Journal of
Social & Health Sciences

LOGIXS JOURNALS

Original Article

Students' perception of smartphones as a new modality to enhance health sciences knowledge

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Citation: Fayyaz SS, Akram A. Students' perception of smartphones as a new modality to enhance health sciences knowledge. J Soc Health Sci. 2022;1:13-21.

Received: 08 November 2022
Revised: 24 December 2022
Accepted: 26 December 2022
Published: 29 December 2022

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Abstract

Smartphones are increasingly being used by health sciences students as a popular and effective learning tool, globally replacing traditional learning methods with advanced e-learning techniques. This study aimed to explore students' perception of smartphones as a new modality to enhance health science knowledge and whether this technology could assist them in accomplishing their educational goals. This descriptive cross-sectional study recruited 222 undergraduate health sciences students using a convenience sampling technique and used Delone and Mclean's information systems (IS) success model to develop variables for five IS success constructs. The study results showed that most participants were females (70.27%), and students used smartphones for multiple purposes, with accessing learning content (weighted average = 4.58), text messaging services (weighted average = 4.48), and internet-based text messaging services (weighted average = 4.36) being the most reported reasons. Students' perceptions regarding most smartphone usage for education included educational purposes and understanding lectures/revising concepts. Using smartphones as an educational aid influenced students' perceptions of system quality, information quality, system importance, usefulness, and satisfaction. Our study highlights the significant role of smartphones in the daily lives of health sciences students and their positive attitudes toward using them as a tool for enhancing their knowledge. Students use smartphones to access learning content and other online resources, and our findings suggest that educators should incorporate them into the educational curriculum. Notably, our study found that students' average daily smartphone usage varied widely. These findings have significant implications for the educational system, as smartphones have become an essential part of the educational experience for health sciences students. However, future studies could investigate the potential negative effects of smartphone usage on academic performance and explore the correlation between smartphone usage and academic outcomes to better understand the impact of smartphones on education.

Keywords

Perception; Smartphone; Mobile applications; Knowledge; Students; e-learning

1. Introduction

Currently, the extent of technology is not limited to gadgets, instruments, motors, and techniques but revolves around the human attempt to fulfill their needs and wants using cutting-edge technology. Many gadgets, such as smartphones, are not just inventions triggering a revolution in the communication sector but have integrated many tools and widgets in themselves by gradually obsoleting the use of narrow feature devices [1]. Technology is multifaceted, which fascinates its users to master all of its features but complicates the situation by advancing the existing features quickly. The causal nexus between technology and its users initiates an intense obsession where people believe life

is meaningless without technology [2]. Progressive technology directly or indirectly impacts all segments of society, resulting in many modifications [3].

The smartphone is among the fascinating technological inventions attracting people from different socioeconomic strata with diverse demographic attributes [4]. Smartphones contain multiple features aiding users' needs, such as a camera, a global positioning system (GPS), maps, internet accessibility, and a scientific calculator. Despite having valuable features, smartphones also account for specific difficulties. For example, the excessive use of smartphones reduces social interactions and physical activities among users, resulting in multiple physical and mental healthcare problems [5]. The literature suggests that smartphone usage during adulthood is correlated with delayed sleep time, shorter sleep periods, and sleep disorders, which lead to mental issues and initiate symptoms of depression [6]. Unrestricted access to sexual and pornographic content is also causing porn addiction among adults, with increasing psychological health problems [7].

In the meantime, smartphones have become a popular and effective learning tool among students of all disciplines, especially in health science, gradually replacing conventional learning methods with advanced e-learning techniques [8]. The student's use of smartphones encompasses using different applications for academic purposes to access rapidly evolving scientific knowledge such as scholarly articles, industry reports, infographics, visual aids, etc. [9]. Given the importance of the field, healthcare students and professionals need to be informed about new technologies, organizational models, and high-value clinical procedures to attain optimal healthcare outcomes. The advancement of technology has made it possible through smartphones with ancillary benefits of cost-effectiveness, as well as rapid and easy access to a broad spectrum of relevant knowledge. After the emergence of COVID-19 as a global pandemic, smartphones are still more vital owing to their copious use in online learning [10, 11].

Pakistan is a densely populated country with many smartphone users. It ranks 11th on the list of emerging economies experiencing an increasing shift in demand for smartphones over a decade. The primary motivation for purchasing smartphones could be the affordability of internet services offered by mobile service providers [12]. Currently, almost every student keeps a smartphone to access online libraries, take notes, and share academic material among themselves [13].

