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RESEARCH PAPER

Effect of Digital Stress on Students' Online Learning Readiness: University Students' Standpoint

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ABSTRACT

Digital stress has significant effect on students' online learning readiness. The main aim of this study was to examine university students' standpoint concerning effect of digital stress on their online learning readiness. Data were collected from 509 participants enrolled in two universities, located in Khyber Pakhtunkhaw who were selected randomly. A survey questionnaire, consisted of two scales, digital stress scale and online learning readiness scale were used to measure the perceptions of students. To analyze the collected data, Mean score, Standard Deviation, Pearson's correlation and Regression analysis were applied. Results of the study revealed that students strongly agreed that digital stress had an effect on their online learning readiness with mean score higher 4.00. All the four hypotheses of the study were accepted which indicate that mode of delivery (r=.960), comfort level (=.918), capacity to learn (r=.833), and learning atmosphere (r=.712) had strong effect on online learning readiness of students in the context of Pakistan. It is concluded that digital stress is a strong predictor of online learning readiness of university students. Policy makers and developers may focus on this important issue while developing policies or developing curriculum for online education. Further studies are recommended to test these results in other contexts. Since this study, was confined to Malakand region, researchers may investigate other variables such as gender, ethnic differences or region wise effect of the variables to have wider understanding of the issue.

KEYWORDS Digital Stress, Malakand Region, Online Learning Readiness, University Students

Introduction

Higher education institutions have changed the way they teach students these days from in-person to online, especially in the post-pandemic environment. Online learning comes with a lot of advantages. Research, however, has shown that online learning is difficult in many ways, and that students struggle to manage the difficulties. Hence, they experience stress. The unexpected consequences of the increased usage of information and communication technology including effects of digital stress is the subject of a substantial amount of research (Händel, Stephan, Gläser-Zikuda, Kopp, Bedenlier & Ziegler, 2020; Muzaffar, Chohdhry, & Afzal, 2019 & Muzaffar, 2016)). Students' readiness to participate in online classes is influenced by their learning environment and capacity for learning (Van, Abbas, Abuhassna, Awae & Dike, 2021). In an age of digital media, it seems that more people will be utilizing digital technologies in future. Scholars opine that the swift assimilation of digital technology poses a risk to the psychological and physiological welfare of persons, and that suboptimal mental health could be associated with perceived

stress, excess, or fatigue during the utilization of digital technology (Xiao & Mou, 2019; Fox & Moreland, 2015).

Mental health issues have been connected to digital stress. Reinecke, Aufenanger, Beutel, Dreier, Quiring, Stark, and Müller (2017) claim that internet based multitasking and communication overload people's stress, which causes burnout and anxiety in those between the ages of 14 and 65. According to longitudinal research, utilizing mobile social networks raises the risk of information overload, which can have an adverse effect on wellbeing causing depression (Matthes, Karsay, Schmuck, & Stevic, 2020). Additionally, the statement "learning includes cognition" is made clearly and separately when discussing learning. To produce a satisfactory outcome, it makes use of a number of cognitive functions, information, and representational manipulations. Terms like "mobile imprisonment," "information overload," "social media fatigue," and "Facebook-induced stress" have been used to characterize these issues (Xiao & Mou, 2019). These ideas have been summed together and labelled as "digital stress" by researchers (Steele, Hall, & Christofferson, 2020).

Stress can affect cognition in a variety of ways, from mild to severe. Studies show that stress impairs cognitive function, which makes learning more difficult. Stress negatively impacts learning as well since it weakens memory in people. Adaptability becomes a question when learning happens online instead of in a traditional classroom. Rapid adaptability is facilitated by neuroplasticity. Additionally, the method-based, digitally multitasking nature of online education makes visual stimuli representation possible even though it may hinder communication. The burden impairs the ability to process and understand what is spoken or taught (Kabir, Nasrullah, Hasan, Ahmed, Hawlader, & Mitra, 2021). These worries about e-learning as well as the present uncertainties have led to a rise in tension among students. Their academic performance and psycho-physiological health have been negatively impacted by ongoing stress, since stress and tension have been linked to a number of physical and mental illnesses. While it appears that online learning will grow in popularity, students still need enough time, parental guidance, and support from educational institutions and families (Malik & Javed, 2021). The idea of an "e-learning crack-up" has a significant effect on students' psychological discomfort and anxiety about the upcoming academic year (Hasan & Bao, 2020). Comparably, survey data from Cao, Fang, Hou, Han, Xu, Dong, & Zheng (2020) revealed that about 25% of students experience extreme anxiety as a result of an e-learning malfunction. Over 83% of students have serious disorders, and 26% do not have access to psychiatric therapy. Because of their poor impression of the e-learning system, Hasan and Bao (2020) claim that this problem presents an urgent necessity to research anxiety among college students.

