factors, it was aimed to check the gender differences concerning digital competency in the teaching and learning process, in both private and public secondary schools in Larkana. The analysis was critically based on the digital divide specifically gender based, such as male and female teachers. The results reveal that all hypotheses have statistically significant results, with R-value, beta coefficient, t-test, and f-test, confirming significant relationship and influence of OS, IS, and SS on the gender digital competencies, in teaching across the secondary schools, either in private or public.

This section presents the hypotheses testing results using linear regression analysis to examine the impact of Operational Skills (OS), Informational Skills (IS), and Strategic Skills (SK) on gender differences among public and private secondary school teachers in Larkana. The regression model evaluates whether these digital competency skills significantly predict gender-based differences.

Table 1, regression analysis illustrates the relationship between OS, IS, and SK with MF, based on R-value, Beta, T-value, F-value, and p-value, as discussed in the following:

TABLE 1: REGRESSION ANALYSIS

Model	R	R Square	Std. Error	Standardized Coefficients (Beta)	T value	F value	p-value
OS → MF	.759[a]	.577	.62498	.759	11.726	137.498	.000
IS → MF	.819[a]	.672	.55039	.819	14.371	206.518	.000
SK → MF	.862[a]	.743	.48643	.862	17.109	292.713	.000

The relationship between operational skills and male and female teachers in secondary schools in Larkana has a strong positive relationship and statistically significant impact

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with an R-value of 0.75 and p-value of 0.000. The variation of relationship shows a 57.7%, validation based on t-value (11.726) and f-value (1127.498). This reveals a significant impact of operational skills on gender (male and female teachers), in the context of digital competency of teaching at public and private schools.

The table shows that the influence of IS on MF is strongly significant with Beta and R-value of 0.8119, where variation shows to explain the variables strongly at 67.2%, including t-value (14.371) and f-value (206.518), shows if IS increases the MF tends to increase. The P-value 0.000 shows a statistically strong and significant relationship between the two variables.

In the relationship between strategic skills and male/female secondary teachers about the digital divide and competency; the table shows a very strong significant influence of SK on MF. However, the R-value and coefficient beta 0.862 show a strong positive relationship between the two variables, the variation of 74.3% indicates if the SK increases the MF tends to improve or increase. The p-value of 0.000 shows a statistically strong significant relationship between the independent variable and with dependent variable.

HYPOTHESES TESTING

As indicated in the analysis above, all three relationships have a significantly strong relationship with the gender, such as male and female teachers, for enhancing the digital competency in teaching at secondary schools (public and private) in Larkana. The table below shows the hypotheses testing validation such as P-value, R-value, and either hypotheses accepted or rejected.

TABLE 2: NULL HYPOTHESES TESTING

Hypothesis	R-Value	P-value	Status
H_{01}: OS_MF	.759[a]	p <0.05	**Rejected**
H_{02}: IS_MF	.819[a]	p<0.05	**Rejected**
H_{03}: SK_MF	.862[a]	p<0.05	**Rejected**

Null Hypothesis (H_{01}): There is no significant difference between Operational skills and male and female teachers for digital competency in the public-private secondary school of Larkana.

The null hypothesis (H_{01}) was to test that there is no relationship between OS and MF teachers for digital competency in public-private secondary schools in Larkana, Sindh. However, the results show that OS has a significant relationship with MF, indicating with R-value (0.59) and p-value less than 0.05. Hence, the H_{01} was ***rejected***. It shows there is a significant difference between OS and MF teachers for digital competency in public-private secondary schools of Larkana.

Null Hypothesis (H_{02}): There is no significant difference between Informational skills and male and female teachers in the Public and private secondary schools of Larkana.

The regression analysis results show that IS has a significant and strong relation with the MF teachers for digital competency in Public and private schools of Larkana. The testing indicates an R-value of 0.819, and a p-value less than 0.05. It ensures a positively strong relationship between IS and MF. Hence, the H02 was ***rejected***. Stating that there is a significant difference between Informational skills and male and female teachers in Public and private secondary schools of Larkana.

Null Hypothesis (H_{03}): There is no significant difference between Strategic skills and male and female teachers of private secondary schools teachers of Larkana.

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In the study, using the regression analysis results indicate that SK and MF for teachers' digital competency have a strong relationship, with an R-value of 0.826 and a p-value less than 0.05, and it shows that H03 was rejected. Perhaps, there is a strong and significant difference between SK and MF teachers for public-private secondary schools in Larkana.

Hence, the three digital competency skills have an impact on gender, such as male/female teachers for the secondary schools both private and public in Larkana. The findings are further discussed with the help of empirical evidence and a literature review.

