TECHNOSTRESS AMONG STUDENTS DURING COVID-19 LOCKDOWN

Kamruddin Shaik Asst. Professor, Department of Management & Commerce Maulana Azad National Urdu University, Gachibowli, Hyderabad *: khamuru.sk@gmail.com*

Abstract

Covid-19 has given unprecedented and challenging times for all individuals and institutions. In this rare and unseen scenario, the whole educational system has been disrupted. Under these circumstances, several educational institutions have resorted to online learning mode. While the option of online learning is an inevitable one, there are several positive and negative outcomes to consider. With the outburst of technological inventions, smartphones, the internet, and mobile-based applications have become a common part of our everyday life. Moreover, educational institutions are compelled to offer courses online to cater to diverse learner needs as well as increase their survival in the educational market. Joblessness and high competition for limited jobs coupled with restricted mobility of individuals, professionals, and students during Covid-19 have created plenty of room for online learning. Yet, all online learning is not fun. There is an associated technostress that is quietly plaguing the present generation of technology users. This problem is less noticed and not addressed appropriately.

In the present paper, an attempt is made to examine the technostress among the higher education students during their online learning experience. A systematic approach is followed to arrive at the research problem, and accordingly, a survey questionnaire is designed to capture the data. The data analysis and results have given several implications to be implemented by the educational institutions to improve the online learning experience of their students. Implications of the study and scope for future research are also presented in the paper.

Keywords:
Technostress; Higher education; Online learning; Covid-19; Technology Behaviors.

1 Introduction

Technological advancements have helped humans to experience the best lifestyles and reduced the barriers of distance, time, and need to have a physical presence. Advancement of technology has unexceptionally entered into all walks of business and life. Educational institutions are no exception to explore and embrace technological progress. Educational technologies have also improved significantly to reduce the learning difficulties by offering an immersive experience to the learners. E-learning has become a very popular and inevitable platform for learners of technological and professional courses. Enabling infrastructural sophistication and access to low-cost alternatives helped institutions make use of online learning technologies. With the wide popularity of social media applications bundled with smartphones, students are always finding ways to interact with their peers and teachers using social media platforms. Many online courses are being popularised on social networking sites. Indeed, social networking has crept into the educational and personal lives of students (Jalali and Bouyer, 2019). Students are finding it convenient to use smartphones and the applications available on them for various purposes. Many higher educational institutions are encouraging the productive use of smartphones. Given the challenges of mobility and physical interaction, the Covid-19 pandemic has accelerated the use of internet-based digital technologies by almost all the educational institutions across the globe (Asamoah, 2020).

Online learning, which once prevailed as an optional method, has now replaced the traditional classroom learning for a considerable amount of time during the pandemic. Wherein online learning is characterized by the use of tools and technologies to deliver learning content to students at different locations with the help of the internet, without having a need to visit the educator or institution (Baytiyeh, 2018). Furthermore, higher education institutions are considering the development of online courses as an important means to attract new students and maintain good student strength (Chen and Hwang, 2019). Whatever may be the technological progress towards using smartphones and online technologies, online learning is also constrained by several barriers, including those of low training, absence of full-fledged knowledge, and non-motivated users (Iqbal, 2020).

Situations such as recessions and pandemics result in lower economic activity leading to a reduction in job openings. Job seekers and students are forced to opt for the betterment of educational qualifications through online learning to remain competitive (Kolowich, 2009). Learners tend to choose online learning technologies to gain benefits of cost, time, and convenience to access. However, the compelling need to use technology puts pressure on educators and students, which may further lead to building technological stress (Burke, 2009). Internet and similar technologies put enormous stress on the end-users due to their high volatility and continued pressure of increased use (Hsiao, 2017). The Covid-19 pandemic left no option for the educators, institutions, and learners except to embrace the

online learning technologies on a massive scale. Many students and educators are unable to rise up to the occasion and use online learning effectively. Such a phenomenon characterized by the inability to adapt and cope up with new technology in a healthful manner is labeled as 'Technostress' (Brod, 1984). In the present paper, an attempt is made to study the levels of technostress experienced by the students of higher education using a systematic research design.

