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THE LEARNED LESSONS THROUGH EMERGENCY REMOTE TEACHING DURING SMOG FOR THE PROSPECTIVE ONLINE EDUCATION

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Abstract:
Smog and other environmental issues have had a significant impact on education, particularly in Pakistan. During the winter, Lahore frequently faces significant smog, causing schools and colleges to close and adapt to online classes. This study investigates how students and faculty at the University of Education, Lahore, handled online learning during the emergency. The study revealed that students faced difficulties such as inadequate internet, lack of devices, and noisy home environments, which hindered their ability to concentrate. Teachers provided crucial support to students through notes, recorded lectures, and timely feedback, but some students missed face-to-face interaction and struggled to maintain motivation. Students advocated for enhanced internet access, more interactive lessons, and a combination of online and physical classes to enhance future online learning. The research underscores the necessity for enhanced preparation, equal technology access, and effective teaching methods to enhance the effectiveness of online learning during emergencies.

Key phrases: Online learning, smog crisis, emergency teaching, student challenges, teacher support, internet access, digital learning, virtual education.

Introduction

Environmental emergencies, such as air pollution and smog, have significantly impacted public health, infrastructure, and education systems in Pakistan. Lahore, a major city, has been particularly vulnerable due to its severe smog, forcing the closure of physical classrooms and disrupting daily life. As a solution, Lahore had turned to online education, but this raises questions about the long-term sustainability, effectiveness, and adaptability of these systems during environmental disruptions. The city's response to these crises highlights the need for sustainable and adaptable education systems.

The global shift to online learning, particularly during the COVID-19 pandemic, has been a significant experience. Emergency Remote Teaching (ERT) was a rapid transition to online education, often without sufficient preparation or infrastructure. However, ERT revealed challenges such as unequal access to technology, inadequate digital literacy, and difficulties in maintaining student engagement. These issues are particularly relevant in Lahore's smog crisis and COVID-19 emphasizing the need for deeper evaluation and improvement of online education systems to be prepared for future crises.

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CJSSR
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Vol.02 No.04 (2024)

Digital inequality, inadequate internet connectivity, and a lack of device access are well-documented issues around the world. Students from marginalized communities, in particular, suffer the most significant challenges to online learning, particularly when living in low-resource situations (Salehi et al., 2020). This is a pressing issue in Lahore, where the digital divide has long existed. Furthermore, teachers frequently struggle to adapt their educational methods to the online medium, particularly if they lack the necessary training or resources to maintain student interest and engagement. The transition to online schooling due to smog not only reveals flaws in the educational system, but also highlights deficiencies in readiness for disruptions induced by environmental causes.

The research objectives and questions are as follows:

Research Objectives

1. To understand how students and teachers adapted to online teaching during the smog crisis.
2. To identify the challenges and successes of online learning and how these can guide future online education practices.
3. To uncover strategies that can help improve student engagement and learning outcomes in online education during environmental crises.
4. To recommend practical solutions and best practices for creating resilient online education systems in the future.

Research Questions

1. How did students and teachers feel about their experiences with online education during the smog crisis?
2. What were the biggest challenges faced during the shift to online learning, and how were these challenges dealt with?
3. Which teaching strategies or tools worked best for keeping students engaged and improving learning outcomes?
4. What aspects of online teaching should be kept, improved, or changed for future online education?

This research aims to explore the experiences of students and teachers at the University of Education, Lahore, during the recent shift to online education prompted by smog. The study will focus on the role of technology, communication methods, and teaching strategies in shaping the online learning experience, with particular attention to identifying strategies that improve student engagement and learning outcomes. Ultimately, the findings of this study aim to contribute to the development of more resilient, flexible, and inclusive education systems capable of functioning effectively during environmental crises and other unforeseen disruptions.

Review of Literature

During environmental crises like smog, natural disasters, and pandemics, online education has emerged as a vital tool for maintaining learning continuity. These occurrences frequently cause disruptions to conventional in-person instruction and pose serious problems for educational systems around the world. Disruptions to the environment make already-existing disparities worse, especially in low-resource environments where access to dependable internet and technology is restricted. Due to limited digital literacy, a lack of devices, and poor internet connectivity, many marginalized communities found it difficult to make the switch to online learning during the COVID-19 pandemic, as noted by Salehi et al. (2020). Cities like Lahore,

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CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.02 No.04 (2024)

where frequent smog outbreaks have disrupted the educational system and forced a move towards online learning, can also relate to this challenge.

