Analyzing the Effects of the Covid-19 Pandemic on University Students' Academic Performance Administration: A Post-Pandemic Assessment

Mahek Arshad[1], Muhammad Ajmal[2], Yasir Riady[3*]

[1]Controller of Examinations, Fazaia Bilquis College of Education for Women, Rawalpindi, Pakistan
[2]Associate Professor, Allama Iqbal Open University, Islamabad, Pakistan
[3]Universitas Terbuka, Indonesia
✉ yasir@ecampus.ut.ac.id*

Check for updates

Abstract

Background of study: Covid-19 disease has significantly impacted all characteristics in life worldwide. Higher education is encountering substantial problems throughout the diverse industries impacted. This transition has resulted in significant implications, especially for the students' in education performance.

Aims and scope of paper: This learning aimed to examine the effect of the Covid-19 on university students' academic routine and to assess the problems posed by the adoption of online learning practices during this period. The study also seeks to provide remedies by creating conceptual models to mitigate the effects of these difficulties in the future.

Methods: This study applied a qualitative methodology to analysed the textual material and employed a fundamental quantitative methodology for doing descriptive analysis that corroborates the findings. A self-administered questionnaire was created. The study employed purposive sampling, yielding a total of 106 respondents. Students encountered various obstacles, including inadequate assistance to adjust to the alterations in their education resulting from COVID-19.

Results: They faced insurmountable workloads that were untenable without sufficient assistance from educators. Moreover, challenges included inadequate computer literacy, absence of energy and internet access at home, and sluggish connection speeds exacerbated their learning experiences, ultimately affecting their academic achievement. Universities are advised to prioritize the allocation of training and resources to adeptly handle analogous situations in the future.

Conclusion: Educators should be provided assistance in developing interactive online learning resources and materials for institutions of higher education. Establishing and maintaining efficient communication techniques with management, staff, educators, and students is crucial for ensuring that all parties are informed and updated regarding subsequent phases of the transition and ongoing training support.

A. Introduction

Early in 2020, the globe was taken aback by the coronavirus known as COVID-19's abrupt and intense attack. It started to spread in Wuhan, China, 2019 of December; the initial instance was discovered in China

on November 17, 2019. As of February 25, 2021, there were over 112,553,318 instances reported worldwide, indicating that the whole planet is impacted. Almost 2,497,419 of these individuals have died, even though nearly 63,504,705 of them have recovered (Hui et al., 2020). As a result, on March 11, 2020, the World Health Organization (WHO) deemed the COVID-19 outbreak to be a global pandemic. As "an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and spreading rapidly," the definition of "pandemic". The Covid-19 pandemic has brought unprecedented challenges to higher education institutions worldwide. The sudden shift to remote learning, coupled with social and economic uncertainties, has created a unique set of circumstances for university students (Csorba & Dabija, 2024). This study delves into the qualitative aspects of the pandemic's influence on academic achievements, seeking to provide a nuanced understanding of the experiences of students during this challenging period. Universities are among the institutions that have asked students, faculty and lecturers to use multiple online communication platforms to ensure the academic process remains uninterrupted, but the COVID-19 poses significant challenges to global higher education community on when using such emerging technologies (Tlais et al., 2025).

Since the epidemic, learning has taken place outside of traditional classroom environments, bringing in an era when virtual and digital platforms are important (Imran et al., 2025). For students used to in-person interactions, the abrupt closing of campuses and the switch to online instruction presented a significant obstacle. The change significantly disrupted the learning environment, which had an impact on student involvement and educational quality as a whole. Students felt alone because there were no physical classrooms, peer connections, or direct professor communication opportunities. This detracted from their drive and concentration.

Numerous strategies were employed to support education in Pakistan during this pandemic, including the rapid rise in numerous countries' use of online learning platforms and other tools to facilitate online learning. A lot of people started using learning management systems (LMS) and other platforms like Zoom, Microsoft Teams and Google Meet. As online learning proliferated, it exposed the already-existing differences in students' access to technology. Not everyone has the same access to digital equipment, fast internet, or a peaceful, comfortable space to study. These differences made already-existing gaps worse by impeding some students' capacity to participate completely in online courses, turn in assignments, and interact with the materials efficiently.