Researchers have examined the psychological well-being of online learners, primarily in foreign countries (Thandevaraj, Gani, & Nasir, 2021), as well as the impact of the virus on learners' emotional well-being (Browning, Larson, Sharaievska, Rigolon, McAnirlin, Mullenbach, & Alvarez, 2021). On the other hand, not much research has been done to examine how learning online affects sadness and anxiety related to school (Mahyoob, 2020; Malik & Javed 2021 & Kabir et al.,2021). But in the current era of online learning, going beyond obstacles is essential to convert into a developing nation like Pakistan effectively and being prepared for a catastrophe down the road.

Digital stress and online learning

Around the world, education has undergone tremendous changes as a result of the rapid digitalization of learning. One of the consequences of this shift is digital stress

(Kumar, 2021). Apart from the numerous benefits that remote learning provides, students are seeing a rise in digital stress these days (Kabir, Hasan & Mitra, 2021). In the present situation, Pakistan's higher education system is likewise changing quickly, particularly in the wake of the Covid-19 pandemic. Nevertheless, in the past, the nation's educational institutions used various online teaching and learning methods for instruction. More recently, though, the government suggested that higher education institutions follow certain policy guidelines in order to progressively switch to online instruction. This has caused teachers and students to face additional stress as they attempt to manage their time effectively, access online resources, prepare for classes, and other issues. These and numerous other factors have made teachers and students particularly stressed out; in many locations, internet access is limited, and in other locations, students are unable to use digital tools, which only make them more stressed (Saqib, Nasir, Gull, Alabbad & Iqbal, 2021).

E-learning is a cutting-edge approach to education that gives students access to material via electronic media and the internet. Under such conditions, their performance might be affected by their preparation. Technology availability, utilization, acceptance, confidence, and the need for training are all components of e-learning readiness (Ünal, Alr, & Soydal, 2014). Moreover, the statement "learning encapsulates cognition" frequently surfaces in discussions about learning (Sandi, 2013). To get the right reaction, it involves a range of procedures, expertise, and brain representation alteration (Kabir.,et al.2021). Stress can affect cognition in a number of ways, ranging from mild to severe (Sandi, 2013). According to studies, stress impairs learning and has an adverse effect on our brain and cognitive performance (Chaby, Sheriff, Hirrlinger, Lim, Fetherston, & Braithwaite, 2015). Human memory is also negatively impacted by stress when learning digitally (Hood, Pulvers, Spady, Kliebenstein, & Bachand, 2015). Additionally, while neuroplasticity facilitates quick adaptation, there are hazards associated with adaptation as traditional classroom instruction gives way to online learning (Jha & Arora, 2020). Online education, which is usually multi-functional and involves digital multitasking, lead to decreased face to face communication. Consequently, the added burden causes problems with processing and understanding the information as recipient of communication has to do all alone which induces stress (Carr, 2020).

Since, it can be challenging for students to quickly transit from in-person to digital learning, not all students are ready for online learning. Face-to-face and online learning are different in that the former allows for direct classroom interaction (Shand & Farrelly, 2017) and human psychological interactions throughout the learning process, both of which help students increase their knowledge of the subject (Hurst, Wallace, & Nixon, 2013). As long as a person has internet access, online learning can be time and place efficient, but it cannot provide a feeling of direct mental and social contact (Stone, 2018; Vanslambrouck, Zhu, & Lombaerts, 2018). Different stress levels can have different effects on cognition, ranging from low to high (Sandi, 2013). One study found that digital stress affects the mind and cognitive function, which may limit our capacity to learn (Chaby, Sheriff, Hirrlinger, & Braithwaite, 2015). When someone tries to handle or adjust to pressure, stress arises. It is defined as an adverse physiological, behavioral, cognitive, and emotional reaction by Prabu (2015). It is critical to keep in mind that stress can have both beneficial and adverse effects on individuals simultaneously (Bataineh, 2013).