This change is not without its challenges, though. Due to the dangerous air quality caused by Lahore's extreme winter pollution, schools are forced to close, and both teachers and students must quickly adjust to online learning environments. Many students in Lahore encounter major obstacles when trying to obtain dependable devices and internet, according to Johnson et al., (2020). Due to these obstacles, they find it challenging to fully engage in online courses, a problem that has become more apparent during the smog crisis. Environmental emergencies, like power outages, intensify the problem by interfering with online learning. Similar to this, Rahiem (2020) observes that in order to maintain learning continuity, schools in Southeast Asia adopted low-tech solutions like recorded lectures and printed materials as a result of natural disasters. Though these solutions offer some education, they don't deal with the root cause of digital inequality and emphasize the need for stronger educational infrastructure to facilitate online learning, especially in places where environmental disruptions are common.

Emergency Remote Teaching (ERT) is the sudden and often unexpected shift to online education during an emergency. Unlike well-planned online learning, which is based on structured pedagogies and adequate infrastructure, ERT is used as a short-term solution during crises. Hodges et al., (2020) emphasize that ERT frequently lacks the necessary planning and resources, resulting in an inadequate learning experience. This lack of preparedness was evident during the COVID-19 pandemic, which forced many countries, including Pakistan, to quickly adapt to online education. However, research shows that this quick transition frequently resulted in poor learning outcomes because ERT lacked the structure, pedagogical strategies, and engagement tools found in planned online education environments (Baytiyeh, 2020).

According to Bawa (2021), teacher preparation is critical to the success of ERT. Teachers who lacked the digital literacy required to effectively engage students struggled to keep students motivated and participating in online classes. The sudden shift to online education in Lahore as a result of the smog crisis exposed gaps in both teacher preparedness and institutional support, emphasizing the need for better emergency planning and training. Hodges et al. (2020) emphasize that for ERT to be effective, educational institutions must have the necessary infrastructure, digital tools, and pedagogical frameworks in place before the crisis occurs. Reactive measures, as seen during the COVID-19 pandemic and the smog crisis in Lahore, frequently result in inefficiencies and impede the overall effectiveness of online education.

Several key challenges have been identified in online learning during environmental crises, many of which have been amplified by the smog crisis in Lahore. Access to technology remains one of the most significant barriers to online education. Many students, especially those in low-income areas, do not have access to reliable internet or modern devices. As Salehi et al. (2020) report, this lack of access limits students' ability to participate effectively in online classes. In Lahore, where the digital divide is evident, the shift to online education due to the smog crisis has further worsened this issue, as many students are unable to fully engage with virtual learning due to poor internet connectivity or lack of devices.

In addition to technological barriers, teachers also face difficulties in maintaining student engagement during online classes. As Ali (2020) points out, online learning can feel isolating, and it is harder for students to stay motivated and engaged without face-to-face interactions. The absence of in-person interactions also hinders community and connection among students, further limiting their participation in the learning process.

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CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.02 No.04 (2024)

Environmental crises like smog can significantly impact students and teachers' mental and physical health, causing stress and health issues that hinder effective learning. In Lahore, students and teachers face academic challenges, respiratory issues, fatigue, and difficulty concentrating due to smog. The lack of physical activity and poor air quality discomfort further hinder focus on learning tasks, leading to a vicious cycle of disengagement and reduced academic performance. Addressing psycho-social factors is crucial for addressing these issues. (Rahiem , 2020)

Several techniques have been presented to address the issues of online education during times of environmental crisis. Baytiyeh (2020) and Hodges et al. (2020) emphasise the need of preparing instructors for efficient usage of online platforms. Teacher preparation is critical for ensuring that educators can engage students and maintain good teaching methods during an emergency. This involves digital literacy training, instructional tactics, and the utilisation of online resources to keep students interested in the learning process.