DISCUSSION

In study findings conveyed based on the empirical evidence, considering factors such as Operational Skills, Informational Skills, and Strategic Skills, as major competencies for the digital divide for teaching secondary schools in Larkana. The null hypotheses testing was carried out using regression analysis, where all three competencies indicated different values but strongly positive, such as OS (R-value =759, IS (R-value =819), and SK (R-value =862) indicating the strong influence of digital skills on the gender, both male and female teachers' digital competency in the process of teaching the secondary schools in Larkana. The gender-based digital competency indicated with variance such as OS (57.7%), IS (67.2%) and SK (74.3%) indicates that digital knowledge is effectively distributed among both genders for training and education. Thus, all null hypotheses were rejected, based on the strongly positive relationship between digital skills and the gender divide.

Moreover, the findings for the operational skills such as Beta (0.759) show a strong relationship, with a p-value of 0.000 proves to build a strong significant impact on the gender. The findings can be connected to the studies e.g. (Vossenberg, 2013; Mahmood;2009) who expressed that the role of technology in enhancing the skills of males/females for the operation of developing countries like Pakistan, and the province of Sindh cannot be ignored drawing the operational skills of teachers making the education system up to date and effective pedagogical contributions. The literature highlighted the importance of digital skills such as operational, to use basic skills in strengthening the teaching skills among male and female teachers for private and public sector schools in Larkana, Sindh province of Pakistan.

The informational skills proved to have a strong correlation (Beta = 0.819) and a statistically positive relationship such as a p-value of 0.000, all indicate how strongly the IS influences the gender, such as male and female teachers to be involved in the effectiveness of digital competency, using for pedagogical grounds in the secondary schools in Larkana. The studies such as (Erthmer et al., 2012; Youssef et al., 2013) found a close relation to the study's empirical findings, indicating that a culture of digital information among teachers is a necessity and important in Pakistan, developing a digital divide among secondary school teachers. One of the reports of the UN (2016) that in most developing countries, the services of internet surfing affect information skills and development, this requires both genders in Larkana, Sindh to represent the institutions with the use of effective skills and learning, drawing experience to have digitally up to date for the developing of secondary level education in Pakistan.

The third digital skill, such as strategic skills has strong integration and involvement in the development of gender digital competencies such as Beta (0.862) and p-value of 0.000, highlighting statistically strong relationship and association. It suggests that disparity needs to be addressed between male and female teachers in adopting digital strategic skills for innovation in teaching and learning. Addressing that Shafique and Mahmood (2008) argued that women often have limited access to digital skills, whereas

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Alampay (2006) found that the environment needs to be developed in the education setting, letting both genders have equal opportunities in ICT, bridging the boundary to get into gender divide for digital competency in secondary s schools in Larkana, Sindh.

It is a common trend in Pakistan where women often get access to leadership opportunities, and play a role in ICT in education. They lack opportunities, due to societal demands getting access to digital competency. This is important for both male and female teachers to receive equal opportunities to become digitally skilled and competent in Pakistan's education setting, especially at the secondary school level in Sindh province.

CONCLUSION AND RECOMMENDATIONS

The study based on the investigation of the factors shaping the Gender Divide in Digital Competence among Secondary School Teachers in Larkana revealed that due to gender disparity, leading to a lack of digital skills among female teachers is a major imbalance that needs to be properly addressed, both in private and public secondary schools in Larkana.

The presence of disparity can be reduced in training the female teachers in public schools, and encouragement in the private schools. Though the nature of the private school is quite better, about gender, the females have fewer opportunities to be trained and professionally skilled based on equity. In the Larkana region, for this issue, both private and public schools have a somewhat similar challenge to be properly addressed and controlled based on initiating policy measures and the right decisions from the district education authorities, and governance.

Effective measures can be imitative such as equitable access to ICT services, policy measures to train the female teachers in public schools, and directing the private schools to equip the schools with digital tools for teaching and proper guidance and special short courses for the female staff. The trend can strengthen digital literacy equally among males and females.

In addressing the digital divide between male and female teachers, the school administration shall convince the provincial government to provide digital equipment with proper workshops to train the public sector teachers and direct the private schools to ensure digital competency among both male and female teachers. Female teachers shall be encouraged to access the computer, internet e-courses, and teaching services, or use technology in instructing the students, such as flipped learning or online classes for extra time to the students grasp the difficult concepts.

No doubt, addressing the gender disparity in the context of digital competency can improve the quality of teaching and learning, and lead to competitive classrooms equipped with digital interaction and tools, meeting the global pedagogical standards. For instance, besides the key findings and recommendations, future researchers can conduct a gender digital divide in the different modes of private schools, such as elite private schools executing digitalization in an effective way, where both male and female teachers are digitally well-trained, in comparison to moderate and low private schools in Larkana, Sindh, the province of Pakistan. It can be addressed by researchers to investigate additional factors such as the experiences of teachers with digital skills, strategic approaches to study, and the influence of adopting technology on students' cognitive skills.

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