At first, an extensive review of the literature is taken up and presented in Section 2. This is followed by the identification of appropriate research methods to examine the problem under study and corresponding data collection, which are explained in Section 3. The analysis of data collected and important findings are summarized in Section 4. The conclusions of the study comprising of implications, limitations, and scope for further research are presented in Section 5.

2 Literature Review

Technostress is understood as the development of stress symptoms among the end-users due to the overburden of information and communication. Moreover, technostress can be studied using a similar conceptual base that is theoretically applied to study stress in general terms (Ragu-Nathan et al., 2008). Technostress is not confined to IT professionals but also applies to the end-users. Technostress is not a completely new phenomenon. As the technologies evolved, so is the continued spread and shaping of technostress. Technostress is viewed and experienced differently by people with different personality characteristics. Xiao and Mou (2019) and several other researchers have found that neurotic personalities have a high chance of experiencing higher levels of stress. Among students, what excites and motivates one may cause stress to another (Allan and Lawless, 2003). While accepting the existence of technostress at the global level, Chen (2015) studied the stress levels among Chinese knowledge workers and established comparable benchmarks. In a work-related situation, Krishnan (2017) found cultural differences impacting levels of technostress. Technostress was predicted through the power distance existing in the organization. Studies suggest that individuals possessing high self-esteem may be less prone to the negative effects of technostress (Bliese et al., 2017; Korzynski et al., 2020). Nimrod (2018) indicated that technostress is not confined to workers and youngsters alone but is spread among all age groups and all types of users, without reservations. In a study based on Japanese students, Jung, Kudo, and Choi (2012) found self-efficacy among the factors that influenced stress levels among the students in an online collaborative learning scenario. Though online collaboration helped in better learning, it also put great pressure on learners. Allan and Lawless (2003) also posit that online collaborations and e-learning environments have the potential to create stress among users. In a situation where the use of smartphones has become a compulsion, Lee et al. (2014) reported that technostress was inevitable among the users due to the increased compulsive use and over-dependence

on smartphones. Lazarevic and Bentz (2020) compared traditional and online learning environments and found differences in levels of stress experienced by the learners.

Little attention is paid in the research studies on technostress experienced by the students at the higher education and university levels. Burke (2009) attributes this lack of attention to a possible notion that students of higher education who are born during the computer era may possess sufficient skills to apply computer-related technologies. Tarafdar, Tu, and Ragu-nathan (2011) made an assessment of negative consequences and stress experienced by students while using mobile devices. Ayyagari, Grover, and Pur vis (2011) also applied the measurement of stress to the context of students learning using mobile phones. Qi (2019) made a significant attempt to fill the research gap by studying the technostress among university students. Upadhyaya and Vrinda (2020) studied the technostress levels among the students of Indian private university and found the technostress levels to be high among the post-graduate students. Chen and Hwang (2019) conducted research focusing on individual differences by examining the personal and behavioral factors responsible for creating stress in online learning. Molino et al. (2020) examined the technostress during the Covid-19 pandemic using the Italian version of the technostress creators scale. Among several studies carried out in the evolving technological context, scales developed by Tarafdar et al. (2007) and Ragu-Nathan et al. (2008) have been widely used to study the technostress, which is derived from empirically strong literature support (Chen, 2015). In many studies, researchers preferred to either customize the existing scales or to develop and test new instruments that may suit their research context.

Taking inspiration from the literature reviewed in the context of technostress among students of higher educational learning, an attempt is made in the present paper to examine the technostress experienced by the students of different higher educational courses studying in different parts of India. This study is of particular significance as it is administered during a crucial period when the whole student community is facing the challenge of Covid-19 and still continues to learn using the online-learning mode.