It is well known that the epidemic has had a negative impact on people's mental health, and college students are not an exception. Many students' mental health has suffered as a result of the pandemic's stress, as well as future uncertainty, money worries, and the difficulties of distance study. The prevalence of anxiety, sadness, and burnout has increased, making it more difficult for students to concentrate on their academic goals. In reaction to the pandemic's restrictions, universities had to reevaluate their examination and evaluation procedures. Online tests have supplanted traditional, in-person exams, raising questions about academic dishonesty and their ability to accurately gauge understanding. For pupils already struggling with the pandemic, adjusting to these new assessment techniques added a new level of stress.

The epidemic created uncertainty for students who were about to graduate about job markets, internships, and career options. The pandemic-induced economic slowdown has resulted in a highly competitive job market, with fewer options available for entry-level roles. Students' academic attention has been impacted by this additional strain, which has an effect on their long-term professional aspirations.

B. Research Methods

This study analyzes the various impacts of the COVID-19 pandemic on the academic performance of students.This study tries to investigate if the implementation of online learning methodologies by university students during the COVID-19 period presented any obstacles to their education for about 2 years. This study aimed to answer the following research questions:

RQ1: How COVID-19 pandemic has affected students' academic performance?

RQ2: What challenges do students face during the COVID-19 lockdown regarding their studies?

RQ3: What were the concerns of students during the COVID-19 lockdown?

Significance of the study of Universities in Pakistan started conducting the entire course of study through online mode, without face to face interaction during COVID-19 pandemic. Many teachers and students in educational institutions complaints about anxiety and difficulties encountered while learning online. Given

that background, the authors of this study decided to collect and analyze student data to delve into the challenges and difficulties faced by university students during the COVID-19 pandemic and their effect on learning. On 11 March 2020, the World Health Organization declared COVID-19 a global pandemic. As of February 2022, there are over 430 million COVID-19 cases worldwide, with an expected 6 million fatalities (Watson et al., 2022). In the United States, about 78 million individuals have contracted COVID-19, leading to more over 926,000 fatalities. Global preventive measures encompassed hand hygiene, mask utilization, social distancing, partial lockdowns, total lockdowns, and stay-at-home orders. These preventative and exclusionary tactics have been associated with symptoms of irritability, anorexia, depression, anxiety, melancholy, and feelings of anger and boredom. Students have been profoundly affected by the COVID pandemic.

The Covid-19 pandemic has significantly impacted university students' academic achievements, with various research highlighting the negative effects on mental health, life satisfaction, and academic performance. The discontinuation of in-person events, modification of schedules, and transition to virtual classes seem to have negatively impacted students' quality of life, academic performance, and mental health (Macciotta et al., 2022). Furthermore, the epidemic has exacerbated existing difficulties faced by university students, including as melancholy, anxiety, insomnia, and variations in appetite. The prolonged quarantine period has intensified the prevalence of depression, anxiety, tension, and anger among university students. Moreover, the job market has become increasingly challenging for university students due to these circumstances, as many individuals have been left unemployed because of the pandemic. The COVID-19 pandemic has significantly affected university students' academic performance, leading to learning interruptions caused by extensive lockdowns, delayed examinations, and unforeseen class cancellations (Cicha et al., 2021). As a result, students have experienced increased stress, limited leisure time, and the burden of frequent evaluations in a competitive environment.

These variables have resulted in diminished academic performance and reduced satisfaction with academic activities among university students (Macciotta et al., 2022). The Covid-19 pandemic has generated a confluence of issues for university students, affecting both their academic performance and emotional well-being (Mosleh et al., 2022). In conclusion, the Covid-19 epidemic has adversely affected the academic performance of university students. Research indicates that face-to-face education produces better academic outcomes than virtual learning (A et al., 2021). Multiple studies indicate that online learning surpasses in-person training in enhancing students' academic performance (Cavanaugh & Jacquemin, 2015). During the COVID-19 pandemic, self-regulated and adaptable students excel academically compared to their face-to-face counterparts due to superior time management and tenacity in an online learning context (Limniou et al., 2021). Nonetheless, educators have done studies on the disparities in student achievement between in-person and online learning. Their findings vary considerably based on the analytical approach and study sample.