A Pakistani-based study reported that 95.8% of medical students had smartphones, among which 41.46% were using medical applications and 28.08% were aware of medical learning applications [14]. Moreover, nearly three-quarters of the students (71.7%) were not reading e-books and e-materials. Therefore, in conformity with previous findings, it is unclear how smartphones could enhance health science students' knowledge. However, it can be comprehended by exploring the self-reported perception of smartphone users. Therefore, we aim to explore students' perception of smartphones as a new modality to enhance health science knowledge and whether this technology could assist them in accomplishing their educational goals.

2. Materials and methods

2.1. Ethical considerations

The study adhered to international ethical guidelines for research involving human subjects [15] and obtained ethical clearance from the Ethical Review Committee at Rai Medical College, Sargodha, Pakistan (No. RMCS/ERC/11/21).

2.2. Study design

This study was conducted using a descriptive cross-sectional study design.

2.3. Study duration

The research was carried out during the period spanning from January to March 2022.

2.4. Study settings

The present study was conducted in Lahore, Pakistan, at three universities: the University of Punjab, the University of Health Sciences, and the University of Lahore. These universities have a combined enrollment of over 144,520 students across various on-campus degree programs, representing diverse social strata [16, 17, 18].

2.5. Participant eligibility

We recruited participants from undergraduate health sciences degree programs who had been enrolled for at least one year and owned and regularly used smartphones. Degree programs included physical therapy, human nutrition, dietetics, radiography and imaging technology, and nursing. We excluded students with any disabilities or impairments from the study.

2.6. Sampling method

We used a convenience sampling technique to collect data for this study. This nonprobability sampling method was utilized due to the practical time constraints and resources available. In addition, the participants were recruited based on their availability and willingness to participate in the study.

2.7. Sample size estimation

At a 95% confidence level, the sample size of 203 was calculated by keeping the significance level at 5%, the power of the test at 90% with a test value proportion of 82%, and the anticipated population proportion at 90% by using the WHO calculator (version 2.0.21) [19]. However, the sample size was further increased to 222 to cater to nonresponses, dropouts, and refusals.

2.8. Study instrument development

We utilized a modified version of Delone and Mclean's information systems (IS) success model, as proposed by Seddon and Kiew [20], as the basis for our study instrument. To develop the questionnaire, we extensively reviewed the relevant literature [19] and formulated a set of questions covering five IS success constructs. The initial questionnaire was subjected to expert validation. University educationists provided feedback on the tool's various sections regarding simplicity, importance, and relevance. Additionally, the questionnaire was pretested on a sample of five students to evaluate its presentation, ease of comprehension, and acceptability. Based on the pretest results, we made necessary modifications to the questionnaire prior to its final use.

2.9. Study Measures

The instrument used in this study consisted of four sections: sociodemographics, students' status regarding smartphone usage, general information regarding smartphone usage, and student perception regarding smartphones as a new modality. The last section was further divided into five subsections that collected information regarding the system quality, information quality, system importance, usefulness, and satisfaction.

Responses were measured using two Likert scales ranging from 'never' to 'always' and strongly disagree' to 'strongly agree,' with scores ranging from 1 to 5.

2.10. Informed consent and questionnaire distribution

Prior to participating in the study, students were provided with information about the purpose of the study and its voluntary nature. Written informed consent was obtained from each participant before the data collection team distributed the questionnaire.

2.11. Data analysis

Data analysis was performed using both Microsoft Excel (Microsoft Corporation, Redmond, WA, USA) and Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA). The internal consistency and reliability of the five IS success constructs, comprising 27 items, were assessed using Cronbach's alpha coefficient. The commonly accepted criterion of 0.70 or higher was used to determine good internal consistency. Descriptive statistics, such as frequencies, percentages, means, and standard deviations (SDs), were used to describe the participants' demographic characteristics. Additionally, the study variables' weighted mean and standard deviation were computed and interpreted using the weighted averages for a 5-point Likert scale guide adapted from a previously conducted study [21].

Table 1. Interpretation for weighted averages of a 5-point Likert scale.

