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How does the COVID-19 pandemic influence students' academic activities? An explorative study in a public university in Bangladesh

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The global impact of the novel coronavirus (COVID-19) has spared no sector, causing significant socioeconomic, demographic, and particularly noteworthy educational repercussions. Among the areas significantly affected, the education systems worldwide have experienced profound changes, especially in countries like Bangladesh. In this context, numerous educational institutions in Bangladesh decided to temporarily suspend classes in situations where a higher risk of infection was perceived. Nevertheless, the tertiary education sector, including public universities, encountered substantial challenges when establishing and maintaining effective online education systems. This research uses a qualitative approach to explore the ways in which the COVID-19 pandemic has influenced the academic pursuits of students enrolled in public universities in Bangladesh. The study involved the participation of 30 students from a public university, who were interviewed in-depth using semi-structured interviews. Data analysis was conducted using thematic analysis. The findings of this study reveal unforeseen disruptions in students' learning processes (e.g., the closure of libraries, seminars, and dormitories, and the postponement of academic and administrative activities), highlighting the complications associated with online education, particularly the limitations it presents for practical and laboratory-based learning. Additionally, a decline in both energy levels and study hours has been observed, along with an array of physical, mental, and financial challenges that directly correlate with educational activities. These outcomes emphasize the need for a hybrid academic approach within tertiary educational institutions in Bangladesh and other developing nations facing similar sociocultural and socioeconomic contexts.

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Introduction and background

The current global issue, the COVID-19 pandemic caused by the novel coronavirus, is impacting both developed and developing nations (World Health Organization [WHO], 2020). Many countries have implemented worldwide lockdowns, enforced social isolation measures, bolstered healthcare services, and temporarily closed educational institutions in order to curb the spread of the virus. According to the United Nations Educational, Scientific, and Cultural Organization (UNESCO, 2020a), the closure of schools, colleges, universities, and other educational establishments due to COVID-19 has impacted over 60% of students worldwide. The pandemic is inflicting significant damage upon the global education sector. University students, in particular, are grappling with notable disruptions to their academic and social lives. The uncertainties surrounding their future goals and careers, coupled with the limitations on social interaction with friends and family (Cao et al., 2020), have left them contending with altered living conditions and increased workload demands compared to the time before traditional classroom teaching was suspended. Despite these challenges, the university setting and its associated activities have become the sole familiar constant amidst their otherwise transformed lives (Neuwirth et al., 2021). The pandemic's interference with academic routines has substantially interrupted students' educational journeys (Charles et al., 2020). The shutdown of physical classrooms and the halt of academic operations due to university closures (Jacob et al., 2020) have disrupted students' study routines and performance. Prolonged periods of solitary studying at home have been linked to heightened stress levels (e.g., depression), feelings of cultural isolation (e.g., loneliness), and cognitive disorders (e.g., difficulty in retaining recent and past information) (Meo et al., 2020). Many educational institutions have responded to COVID-19 by transitioning from traditional face-to-face instruction to online alternatives to minimize educational disruptions. However, research indicates that students often feel uncomfortable and dissatisfied with online learning methods (Al-Tammemi et al., 2020). Beyond the challenges posed by online education, such as limited access to electronic devices, restricted internet connectivity, and high internet costs, students are also faced with adapting to new online assessment techniques and technologies, engaging with instructors, and navigating the complexities of the shift to online delivery (Owusu-Fordjour et al., 2020).

Bangladesh, a South Asian developing nation, has also been significantly impacted by COVID-19. To prevent the virus's spread, the country opted to close its educational institutions, leading to students staying home to maintain social distancing (Institute of Epidemiology Disease Control and Research [IEDCR], 2020). The higher education sector in Bangladesh encountered challenges during this period. The closure of educational institutions disrupted students' learning activities (UNESCO, 2020b; Al-Tammemi et al., 2020). Modern technology tools and software have become the means through which most university students engage in study-related tasks at home during their free time. The shift to online education is seen as a fundamental transformation in higher education in Bangladesh, departing from the traditional academic approach. However, for many teachers and administrators at Bangladeshi institutions, online education is a new frontier. Face-to-face teaching and learning have been the predominant mode at Bangladeshi universities for a long time, making it challenging to embrace the shift to an advanced online environment.

Bangladesh hosts more than 5,000 higher education institutions, encompassing both government and private universities, vocational training centers, and affiliated colleges, with an enrollment of 4 million students (Ahmed, 2020). In response to the health crisis, the government introduced emergency online

education methods to enable students to continue learning despite temporary school closures. Challenges such as overcrowding, unequal access to technology compared to pre-COVID-19 times, and the difficulties in swift adaptation led to delays, teaching interruptions, and the adoption of extended distance learning. These issues were further exacerbated by the ongoing overcrowding, which posed a risk for the resurgence or spread of COVID-19 if in-person teaching were to resume. Undoubtedly, COVID-19 has left a profound impact on university education in Bangladesh. Despite numerous studies on COVID-19's impact on a range of topics, the effects on higher academic activities in Bangladesh have received limited research attention. Shahjalal University of Science and Technology (SUST), a public institution and one of Bangladesh's universities, stands as an example. Given the COVID-19 regulations, this study aims to investigate the effects of online learning on the academic endeavors of university students in Bangladesh. The study also seeks to assess students' satisfaction with online education, their adaptability to this new format, and their participation in extracurricular activities during the COVID-19 period, in addition to their academic pursuits.