The Covid-19 pandemic has disrupted the standard operations of universities and colleges, leading to a decline in students' academic performance. The inability to engage in social activities and the transition to online learning have negatively affected students' academic performance and increased stress levels. As a result, students may have experienced academic challenges and changes in their social interactions. The Covid-19 pandemic has significantly hindered the academic performance of university students. The Covid-19 pandemic has negatively impacted the academic performance of university students (Acheampong, 2023). The disruptions caused by the Covid-19 pandemic, including statewide lockdowns, examination delays, unexpected class cancellations, and the transition to online education, have resulted in reduced educational attainment and academic performance among university students. Numerous studies indicate the negative effects of the Covid-19 pandemic on university students' academic performance (Mosleh et al., 2022).

The disparity in access to digital resources and connectivity, along with inadequate training, has created substantial barriers for students engaged in remote education, thereby exacerbating the negative impacts on their academic performance. (Basar et al., 2021) identified several factors that affect students' overall academic performance in educational institutions: online learning, connectivity issues, internet bundle expenses, device-related challenges, home responsibilities, and general attitudes towards e-learning. The Covid-19 pandemic has significantly impacted the academic performance of university students due to disruptions in learning, increased stress levels, diminished leisure time, and the transition to online education. The Covid-19 pandemic has negatively affected the academic performance of university students. The Covid-19 pandemic has had a considerable negative impact on the academic performance of university students (Mosleh et al., 2022).

(Kuhfeld et al., 2020) found that excessive school absences related to the COVID-19 pandemic are likely to negatively impact students' academic performance. The authors contended that students would likely require two full years to make up for the lost instructional time and emphasized the importance of an extended recovery period. A notable limitation of the study is that, while it identified students' increased likelihood of returning with improved academic skills and performance variability, it did not evaluate the differential impact of COVID-19 across various racial groups. (C et al., 2020) found that students' inability to learn effectively at home undermines the efficacy of the online learning system. The authors highlighted the limitations of parental support in aiding their children.

Research (Aristovnik et al., 2020) indicates a deterioration in students' academic performance due to factors such as insufficient quiet study environments, limited access to course materials, inadequate digital literacy, unreliable Internet connectivity, subpar material design and preparation, insufficient teacher engagement, lack of support from online resources, and challenges in understanding independently completed materials.

This study employed a qualitative research methodology to examine the gathered data. An open-ended self-administered questionnaire was developed encompassing three primary sections: demographic data; open-ended inquiries evaluating the impact of COVID-19 on students' academic performance and challenges faced during that period; and a third section providing respondents with sufficient written space to articulate their perspectives on the long-term effects of COVID-19 on their education and recommendations for future coping strategies based on their experiences.

Data were gathered by purposive sampling. A total of 106 respondents participated, a figure deemed adequate by the researchers for the qualitative analysis required to address the study questions and achieve a meaningful descriptive analysis typical of qualitative research. In qualitative research, sample sizes should remain small to facilitate the extraction of nuanced nuances. Simultaneously, achieving data saturation will be challenging if the sample size is insufficient. The selected population comprised BS level students in their 7th and 8th semesters from various academic fields, enrolled in public sector universities in Islamabad, who possessed experience in both face-to-face and online learning modalities. Thematic analysis is utilized to discern patterns, similarities, and divergences in the responses, facilitating an in-depth examination of the subject matter. Data was gathered from September to December 2022.

1. Data Study

This study employed qualitative analysis, it depends on subjective of documentary material to establish a systematic classification procedure that includes codifying and detecting themes and patterns. Initially, we restructured and categorized the gathered data. The information retained by the database is subsequently reexamine. Third, we compiled a list of significant issues derived from the gathered responses and additional pertinent data. Fourth, we distilled the data refrains utilizing a framework. The entailed synthesizing transcripts into subtexts and subsequently searching for evidence of the codes from the databases utilized in the study.

