Impact of ICT on the Academic Performance of Students at University Level

Dr. Bakht Jamal[1], Qurrat-ul-Ain[2], Doung Dara[3], Aiman Shabbir[4], Gul Muhammad Shaikh[5]

Abstract
Contemporary educational institutions heavily rely on information and communication technology (ICT) which has put impact on students' learning. The researcher investigated the impact of ICT on the academic performance of students at the university level. To achieve research objectives, the descriptive research design of the quantitative survey approach was employed. All the students of the MS (Education) program were population in 15 public sector universities in Punjab while 500 samples of the students were taken through simple random sampling. The self-structured quantitative questionnaire was used as a research tool. Validation and reliability were confirmed through experts' opinions. Descriptive and inferential statistics were used for data analysis. The findings reflected that the majority of the students used ICT devices and improved their academic performance. Therefore, it was concluded that students at the university level were actively involved in using ICT devices and recommended to infuse ICT in teaching learning and ensuring collaborative learning.
Keywords: ICT, Academic Performance, University Students, Public Sector Universities

1. Introduction

Information and communication technology have impacts on the lives of people and it becomes an essential part of the routine. The ICT tools greatly changed every aspect of life and especially impacted the students' learning. Therefore, ICT tools widely develop digital culture in every society and help students benefit from its positive aspects (Schuler, 2020). The major characteristic of information and communication technology is the enhancement of the quality of education, its cost and the provision of education for all people. ICT has positive impacts on teaching teaching-learning process and the provision of any educational content with only one click (Moore, 2013). The ICT platforms i.e., the internet provide great opportunities for students to learn anytime, anyplace as well as teachers may benefit from its effectiveness in the classrooms and they may develop digital culture (Michael, 2011). Through the wide use of ICT, the transfer of knowledge and skills to a larger number of students is possible within no time (Smith et al., 2005; ven Zanden, 2023).

Information and Communication Technology (ICT) provides opportunities for learners to participate at any time and anywhere for example at home or office time. In service, people manage their learning timings according to their schedule when the time is convenient for them. So digital education encounters the requirements of the individuals (Mishra, 2011). Continuous and rapid learning is a necessity of individuals in the global community and flexibility demands increasing over time (Chen, 2003). Information and Communication Technology (ICT) is an effective way of delivering education to the masses as it is a lost cost (O, neill et al., 2004; Feng & Qi, 2024).

Information and Communication Technology (ICT) provides opportunities for people to participate in learning activities according to their schedules. Information and Communication Technology (ICT) does not force learners to travel from one place to another daily. In this way, much of the time and cost saved as well as the routine of their jobs may not be disturbed (Chen, 2003). Information and Communication Technology (ICT) is an operational model from the institutional point of view as it is low cost and institutions reduce their cost (Ercan, 2010; Audi et al., 2022). Any digital or virtual university can provide digital education on a large basis with limited human resources (Gladeieux, 2000; Audi et al., 2021). Information and Communication Technology (ICT) can be managed in any location, at any time, with no need to travel from one place to another and the learners can spend the saved time for their learning (Adedara & Onwuegbuzie, 2014; Ash, 2009; Abulrub & Attridge, 2011).

1.1. Research Objectives

To find out the extent of ICT use among students at the university level.
To investigate the impact of ICT on the student's academic performance at the university level.
To compare the use of ICT and Face-to-Face learning on the student's academic improvement at the university level.

2. Review of the Literature

ICT has turned into a dynamic part of the education system which changes how students learn and access the information that they want. Students may get a lot of knowledge and skills while using information and communication technology (Bibi et al., 2023). The effectiveness of ICT in the homeroom impacted students' stimulation, motivation, decision making and critical thinking. The use of ICT devices improved the knowledge and skills among college and university students (Nwigbo, & Madhu, 2016; Karhan, 2019; Geda, 2023).

ICT and E-learning have gained obvious excellence in learning for university students. The ICT and e-learning-oriented activities enhanced academic development and efficiency at the university level (Skryabin et al., 2015). Information and communication technology (ICT) allows conversion opportunities for academic growth by fitting educational material and addressing individual needs. The learning worked with information and communication technology (ICT) devices, insistently influences students' independent academic performance, prompting more significant levels of academic development. Therefore, information and communication technology (ICT) learning can encourage academic proficiency and development among university students (Aristovnik, 2012).

Information and communication technology (ICT) devices develop supportive learning and positive communication among students. Supportive learning through ICT refines students' critical and reasoning abilities. Moreover, it develops communication channels among students to overcome learning problems and manage their skills (Lu & Song, 2020). The ICT resolve the students' academic and learning difficulties (Carnoy, 2004; Bibi, 2019).