Literature review

The COVID-19 pandemic has had a notable impact on the landscape of online teaching and learning (Aldowah et al., 2019; Basilaia and Kvavadze, 2020; Khan and Abdou, 2021). Notably, Rameez et al. (2020) emphasize that a critical hurdle faced in Sri Lanka revolves around the lack of virtual teaching and learning proficiency among both educators and students, impeding a smooth educational process. University shutdowns and dormitory quarantines due to COVID-19 have significantly disrupted students' learning abilities (Burgess and Sievertsen, 2020; Kedraka and Kaltsidis, 2020). Difficulties have arisen, encompassing challenges related to online lectures, exams, evaluations, reviews, and tutoring. While Kedraka and Kaltsidis (2020) laud online learning as modern, relevant, suitable, and advantageous, they also underline its drawbacks. Notably, it has led to a substantial loss of student social interaction, interrupting group learning, in-person interactions, and connections with peers and educators (Kedraka and Kaltsidis, 2020; Rameez et al., 2020).

In the context of higher education institutions in Bangladesh, Khan and Abdou (2021) propose adopting the flipped classroom method to sustain teaching and learning during the COVID-19 epidemic, an approach echoed in Alam's (2021) comparison of pre-and post-pandemic students. Alam's findings reveal better academic performance among post-pandemic students. Conversely, Biswas et al. (2020) report a positive attitude toward mobile learning among most students in Bangladesh, finding it effective in bridging knowledge gaps created by the pandemic. Emon et al. (2020) highlight discontinuities in learning opportunities in Bangladesh, emphasizing the need for technical solutions to maintain effective education systems during the pandemic. Ahmed's (2020) study on tertiary students unveils a lack of technology and connectivity, leading to delays in coursework, exams, results, and class promotions. These disruptions have exacerbated student anxiety, frustration, and disappointment. Burgess and Sievertsen (2020) note students' concerns about falling behind academically, missing job opportunities, facing post-graduation employment challenges, and enduring emotional pressure.

Rajhans et al. (2020) observe that the pandemic has driven significant advancements in academies worldwide, particularly in adopting online learning. A similar impact is seen in India's optometry academic activities, where quick adoption of online

learning supports both students and practising optometrists (Stanistreet et al., 2020). Consequently, educational events like commencement ceremonies, seminars, and sports have been postponed or canceled (Liguori and Winkler, 2020; Sahu, 2020; Shrestha et al., 2022), necessitating remote work for academic support staff (Abidah et al., 2020).

In higher education, teachers play a pivotal role in implementing online learning. The sudden shift to online education due to the pandemic has left some instructors grappling with limited IT skills and a challenge in maintaining the same level of engagement as in face-to-face settings (Meo et al., 2020; Wu et al., 2020). Furthermore, the transition has led to concerns about effective scheduling, course organization, platform selection, and measuring online education's impact (Wu et al., 2020; Toquero, 2020). Zawacki-Richter (2021) predicts digital advancements in German higher education, driven by the crisis, faculty dedication, and higher expectations.

COVID-19's influence on education extends to students' mental well-being. Some students' inadequate home networks have hindered access to online materials, exacerbating their distress (Akour et al., 2020). Mental health challenges stem from various sources, including parental pressures, financial strains, and family losses (Bäuerle et al., 2020). Long-term quarantine intensifies psychological and learning challenges, impacting students' overall performance and study time (Farris et al., 2021; Meo et al., 2020). Blake et al. (2021) advocate for colleges to address students' isolation needs and prepare for long-term effects on student welfare.

With its large population, Bangladesh grapples with challenges in effective technology adoption, especially with online education becoming an alternative system during the pandemic. The overcrowding issue has been exacerbated by the need for distance learning, causing skill transfer difficulties and delays. Given these circumstances, this study delves into how COVID-19 affects online education and Bangladeshi university students' academic endeavors, offering insights from the students' perspective. Unlike prior studies focusing on challenges, this research also uncovers opportunities triggered by the pandemic. Such a nuanced view of the impacts of COVID-19 on education will help formulate effective policies and programs to elevate online learning quality in Bangladesh's higher education.

Methodology

Research design. This study employs a descriptive research approach, which aims to portray a situation, an individual, or an event and illustrate phenomena's connections and natural occurrences (Blumberg et al., 2005). A qualitative approach was adopted to analyze specific circumstances thoroughly. Grounded theory, developed by Glaser and Strauss in 1967, served as the overarching framework for this research (Denscombe, 2007). Grounded theory follows an inductive research approach that refrains from starting with preconceived assumptions and instead generates new questions as insights emerge. This methodology rests upon participants' perspectives, experiences, and realities (Bytheway, 2018).

For this study, in-depth interviews were employed to assess how the recent pandemic impacted students' academic engagement and the factors related to COVID-19 that influenced their academic activities. This examination sought to understand the pandemic's implications on students, the facets of these consequences, and which students might be more susceptible to these effects concerning academic performance and engagement. Conducted over the phone, the in-depth interviews featured a relatively small of participants, leading to the choice of a descriptive study design. This design, however, is unable to

Table 1 Participant's age, gender, and educational level (N = 30).