3 Methodology

To examine the levels of technostress experienced by the students during the online learning approach being used by several higher educational institutions during the Covid-19 scenario, the technostress creators scale (Ragu-Nathan et al., 2008) has been used. Among the five dimensions of the technostress creators scale, two dimensions, techno-insecurity, and techno-uncertainty were not considered for the study as they are more suitable to an organizational context. Only the three dimensions, techno-overload, techno-invasion, and techno-complexity, were included to understand the technostress among the students in an online learning context. The items were customized and pre-validated to match the online learning context using expert researchers' opinions and opinions of students in real-

time using a pilot version of the instrument. A structured questionnaire was developed using a five-point Likert scale with anchors as Strongly Disagree and Strongly Agree on either extreme. For the remaining items which provide additional information also, a five-point scale was adjusted to the items. The questionnaire also comprised of demographic details of the respondents and a snapshot of their online learning experience profile.

Due to the short time and mobility restrictions, the present research used a convenience sampling method. To reach the target students, chain sampling and variants of snowball sampling were applied on the social media platforms and group chat platforms. Faculty members from more than 100 institutes were contacted to enroll students for the study purpose. The questionnaire was administered to the students who were enrolled in various higher educational institutes in the Indian states of Andhra Pradesh and Telangana. The questionnaire in a web form format reached more than 1300 students. However, only 730 students completed the survey. During the initial data analysis phase, questionnaires that were incomplete or having erroneous data were carefully removed to avoid any undesirable bias. A final sample of 606 responses was retained for further analysis.

4 Data Analysis and Findings

Responses of 606 respondents were analyzed using statistical methods. Various techniques were applied, including descriptive techniques, correlational analysis, ANOVA, and certain non-parametric tests where applicable. Instead of the independent samples *t*-test, for examining distributions, as a better alternative, a two-tailed Mann-Whitney two-sample rank-sum test was employed (Conover & Iman, 1981).

4.1 Demographic Profile of Respondents

Frequencies and percentages were calculated for gender, age, area of stay, and educational qualification. Among the respondents, male (n = 440, 73%) respondents were proportionately higher. Respondents in the age group of less than 20 years (n = 228, 38%) were representing the larger group among the age groups. Presence of respondents from rural (n = 378, 62%) area was higher than their urban counterparts. Among the respondents, those with was under-graduation (n = 486, 80%) as current education is significantly high. Table 1 presents the respondents' profile.

Table 1

Frequency Table for Nominal Variables

Variable	*n*	*%*
Gender		
Male	440	72.61
Female	166	27.39
Age (Years)		
Less than 20	228	37.62
20 to 23	218	35.97
More than 23	160	26.40
Area of residence		
Rural	378	62.37
Urban	228	37.62
Current Education		
PG	120	19.80
UG	486	80.20

4.2 Differences in Technostress by Gender

A two-tailed Mann-Whitney two-sample rank-sum test was applied to understand significant differences in technostress, if any, between the levels of gender. Among the 440 male respondents and 166 female respondents, the result of the two-tailed Mann-Whitney *U* test was not significant based on an alpha value of 0.05, $U = 38932.5$, $z = -1.26$, $p = .209$. The mean rank for group Male was 308.98, and the mean rank for group Female was 288.97. This suggests that the distribution of technostress for group Male (*Mdn* = 42.00) was not significantly different from the distribution of technostress for the Female (*Mdn* = 41.00) category. The results are presented in Table 2.

Table 2

Two-Tailed Mann-Whitney Test for technostress by gender

	Mean Rank				
Variable	Male	Female	*U*	*z*	*p*
Technostress	308.98	288.97	38932.50	-1.26	.209

4.3 Differences in Technostress by Age Group

An analysis of variance (ANOVA) test was conducted to determine whether there were significant differences in technostress by Age group.