In Pakistan, online education has been already officially approved for use in academic institutions. However, the extensive application of recently developed online learning methods has come under fire for increasing mental health problems, like felt stress, among students (de Oliveira Arajo, de Lima, Cidade, Nobre, & Neto, 2020; Fawaz & Samaha, 2021). Even though many organizations have started offering online courses and programs, students who were not accustomed to online learning encountered culture

shock when they participated in entirely online instruction-based programs. (Ngampornchai & Adams, 2016). Furthermore, Kabir, Hasan, and Bhuya (2021) reported that the rapid adoption of e-learning into curricula nationwide caused anxiety in students.

Recent studies have shown that technology, academics, and communication issues are the main factors driving the excessive use of online learning (Hao, Shah, Nawazb, Barkat, & Souhail, 2020; Mahyoob, 2020; Sharin, 2021). Furthermore, students are not given enough opportunities to learn because of discrimination against larger family facilities (Jager & Blaabaek, 2020). Research on digital disparities undertaken during the COVID-19 era indicates that most educational institutions were adopting online courses (Beaunoyer, Dupéré, & Guitton, 2020). Low internet connectivity and an uncomfortable learning environment make it particularly challenging for students from rural areas and poor communities to study during this outbreak (Kapasia, Paul, Roy, Saha, Zaveri, Mallick & Chouhan, 2020). Scarce research has focused these phenomena in the context of Pakistan. The present study wanted to examine the extent to which the university students experienced digital stress whether studying online or getting ready for online classes. Therefore, the purpose of this research was to collect empirical data regarding how university students in the Malakand division were prepared for online learning in relation to digital stress.

Research Hypotheses

$H_0$1: There is no effect of mode of delivery on online learning readiness of university students.

$H_0$2: There is a no effect of comfort level on online learning readiness of university students.

$H_0$3: There is no effect of capacity to learn on online learning readiness of university students.

$H_0$4: There is a no effect of learning atmosphere on online learning readiness of students.

Material and Method

The current study was conducted by using a quantitative correlation design. In a correlation studies, the degree and direction of relationships among variables are studied. In this study, the relationship between digital stress and online learning readiness of university students was examined. The four levels of digital stress such as mode of delivery, comfort level, capacity to learn and learning atmosphere on online learning readiness of students were tested.

To collect students' viewpoint, all students of public sectors universities in Malakand division constituted the population of this study. The study was delimited to two public sector universities, the University of Malakand and the University of Swat, due to financial resource and time constraints. A basic random sampling technique was used to choose the sample. A total of 509 students were selected from both universities, university of Malakand (n=302) and university of Swat (n=207).

Two scales were used as data collection tool: digital stress scale and online learning readiness scale. The digital stress scale had 18 items. The scale was used to measure students' perceptions of digital stress. The online readiness scale was used for measuring perceptions of students about their online readiness. The scale has 18 items and adopted

from Hung, Chou, Chen & Own (2010). The scales were developed on 5-point Likert scale format with response format of strongly agree =5 and strong disagree =1 value.

The scales were piloted on a sample of 30 students initially for refinement, for using in the new context and to find out the reliability. Five experts were requested to check the items of the scale for content validity. Their feedback was incorporated to refine the scales before data collection. Inter-item consistency test was used to find out the reliability of the scales. The alpha values for both the scales were above .70.The instrument was personally administered by the researchers.

Both descriptive and inferential statistical methods were applied for the analysis of the data. Mean, standard deviation, skewness and kurtosis were used to prepare and summarize the collected data. Pearson's r was used to analyze the relationship between the study's variables and Regression analysis was done to find the hypotheses testing.