Demographic characteristics	N (%)
Gender	
Female	17 (56.7)
Male	13 (43.3)
Bachelor's degree programs (N = 26)	
1st year	4 (13.3)
2nd year	8 (26.7)
3rd year	8 (26.7)
4th year	6 (20.0)
Master's degree programs (N = 4)	4 (13.3)
Age	
Mean	21.37
Std. deviation	1.991
Minimum	18
Maximum	25

establish causal relationships, which could be explored and compared using quantitative methodologies. Moreover, the potential influence of the interviewer's presence during phone interviews was considered.

Study locations, population, and sample. This study delves into the academic challenges encountered by students during the COVID-19 lockdown. Shahjalal University of Science and Technology (SUST), a public university in Bangladesh's Sylhet district, was purposefully selected for the study due to its high student enrollment. The participants consist of students from diverse disciplines of SUST. Employing purposive sampling, a non-probability sample technique, the research collected qualitative data through volunteers recruited via social media advertisements within a university group on Facebook. Participants were informed of the study's objectives, and the data collection spanned from September 20 to October 3, 2021, supplemented by additional interviews from December 24 to December 27, 2021, to ensure data saturation. Information from 30 university students was gathered, covering a range of faculties. Table 1 provides an overview of participant's age, gender, and educational level: 56.7% of participants identified as female, and 43.3% as male. In terms of educational distribution, 87% were enrolled in Bachelor's degree programs, while 13% were pursuing Master's degrees. The participants' ages from 18 to 25 years, with a mean of 21.37 and a standard deviation of 1.99.

Data collection and data analysis. The research team, comprising a graduate student (B.S.) with qualitative research training, a sociology professor (S.M.A.H., PhD) with extensive qualitative and quantitative experience, and a sociology postdoctoral fellow (K.J.A., PhD), handled data collection and analysis. In-depth interviews, facilitated by a semi-structured interview instrument, were employed to gather for this qualitative study. This approach allowed participants to provide substantial insights by responding to open-ended questions on the research topic. The interviews explored the impact of COVID-19 on students' academic activities, their online learning experiences, and the effects of the pandemic on educational pursuits. Ethical guidelines concerning confidentiality, informed consent, the use of data only for the present study, and non-disclosure were followed throughout the data collection, and the participation was voluntary, and they could withdraw their participation at any time during the research process. Participants were informed about the research through a participation information sheet prior to their involvement, and their consent was obtained in written form through

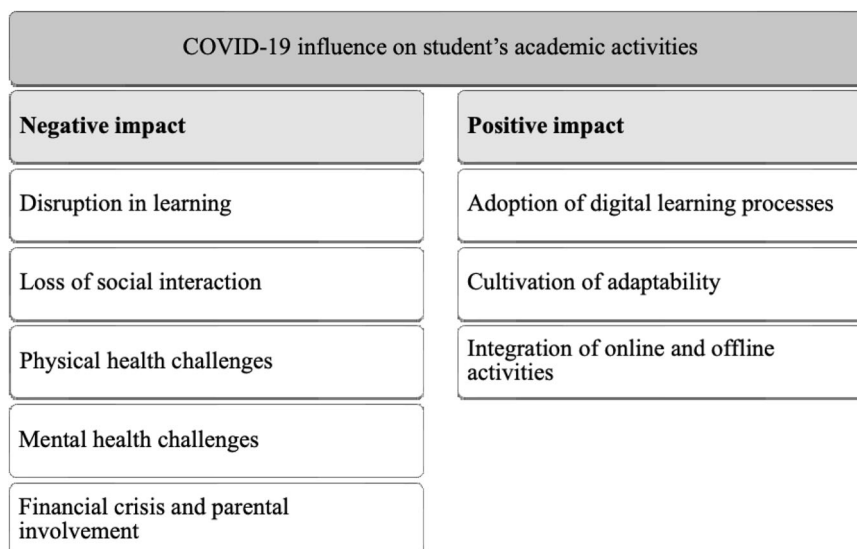


Fig. 1 Schematic summarizing major themes of COVID-19's influence on student's academic activities. Note: see Figs. 2 and 3 for subthemes of academic activities.

email correspondence. Interviews were carried out in Bengali by the first author (B.S.) phone calls and were recorded. Subsequently, the recorded interviews were promptly transcribed into English using a word processing program.

The collected data underwent thorough analysis involving coding in Microsoft Excel, interpretation, and validation through discussions among the research team. Themes and subthemes emerged during the coding process, guiding the categorization and organization of data. Saturation was achieved after the 30th interview, indicating data sufficiency. The research team, without prior relationship with participants, ensured the reliability and credibility of the analysis through verbatim transcripts, individual and group analysis, and written notes.

Results

The research identified eight themes (see Fig. 1) that characterized two main factors: the negative impact on student academic activities (see Fig. 2) and the positive impact on academic activities (see Fig. 3). The negative impact encompassed themes such as learning disruption, loss of social interaction, physical and mental health issues, financial struggles, and parental involvement. The positive impact included themes such as digital learning, adaptability, and engagement in online/offline activities. In-depth analyses were conducted for each theme, accompanied by citations indicating the participant's identification number and gender.