The results of the ANOVA (based on an alpha value of 0.05) were not significant, $F(2, 603) = 0.00$, $p = .998$, indicating the differences in technostress among the levels of age group were all similar (Table 3). The main effect, age group, was not significant, $F(2, 603) = 0.00$, $p = .998$, indicating there were no significant differences of technostress by age group levels. The means and standard deviations are presented in Table 4.

Table 3

Analysis of Variance Table for technostress by age group

Term	*SS*	*df*	*F*	*p*	η_p^2
age group	0.15	2	0.00	.998	0.00
Residuals	23929.70	603			

Table 4

Mean, Standard Deviation, and Sample Size for technostress by age group

Combination	*M*	*SD*	*n*
Less than 20	41.66	6.16	228
20 to 23	41.63	6.46	218
More than 23	41.62	6.28	160

4.4 Differences in Technostress by current education

A two-tailed Mann-Whitney two-sample rank-sum test was applied to understand significant differences in technostress, if any, between the levels of current education. Among the 120 Post-Graduate (PG) and 486 Under-Graduate (UG) respondents, the result of the two-tailed Mann-Whitney *U* test was not significant based on an alpha value of 0.05, $U = 31516$, $z = -1.37$, $p = .170$. The mean rank for group PG was 323.13, and the mean rank for group UG was 298.65. This suggests that the distribution of technostress for group PG ($Mdn = 43.00$) was not significantly different from the distribution of technostress for the UG ($Mdn = 41.00$) category. Table 5 presents the result of the two-tailed Mann-Whitney *U* test.

Table 5

Two-Tailed Mann-Whitney Test for technostress by current education

	Mean Rank				
Variable	PG	UG	*U*	*z*	*p*
Technostress	323.13	298.65	31516.00	-1.37	.170

4.5 Differences in Technostress by whether received any training on online learning

A two-tailed Mann-Whitney two-sample rank-sum test was applied to understand significant differences in technostress, if any, based on whether received any training on online learning. Among the 300 respondents who received training and 306 respondents who did not receive any training, the result of the two-tailed Mann-Whitney *U* test was not significant based on an alpha value of 0.05, $U = 47319.5$, $z = -0.66$, $p = .509$. The mean rank for the group which received training was 308.23, and the mean rank for the group which did not receive training was 298.86. This suggests that the distribution of technostress for the group that received training (*Mdn* = 42.00) was not significantly different from the distribution of technostress for the group that did not receive training (*Mdn* = 41.50) category. Table 6 presents the result of the two-tailed Mann-Whitney *U* test.

Table 6

Two-Tailed Mann-Whitney Test for technostress by whether received any training on online learning

	Mean Rank				
Variable	Yes	No	*U*	*z*	*p*
Technostress	308.23	298.86	47319.50	-0.66	.509

4.6 Differences in Technostress by the levels of the area of residence

A two-tailed Mann-Whitney two-sample rank-sum test was applied to understand significant differences in technostress, if any, based on the levels of area of residence. Among the 378 respondents from the rural area and 228 respondents from the urban area, the result of the two-tailed Mann-Whitney *U* test was not significant based on an alpha value of 0.05, U = 42029, z = -0.51, p = .610. The mean rank for group rural was 300.69, and the mean rank for group urban was 308.16. This suggests that the distribution of technostress for group Rural (*Mdn* = 41.00) was not significantly different from the

distribution of technostress for the Urban (*Mdn* = 42.00) category. Table 7 presents the result of the two-tailed Mann-Whitney *U* test.

Table 7

Two-Tailed Mann-Whitney Test for technostress by area of residence

	Mean Rank				
Variable	Rural	Urban	*U*	*z*	*p*
Technostress	300.69	308.16	42029.00	-0.51	.610

4.7 Descriptive statistics for dimensions of technostress creators

Descriptive statistics were calculated for the three dimensions of technostress: techno complexity, techno overload, and techno invasion. The observations for techno complexity had an average of 16.39 (*SD* = 3.52, SE_M = 0.14, Skewness = -0.39, Kurtosis = -0.28). The observations for techno overload had an average of 14.76 (*SD* = 2.57, SE_M = 0.10, Skewness = -0.55, Kurtosis = 0.56). The observations for techno invasion had an average of 10.49 (*SD* = 2.53, SE_M = 0.10, Skewness = -0.48, Kurtosis = -0.21). The summary statistics are presented in Table 8.