---
[1] Corresponding Author, SED, Government of Punjab, Pakistan, bakht.phdedu155@iiu.edu.pk
[2] MPhil Education, Department of Education, University of Lahore, Pakistan
[3] Deputy Director of Education and Research at Mindset Development Organization, (MDO), Cambodia
[4] Department of Computer Science, Muhammad Nawaz Shareef University of Agriculture, Multan, Pakistan
[5] Assistant Professor Dental Education, Shahida Islam Medical and Dental College Lodhran, Pakistan

Information and communication technology (ICT) devices also inspired the students' commitment to their studies and motivated them to accomplish their work with significant efficiency (Asif et al., 2022)

The extensive use of cell phones has opened up new roads for educational transformation through m-learning. The m-learning developed students' academic performance and learning results. M-learning permits students to involve themselves in educational activities anywhere and in place (Picatoste et al., 2018).

Computer-generated Reality (VR) and Expanded Reality (AR) developed extraordinary potential to change the educational scenario. Utilization of VR in universities indicated positive effects on students' academic performance and skills. VR and AR develop students' academic performance by developing their learning potential (Aboderin, 2019). The massive approach to information and communication technology has established opportunities for teachers and students to develop their knowledge and skills into execution. The massive use of ICT devices developed the academic performance of students and teachers at the university level (Ritzhaupt et al., 2013).

Information and communication technology (ICT) resolved issues related to inclusive education. The students with differently abled capabilities developed their academic performance as well as boosted their motivation level. (Chillas et al., 2015). The use of ICT improved communications, cooperative learning and critical thinking at the university level (Pagani et al., 2016). The use of ICT impacted the growth and efficiency of students at the university level.

The assimilation of gamification, mobile learning and inclusive ICT practices have all shown auspicious outcomes in improving students' learning experiences and academic performance. Therefore, incessant research and application efforts are essential to address encounters and fully inspire the potential of ICT in higher education. By implementing innovative ICT approaches, universities may permit their students to engage in the digital age and accomplish greater development and efficiency in their academic pursuits (Qi, 2019).

3. Research Methodology

The researcher investigated the impact of ICT on the academic performance of students at the university level. To achieve research objectives, the descriptive research design of the quantitative survey approach was employed. All the students of the MS (Education) program in 15 public sector universities in Punjab were the population while the sample was 500 students taken through a simple random sampling technique. The self-structured quantitative questionnaire was used as a research tool. Validation and reliability were confirmed through experts' opinions and also established through pilot testing. After refining the tool, the data were collected and managed properly. The descriptive and inferential statistics i.e., frequency percentage and t-test. The findings reflected that the majority of the students using ICT devices improved their academic performance while significant differences were noted among students in using e-learning platforms and face-to-face learning. It was concluded that students at the university level were actively involved in using ICT devices, improved their learning, making collaboration and information and communication technology develop an attractive environment for teaching and learning at the university level. Therefore, it was recommended to incorporate information and communication technology in teaching-learning to develop an interactive learning environment and collaboration among students at the university level.

Table 1: ICT Use among Students at University Level

ICT Aspects	F	%age
1. Regular Use of LMS	250	50%
2. Utilization of Online Database for Research	180	36%
3. Engagement in Online Discussion Forums	220	44%
4. Interactive Virtual Simulations in Labs	150	30%
5. Participation in Webinars and Virtual Lectures	130	26%
6. Use of Educational Mobile Apps	170	34%

Table 1 reflected the use of ICT at the university level and showed that the use of LMS ($f = 250$, 50%); utilization of online database for research ($f = 180$, 36%); engagement in online discussion forums ($f = 220$, 44%); interactive virtual simulation in labs ($f = 150$, 30%); participation in webinars and virtual lectures ($f = 130$, 26%); Use of educational mobile apps ($f = 170$, 34%).

Table 2: Impact of ICT on the Students' Academic Performance at the University Level

Aspects	F	%age
1. Improved Time Management	300	60%
2. Enhanced Learning Experience	380	76%
3. Increased Productivity	260	52%
4. Improved Academic Performance	350	70%
5. Improved Collaboration	210	42%

Table 2 presented the impact of ICT on the students' academic performance at the university level and reflected the impact of ICT on different aspects i.e., improved time management ($f = 300$, 60%); enhanced learning experiences ($f = 380$, 76%); increased productivity ($f = 260$, 52%); improved academic performance ($f = 350$, 70%); improved collaboration ($f = 210$, 42%).