2. Findings
    a. Difficulties Students Face: Some students had trouble with online learning because they couldn't always access the internet or use technology well.
    b. Stress and worry: The pandemic made students feel more anxious, alone, and unsure. This had a bad effect on their mental health and their ability to focus on school work.
    c. Support: Students needed help during the pandemic so they turned to their family, friends, and the University for Support.
    d. Adaptation strategies: Some students made new study schedules, learned how to manage their time better, and became more self-disciplined to deal with the challenges of remote learning.
    e. It shows that some students did really well with remote learning, but others struggled a lot. Participants were worried about not getting the hands-on learning, not being able to talk to their teachers as much, and not having enough resources which is affecting their education quality.

C. Results and Discussion

1. Results

Demographic data collected based on defendants to the several questions used in this study which can be found in Table 1 above. The amount of participants were 62 males and 44 females, there were 59 students of 7th Semester and 47 in 8th semester of BS programs, while a total of 66 participants were in the age range of 16 - 20 years, which is the largest group compared to the smallest number 08 who were over 26

years of age. About 89 participants were residents of Rawalpindi/Islamabad, while fewer participants (17) were from other cities.

Table 1. Demographic respondents (N=106)

Demographics	Description	Rate of recurrence
Gender	Male	62
	Female	44
BS Semester	7th	59
	8th	47
Resident	Islamabad/Rawalpindi	89
	Other cities	17
Age Group	16-20 years	66
	21-25 years	32
	Above 26	08

Theme 1: The Covid-19's effect on students' speculative routine

The purpose of this study was to ascertain how COVID-19 affected students' daily life academic. Most of respondents approved, to differing degrees, that COVID-19 had impacted their academic performance. This has been revealed by the research showing how the lockdowns have impacted students' learning performance, learning quality, amount of assignments, and field of study-specific knowledge. 'It was difficult for me to manage timely submission of assignments and group project without help at that time which negatively affected my grades'. 'In-person lectures are more creative and engaging than virtual ones, which lack face-to-face interaction and foster bad classroom sociability which leads towards boredom. These caused me to perform worse academically'.

A significant barrier for pupils was the difficulty in adapting to and the unfamiliarity with the new online learning environment. A BBA student articulated the superiority of in-person instruction over virtual learning: 'I comprehend more effectively through discussion, which is why I grasped concepts better during face-to-face interactions with teachers and peers, a dynamic unattainable in online learning. Consequently, my CGPA suffered, as I had maintained a 4.0 CGPA prior to the lockdown.'

In spite of this, 24 out of 106 students (23%) said that learning online through COVID-19 helped them do better in school. The program helped me do better in school by giving me access to digital skills and creative teaching methods that I couldn't get when I was learning in person.

The COVID-19 pandemic has posed numerous challenges for students, adversely impacting their academic achievement. A majority of participants (68 out of 106, or 64%) identified the following barriers to their academic success: poor Internet connectivity, monotony, socioeconomic factors, high Internet expenses, insufficient learning devices, limited access to online resources, low interactivity, isolation, distractions, inadequate digital skills, and insufficient Internet data plans.

A BS Engineering student articulated the detrimental effects of rushed, high-pressure, and subpar instruction, alongside a lack of focus and understanding: 'I engage in study groups or collaborate with learning partners on campus, where we collectively navigate the material and elucidate aspects of our lecturers' teachings that we found challenging to comprehend through discussion.' The lockout hindered my ability to learn independently due to instructional methods not aligning with online learning requirements.

Theme 2: Challenges students face through COVID-19 remoteness

Participants stated they were not very motivated to study or meet deadlines, that they lacked self-discipline, that they didn't grasp the courses because they were usually completed quickly, that they didn't interact with their peers, and that there was little to no group learning when they were taking online courses during COVID-19.

