Muslim Education Review
Vol. 4 No. 2, 2025, 202-230
https://doi.org/10.56529/mer.v4i2.524

Role of Head Teachers in Sustaining Academic Continuity Amidst Smog in South Punjab, Pakistan

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"From October to January, smog has become Punjab's fifth season, with a thick layer of pollution blanketing urbanized and industrialized cities" (Environmental Protection Department, 2024).

Abstract
For a couple of years, smog has emerged as an environmental danger due to industrial smoke in the lives of people in Punjab, Pakistan; it harms children's health, causing breathing and lung diseases, disrupting school schedules, and resulting in study loss. This study examines the role of head teachers in maintaining academic continuity in government primary schools in Southern Punjab during school closures due to the smog season. This qualitative research employs a case study design to explore the specific strategies that head teachers use to overcome study loss. The study investigates how school leaders use their leadership qualities, proactive planning, and coordination to ensure the continuity of teaching and learning within their schools. I used semi-structured interviews with two school heads of public primary schools in southern Punjab. Analysis of the documents from the Health Department of Punjab and the Punjab Environment Protection and Climate Change Department was also employed. This study found that headteachers used leadership skills to address educational crises caused by smog. The main recommendations are that school leaders can play a significant role in saving students' valuable time by leveraging leadership skills and the effective use of technology and remote learning teaching methods, even in the absence of funding, so school leaders can make a huge difference with existing resources. The results suggest that relevant authorities should take serious policy measures to encourage and train school heads.

Keywords: *academic continuity; climate change; headteachers; smog; transformational leadership*

Introduction

Smog is a visible air pollution comprising smoke, fog, dust, and other pollutants like agricultural residue. It has been identified as one of the most serious environmental hazards affecting people's lives; it harms health and disrupts school schedules. Smog occurs when smoke and fog come together through industrial emissions, vehicle exhausts, crop residue burning, and other pollutants and moisture in the air (Malik et al., 2024). According to Bukhari and Shahid (2024), Pakistan's Punjab province declared a health emergency due to smog, prohibiting development, closing schools, and moving universities online. Similarly, in another report by Al Jazeera (n.d.), Pakistan's Punjab province closes schools and establishes a 'Smog War Room' to combat air pollution.

This environmental challenge, or poor air quality, has been linked to various health issues in children, including respiratory illnesses and lower cognitive ability. Research indicates that smog and various forms of air pollution adversely affect children's health and educational outcomes, leading to increased absenteeism and diminished academic performance (Khan & Kauser Takreem, 2024; Nadeem et al., 2024). The negative impacts are seen not only on the physical aspect of the students but also on their mental ability. Consequently, addressing the school environment has become an urgent task for school administrators, particularly the school heads, to maintain a healthy and conducive learning atmosphere during any calamity. The school leaders play an important role during smog, as they take immediate actions for the safety of students and also plan long-term strategies to reduce the risks and maintain learning continuity (Andersson et al., 2015; Braus & Wood, 1993).

According to Dadvand et al. (2015), children exposed to air pollutants are more likely to be caught by chronic respiratory disorders, which interfere with school attendance and learning. Similarly, air pollution has a deleterious impact on cognition, causing kids' learning results to fall far short of their academic potential (Feng et al., 2020). The environmental problems are known to affect schools, but common people

don’t understand the challenges the school leaders face. Smog, heatwaves, and poor air quality require students to protect themselves, adjust the school routines, respond to emergencies, and keep learning going. So, more research is needed to understand how these conditions influence school leaders' responsibilities. According to Bass and Riggio (2006), transformational leadership has been regarded as the most effective strategy for school leaders to deal with disasters like pollution. Such leadership understands the need to form a collective view and build capacity during smog, factors that improve the school climate, as proposed by Jantzi (2005) and Hallinger (2003). However, pollution reduction cannot be achieved purely through integrated techniques because of limited resources and assessed policies; the ability to improve decision-making, communication, and teamwork remains critical (Iqbal, 2020). However, many rules and resources continue to hinder leadership today. Teachers and students in Pakistani schools and colleges, both institutionally and individually, are unaware of environmental threats due to weak or no health policies, inadequate infrastructure, and underfunded educational facilities, particularly in rural areas. Studies in the United States and China have demonstrated the need to establish environmental health programs within educational institutions; school leadership has successfully controlled environmental dangers while maintaining educational continuity.

Globally, smog has emerged as both an environmental and educational crisis, disrupting learning processes in educational institutions. When the outdoor air quality reaches a dangerous level, schools are forced to close or to move teaching online; it is a challenge for the school leadership to sustain the continuity of learning. In such situations, the role of head teachers becomes more critical because they need to coordinate all safety responses and communicate with parents, and the crisis threatens the continuity of education (Chen et al., 2018).