Weighted Average	Result Interpretation Likert Scale 1	Result Interpretation Likert Scale 2
4.20 – 5.00	Always	Strongly agree/Very influential
3.40 – 4.19	Frequently	Agree/Influential
2.60 – 3.39	Occasionally	Undecided/Neutral
1.80 – 2.59	Rarely	Disagree/Uninfluential
1.00 – 1.79	Never	Strongly disagree/Very uninfluential

3. Results

The Cronbach's alpha value was 0.832, indicating high correlation and reliability among the items measuring each construct. This suggests that the constructs were accurately and consistently measured, and the items can be considered reliable indicators of the underlying constructs.

Table 2 shows that the participation rate of females (70.27%) was higher than that of males (29.73%). The majority of students studied under the local education system, namely, matriculation (88.29%) and higher secondary level (91%). In contrast, a smaller proportion of students followed the Cambridge study system: O levels (11.71%) and A levels (9.01%). Notably, the average usage of smartphones among students varied significantly, ranging from less than an hour to over six hours. Furthermore, students' average monthly household income was PKR 65,216.22 ± 34,807.53.

Table 3 indicates that students use smartphones for a range of purposes. Among the study respondents, accessing learning content (4.58 ± 4.05), text messaging services (4.48 ± 3.95), and internet-based text messaging services (4.36 ± 3.83) were the most commonly used functions. The table also reveals that the study participants viewed smartphones as essential for educational purposes (4.26 ± 3.72), such as understanding and revising concepts delivered through lectures (4.26 ± 3.73). However, students reported using smartphones less frequently to access online libraries (3.27 ± 2.27).

Table 2. Demographic attributes of health sciences students (n = 222).

Demographics		N (%)
Gender	Male	66 (29.73)
	Female	156 (70.27)
Age (in years), Mean ± SD		20.50 ± 2.07
Monthly household income (in PKR), Mean ± SD		65,216.22 ± 34,807.53
Field of study	Physical therapy	31 (13.96)
	Human nutrition and dietetics	10 (4.50)
	Nursing	108 (48.65)
	Radiography and imaging technology	62 (27.93)
	Genetics	11 (4.95)
The education system at the secondary level	Matriculation (local system)	196 (88.29)
	Cambridge O Levels	26 (11.71)
The education system at the high secondary level	Intermediate (local system)	202 (91.00)
	Cambridge A Levels	20 (9.01)
Geographical location	Urban	122 (54.95)
	Rural	100 (45.05)
Average daily smartphone usage	Less than an hour	4 (1.80)
	1 – 2 hours	75 (33.78)
	3 – 4 hours	75 (33.78)
	5 – 6 hours	47 (21.17)
	More than 6 hours	21 (9.46)

Table 3. Smartphone usage: individual purposes and overall perceptions of students (n = 222).

Description	Weighted Average	Weighted SD	Interpretation
Individual Purposes			
Enhance societal communication	3.95	3.42	Agree
Access learning content	4.58	4.05	Strongly agree
Stay up to date with the latest news	4.12	3.58	Agree
Access email	3.97	3.43	Agree
Playing games	3.44	2.90	Agree
Entertainment purposes	4.05	3.51	Agree
Explore directions	4.13	3.60	Agree
Text messaging services	4.48	3.95	Strongly agree
Internet-based text messaging services	4.36	3.83	Strongly agree
Overall Perceptions			
Educational purposes	4.26	3.72	Strongly agree
Access the learning management information system	3.97	3.43	Agree
Attend online lectures	3.89	3.35	Agree
Access online libraries	3.27	2.72	Occasionally
Prepare for examinations	3.89	3.35	Agree
Understand lectures/revise concepts delivered through lectures	4.26	3.73	Strongly agree
Complete assignments	4.19	3.66	Agree
Upload educational learning material for peers and colleagues	3.86	3.33	Agree

Table 4 shows that all components indicating smartphones as a new modality to enhance health sciences knowledge, including system quality, information quality, system importance, usefulness, and satisfaction, influenced the students' perception.

Table 4. Student perception of smartphones for health sciences learning (n = 222).

Smartphones as a Modality: Key Components	Weighted Average	Weighted SD	Interpretation
System quality	3.97	3.43	Influential
Information quality	3.78	3.24	Influential
System importance	3.85	3.31	Influential
Usefulness	4.10	3.56	Influential
Satisfaction	3.90	3.36	Influential

4. Discussion

Our study findings have highlighted the significant role of smartphones in the daily lives of health sciences students. The results demonstrated that students use smartphones for a variety of purposes, including accessing learning content, text messaging services, and internet-based messaging services. Interestingly, the average daily smartphone usage among students varied widely, ranging from less than an hour to more than six hours. Our study also revealed that the majority of students had completed their secondary and high secondary education under the local education system, specifically matriculation and higher secondary level, while a smaller proportion of students had followed the Cambridge study system, i.e., O and A levels. Moreover, our study showed that students perceived smartphones as a new modality to enhance their knowledge in health sciences, as evidenced by their positive perception of system quality, information quality, system importance, usefulness, and satisfaction. These findings suggest that smartphones have become an integral part of the educational experience for health sciences students, and their use should be encouraged for educational purposes.