A female participant expounded upon the challenges of studying during the pandemic closure. 'As a daughter, I had to help my mother in the kitchen and take care of household duties as well, and along with al home responsibilities It was very challenging for me to focus on my studies after completing all of these many tasks, I was unable to focus on my online education or finish my classwork.'

According to some respondent (27 out of 106, 25%) during the COVID-19 closure, students' low socioeconomic circumstances had a substantial impact on their capacity to buy broadband Internet connectivity and successfully shift to online learning. A student from BS Education says that:

Due to budgetary limitations it was very difficult for me to survive pandemic; I found it challenging in make the seamless changeover on or after in-person for online learning. Prior the lockdowns, I mostly relied on the computers and free Internet access at the university'.

Another responder indicated that while residing in a university hostel, the COVID-19 pandemic necessitated my return to my town, which is characterized by limited digital learning resources and expertise, as well as inadequate internet connectivity and frequent power outages. Due to my upbringing in a financially disadvantaged household and the inability to access essential educational tools, my academic performance deteriorated.

A BS Psychology student noted that human interference posed a significant obstacle to successful learning during the COVID-19 pandemic: 'While attending online classes, family members would shout or call my name for assistance, which disrupted my concentration.'

Seventy-one percent (76 out of 106) of students indicated experiencing stress due to various factors, including the heightened duration of online study, the burden of excessive online assignments, unreliable internet connectivity, insufficient resources related to their subjects, and anxiety regarding virus transmission.

Theme 3: COVID-19 Post Activities

The negative effects on our daily lives, there are still numerous benefits to online learning in disease, such as increased time and cost savings, increased adoption of new technologies for learning, the acquisition of new skills, and the availability of online learning resources. Several earlier studies (Al-Ansi et al., 2021) covered the benefits of online learning in improving the skills and capabilities of educators and students as well as in streamlining the learning process. Social media plays important role in online-based education during COVID-19, utilizing social media and disseminating diverse content on the same platforms can greatly enhance students' comprehension of complicated topics (Sobaih et al., 2022) and enable them to publish and exchange thoughts with each other. 34% Participant's (36 out of 106) also appreciate the role of online learning during COVID-19 pandemic. A student of Software Engineering says that "online-learning makes teaching learning possible during pandemic otherwise our time will be wasted", another student says that "Online learning helps me a lot, even now I browse for information anytime anywhere I want sometimes without attending classes ".

However, there are numerous obstacles to online learning in developing nations (Garad et al., 2021). A few of these difficulties include the internet's speed, coverage, and cost; issues with electricity; the high cost of infrastructure; managing and organizing classrooms; hardware and software maintenance; and a lack of experience.

A student of Mass Communication says that "I belong to lower middle class family, we are 5 siblings and it was very difficult for my father to manage our educational expenses but during COVID our transportation expenses were cut down and we learned online-learning techniques, now my two siblings are studying through Distance learning".

Student of BS Mathematics says that 'Online learning during COVID was temporary way to deal with the situation, long-term online learning is not for us, because we don't have much experience and facilities and in result learning didn't take place, I am in last semester but my concepts are not clear because of online learning along with some classes during COVID-19'.

Table 2. Sub-Themes

Themes	Sub-Themes	
Covid-19 pandemic effect on students' academic performance	Concentration issue	68 out of 106, (64%) highlighted the barriers to their academic success during COVID-19.
	Stress	
	Lack of interest and boredom	
	Lack of discussion	
	opportunities to learn digital skills	24 out 106 (23%) students reported that online during who learn in COVID-19 had a beneficial impact on their academic achievement.
	low-quality instruction	

Themes	Sub-Themes	
Challenges students face during the COVID-19 lockdown	lacked self-discipline	
	less interaction with their peers	
	no group learning	
	home chores	
	low socioeconomic circumstances	
	Internet connectivity, speed, coverage load shading of electricity	
	learning quality	
	timely management of tasks	
	unfamiliarity with the new online learning	
	high Internet costs, lack of learning devices	
Post-COVID-19 Scene	increased adoption of new technologies for leaning	39 % (41 out of 106) students reported that their basic concepts were not cleared during online learning that affects their present studies.
		34% Participant's (36 out of 106) also appreciate.
	Online learning the pandemic saved time and also finance for students like hostel fee and travelling expenses.	
	Non clarity of concepts	

2. Discussion

This study aimed to evaluate the impact of the Covid-19 pandemic on the academic performance of university students using a post-pandemic assessment. Data were gathered via a combination of surveys, academic records, and interviews with students and administrative personnel. The results indicate numerous significant trends in academic achievement, administrative functions, and student attitudes during and following the epidemic.