Table 3: ICT and Face-to-Face Learning Comparison on Students' Academic Improvement at University level

Groups	N	Mean	Std	t-value	Sig
E-Learning Platforms	200	81.531	5.201	4.68	.001
Face-to-Face	300	87.233	6.182		

Table 3 presented the ICT and Face-to-Face learning comparison on students' academic improvement at the university level and reflected that students improved their academic performance in the context of E-learning and Face-to-Face ($M = 81.531$, 87.233)

while the (t-value = 4.68, sig = .001 at $P > .05$). It reflected that significant differences were existed among the students in the context of ICT and Face-to-Face learning improvement at university level.

4. Discussion

Today, the use of ICT plays a great role in every person's life, especially in improving students' academic achievements. The findings of the study link with Jamal et al. (2023) that university students feel the need for digital devices and are involved in using digital devices. Similarly, Jamal et al. (2023) found that university students were involved in digital citizenship practices. Jamal et al. (2021) claimed that online resources are available at the university level to students with different ratios among private and public sector universities. Iqbal and Ahmed (2020) claimed that students were heavily involved in practicing the information and communication technologies programs after Covid-19. Rehman (2018) supported the claim that students are involved in digitalization and these programs have positive impacts on the improvement of their academic performance throughout Pakistan. Memon (2017) highlighted that both males and females use the devices of information and communication technology and improve their academic achievements.

5. Conclusions

It was concluded that the students using ICT tools in higher education at the university level and actively involved in learning through ICT tools as well as improve their academic performance. The usage of ICT tools and devices heavily put positive impact on the improvement of students' academic performance academic-wise. It was concluded that students were significantly different opinions regarding face-to-face and ICT learning and the majority of the students preferred a face-to-face learning environment as compared to learning through ICT.

6. Recommendations

It was recommended to improve students' academic performance, the universities may encourage and support the integration of ICT in their teaching-learning practices. The teachers at the university level may present teaching content through an interactive approach to get comprehensive benefits from ICT tools and to create a constructive environment in the classrooms. For the promotion of collaborative learning, different platforms i.e., webinars, workshops, conferences, seminars and symposiums may be conducted through ICT use where students may be involved practically to develop a cooperative culture among them. It was also recommended that universities manage training opportunities for teachers for effective implementations of ICT at the university level as well as equip them with modern technological changes.

7. Suggestions for Future Research

The findings of the research recommended that future research may be conducted to analyze the impact of ICT or digital education and digital citizenship at different levels of education from school to university level. Moreover, further research may be conducted about the gaps between the ICT provisions, challenges and classroom practices.

References

Aboderin, O. S. (2019). A multidisciplinary study on the relationship between ICT literacy levels and academic performance of e-learners in an e-learning setting. *Journal of Management & Administration*, *2019*(1), 1-23.

Abulrub, A. H. G., Attridge, A. N., & Williams, M. A. (2011, April). Virtual reality in engineering education: The future of creative learning. *In 2011 IEEE Global Engineering Education Conference (EDUCON)* (pp. 751–757). IEEE.

Adedara O.G. & Onwuegbuzie I.U., (2014). Copying with the age of digitalization in academics: the e-learning sensibility. *Computing, Information Systems, Development Informatics & Allied Research Journal, 5* (4), 54–64.

Aristovnik, A. (2012). The impact of ICT on educational performance and its efficiency in selected EU and OECD countries: a non-parametric analysis. *Available at SSRN 2187482*.

Ash, K. (2009). Experts debate the cost savings of virtual education. *Education Week, 28*(25), 1–9

Asif, M., Sheeraz, M., & Sacco, S. J. (2022). Evaluating the Impact of Technological Tools on the Academic Performance of English Language Learners at Tertiary Level: A Pilot Investigation. *Pegem Journal of Education and Instruction*, *12*(1), 272-282.

Audi, M., Ali, A., & Al-Masri, R. (2022). Determinants of Advancement in Information Communication Technologies and its Prospect under the role of Aggregate and Disaggregate Globalization. *Scientific Annals of Economics and Business*, *69*(2), 191-215.

Audi, M., Ali, A., & Roussel, Y. (2021). *The Advancement in Information and Communication Technologies (ICT) and Economic Development: A Panel Analysis. International Journal of Innovation, Creativity and Change*, 15(4), 1013-1039.

Bibi, C. (2019). Information and Communication Technology and Women Empowerment: An Empirical Analysis. *Journal of Policy Options*, *2*(1), 24-31.

Bibi, H. J., Ayub, A., & Ismail, I. (2023). Impact of ICT on the Progress and Productivity of Students at the University Level. *Journal of Social Sciences Review*, *3*(1), 270-282.

Carnoy, M. (2004). ICT in education: Possibilities and challenges. *Inaugural Lecture of the UOC, 2005*.

Chen, T. (2003). Recommendations for creating and maintaining effective networked learning communities: A review of the literature. *International Journal of Instructional Media, 30*(1), 35.