Results and Discussion

Table 1
Demographic Profile of Respondents

Variable	Frequency	Percentage
Gender		
Male	368	72.2 %
Female	142	27.8%
Total	509	100 %
Discipline		
Faculty of Social Science	347	68.0 %
Faculty of Physical Science	125	24.5 %
Faculty of Humanities	38	07.5 %
Level of education		
Undergraduate	451	88.4 %
Postgraduate	59	55.6 %

Table 1 indicates the frequency and percentage of respondents in terms of demographic variables. Out of the total respondents 72 percent were male and 27 percent were female students. In terms of discipline, out of the total respondents 86 percent were from faculty of Social Sciences, 24 percent were from faculty of Physical Sciences and 7.5 percent were from faculty of Humanities. In terms of level of education, 88 percent were undergraduates and 55 percent were postgraduates.

Descriptive Analysis

Table 2
Mean Score and Standard Deviation of digital stress

Level	N	Mean	Standard Deviation
Mode of delivery	509	4.142	1.28
Comfort level	509	4.031	1.53
Capacity to learn	509	4.188	1.400
Learning atmosphere	509	3.234	0.905

Table 2 indicated that the mean score of all dimensions of digital stress are above 3.00, with mode of delivery (m=4.142), comfort level (m=4.031), capacity to learn (4.188) and learning atmosphere (m=3.234) meaning that the students strongly agreed that they were digitally stressed.

Table 3
Mean Score and Standard Deviation (SD) of online learning readiness

Variable	N	Mean	Standard Deviation

Online Learning Readiness	509	3.551	1.320

Table 3 indicated that the mean score for online learning readiness of students was greater than 3.00 with (m=3.551) meaning that the students strongly agreed with the statements regarding the online learning readiness.

Table 4
Correlation between indicators of digital stress and online learning readiness of students

Control Variables			Mode of learning	Capacity to learning	Comfort level	Learning atmosphere
Online Learning readiness	Mode of delivery	Correlation	1.000	.722	.218	.095
		Significance (2-tailed)	.	.000	.000	.007
		Df	0	811	811	811
	Comfort level	Correlation	.722	1.000	.182	.085
		Significance (2-tailed)	.000	.	.000	.016
		Df	811	0	811	811
	Capacity to learn	Correlation	.218	.182	1.000	.562
		Significance (2-tailed)	.000	.000	.	.000
		Df	811	811	0	811
	Learning atmosphere	Correlation	-.095	.085	.562	1.000
		Significance (2-tailed)	.007	.016	.000	.
		Df	811	811	811	0

Table 4 shows that there was a strong negative correlation between students' readiness for online learning and the four dimensions of digital stress (mode of delivery , comfort level, capacity to learn, and learning atmosphere) (r=.300 and p.001).

Table 5
Effect of mode of delivery on online learning readiness of students

Model		Sum of Squares	Df	Mean Square	R	F	Adjusted R Square	Sig.
1	Regression	330.561	1	330.561	.960	966.916	.922	.000[b]
	Residual	277.885	812	3.415				
	Total	357.446	813					

a. Dependent Variable: online learning readiness
b. Predictors: (Constant): mode of delivery

Table 5 indicates that the mode of delivery independent variable is a good predictor (r=.960) of the dependent variable online learning readiness of students. It signifies that there was a significant positive effect of mode of delivery on online learning readiness of students as .916 percent of the respondents agreed that mode of delivery had a significant effect on students' online learning readiness. Thus, the null hypothesis "*there is no effect of mode of delivery on online learning readiness of students*" was rejected. It gives an evidence that mode of delivery has an effect on students' readiness for online learning.

Table 6
Effect of comfort level on online learning readiness of students

Model		Sum of Squares	Df	Mean Square	R	F	Adjusted R Square	Sig.
1	Regression	301.486	1	301.486	.918	433.589	.842	.000[b]
	Residual	564.960	812	6.954				
	Total	357.446	813					

a. Dependent Variable: online learning readiness
b. Predictors: (Constant): comfort level

Table 6 shows that the independent variable comfort level is a strong predictor (r=.918) of the dependent variable online learning readiness of students. This indicates that comfort level has a significant positive effect on students' online learning readiness" as .842 percent of respondents agreed that their readiness for online learning was significantly affected by their comfort level. Thus, the null hypothesis "*there is no effect of comfort level on online learning readiness of students"* was rejected. It gives indication that "comfort level" positively influences "students' readiness for online learning" in a significant way.