Initially, regarding academic success indicators, the data revealed that a considerable percentage of students encountered variations in their academic accomplishments. The course completion rate experienced a significant decrease of during the epidemic. This decline was mainly due to obstacles in obtaining educational resources, unreliable internet connectivity, and problems in adjusting to online learning environments. Following the alleviation of pandemic limitations, course completion rates increased although they have not yet entirely reverted to pre-pandemic levels.

The epidemic presented significant obstacles from the standpoint of academic administration. Students saw delays in administrative services, including as grade notifications, course enrollments, and the provision of academic documentation. During the post-pandemic recovery phase, although administrative efficiency of

students continue to experience intermittent delays, frequently attributed to system backlogs and insufficient manpower.

A significant majority of students recognized that their learning efficacy was negatively impacted during the online learning phase of the course. Concerns like restricted engagement, technological challenges, and diminished motivation were commonly noted. Following the reversion to in-person or hybrid learning modalities, students indicated an enhancement in their academic engagement and satisfaction. Notwithstanding these advancements, the psychological repercussions of the pandemic persist, respondents indicating heightened academic stress and diminished motivation throughout this period. Despite a reduction in the post-pandemic period, the data highlight the ongoing significance of mental health support services on campus.

In response to the obstacles presented by the epidemic, the majority of universities instituted academic relief procedures. The results underscore the tenacity and adaptability of students and university administration in managing the challenges of academic performance during and after the pandemic. Despite advancements in improving academic performance and administrative efficiency, issues remain, especially regarding mental health and system responsiveness.

2.1 Implications

Unquestionably, the COVID-19 pandemic has had a long-lasting impact on the academic success of university students. Students' academic journeys have been impacted by a number of obstacles, including the sudden move to online learning, technical inequities, mental health issues, changes in evaluation methodologies, and uncertainty about what lies ahead after graduation. Addressing these issues and giving students access to support networks is essential to minimizing the long-term effects on their academic performance and general well-being as colleges continue to change and adapt. This qualitative exploration sheds light on the multifaceted impact of the COVID-19 pandemic on university students' academic achievements. The findings underscore the importance of recognizing and addressing the diverse challenges faced by students to ensure equitable educational outcomes.

2.2 Research contribution

According to the findings of present study, the COVID-19 lockdown had affected students' academic performance and success because it made them feel less engaged, less connected, lonely, and uninterested. It also made the internet unavailable and expensive, prevented students from using learning gadgets, and made online learning materials inaccessible. The findings of (Tamrat, 2021) and (C et al., 2020) support this conclusion.

2.3 Limitations

The study's conclusions are limited to three public sector universities in Islamabad and cannot be generalized to all higher education institutions. Future research may be conducted among students at different colleges employing quantitative methods. This study has identified challenges that negatively affect student academic performance and warrant attention. To resolve the identified challenges and fulfill the requirements of the broader student population, higher education institutions should consider a balance between online and face-to-face learning. They must obtain licensed e-learning technologies and provide training in digital competencies for students and instructors.

2.4 Suggestions

The study revealed students' perceptions of the various obstacles that have a detrimental impact on their academic achievement, such as inadequate internet access, socioeconomic variables, human interference, procrastination, distraction, a lack of digital competency, outdated device availability, and poor internet connectivity. However, due to limitations, the findings cannot be applied to all universities of Islamabad.