Chillas, S., Marks, A., & Galloway, L. (2015). Learning to labour: an evaluation of internships and employability in the ICT sector. *New technology, work and employment*, *30*(1), 1-15.

Ercan, T. (2010). Effective use of cloud computing in educational institutions. *Procedia-Social and Behavioral Sciences, 2*(2), 938–942.

Feng, J., & Qi, S. (2024). Digital Infrastructure Expansion and Economic Growth in Asian Countries. *Journal of Business and Economic Options*, *7*(2), 27-32.

Geda, A. (2023). Advancing Rural Welfare-The Role of Irrigation Technology in Ethiopia's Agricultural Sector. *Journal of Business and Economic Options*, *6*(2), 32-38.

Gladieux, L. E. (2000). Global online learning: Hope or hype? *Higher Education in Europe, 25*(3), 351–353.

Iqbal, M. J., & Ahmad, M. (2020). Enhancing quality of education through e-learning: the case study of Allama Iqbal Open University. *Turkish Online Journal of Distance Education, 11*(1), 84–97.

Jamal, B. & Rizvi, S. A. A. (2023). Analysis of the digital citizenship practices among university students in Pakistan. *Pakistan Journal of Distance and Online Learning, 9*(1), xx–xx.

Jamal, B., Kishwer, R., Kumber, M. I., Khan, M. H.N., & Ahmed, M. (2021). Assessing the availability and usage of online resources among university students in Pakistan. *Humanities & Social Sciences Reviews,9* (1), 161-170.

Jamal, B., Rizvi, S. A.A., & Kayani, M. M. (2023). Analysis of the digital education practices among university students in Khyber Pakhtunkhwa. *Journal of Contemporary Teacher Education, 7,* 21–38.

Karhan, G. (2019). Investing in Research and Development for Technological Innovation: A Strategy for Turkey's Economic Growth. *Journal of Business and Economic Options*, *2*(4), 152-158.

Lu, Y., & Song, H. (2020). The effect of educational technology on college students' labor market performance. *Journal of Population Economics*, *33*, 1101-1126.

Memon, G. R., (2017). Education in Pakistan: The Key Issues, Problems and The New Challenges. *Journal of Management and Social Sciences, 3*, 47–55.

Michael, V. B., (2011). *Introduction: What is virtual learning?*

Mishra, P. K. (2011). *Managing electronic resources*. Gyan Publishing House.

Moore, M. G. (Ed.). (2013). *Handbook of distance education*. New York: Routledge.

Nwigbo, S., & Madhu, B. K. (2016). Impact of ICT on the Teaching and Learning Process. *IOSR Journal of Mobile Computing & Application (IOSR-JMCA)*, *3*(2), 1-7.

O'neill, K., Singh, G., & O'donoghue, J. (2004). Implementing eLearning programmes for higher education: A review of the literature. *Journal of Information Technology Education: Research, 3*(1), 313–323.

Pagani, L., Argentin, G., Gui, M., & Stanca, L. (2016). The impact of digital skills on educational outcomes: evidence from performance tests. *Educational studies*, *42*(2), 137-162.

Picatoste, J., Pérez-Ortiz, L., & Ruesga-Benito, S. M. (2018). A new educational pattern in response to new technologies and sustainable development. Enlightening ICT skills for youth employability in the European Union. *Telematics and Informatics*, *35*(4), 1031-1038.

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.

Rehman. A. (2018). *Higher Education Status in Pakistan.* Newspaper Article "The News", 5 November 2008.

Ritzhaupt, A. D., Liu, F., Dawson, K., & Barron, A. E. (2013). Differences in student information and communication technology literacy based on socio-economic status, ethnicity, and gender: Evidence of a digital divide in Florida schools. *Journal of Research on Technology in Education*, *45*(4), 291-307.

Schuler, D. (2020). Digital cities and digital citizens. In: Tanabe, M., van den Besselaar, P., Ishida, T. (eds) *Digital Cities II: Computational and Sociological Approaches. Digital Cities 2001. Lecture Notes in Computer Science, vol 2362* (71-85). Springer, Berlin, Heidelberg.

Skryabin, M., Zhang, J., Liu, L., & Zhang, D. (2015). How the ICT development level and usage influence student achievement in reading, mathematics, and science? *Computers & Education*, *85*, 49-58.

Smith, K. G., Collins, C. J., & Clark, K. D. (2005). Existing knowledge, knowledge creation capability, and the rate of new product introduction in high-technology firms. *Academy of Management Journal, 48*(2), 346- 357.

van Zanden, J. L. (2023). Examining the Relationship of Information and Communication Technology and Financial Access in Africa. *Journal of Business and Economic Options*, *6*(3), 26-36.