Table 7:
Effect of capacity to learn on online learning readiness of students

	Model	Sum of Squares	Df	Mean Square	R	F	Adjusted R Square	Sig.
1	Regression	248.343	1	248.343	.833	1840.334	.693	.000[b]
	Residual	109.103	812	13.489				
	Total	357.446	813					

a. Dependent Variable: online learning readiness
b. Predictors: (Constant): capacity to learn

Table 7 shows that the dependent variable, students' readiness for online learning, is strongly predicted by the independent variable, capacity to learn (r=.833). It indicates that capacity to learn has a significant positive effect on students' readiness for online learning as .693 percent of respondents agreed there that readiness for online learning was significantly affected by their comfort level. Thus, the null hypothesis "*there is no effect of capacity to learn on online learning readiness of students"* was rejected. It gives evidence that capacity to learn has a strong positive effect on students' readiness for online learning.

Table 8:
Effect of learning atmosphere on online learning readiness of students

	Model	Sum of Squares	Df	Mean Square	R	F	Adjusted R Square	Sig.
1	Regression	181.299	1	181.299	.712	836.380	.507	.000[b]
	Residual	176.147	812	21.705				
	Total	357.446	813					

a. Dependent Variable: online learning readiness
b. Predictors: (Constant): learning atmosphere

Table 8 shows that the dependent variable, students' readiness for online learning, is strongly predicted by the independent variable, learning atmosphere" (r=.712). It means that there was a significant positive effect of learning atmosphere on 'students' online learning readiness as .507 percent of the respondents agreed that learning atmosphere had a significant effect on their online learning readiness. Thus, the null hypothesis "*there is no effect of learning atmosphere on online learning readiness of students"* was rejected. It provides proof that students' readiness for online learning is significantly enhanced by the learning environment.

Conclusion

The present study envisioned to derive students' standpoint regarding their digital stress and its influence on their online learning readiness. The results of present investigation were compared to recent literature by the researcher. Some findings from this investigation, include how delivery mode affect university students' readiness for online learning, which were corroborated by earlier research as of Kabir et al.(2021) who found that students enrolled in e-learning reported higher levels of stress compared to those in traditional campus-based learning, suggesting that online learning preparation is

influenced by the mode of delivery. Additionally, Händel, et al.(2020) discovered that students value online learning environments when they possess both personal and technology skills, reducing feelings of stress, isolation, and anxiety as well as the style of instruction. 13% of students reported mild to moderate e-learning stress, according to Adel (2017). This discrepancy might result from variations in the teacher's delivery mode, including time of day, location, and access to technology. Ilgaz & Gulbahar (2017) found that a variety of factors, such as instructor expertise, physical distance, personal accountability, and accessibility, affect students' willingness for online learning.

The majority of researchers, however, have confirmed and verified our findings, showing that the teacher's delivery style is the most encouraging indicator that enhances students' readiness for online learning. Adinda & Mohib (2020) state that discussion forums give students the chance to interact with their teachers, share experiences, and actively work through problems. Consequently, it fosters their education, which they believe stems from the growth of pupils' independent learning. According to this study, university students' comfort level had a favorable impact on their readiness for online learning. The current findings supported the idea that university students' comfort level affected their readiness for online education. Because the physical classroom was suddenly replaced by online platforms during the pandemic, the organizational support provided to students in the form of directives, counselling systems, programmer progress monitoring, career planning, and technical support had a significant impact on their comfort level with online learning.