Despite the fact that COVID-19 has compelled educational institutes to alter their methods of instruction and communication, the structure of lesson plans has not changed. Some university teachers and students lack the necessary expertise or experience to use, evaluate, and oversee online teaching and learning. This is in line with earlier studies that suggested a deficiency in online teaching and learning experiences is causing additional issues for some instructors and students in light of the unexpected appearance of COVID-19 (Bao, 2020). 39 % (41 out of 106) students reported that their basic concepts were not cleared during online learning phase that's why even now in senior semesters they are facing difficulties in understanding the advance concepts. A student said 'I was enjoying online learning at that time and was not studying and participating in classes but now I understand that It makes my studies difficult now'.

D. Conclusion

This study has identified challenges that negatively affect student academic performance and warrant attention. To resolve the identified challenges and fulfill the requirements of the broader student population, higher education institutions should consider a balance between online and face-to-face learning. They must obtain licensed e-learning technologies and provide training in digital competencies for students and instructors. Educators should be provided assistance in developing interactive online learning resources and materials for higher education institutions. Establishing and maintaining efficient communication techniques with management, staff, educators, and students is crucial for ensuring that all parties are informed and updated regarding subsequent phases of the transition and ongoing training support.

Educators should be provided assistance in developing interactive online learning resources and materials for institutions of higher education. Establishing and maintaining efficient communication techniques with management, staff, educators, and students is crucial for ensuring that all parties are informed and updated regarding subsequent phases of the transition and ongoing training support. The study's conclusions are limited to three public sector universities in Islamabad and cannot be generalized to all higher education institutions. Future research may be conducted among students at different colleges employing quantitative approaches.

E. Acknowledgment

F. Author Contribution Statement

MA provided the idea and designed the entire manuscript, MAJ collected literature reviews and data from users. YR was also involved in data analysis and review. All authors have read and approved the final version.

References

A, S. I.-P., Hernandez-García, A. ´, Chaparro-Pelaez, J. ´, & Prieto, J. L. (2021). Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID- 19 . The COVID-19 resource centre is hosted on Elsevier Connect , the company ' s public news and information. *Computers in Human Behavior*, *119*(3), 1–19. https://doi.org/10.1016/j.chb.2021.106713

Acheampong, J. O. (2023). The impact of COVID-19 on students' academic performance: The case of the university of Ghana business school. *Cogent Education*, *10*(1), 1–13. https://doi.org/10.1080/2331186X.2023.2186011

Al-Ansi, A. M., Garad, A., & Al-Ansi, A. (2021). ICT-Based Learning During Covid-19 Outbreak: Advantages, Opportunities and Challenges. *Gagasan Pendidikan Indonesia*, *2*(1), 10. https://doi.org/10.30870/gpi.v2i1.10176

Aristovnik, A., Keržič, D., Ravšelj, D., Tomaževič, N., & Umek, L. (2020). Impacts of the COVID-19 Pandemic on Life of Higher Education Students: A Global Perspective. *Sustainability (Switzerland)*, *12*(20), 1–34. https://doi.org/10.3390/su12208438

Bao, W. (2020). COVID-19 and online teaching in higher education: A case study of Peking University. *Human Behavior and Emerging Technologies*, *2*(2), 113–115. https://doi.org/10.1002/hbe2.191

Basar, Z. M., Mansor, A. N., Jamaludin, K. A., & Alias, B. S. (2021). The Effectiveness and Challenges of Online Learning for Secondary School Students - A Case Study. *Asian Journal of University Education*, *17*(3), 119–129. https://doi.org/10.24191/ajue.v17i3.14514

C, O. F., C.K, K., & D, H. (2020). THE IMPACT OF COVID-19 ON LEARNING -. *European Journal of Education Studies*, *7*(3), 88–101. https://doi.org/10.5281/zenodo.3753586

Cavanaugh, J. K., & Jacquemin, S. J. (2015). A large sample comparison of grade based student learning outcomes in online vs. Face-to-Face courses. *Journal of Asynchronous Learning Network*, *19*(2), 1–8. https://doi.org/10.24059/olj.v19i2.454

Cicha, K., Rizun, M., Rutecka, P., & Strzelecki, A. (2021). Covid-19 and higher education: First-year

students' expectations toward distance learning. *Sustainability (Switzerland)*, *13*(4), 1–20. https://doi.org/10.3390/su13041889