The results of our study are consistent with another study conducted at the Medical University of India, which examined the effect of mobile phone use on students' learning [22]. According to this study, medical students primarily use smartphones to access educational resources such as video lectures, medical websites, and applications. They also use their phones to take notes during lectures and assessments after watching the lectures. Other Saudi study results align with our study results that assessed practices of smartphone usage among undergraduate nursing students and revealed that 94.8% of students carry smartphones at all times [23]. In addition, students reported smartphone usage for documenting class information (77.8%), accessing information from websites during group studies (93.3%), using communication applications for group studies (89.6%), and using social media platforms for academic purposes (85.2%). Our study results are consistent with another study in the United Kingdom (UK) that recruited clinical and medical students to determine smartphone usage and its acceptability as a modality to enhance knowledge. The study revealed that 59% of students owned a smartphone; 37% used it to support their learning. Furthermore, the students had a positive attitude toward the concept of smartphones as future academic aids, and 84% believed smartphones are helpful in academics [24].

The use of smartphones among students, specifically for educational purposes, has dramatically increased during the COVID-19 pandemic due to lockdown restrictions. For example, a Jordanian study assessed smartphone addiction among university students during the COVID-19 lockdown period by recruiting 6,157 students [25]. The majority of the students (85%) reported that their smartphone usage greatly increased, and 27.6% reported increased smartphone usage during the lockdown. In addition, 42% of participants reported smartphone use for more than six hours a day. Another study compared electronic gadget usage during the COVID-19 pandemic among higher education stu-

dents in Italy, Spain, and Ecuador and highlighted that along with smartphones, laptops were among the most widely used devices for educational and information purposes [26].

The study's results are not supported by a Malaysian study that determined smartphone usage among university students and indicated that most students somewhat agreed that they used smartphones without any compelling reasons every hour and that it induced emotional stability [27]. The findings implied that the students were somewhat addicted to smartphones but did not use them for academic purposes. Similarly, a Brazilian study revealed that most students were addicted to smartphones but explicitly used them to access social media platforms, including Instagram, Facebook, and Snapchat [28].

Increased smartphone use among multidisciplinary students, especially in the health sciences discipline, can be attributed to the ease of carrying a phone, taking lecture notes, gathering relevant information, and accessing the internet, which helps them in their studies [29]. Furthermore, students use smartphones due to different discipline-based applications, which aids them in academics and improves their learning concepts [30]. All common uses of smartphones, such as recording lectures, storing files, and retrieving information whenever needed, have made them a novel modality in healthcare education [31]. Additionally, smartphone usage is widespread for communication and socialization as a cheaper, more reliable, and instant source of communication [32]. Finally, in addition to using smartphones for academic purposes, the popularity of this modality can be attributed to various determinants, including entertainment reasons, listening to music, watching videos and movies, and socializing through different social network applications [33].

Our study has shed light on the importance of smartphones in the lives of health sciences students and their positive perceptions of smartphones as a new modality to enhance their knowledge. To the best of our knowledge, this study is among the few that have explored this topic in local settings, making a significant contribution to the literature. Nonetheless, our study has some limitations that should be acknowledged. First, we did not investigate the potential negative effects of smartphone usage on students' academic performance. Additionally, we did not explore the correlation between smartphone usage and academic performance. Future studies could address these gaps in the literature. Second, we used descriptive statistics to analyze the data but did not employ inferential statistics. Therefore, the findings of the study should be interpreted with caution. Despite these limitations, our study provides important insights into students' perceptions of using smartphones for educational purposes in the field of health sciences.

5. Conclusions

In conclusion, our study highlights the significant role of smartphones in the daily lives of health sciences students and their positive attitudes toward using them as a tool for enhancing their knowledge. Students use smartphones to access learning content and other online resources, and our findings suggest that educators should incorporate them into the educational curriculum. Notably, our study found that students' average daily smartphone usage varied widely. These findings have significant implications for the educational system, as smartphones have become an essential part of the educational experience for health sciences students. However, future studies could investigate the potential negative effects of smartphone usage on academic performance and explore the correlation between smartphone usage and academic outcomes to better understand the impact of smartphones on education.