In places with limited internet connectivity, using low-tech options such as recorded lectures, offline materials, and mobile-compatible applications can aid in the continuity of learning. Rahiem (2020) proposes that these tactics can assist bridge the digital gap and make online education more inclusive during environmental crises, particularly in areas with limited access to dependable internet. Recorded materials and offline information enable students to continue learning at their own speed, minimising the reliance on real-time internet connectivity and increasing flexibility.

Olugbara et al. (2021) contend that flexible learning models, in which students can learn at their own pace, can result in improved learning results, particularly during emergencies. Student-centered learning methods that give learners control in their educational journeys are especially effective during disturbances such as environmental catastrophes. These methods enable students to continue learning despite disruptions to traditional face-to-face classes, giving them the freedom to manage their education while simultaneously addressing environmental challenges.

Another approach to bridging the digital divide is to establish community-based learning hubs. According to Salehi et al. (2020), collaborating with local organisations or community centers can provide students in underserved areas with access to devices, internet connectivity, and a supportive learning environment. These learning centres can serve as secure venues where students can attend online classes, collaborate with their peers, and receive teacher supervision, ensuring that learning continues despite the digital divide.

Research on online education during environmental crises is limited, with few studies specifically addressing the impact of recurring crises like smog on education systems. Additionally, there is limited research on the experiences of students and teachers in developing countries like Pakistan, where digital inequality and infrastructure challenges are more pronounced.

This study examines the transition to online education in Lahore, focusing on the challenges faced by students and teachers during the smog crisis. It offers practical solutions for improving online education systems and contributes to understanding how cities with frequent environmental disruptions can make online education more resilient, inclusive, and adaptable.

The shift to online education during environmental crises presents both challenges and opportunities. Technological barriers, engagement issues, and psychosocial factors hinder its effectiveness. Strategies like teacher training, low-tech solutions, and community support can

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CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.02 No.04 (2024)

improve its effectiveness. Learning from the COVID-19 pandemic and Lahore smog crisis can help develop more resilient, inclusive, and adaptable education systems.

Methodology

Research Design

The study uses a qualitative research approach to examine the lessons learned from Emergency Remote Teaching (ERT) and how these insights can inform the future of online education. It uses semi-structured interviews to capture the personal experiences of students and teachers during the environmental crisis in Lahore, allowing for guided questions and deeper responses.

Research Setting

The research was conducted at the University of Education, Lahore, which quickly transitioned to online learning due to the smog crisis. The university's BS-level education programs provided an ideal setting to explore student and teacher experiences, and as a PhD student, it provided a personal context for studying challenges and adaptations.

Participants

The study involved 20 BS-level students and 10 teachers from the University of Education, Lahore, who participated in online classes during the smog crisis. The students' experiences provide valuable insights into the challenges and support they received, while the teachers' experiences offer insights into the adjustments they made and strategies they used to engage students effectively. The sample size of 30 participants allowed for a deeper understanding of the issues at hand.

Data Collection

The study used semi-structured interviews on Google Docs, a familiar platform for online learning. Participants could respond at their own pace, allowing for thoughtful and reflective responses. The researcher could monitor responses in real-time and provide clarification or follow-up questions through comments, making the process smoother.

Interview Process

The study involved two weeks of interviews with students and teachers, using open-ended questions. Participants were given a personalized link to Google Docs, where they could answer the questions. The researcher monitored the Docs for responses and provided clarification. Follow-up emails or comments were used for assistance. Participants had 2-3 days to respond, and completion was confirmed via email after submission.

Interview Questions

The interview questions were open-ended, aiming to encourage detailed and reflective responses.

Teacher Interview Questions

1. How did you feel about shifting to online teaching during the smog crisis?
2. What adjustments did you make to your teaching methods?
3. Did your institution provide support or training for online teaching?
4. What challenges did you face while teaching online?
5. How did the shift to online teaching affect students' participation and performance?
6. Which online platforms (e.g., Zoom, Google Classroom) worked best for you?
7. What support would have made online teaching easier for you?
8. What lessons can make online education more effective and inclusive in the future?