Negative impact on student's academic activities

Disruption in learning. In the early months of 2020, the global spread of COVID-19 prompted the government of Bangladesh to close all educational institutions due to suspicious incidents. Participants unanimously expressed their initial surprise and frustration at the abrupt closure but soon recognized its necessity in the face of the pandemic. Libraries, seminars, and dormitories were immediately shut down. This posed a challenge for students residing on campus, who had quickly departed and lacked access to necessary resources. Academic and administrative activities across these institutions came to a halt. Alongside the strain of crowded classrooms, students voiced discontent, uncertainty, and anxiety about their studies, assessments, and outcomes.

Several participants shared their experiences:

"I used to follow the teachers' instructions, attend lectures, and complete projects. But now that classes are suspended, my studying has come to a halt. I worry this pause might be prolonged." (M₇, M₁₄, F₁₇)

These students identified various obstacles to effective learning. They found the absence of a structured routine for attending classes and lectures at home demotivating. Although they kept busy with other activities, they noted a decline in their enthusiasm for education. They struggled to retain and apply the knowledge gained from classes, attributing it to the sudden disruption. Limited access to educational materials and books, often left behind in campus dormitories, also hindered their learning progress. Reading from the library, they mentioned, was a costly alternative. As a result, the inability to access essential resources posed a challenge. Furthermore, students found it difficult to concentrate on their studies due to unsuitable home environments, impacting their academic performance.

A participant shared:

"I need a quiet study environment, which I can't find at home. I used to study at departmental seminars or the library. Even though I've been home, I still struggle to concentrate." (M₁)

Another student added:

"The university closed shortly after I enrolled. As a result, I missed out on getting to know my peers, professors, and seniors. I couldn't enjoy the university's cultural activities and events." (F₃₀)

Several participants said,

"The vast majority of their courses are laboratory-based. Taking these classes online during COVID-19 made them difficult to understand, and even the teachers struggled to understand them." (M₄, M₁₉, F₂₉, F₃₀)

Loss of social interaction. Students strongly desired to return to their educational environment and reconnect with peers and professors. Collaborative problem-solving and discussions with batchmates were a common practice, and the absence of in-person interactions disrupted this dynamic. They found comfort in studying together on campus, rather than in isolation at home.