Table 8

Descriptive Statistics Table for Dimensions of technostress

Variable	*M*	*SD*	*n*	SE_M	Skewness	Kurtosis
Techno complexity	16.39	3.52	606	0.14	-0.39	-0.28
Techno overload	14.76	2.57	606	0.10	-0.55	0.56
Techno invasion	10.49	2.53	606	0.10	-0.48	-0.21

4.8 Respondents online learning profile

Frequencies and percentages were calculated for whether received training on online learning, no. of hours per day spent on online learning, internet speed, and overall learning experience in online learning mode. The most frequently observed category of whether received training on online learning was no (*n* = 306, 50%). The most frequently observed category of no. of hours per day spent on online learning binned was 3 to 6 hours (*n* = 290, 48%). The most frequently observed category of internet speed was 5 (Excellent) (*n* = 139, 23%). The most frequently observed category of the overall learning

experience in online learning mode was 3 (Good) (*n* = 162, 27%). Frequencies and percentages are presented in Table 9.

Table 9

Frequency Table for Respondents' online learning profile

Variable	*n*	*%*
Whether received training on Online Learning		
Yes	300	49.50
No	306	50.50
No. of Hours Per Day Spent on Online Learning		
Less than 3	79	13.04
3 to 6	290	47.85
More than 6	237	39.11
Internet Speed		
1- Very Poor	111	18.32
2- Poor	120	19.80
3- Average	128	21.12
4- Better	108	17.82
5- Excellent	139	22.94
Overall Learning Experience in Online Learning Mode		
1- Very Bad	114	18.81
2- Bad	105	17.33
3- Good	162	26.73
4- Very Good	118	19.47
5- Excellent	107	17.66

4.9 Correlation among respondents and technostress

A Kendall correlation analysis was conducted among no. of hours per day spent on online learning, internet speed, overall learning experience in online learning mode, and technostress. Effect size was determined using Cohen's (1988) standard.

A significant positive correlation was observed between no. of hours per day spent on online learning and technostress (r_k = 0.08, p = .040, 95% CI [0.00, 0.16]). The correlation coefficient between no of hours per day spent on online learning and technostress was 0.08, indicating a small effect size. This correlation indicates that as no. of hours per day spent on online learning increases, technostress tends to increase. No other significant correlations were found. Table 10 presents the results of the correlations.

Table 10

Kendall Correlation Results Among No. of Hours Per Day Spent on Online Learning, Internet Speed, Overall Learning Experience in Online Learning Mode, and Technostress

Combination	r_k	95% CI	p
No. of Hours Per Day Spent on Online Learning-Internet Speed	-0.04	[-0.11, 0.04]	.386
No. of Hours Per Day Spent on Online Learning-Overall Learning Experience in Online Learning Mode	0.05	[-0.03, 0.13]	.244
No. of Hours Per Day Spent on Online Learning-Technostress	0.08	[0.00, 0.16]	.040
Internet Speed-Overall Learning Experience in Online Learning Mode	0.07	[-0.01, 0.15]	.093
Internet Speed-Technostress	0.00	[-0.08, 0.08]	.962
Overall Learning Experience in Online Learning Mode-Technostress	-0.01	[-0.09, 0.07]	.793

Note. n = 606. Holm corrections were used to adjust p-values.

5 Implications and Conclusion

In the present study, levels of technostress among higher education students were examined using the technostress creators scale. A structured questionnaire was administered to the student sample using various social networking and group chat platforms. Data collected from 606 respondents were analyzed, and the results were presented in Section 4. Based on the results, the present study leads to the following implications.