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CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.02 No.04 (2024)

9. What recommendations would you suggest for better preparation for future online education?

Student Interview Questions

1. How did you feel when you first switched to online classes due to the smog crisis?
2. What were the biggest challenges you faced during online learning?
3. How did online classes impact your motivation and participation?
4. What kind of support or feedback from teachers was most helpful?
5. Did you face any internet or technology issues?
6. How did these affect your learning?
7. How did your home environment influence your online learning experience?
8. Do you think the quality of your learning was affected?
9. What improvements would you suggest for online education in the future?

Ethical Considerations

The study adhered to ethical guidelines, respecting participants' rights and privacy. Participants were informed about the study's purpose, anonymized, and their responses coded for privacy. Only the researcher had access to the data, and participation was voluntary.

Data Analysis

Thematic analysis was used to analyze interview data, breaking responses into smaller segments and assigning codes to capture main ideas. These codes were grouped to form broader themes, such as "Technological Challenges" for internet issues. The themes were reviewed and refined to accurately represent the data, and some were combined or renamed to better reflect responses. The final themes were interpreted to offer insights into how ERT can inform future online education practices.

Limitations

The study, conducted at a single university, offers valuable insights but has limitations such as limited generalizability, a small sample size for varied prospectives, and potential bias due to self-reported data, as participants may overstate or understate certain aspects of their experiences.

Findings (Students prospective)

This research was conducted to understand the experiences of students and teachers during the transition to online education during Lahore's smog crisis, using qualitative methods like open-ended interviews to identify lessons for future online education practices during environmental emergencies.

This study explored key themes related to student responses, including technological barriers, engagement, motivation, teacher support, and home learning environments. It highlights systemic issues and effective practices in online education (ERT) and offers insights for building resilient, inclusive, and effective systems for future disruptions.

Extensive Qualitative Analysis with Expanded Interpretations

1. Theme: Initial Reactions to Online Classes

Codes: Mixed Emotions, Technical Challenges

Findings:

Mixed Emotions: Students expressed varied reactions, with some feeling disengaged or bored, while others appreciated the safety from smog. One student stated, "I felt bad because it was boring, but I understood it was for our health."

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.02 No.04 (2024)

Technical Challenges: Participation was hindered by frequent connectivity issues. A participant noted, "Internet problems kept disrupting the lecture, making it difficult to focus."

Adaptation Needs: The sudden shift to online learning caused stress as students had to adjust to new tools and routines.

Interpretation:

Students' reactions to emergency shifts in learning methods are mixed, with some feeling relieved from commuting and health risks, while others feel unprepared. Technical hurdles like poor internet exacerbate the difficulty, highlighting the need for smoother transitions and training.

2. Theme: Platform Usability

Codes: User Experience, Technical Familiarity, Improvement Suggestions

Findings:

User Experience: Some users found familiar platforms like Zoom and Google Classroom helpful, while others encountered difficulties with installation and usage. For instance, one student shared, "Initially, I couldn't download Zoom, but I managed using my brother's phone."

Technical Familiarity: Students familiar with platforms during COVID-19 adapted faster. "We already knew how to use these platforms from COVID, so it wasn't an issue."

Improvement Suggestions: Simplifying interfaces and addressing platform limitations, such as time limits on Zoom, were frequently mentioned.

Interpretation:

The study highlights the digital divide and the need for user-friendly, strong platforms in educational institutions. Familiarity accelerates adaptation, but technical barriers for first-time users highlight the digital divide, highlighting the need for consistency.

3. Theme: Motivation and Engagement

Codes: Isolation, Teacher Support, Distractions

Findings:

Isolation and Distractions: Without face-to-face interactions, many felt disconnected. Social media and home distractions were recurring obstacles. "Notifications from WhatsApp and Instagram kept interrupting my focus."

Teacher Support as Motivation: Many credited teachers for maintaining engagement through interactive teaching. "The way teachers explained kept me motivated despite challenges."

Some students self-regulated their learning. "Using calendars and to-do lists helped me stay organized."

Interpretation:

The absence of a structured physical environment reduced engagement, emphasizing the need for social connections and personalized support from teachers. However, not all students developed self-regulation strategies, necessitating institutional efforts.

4. Theme: Teacher Support

Codes: Feedback, Flexibility, Responsiveness

Findings:

Constructive Feedback: Students valued detailed guidance on assignments. "Timely feedback helped me identify my weaknesses and improve."