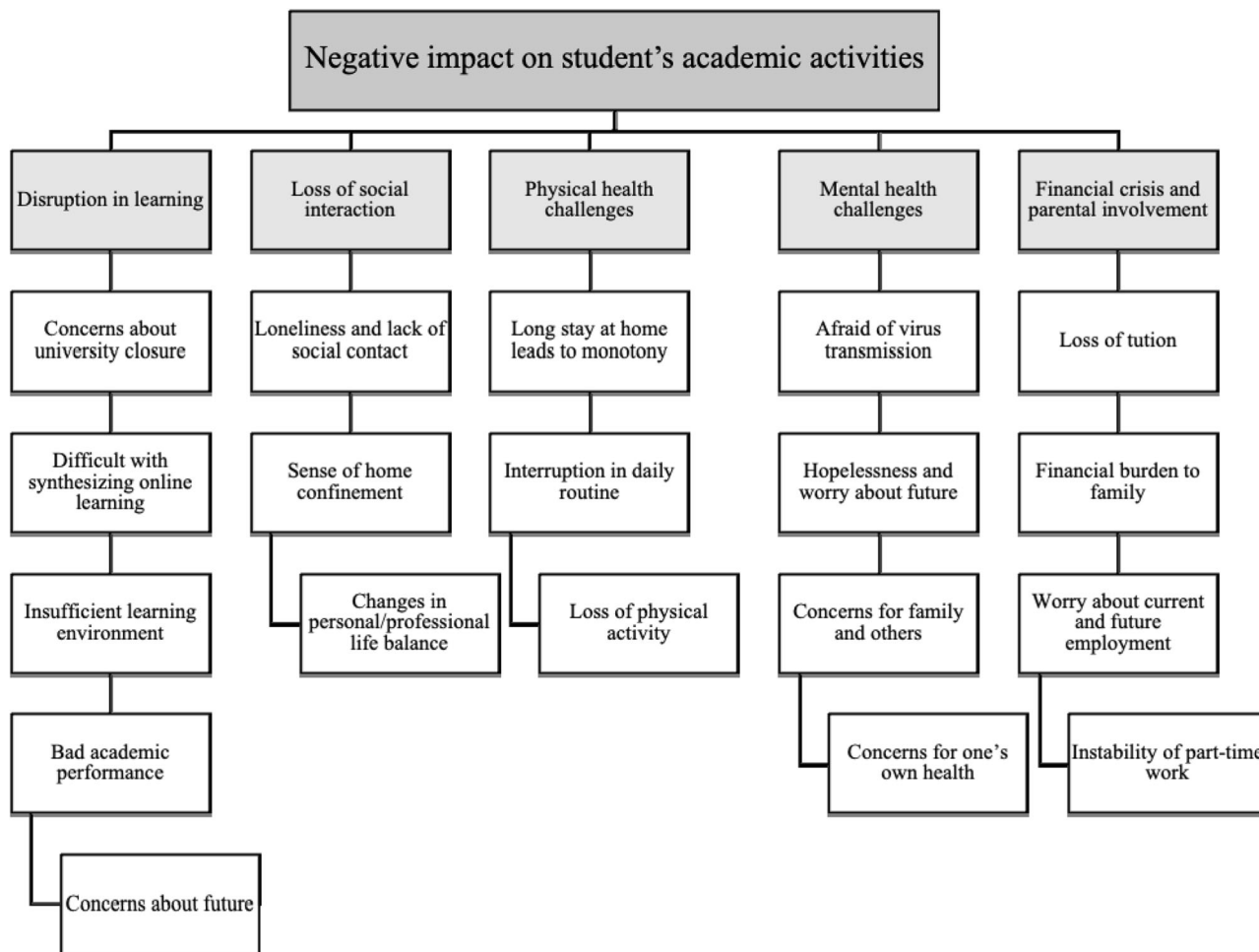


Fig. 2 Negative impacts on student's academic activities.

The prolonged separation from friends and classmates resulted in a breakdown of peer learning processes. While attempts were made to stay connected through digital means, participants found these interactions lacking in the vibrancy of face-to-face communication. Recalling earlier interactions for study or leisure became challenging, eroding the motivation to learn.

One participant noted:

“Group study is no longer possible due to the pandemic, and my interest in studying has waned. This could pose communication challenges even after the pandemic subsides.” (M₁₉)

Others explained:

“I can't interact with my friends or have the same enjoyment as before due to extended periods at home. This saddens me. It's made studying with them much harder. I anticipate a communication gap post-pandemic, as we might forget how to engage openly.” (F₁₂)

Another student expressed:

“I was admitted to the university, but it closed just a month later. This meant that I didn't have the chance to get to know my fellow students, teachers, or seniors. I also missed out on the university's cultural activities, concerts, and festivals.” (F₂₉)

Physical health challenges. The participants pointed out that COVID-19 had wide-ranging effects on their daily routines. They noted shifts in sleep patterns, eating habits, and physical activity

levels, leading to daytime fatigue, disrupted sleep, reduced appetite, and sedentary behavior, resulting in weight gain. These physical symptoms contributed to a sense of exhaustion, weakness, and overall discomfort. Many participants linked these physical challenges to their waning interest in studying at home, creating a disconnect from their academic pursuits.

One participant shared:

“I have gained weight due to excessive eating and spending all day at home. My body feels heavy, my mind feels foggy, and I experience a mix of happiness and lethargy. Is this is an environment conducive to studying?” (M₄)

Another student explained:

“I have polycystic ovarian syndrome (PCOS), which requires a balanced lifestyle. I exercised and ate well on campus, keeping my physical condition in check. But with the shift to remote learning, my routine changed, worsening my physical health. This has affected my concentration on studies, adding to my frustration.” (F₉)

Mental health challenges. Stress emerged as a prevailing mental health concern among participants. They exhibited heightened anxiety, not only due to the pandemic itself but also concerning their educational commitments. In addition to fears of contracting COVID-19, participants expressed concern about maintaining organization, motivation, and adapting to new learning methods. Worries extended to upcoming courses, exams, result