Händel et al.(2020) found that students with access to technology were more prepared, faced far less stress and felt more at ease when it came to online learning. Kabir et al.(2021) found that technological accessibility and ease of use, along with the degree of comfort of the learners, may boost the perceived readiness of learners for e-learning, supported the study's findings.This current study discovered that university students' preparedness for online learning is positively impacted by their capacity to learn. Current results showed that learning ability has an impact on university students' preparedness for online learning. Wagiran, Suharjana, Nurtanto, and Mutohhari (2022) found that equipment ability, learning capacity, and student's happiness were all directly impacted by technological skills. Accordingly, the functionality of the equipment significantly affects customer satisfaction. This study shows that as students become more adept at using online instruction support devices and more proficient with digital technology, their satisfaction as to services as customers rises. In order for technology equipment to be accessed and used through online learning, technical knowledge is necessary. In their research, Ribble & Miller (2013) found that students using desktop and laptop computers were significantly more prepared than those using mobile and tablet computers. This discrepancy may be due to the fact that people who are accustomed to using PCs typically have a deeper understanding of online management tools and modules connected to online learning, whereas using mobile phones comes with certain restrictions that make the process more challenging.

The positive effects of the learning environment on university students' readiness for online learning were also found in this study. Our research showed that university students' readiness for online learning is influenced by the learning environment. Kabir et al.(2021) found that in the unadjusted model, students without a private area had a significant correlation with e-learning stress. Owning a private place, however, did not substantially connect in the adjusted model with reported stress associated with online learning. The preference for e-learning among the students in this study, which was originally linked to e-learning stress in the unadjusted model, may collide with their need for privacy. In the modified model, however, owning a private space did not significantly

correlate with reported stress related to online learning. Lamichhane (2019) claims that a calm and serene environment can reduce students' stress levels related to learning.

In a similar vein, Masha'al, Rababa, and Shahrour (2020) found that giving students a private space to study reduces the stress associated with online learning. Learning preparedness enhances academic accomplishment and student success in online situations as acclaimed by Adinda & Mohib (2020).One way that online environments support self-directed preparation is by giving learners the freedom to choose how they want to learn.The results showed that students thought they had control over the environment and atmosphere in which they learned. These results are in line with those of Rafique, Mahmood, Warraich, and Rehman (2021) who discovered that students evaluated learner atmosphere and learning control favorably when compared to other factors. This might be the case due to the fact that students who learn online are less worried and have a more enjoyable experience than those who learn in a traditional classroom.

In a different study by Keser Aschenberger, Radinger, Brachtl, Ipser, & Oppl (2023) it was found that, on average, the effects of the physical learning environment on motivation, focus, and learning performance were neutral to somewhat favorable. The appropriateness and comfort of the learning environment received high marks. This study found that preparation for online learning and participation in the classroom are positively correlated. According to this research, there is a positive correlation between students' preparedness for online learning and interaction in the learning environment—lower readiness is associated with less engagement. The study's findings match with those of Demir, Kaymak & Horzum (2013) who found that self-directed learning, online communication, computer/internet self-efficacy, and online communication all have an impact on relationships with the learning environment.

The study concludes that digital stress in all of its dimensions has significant effects on university students' readiness for online learning. The mode of delivery and university students' readiness for online learning are closely related. In addition to the instructor's mode of delivery, students also value online learning environments when they are well-equipped with technological and interpersonal skills that reduce tension, anxiety, and feelings of loneliness. The study also discovered that university students' comfort level affects their preparedness for online learning. It shows that learners' perceived readiness for e-learning may be improved while reducing stress caused by the use of digital technology tools, contingent on the accessibility and utilization of technological gadgets as well as the comfort level of the learners. Additionally, it is determined that university students' preparedness for online learning is positively impacted by their capacity to learn.

Recommendations

- For long lasting effect of online learning, teachers should foster readiness for online system of education. If students are ready to learn online then they can cope with digital stress more smartly. In this way, teachers can prepare them for any unforeseen situation like pandemic in which they had to switched over to online learning but they were not ready for that and encountered digital stress due to incompetence of dealing with online system and digital tools.
- Teachers be trained for online teaching so that they may enable themselves to use variety of teaching styles that may promote students' online involvement and teachers' use of corrective feedback.
- Teachers should be aware of various indicators of digital stress that may hinder in students' online learning readiness.

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