Author contributions: Conceptualization, SSF, and AA; methodology, SSF, and AA; software, SSF, and AA; validation, SSF, and AA; formal analysis, SSF, and AA; investigation, SSF; resources, SSF; data curation, SSF, and AA; writing—original draft preparation, SSF; writing—review and editing, AA; visualization, SSF, and AA; supervision, AA; project administration, SSF. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no specific grant from the public, commercial, or not-for-profit funding agencies.

Ethics statement: This study obtained ethical clearance from the Ethical Review Committee at Rai Medical College, Sargodha, Pakistan (No. RMCS/ERC/11/21).

Consent to participate: Prior to questionnaire distribution, written informed consent was obtained from all participants.

Data availability: All data are presented in this study.

Acknowledgments: We wish to thank all the staff and administrators at the University of Punjab, the University of Health Sciences, and the University of Lahore.

Conflicts of interest: The authors declare no conflicts of interest.

References

[1] Wilson K. Mobile cell phone technology puts the future of health care in our hands. CMAJ. 2018;190(13):E378-9. https://doi.org/10.1503/cmaj.180269

[2] Pew Research Center. Experts say the 'new normal'in 2025 will be far more tech-driven, presenting more big challenges. 2022 [cited 05 July 2022]. Available from: https://www.pewresearch.org/internet/wp-content/uploads/sites/9/2021/02/PI_2021.02.18_New-Normal-2025_FINAL.pdf.

[3] Mariscal J, Mayne G, Aneja U, Sorgner A. Bridging the gender digital gap. Econ. 2019;13(2019-9):20190009. https://doi.org/10.5018/economics-ejournal.ja.2019-9

[4] Tsetsi E, Rains SA. Smartphone Internet access and use: Extending the digital divide and usage gap. Mob Media Commun. 2017;5(3):239-55. https://doi.org/10.1177/2050157917708329

[5] Kickbusch I, Piselli D, Agrawal A, Balicer R, Banner O, Adelhardt M, et al. The Lancet and Financial Times Commission on governing health futures 2030: Growing up in a digital world. Lancet. 2021;398(10312):1727-76. https://doi.org/10.1016/S0140-6736(21)01824-9.

[6] Orben A, Przybylski AK. The association between adolescent well-being and digital technology use. Nat Hum Behav. 2019;3:173-82. https://doi.org/10.1038/s41562-018-0506-1

[7] Sutisna D, Widodo A, Nursaptini N, Umar U, Sobri M, Indraswati D. An analysis of the use of smartphone in students' interaction at senior high school. 1st Annual Conference on Education and Social Sciences (ACCESS 2019); 2020 Oct 26-27; Mataram, Indonesia. Paris: Atlantis Press; 2020. p. 221-4.

[8] Shakoor F, Fakhar A, Abbas J. Impact of smartphones usage on the learning behaviour and academic performance of students: Empirical evidence from Pakistan. Int J Acad Res Bus Soc Sci. 2021;11(2):862-81. http://dx.doi.org/10.6007/IJARBSS/v11-i2/8902

[9] Nicolaou C, Matsiola M, Kalliris G. Technology-enhanced learning and teaching methodologies through audiovisual media. Educ Sci. 2019;9(3):196. https://doi.org/10.3390/educsci9030196

[10] Vinay KV, Vishal K. Smartphone applications for medical students and professionals. J Health Allied Sci NU. 2013;3(1):59-62. http://dx.doi.org/10.1055/s-0040-1703635

[11] Sindhu KK. The phone: Communication in the age of COVID-19. Patient Educ Couns. 2021;104(8):1889-90. https://doi.org/10.1016/j.pec.2021.02.013

[12] Schwaiger E, Tahir R. Nomophobia and its predictors in undergraduate students of Lahore, Pakistan. Heliyon. 2020;6(9):e04837. https://doi.org/10.1016/j.heliyon.2020.e04837

[13] Khan H, Malik A. Academic use of smartphones among medical students in Pakistan. Inf Dev. 2021;38(2):299-309. https://doi.org/10.1177/0266666921993518

[14] Shah J, Haq U, Bashir A, Shah SA. Awareness of academic use of smartphones and medical apps among medical students in a private medical college. J Pak Med Assoc. 2016;66(2):184-6.