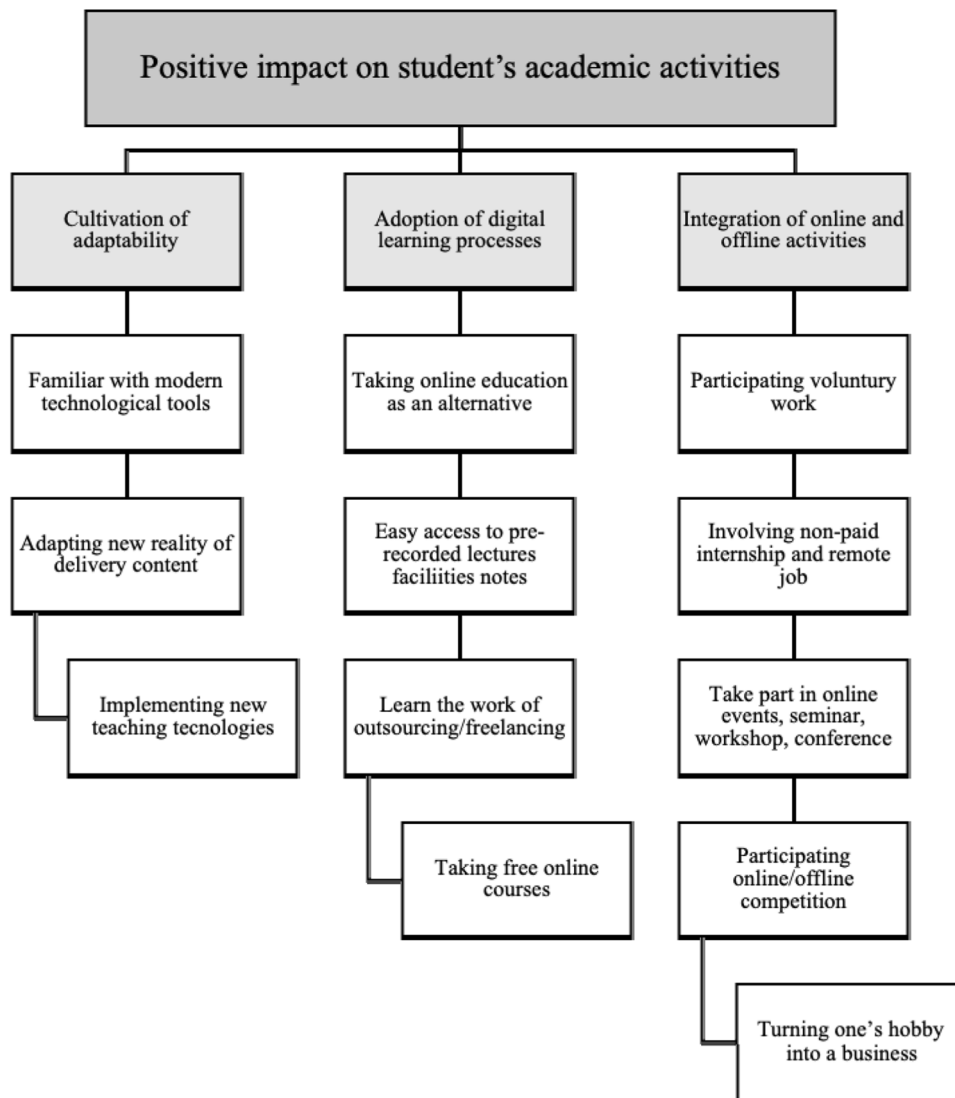


Fig. 3 Positive impact on student's academic activities.

publication, and starting a new academic year. The post-epidemic landscape was also concerned with the potential pressure to expedite course completion. These uncertainties overshadowed the primary goals of their educational journey.

A number of participants found themselves increasingly frustrated when contemplating their future professional aspirations. Their anxiety and anger stemmed from the inability to finish their final year of university as planned. The pandemic further amplified their concerns about securing employment and setting a stable foundation for themselves. They argued that an extended academic year could impede their career opportunities and create challenges in securing a post-graduation job. Moreover, there was a prevailing fear that their relatively advanced age might hinder their employability in Bangladesh.

Several participants elaborated:

“Most government and private sector jobs in Bangladesh have age restrictions. Exam topics often diverge from the academic curriculum. The prolonged academic year due to COVID-19 makes me uncertain about my job prospects. Global economic instability adds to my worries. This anxiety

affects my ability to focus, leaving me disinterested in everything, including studying.” (M₁₆, M₄, F₁₀)

For female participants, the pressure to marry before completing their education emerged as an additional concern, leading to emotional distress and academic setbacks. Some female participants added:

“Given the uncertainty surrounding when the pandemic would conclude and when we would have the opportunity to complete our studies, our families urged us to consider marriage before finishing our education. This predicament weighed heavily on us, causing a sense of melancholy, and subsequently, academic performance suffered as we grappled with the idea of getting married before our graduation.” (F₁₇, F₂₀, F₂₁, F₁₀)

Financial crisis and parental involvement. COVID-19's economic impact was deeply felt among participants, who relied on part-time jobs or tuition to support themselves. The abrupt halt in academic and work activities severely impacted their financial stability. With local and global economies suffering, family

incomes dwindled, making it harder for students to afford internet connectivity and online resources.

One participant shared:

“My ability to attend online classes suffered due to my family’s limited finances. I feared my grades would suffer and I might fail courses.” (F₂₈)

Additionally, the prolonged closure of institutions resulted in difficult conditions for many students. Financial hardships and familial challenges, such as job loss, reduced income, and parental pressure, further exacerbated students’ emotional distress. Having lost a parent before the pandemic, some students found it even harder to make ends meet.

One participant explained:

“I supported my family and myself with tuition before COVID-19. Losing my father earlier made me the sole provider. But with COVID-19, I had to forfeit my tuition and supporting my family became a struggle.” (M₂₇)

Positive impact on student academic activities

Adoption of digital learning processes. Amidst the challenges posed by the pandemic, integrating technology into education stands out as a significant advantage. The global situation intensified the strong connection between technology and education. The closure of institutions led to a swift transformation of on-campus courses into online formats, turning e-learning into a vital method of instruction. This shift extended beyond content delivery to encompass pedagogy and assessment methods changes. The participants adapted to Zoom, Google Meet, and Google Classroom platforms for attending online lectures. They found pre-recorded classes accessible through online media, simplifying note-taking. Asking questions online became convenient, and submitting online assignments posed no significant hurdles. Many students also embraced the opportunity to engage with the free online courses from platforms such as Coursera, edX, and Future Learn, further enhancing their skill sets.

A participant shared:

“Recorded lectures are a boon; I can revisit them whenever I want. I don’t need to focus on note-taking during class since I can easily access the lectures later.” (F₃)

Another participant noted:

“I enrolled in several free online courses during COVID-19, using platforms such as Coursera, edX, and Future Learn. These tasks boosted my productivity and introduced me to the world of freelancing.” (F₆)

Cultivation of adaptability. The pandemic propelled digital technologies to the forefront of education. The transition to digital learning required both educators and students to enhance their technological literacy. This shift also paved the way for pedagogy and curriculum design innovation, fostering changes in learning methods and assessment techniques. As a result, a large group of students could simultaneously engage in learning. Forced to embrace technology due to the pandemic, participants improved their digital literacy.