Responsiveness: Teachers' openness to questions encouraged participation. "They always said, 'Feel free to ask again,' which helped us learn better."

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.02 No.04 (2024)

Flexible Teaching Methods: Recorded lectures and notes helped students revisit complex topics. "PDFs and recorded sessions made it easier to catch up."

Interpretation:

Teacher flexibility and accessibility are crucial for online education quality, creating an inclusive environment. However, inconsistencies in support suggest all teachers should receive training in effective virtual pedagogy.

5. Theme: Access to Technology

Codes: Internet Connectivity, Device Availability, Impact on Learning

Findings:

Internet Connectivity Issues: Most participants cited poor internet as a significant barrier. "Frequent disconnections made me miss parts of the lecture."

Device Sharing: Shared access to devices disrupted learning schedules. "I had to share my smartphone with family members, which limited my study time."

Impact on Learning: Unstable technology caused delays and reduced comprehension. "Missed instructions due to network issues affected my understanding of key topics."

Interpretation:

Unequal access to reliable technology in educational systems, particularly for low-resource students, is a significant issue. Infrastructure improvements and government initiatives to provide affordable internet and devices could improve accessibility.

6. Theme: Home Environment

Codes: Noise, Lack of Study Space, Family Interruptions

Findings:

Distractions at Home: Many students found shared spaces noisy and distracting. "Living in a joint family made it hard to focus, with constant interruptions."

Need for Dedicated Study Areas: Students suggested quieter, organized study spaces. "A soundproof room would make online learning better."

Positive Experiences: A few students appreciated their home setup for learning. "I attended classes without interruption as my family was supportive."

Interpretation:

The home environment can be both supportive and stressful, influenced by socioeconomic factors. Addressing these disparities through dedicated study areas and community resources like learning hubs can provide equitable learning conditions.

7. Theme: Learning Quality

Codes: Interaction Deficit, Visual Learning, Suggestions for Improvement

Findings:

Interaction Deficit: Limited face-to-face interaction impacted learning depth. "It was hard to ask questions like we do in physical classes."

Visual Learning Preferences: Students preferred lectures with visual aids. "Whiteboards and slides would make understanding easier."

Improvement Suggestions: Hybrid models combining online and physical classes were proposed. "A mix of online and offline learning would balance interaction and flexibility."

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ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.02 No.04 (2024)

Interpretation:

Online education has reduced classroom interaction, necessitating active engagement strategies. Visual aids and two-way communication tools could bridge gaps, while hybrid models integrate physical and digital learning environments.

8. Theme: Collaboration Among Peers

Codes: Limited Interaction, Digital Collaboration Tools

Findings:

Limited Interaction: Online classes lacked structured peer collaboration. "We weren't allowed to collaborate during class, so we texted on WhatsApp instead."

Digital Collaboration Tools: Tools like Google Docs and WhatsApp facilitated group projects. "We used Google Docs to share ideas and complete assignments together."

Interpretation:

Online classes hindered peer collaboration, affecting collective learning. Institutions could improve by integrating built-in features, structuring group tasks, or implementing breakout sessions to enhance learning.

9. Theme: Recommendations for Online Education

Codes: Technological Upgrades, Pedagogical Adjustments, Inclusivity

Findings:

Technological Upgrades: Better internet and devices were the top recommendations. "Provide free internet to students who can't afford it."

Pedagogical Adjustments: Interactive and engaging lessons were suggested. "Teachers should use more visuals and examples to make classes interesting."

Inclusivity: Students called for equitable access to resources. "Every student should receive the same facilities for effective learning."

Interpretation:

Participants suggest addressing systemic barriers to online education, providing resources, and implementing interactive teaching methods to improve inclusivity and engagement.

10. Theme: Key Lessons for Regular Online Education

Codes: Clear Communication, Accessibility, Hybrid Models

Findings:

Clear Communication: Students stressed timely feedback and updates. "Regular updates and feedback keep us on track."

Accessibility: Ensuring all students have access to technology was a recurring suggestion. "Provide devices and internet for those who can't afford them."