5.1 Implications

There were no significant differences in levels of technostress by gender, age group, current education, areas of residence, and whether training was offered on online learning. Thus, online learning experiences induced technostress levels do not differ significantly from the demographic backgrounds. Half of the respondents did not receive any training related to online learning. Around 87 percent of the respondents are spending more than three hours on online learning per day. This is a significantly high proportion. Institutions should try to reduce the amount of burden due to online learning activity. About 60 percent of the respondents are experiencing internet speeds, which are average or below. The educational institutes need to provide content that can be accessed at lower internet speeds without disturbing the learning sequence. Nearly 35 percent of the respondents have expressed bad experience with online learning. Education institutes need to take regular feedback from the students and provide them a better learning experience. The study found a significant correlation between the no. of hours spent on online learning per day by the students and the level of technostress they experience. This implies that the educators and administrative departments running the educational institutes should reduce the burden of no. of hours being spent for the purpose of online learning by the students.

5.2 Limitations

The present study is based on the select dimensions of the technostress creators scale. All the dimensions were not included considering their non-applicability. However, it may act as a minor limitation overall. The sample represents students from two states of southern India. This may be a limitation impacting the opinions due to the non-representation of students from other states.

5.3 Scope for further research

The present study was conducted in a limited time frame, and the study can be elaborated to take up a longitudinal form. The technostress creators scale used in the present study is widely researched and is under discussion. The items and the scale can further be improved to suit the administration of the online learning context. Some dimensions, such as software issues, technical issues, educator issues, were not made a part of the present study. Further studies may be conducted along those lines. The study has considered only students pursuing higher education. However, it is observed that students at the primary level and secondary level education also are undergoing online learning classes. Hence, studies in the future can be taken up to include students from different levels of education.

References

1. Allan, J., & Lawless, N. (2003). Stress caused by on-line collaboration in e-learning: a developing model. Education + Training, 45(8/9), 564-572. doi: 10.1108/00400910310508955.

2. Asamoah, M. K. (2020). Sturdiness and scuffle in deploying educational technologies for teaching and learning in a low-technology context: Students' experience in a developing society. African Journal of Science, Technology, Innovation and Development, 1–18. doi:10.1080/20421338.2020.1773604
3. Ayyagari, R., V. Grover, and R. Purvis. 2011. "Technostress: Technological Antecedents and Implications." MIS Quarterly 35 (4): 831–858.
4. Baytiyeh, H. (2018). Online learning during post-earthquake school closures. Disaster Prevention and Management: An International Journal, 27 (2), 215-227. DOI: 10.1108/DPM-07-2017-0173
5. Bliese, P.D., Edwards, J.R. and Sonnentag, S. (2017), "Stress and well-being at work: a century of empirical trends reflecting theoretical and societal influences", Journal of Applied Psychology, Vol. 102 No. 3, pp. 389-402.
6. Brod, C. (1984). Technostress: The human cost of the computer revolution. Reading, MA: Addison-Wesley.
7. Burke, M. S. (2009). The incidence of technological stress among baccalaureate nurse educators using technology during course preparation and delivery. Nurse Education Today, 29(1), 57–64. doi: 10.1016/j.nedt.2008.06.008
8. Chen, L. (2015). Validating the technostress instrument using a sample of Chinese knowledge workers. Journal of International Technology and Information Management, 24(1), 5.
9. Cohen, J. (1988). Statistical power analysis for the behavior sciences (2nd ed.). West Publishing Company.
10. Conover, W. J., & Iman, R. L. (1981). Rank transformations as a bridge between parametric and non-parametric statistics. The American Statistician, 35(3), 124-129. https://doi.org/10.1080/00031305.1981.10479327
11. Hsiao, K.-L. (2017). Compulsive mobile application usage and technostress: The role of personality traits. Online Information Review, 41(2), 272–295. https://doi.org/10.1108/OIR-03-2016-0091
12. Iqbal, S., & Bhatti, Z. A. (2020). A qualitative exploration of teachers' perspective on smartphones usage in higher education in developing countries. International Journal of Educational Technology in Higher Education, 17(1). doi:10.1186/s41239-020-00203-4
13. Jalali, M., & Bouyer, A. (2019). Exploring the relationship of university students' educational variables and the degree of their use of virtual social networks. Information Discovery and Delivery, 47(4), 10.
14. Jung, I., Kudo, M., & Choi, S. K. (2012). Stress in Japanese learners engaged in online collaborative learning in English. British Journal of Educational Technology, 43(6), 1016-1029.