Participants commended the Bangladeshi government’s shift from traditional face-to-face learning to online education as a necessity. They recognized the efficacy of online learning in the local context and found inspiration in mastering new technologies. Many educators sought to improve the effectiveness of online courses, making the most of available resources.

Participants gained familiarity with technology tools and demonstrated their adaptability and commitment to mastering new skills.

A male participant said:

“An unexpected opportunity arose amidst the pandemic. Virtual learning was the need of the hour. Adapting to this sophisticated technology was initially challenging, but I eventually became comfortable with the new mode.” (M₂₉)

Integration of online and offline activities. The pandemic prompted students to diversify their activities. They devoted time to hobbies such as farming, painting, gardening, and crafts. Engaging in extracurricular activities such as cooking, volunteering, attending religious events, and using social media platforms such as Facebook and Instagram became a norm. Some events created uplifting content for social media, using platforms as a potential source of income. Others embarked on online entrepreneurship ventures, reflecting their entrepreneurial spirit. Volunteering became appealing, bridging the gap between virtual and physical engagement.

Two participants shared:

“I wasn’t part of any groups during my student years. However, I joined several volunteer groups during COVID-19. These efforts included both offline initiatives such as distribution of food and masks, online initiatives.” (F₁₅, M₁₈)

Another participant shared:

“I had time for myself after extensive studying. I explored various creative pursuits, cooked using YouTube recipes, and found joy in them. I am considering a career in cooking.” (F₁₁)

Another participant expressed:

“Amidst this time apart, many companies and organizations offer unpaid internships. I have participated in such an internship, attended seminars, conferences, workshops, and events. This period has enriched both my soft and hard skills, and I have participated in various physical and online events.” (M₂₂)

Discussion

The primary objective of this study was to assess the impact of COVID-19 on the academic activities of university students. The study aimed to understand students’ satisfaction with online education during the pandemic, their responses to this learning mode, and their engagement in non-academic activities. The pandemic has significantly disrupted not only regular teaching and learning at our university but also the lives of our students. Amid this outbreak, several students found solace in spending quality time with their families and tackling long-postponed household chores. It is crucial to acknowledge that a diverse range of circumstances, personalities, and coping mechanisms exist within human communities like ours. Despite these variations, the resilience exhibited by the individuals in this study stands out remarkably.

In recent research, educational institutions, particularly public universities, adopted digital online learning and assessment platforms to respond to the pandemic (Blake et al., 2021; Wu et al., 2020). Consequently, participants in our study discussed their experiences with digital platforms during COVID-19, highlighting both positive and negative impact on academic activities (see Figs. 1–3).

Our findings demonstrate that online learning offers benefits by enhancing educational flexibility through the accessibility and user-friendliness of digital platforms. These findings align with those of Kedraka and Kaltsidis (2020), who identified convenience and accessibility as primary advantages of remote learning. Moreover, Burgess and Sievertsen (2020) emphasized the potential of distance learning and technology-enabled indirect instruction, while Basilaia and Kvavadze (2020) underscored technology's role in driving educational adaptation during a pandemic.

According to our study, the pandemic led to students' significant loss of social connections. Collaborative group study plays a pivotal role in conceptual understanding and academic progress. However, due to the outbreak, students' routine group study sessions in libraries or on campus, face-to-face interactions, and conversations with peers and educators suffered setbacks. These disruptions might potentially impact their motivation for sustained high-level learning. Participants voiced concerns about online learning, including the absence of human interaction, challenges in maintaining audience engagement, and, most notably, the inability to acquire practical skills. These limitations have been observed previously, indicating that these teaching and learning methods are hindered by constraints in conducting laboratory work, providing hands-on experience, and delivering comprehensive feedback to students, leading to reduced attention spans (Zawacki-Richter, 2021).

Likewise, Naciri et al. (2020) highlighted educators' difficulties in sustaining student engagement, multitasking during virtual sessions, subpar audio and video quality, and connectivity issues. In our study, students reported that the quality of their internet connection directly influenced their online learning experience. They also expressed frustration at the extended screen time and feelings of fatigue. To address these concerns, experts recommended utilizing tools such as live chat, pop quizzes, virtual whiteboards, polls, and reflections to structure shorter, more interactive sessions.

Consistent with prior research, our recent poll findings suggested that participants were more surprised than disappointed by the swift decision to close educational institutions nationwide. Moreover, the study revealed that the prolonged closure of universities and confinement to homes led to substantial disruptions in students' learning, aligning with findings from various studies that highlight disturbances in daily routines and studies (Meo et al., 2020), limited access to educational resources due to closed libraries, difficulties in learning at home, disruptions in the household environment, and challenges in retaining studied material (Bäuerle et al., 2020). All participants expressed some degree of apprehension. Staying at home exacerbated both physical and mental health issues. Study habits suffered, and interest in learning waned. Physical health concerns excessive daytime sleepiness, disrupted nocturnal sleep patterns, decreased appetite, sedentary behavior, weight gain or obesity, as well as feelings of fatigue, dizziness, and listlessness. Toquero (2020) noted similar issues, outlining the impact of COVID-19 on children's mental health and educational performance. Delays in examinations, results, and promotions to the next academic level intensified student stress, echoing findings by Sahu (2020).