Hybrid Models: Many advocated for combining online and offline classes. "Hybrid models improve interaction and discipline while offering flexibility."

Interpretation:

Effective online education requires clear communication, accessibility, and adaptability, with hybrid models promising inclusivity and personalized learning. Scaling requires robust technological infrastructure and pedagogical innovation.

5. Conclusion

The transition to online education during the smog crisis revealed both the advantages and disadvantages of emergency remote teaching. The solution to an urgent problem highlighted several challenges that must be addressed for online education to become a reliable learning

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ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.02 No.04 (2024)

method in the future. The experience highlights the need for numerous lessons to enhance the system.

The primary issue faced by students was inadequate technology, including poor internet connectivity, frequent disconnections, and a lack of devices. The technical issues caused disruptions in learning, leading to student frustration and difficulty in keeping up. As one student said, *"Frequent disconnections made me miss parts of the lecture."* The issue highlights the significant digital divide, particularly in communities with limited resources. To ensure the success of online education, technology access should be considered a fundamental right, not a privilege. Institutions, with government support, must ensure that all students have access to affordable internet and devices. The issue of online education is crucial for ensuring that some students are not left behind.

The study highlighted the usability of online platforms, revealing that some students were already familiar with tools like Zoom and Google Classroom, while others struggled to adapt. A student struggled to download Zoom and relied on a sibling's phone, highlighting the importance of user-friendly platforms and proper orientation sessions for effective learning. Online platforms should be consistent, simple, and support students and teachers with minimal interruptions to prevent students from feeling alienated by the tools.

The issue of engagement and motivation has emerged as a significant challenge. Many students experienced feelings of disconnection due to the absence of face-to-face interaction. They were often distracted by their phones or home environments, making it hard to focus. As one student admitted, *"WhatsApp and Instagram notifications kept interrupting my focus."* Teachers significantly contribute to student motivation by providing regular feedback, clearly explaining concepts, and engaging in interactive teaching methods. Teachers need better training to adapt to online methods, engaging classes, and developing independent learning skills to ensure online classes remain productive and engaging for students.

Home environments significantly impact students' learning abilities, with most struggling with noise, distractions, and lack of privacy, despite some enjoying quiet settings. One student, living in a joint family, described constant interruptions, saying, *"My home is noisy, and I can't focus with so many people around."* The issue highlights the need for community-based learning hubs to offer students quiet, resourceful spaces for effective learning. Economic conditions significantly impact a student's learning environment, as not all families can afford dedicated study spaces, affecting overall learning quality and highlighting student awareness of gaps. Students frequently missed the freedom to interact with teachers, ask questions, and collaborate with classmates in physical classrooms. One student suggested using *"whiteboards and slides to explain concepts visually,"* which shows the need for better teaching tools in online education. To ensure effective learning, it is crucial to incorporate visual aids, interactive activities, and two-way communication opportunities. Many students prefer a hybrid model, combining online and physical classes, to balance face-to-face interaction with the flexibility of online learning.

The online setup has negatively impacted peer collaboration, as students have missed the group activities and discussions they were accustomed to in physical classrooms. Students frequently utilized tools like WhatsApp for communication, but it was evident that there were no structured opportunities for teamwork during class. Online platforms should incorporate built-in tools for group work, such as breakout rooms or shared workspaces, and teachers can design group tasks to promote collaboration and social connection.

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CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.02 No.04 (2024)

As we reflect on this entire experience, it is clear that online education holds promise, but it needs major improvements to become truly effective and inclusive. First, reliable internet and access to devices must be ensured for all students. Second, teachers must receive proper training to adapt their methods and keep students engaged. Third, online platforms need to be simplified and made more interactive to reduce barriers for students. Finally, there needs to be a focus on finding a balance between online and physical education. A hybrid model can combine the strengths of both systems, ensuring that no student feels disconnected or left behind. Hence, Emergency Remote Teaching, while serving as a temporary solution, exposed significant weaknesses in our educational system. To ensure the future reliability of online education, it is crucial to establish a robust infrastructure, promote inclusive practices, and employ engaging pedagogy. The experience provides valuable lessons for institutions, teachers, and policymakers to create a resilient system capable of delivering quality education for all students.

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