Csorba, L. M., & Dabija, D. C. (2024). The impact of the COVID-19 pandemic on students' future online education behaviour. *Heliyon*, *10*(20), e39560. https://doi.org/10.1016/j.heliyon.2024.e39560

Garad, A., Al-Ansi, A. M., & Qamari, I. N. (2021). The role of e-learning infrastructure and cognitive competence in distance learning effectiveness during the covid-19 pandemic. *Cakrawala Pendidikan*, *40*(1), 81–91. https://doi.org/10.21831/cp.v40i1.33474

Hui, D. S., Azhar, E. I., Madani, T. A., Ntoumi, F., Kock, R., Dar, O., Ippolito, G., Mchugh, T. D., Memish, Z. A., & Drosten, C. (2020). Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID- 19 . The COVID-19 resource centre is hosted on Elsevier Connect , the company ' s public news and information. *International Journal of Infectious Diseases : IJID : Official Publication of the International Society for Infectious Diseases, 91*(January), 264–266. https://doi.org/10.1016/j.ijid.2020.01.009

Imran, M., Almusharraf, N., & Abbasova, M. Y. (2025). Digital learning transformation: A study of teachers' post-Covid-19 experiences. *Social Sciences and Humanities Open*, *11*(October 2024), 101228. https://doi.org/10.1016/j.ssaho.2024.101228

Kuhfeld, M., Soland, J., Tarasawa, B., Johnson, A., Ruzek, E., & Liu, J. (2020). Projecting the Potential Impact of COVID-19 School Closures on Academic Achievement. *Educational Researcher*, *49*(8), 549–565. https://doi.org/10.3102/0013189X20965918

Limniou, M., Varga-Atkins, T., Hands, C., & Elshamaa, M. (2021). Learning, student digital capabilities and academic performance over the COVID-19 pandemic. *Education Sciences*, *11*(7). https://doi.org/10.3390/educsci11070361

Macciotta, A., Farinella, D., Dell'aversana, G., Fornili, M., Petri, D., Baglietto, L., Baccini, M., Montiel, C. B., Fiorentino, G., Severi, G., Ricceri, F., Campolo, M. G., & Bruno, A. (2022). Remote Working and Home Learning: How the Italian Academic Population Dealt with Changes Due to the COVID-19 Pandemic Lockdown. *Sustainability (Switzerland)*, *14*(13), 1–21. https://doi.org/10.3390/su14138161

Mosleh, S. M., Shudifat, R. M., Dalky, H. F., Almalik, M. M., & Alnajar, M. K. (2022). Mental health, learning behaviour and perceived fatigue among university students during the COVID-19 outbreak: a cross-sectional multicentric study in the UAE. *BMC Psychology*, *10*(1), 1–11. https://doi.org/10.1186/s40359-022-00758-z

Sobaih, A. E. E., Palla, I. A., & Baquee, A. (2022). Social Media Use in E-Learning amid COVID 19 Pandemic: Indian Students' Perspective. *International Journal of Environmental Research and Public Health*, *19*(9), 1–12. https://doi.org/10.3390/ijerph19095380

Tamrat, W. (2021). Enduring the impacts of COVID-19: experiences of the private higher education sector in Ethiopia. *Studies in Higher Education*, *46*(1), 59–74. https://doi.org/10.1080/03075079.2020.1859690

Tlais, S., Hamdan, R., HajjHussein, H., Alkhatib, A., & Hallal, K. (2025). Post-COVID student preferences: Shaping higher education's future. *Social Sciences and Humanities Open*, *11*(April), 101582. https://doi.org/10.1016/j.ssaho.2025.101582

Watson, O. J., Barnsley, G., Toor, J., Hogan, A. B., Winskill, P., & Ghani, A. C. (2022). Global impact of the first year of COVID-19 vaccination: a mathematical modelling study. *The Lancet Infectious Diseases*, *22*(9), 1293–1302. https://doi.org/10.1016/S1473-3099(22)00320-6