[15] Council for International Organizations of Medical Sciences (CIOMS) in collaboration with the World Health Organization (WHO). International Ethical Guidelines for Health-related Research Involving Humans. Geneva (GE): CIOMS; 2016.

[16] The University of Lahore. Why UOL. 2022 [cited 15 July 2022]. Available from: https://uol.edu.pk/#.

[17] University of the Punjab. Introduction. 2022 [cited 15 July 2022]. Available from: http://pu.edu.pk/page.

[18] Specialized Health Care & Medical Education Department. Prospectus. 2022 [cited 15 July 2022]. Available from: https://www.uhs.edu.pk/mcat/prospectus2019.pdf.

[19] Javed K, Sharif S, Anwar MJ, Naveed A, Afzal S, Hayder A. Smart Phones: A new modality to enhance knowledge for medical students. Pak J Med Sci. 2019;13(1):79-84.

[20] Seddon P, Kiew MY. A partial test and development of Delone and Mclean's Model of IS success. Australas J Inf Syst. 1996;4(1): 90-109. https://doi.org/10.3127/ajis.v4i1.379
[21] Alonazi M. MGAUM: a new framework for the mobile government service adoption in Saudi Arabia [dissertation]. Brighton (BN): University of Sussex; 2019.
[22] Gavali MY, Khismatrao DS, Gavali YV, Patil KB. Smartphone, the new learning aid amongst medical students. J Clin Diagn Res. 2017;11(5):JC05-8. https://doi.org/10.7860/JCDR/2017/20948.9826
[23] Alsayed S, Bano N, Alnajjar H. Evaluating practice of smartphone use among university students in undergraduate nursing education. Health Prof Educ. 2020;6(2):238-46. https://doi.org/10.1016/j.hpe.2019.06.004
[24] Robinson T, Cronin T, Ibrahim H, Jinks M, Molitor T, Newman J, et al. Smartphone use and acceptability among clinical medical students: A questionnaire-based study. J Med Syst. 2013;37:9936. https://doi.org/10.1007/s10916-013-9936-5
[25] Saadeh H, Al Fayez RQ, Al Refaei A, Shewaikani N, Khawaldah H, Abu-Shanab S, et al. Smartphone use among university students during COVID-19 quarantine: An ethical trigger. Front Public Health. 2021;9:600134. https://doi.org/10.3389/fpubh.2021.600134
[26] Tejedor S, Cervi L, Pérez-Escoda A, Tusa F. Smartphone usage among students during COVID-19 pandemic in Spain, Italy and Ecuador. In: García-Peñalvo FJ, García-Holgado A, editors. TEEM'20: Eighth International Conference on Technological Ecosystems for Enhancing Multiculturality; 2020 Oct 21; Salamanca, Spain. New York: Association for Computing Machinery; 2021. p. 571-6.
[27] Fook CY, Narasuman S, Abdul Aziz N, Syed Mustafa SM, Tau Han C. Smartphone usage among university students. Asian J Univ Educ. 2021;17(1):282-91. https://doi.org/10.24191/ajue.v17i1.12622
[28] Laurence PG, Busin Y, Lima HS, Macedo EC. Predictors of problematic smartphone use among university students. Psicol Reflex Crit. 2020;33:8. https://doi.org/10.1186/s41155-020-00147-8
[29] Alson JN, Misagal LV. Smart phones usage among college students. Int J Eng Res Technol. 2016;4(3):63-70.
[30] Yakoub Masadeh TS. Smartphone Use in learning as perceived by university undergraduates: Benefits and barriers. Int J Res. Granthaalayah. 2021;9(3):56-65. https://10.0.113.193/granthaalayah.v9.i3.2021.3764
[31] Hossain ME, Ahmed SZ. Academic use of smartphones by university students: A developing country perspective. Electron Libr. 2016;34(4):651-65. https://doi.org/10.1108/EL-07-2015-0112
[32] Lee H, Kim JW, Choi TY. Risk factors for smartphone addiction in Korean adolescents: Smartphone use patterns. J Korean Med Sci. 2017;32(10):1674-9. https://doi.org/10.3346/jkms.2017.32.10.1674
[33] Kuldeep Singh MK, Samah NA. Impact of smartphone: A review on positive and negative effects on students. Asian Soc Sci. 2018;14(11):83-9. https://doi.org/10.5539/ass.v14n11p83