As an unintended outcome of the pandemic, online alternatives to traditional higher education have gained prominence, particularly in Bangladesh. However, these methods are not without their limitations. The study identified persistent challenges in Bangladesh's online education system, including a lack of electronic devices such as laptops, smartphones, computers, and essential tools for online courses. Additionally, limited or absent internet access, expensive mobile data packages or broadband

connections, disruptions during online classes due to slow or unstable internet speeds, and frequent power outages in both urban and rural areas hamper the efficacy of online learning. These findings echo prior research (Aldowah et al., 2019; Liguori and Winkler, 2020).

Amidst the challenges, the study also unveiled positive outcomes in academic pursuits. Students reported spending more time engaging with television, movies, YouTube videos, computer and mobile device gaming, and social networking platforms like Facebook and Instagram compared to pre-pandemic times. Some students even took a break from their studies due to university closures. They capitalized on online platforms such as Coursera, edX, and FutureLearn during their downtime at home, while others embraced hobbies like cooking and drawing. Furthermore, students actively participated in voluntary extracurricular activities, such as freelancing, unpaid internships, remote jobs, virtual conferences, seminars, webinars, workshops, and various competitions. These findings parallel those of Ali (2020), underscoring students' varied engagement during the pandemic. In response, students proposed suggestions for enhancing educational operations, including reducing homework loads, minimizing screen time, and improving lecture delivery. Scholars like Ferrel and Ryan (2020) have recommended reducing cognitive load, enhancing engagement, implementing identity-based access, introducing case-based learning, and employing comprehensive assessments.

In conclusion, this study sheds light on the multifaceted impacts of COVID-19 on university students' educational experiences. The pandemic prompted an accelerated shift towards digital learning, demonstrating advantages and limitations. Despite the challenges, students exhibited resilience and adaptability. As we navigate these uncharted waters, embracing the positive aspects of technology-enabled education while addressing its challenges will be pivotal for ensuring continued learning excellence.

Conclusion

Bangladesh boasts diverse educational institutions, ranging from colleges and universities to schools and beyond. The widespread repercussions of the COVID-19 pandemic have jolted the global academic community. This study delves into how COVID-19 has influenced students' academic performance, encompassing emotional well-being, physical health, financial circumstances, and social relationships. However, certain aspects of the curriculum, particularly science and technology-focused areas involving online lab assessments and practical courses, present challenges. Despite its adverse effects on academic activities, COVID-19 has ushered in positive outcomes for several students, revealing successful interactions with virtual education and contentment with online learning methods.

This study paves the way for further research to refine the online learning environment in Bangladeshi public universities. The findings indicate that the current strategies employed for online university teaching may lack the motivational impetus required to elevate students' comprehension levels and actively involve them in the learning process. Consequently, there is room for conducting additional studies to enhance the online learning experience, benefiting both educators and students alike. Higher education institutions need to exert concerted efforts to establish sustainable solutions for Bangladesh's educational challenges in the post-COVID era. A hybrid learning approach, blending online and offline components, emerges as a potentially effective strategy to navigate future situations akin to COVID-19. A collaborative effort involving governments, organizations, and educators is imperative to bridge educational gaps within this

framework. Governments could play a pivotal role by providing ICT training to instructors and students, fostering a more technologically adept academic community.

This research furnishes policymakers with insights to devise strategies that mitigate the detrimental impacts of crises such as pandemics on the educational system. Notwithstanding its limitations, including a confined sample size and the sole focus on a single university within a specific country, the study contributes valuable data. This research serves as a foundation, particularly in a science and technology-focused institution where the transition to online formats is intricate due to the nature of practical courses and lab work. This information could prove invaluable to Bangladesh's Ministry of Education as it formulates policies to counteract the adverse effects of crises on the educational realm.

Furthermore, this study serves as a springboard for subsequent investigations into the far-reaching implications of COVID-19 on academic engagement. Expanding the scope, larger-scale studies could be conducted in various locations to enrich the data pool. Additionally, considering the perspectives of professors and other stakeholders within higher education is an avenue for future exploration. Employing quantitative research methodologies with substantial sample sizes can ensure the broader applicability of the results. This study offers a multifaceted view of how COVID-19 has permeated students' academic pursuits, opening doors for comprehensive research and proactive policy-making in education.

Data availability

The data collected from the participants in the study cannot be shared, since participants were explicitly informed during the qualitative data collection process that their information would remain confidential and not be disclosed. Participants provided consent solely for the collection of relevant data for the study.

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Ethical approval

At the time the study was undertaken, there was no official ethics committee. Since it is crucial that ethical reviews occur before the start of every research, retrospective approval for completed studies like this study is not practicable. To ensure the safety of participants and the validity of the study, the research, nevertheless, complies with accepted ethical standards. Potential conflicts of interest were handled openly, and data management protocols respected anonymity.

Informed consent

Before engaging in the study, participants were informed about the objectives of the study by the interviewer. Furthermore, they were assured that any data they contributed

would remain confidential and exclusively used only for the study. Transparency was emphasized in conveying that the study's results and findings would be disseminated in a published format. As a critical component of ethical research practice, participants were requested to give their informed consent prior to their active involvement in the study.

Competing interests

The author declares no competing interests.

Additional information

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