15. Kolowich, S. (2009). "Recession may drive more adult students to take online classes", Chronicle of Higher Education, Vol. 55 No. 19, p. A11.
16. Korzynski, P., Rook, C., Florent Treacy, E., & Kets de Vries, M. (2020). The impact of self-esteem, conscientiousness and pseudo-personality on technostress. Internet Research, ahead-of-print(ahead-of-print). https://doi.org/10.1108/INTR-03-2020-0141
17. Lazarevic, B., & Bentz, D. (2020). Student Perception of Stress in Online and Face-to-Face Learning: The Exploration of Stress Determinants. American Journal of Distance Education, 1–14. https://doi.org/10.1080/08923647.2020.1748491
18. Lee, Y.-K., Chang, C.-T., Lin, Y., & Cheng, Z.-H. (2014). The dark side of smartphone usage: Psychological traits, compulsive behavior and technostress. Computers in Human Behavior, 31, 373–383. doi: 10.1016/j.chb.2013.10.047
19. Molino, M., Ingusci, E., Signore, F., Manuti, A., Giancaspro, M. L., Russo, V., Zito, M., & Cortese, C. G. (2020). Wellbeing Costs of Technology Use during Covid-19 Remote Working: An Investigation Using the Italian Translation of the Technostress Creators Scale. Sustainability, 12(15), 5911. https://doi.org/10.3390/su12155911
20. Nimrod, G. (2018). Technostress: Measuring a new threat to well-being in later life. Aging & Mental Health, 22(8), 1086–1093. https://doi.org/10.1080/13607863.2017.1334037
21. Pei-Ying Chen & Gwo-Jen Hwang (2019) An empirical examination of the effect of self-regulation and the Unified Theory of Acceptance and Use of Technology (UTAUT) factors on the online learning behavioural intention of college students, Asia Pacific Journal of Education, 39:1, 79-95, DOI: 10.1080/02188791.2019.1575184
22. Qi, C. (2019). A double-edged sword? Exploring the impact of students' academic usage of mobile devices on technostress and academic performance. Behaviour & Information Technology, 38(12), 1337–1354. doi:10.1080/0144929x.2019.1585476
23. Ragu-Nathan, T. S., Tarafdar, M., Ragu-Nathan, B. S., & Tu, Q. (2008). The consequences of technostress for end users in organizations: Conceptual development and empirical validation. Information Systems Research, 19(4), 417–433.
24. Tarafdar, M., Q. Tu, and T. S. Ragu-nathan. 2011. "Impact of Technostress on end-User Satisfaction and Performance." Journal of Management Information Systems 27 (3): 303–334.
25. Tarafdar, M., Tu, Q., Ragu-Nathan, B. S., & Ragu-Nathan, T. (2007). The impact of technostress on role stress and productivity. Journal of Management Information Systems., 24(1), 301–328. https://doi.org/10.2753/MIS0742-1222240109.
26. Upadhyaya, P., & Vrinda. (2020). Impact of technostress on academic productivity of university students. Education and Information Technologies. https://doi.org/10.1007/s10639-020-10319-9

27. Xiao, L. and Mou, J. (2019), "Social media fatigue – technological antecedents and the moderating roles of personality traits: the case of WeChat", Computers in Human Behavior, Vol. 101, pp. 297-310.