Problem Statement

Southern Punjab has limited access to education and health care; thus, school leaders must fulfil their responsibilities as climate warriors regardless of available resources (Malik, 2011). Smog has an impact on students' health and absence, hence school-based interventions must be implemented (Mohai et al., 2011). Unplanned school closures due to smog place additional responsibility on headteachers to sustain instructional activities, as students already receive below-average education (Malik, 2011).

Research Gap

Previous studies have viewed smog as a climate change issue. However, there is limited research on the role of headteachers or school leaders in maintaining educational continuity during smog, especially in southern Punjab. Although the school in South Punjab encounters smog-related disturbances, there is no study on how headteachers/school leaders might address the issues in these low-resource areas. Existing research focuses on the health effects of smog and the importance of school-based interventions, but it does not explain what school leaders do, what constraints they confront, or how they make decisions when schools close. The absence of empirical understanding leaves a huge gap; Headteachers' actions go uncounted and unreported, especially in areas where government financing for infrastructure and institutional support is already low.

Research Question

How do head teachers of government primary schools in southern Punjab sustain educational continuity by using their leadership qualities and caring for students' health amidst smog?

Research Objectives

This study observes the leadership role of head teachers in government primary schools in southern Punjab who adhere to school closure directives from the School Education Department, Punjab, for smog management, aimed at safeguarding children from harmful impacts while preserving educational continuity amid climate change. In the context of Punjab, the head teachers hold key responsibilities as teachers, managers, guards, policymakers, critics, and even, in some situations, doctors. This study emphasizes the resources, focusing only on students' well-being and educational continuity.

Significance of the Study

This work is essential because it adds to the understanding of how Pakistani school leaders can effectively minimize environmental concerns, such as smog and climate change, to improve educational quality in schools. Environmental issues impact education in South Punjab, yet there is a scarcity of published research on how school leaders in Pakistan approach these challenges. The study will offer insights into the strategies school leaders employ to mitigate environmental effects on instructional continuity. This argument will help policymakers and school administrators understand current school practices, resulting in a recommended framework for head teachers to address environmental and climatic concerns in educational institutions. The study will offer safety guidelines and awareness campaigns to improve schools, particularly in areas with high air pollution levels. The study reveals that the efforts to improve the learning environment contribute to providing a safe educational setting to continue studies for pupils even when the smog is hard.

Literature Review

Although climate change persists as a worldwide concern, the effects of smog are evident and affect numerous individuals daily. Smog occurs when combusted fuels and pollutants combine with fog, heightening health risks (DeFusco, 2021). Smog is a prevalent issue in Punjab, especially in autumn, attributed to agricultural burning, industrial activities, and urbanization (Ali & Rana, 2024). According to the Air Quality, Energy, and Health (n.d.), smog is becoming a main health concern; also, the World Health Organization findings say exposure significantly increases the risk of respiratory and cardiovascular disease, among other related health problems. The necessity for enhanced comprehension of environmental issues and more robust leadership in fostering ecological awareness has been acknowledged. Ecological leadership instructs individuals and their communities on addressing the adverse effects of climate change and pollution (Omarova & Jo, 2022). The approach emphasizes environmental protection and management through public engagement and the preservation of resources for future generations. Scholarly studies show that smog is an environmental hazard that hinders children's health and learning capacity (Nadeem, Bajwa, & Bajwa, 2024; Khan, 2024). School leadership, especially principals, is in a position to safeguard students from negative impacts and continue with learning even if the environment is against it (Nadeem et al., 2024).

1. Environmental Challenges in Education

This section will discuss how environmental pollution affects school functioning and education quality. It was established that smog affects children's health in their classrooms because it causes respiratory diseases, infections, and/or asthma, which translates to school dropout rates and poor academic performance. It has been established in various works that air pollution hinders students' ability to focus and exercise physical strength (Dadvand et al., 2015; Mushtaq & Mahmood, 2024).

(Andersson et al., 2015) These health issues interfere with the direct delivery of education and create an enormous problem for school administration.

Facing such challenges, school leaders have the essential task of moderating the risks from the school environment to provide special conditions for learning. Some authors who share such an opinion include Andersson et al. (2015), who opine that generating school leadership is not limited to performing administrative roles but also involves handling environmental risks such as smog. Bass & Riggio (2006) and Iqbal (2020) noted that principals are expected to protect students and provide them with continuity of education in the event of smog disruptions in Southern Punjab, with an extreme scarcity of resources.

2. Role of School Leaders in Crisis Management

Transformational leadership is well-suited for school leaders because it allows them to adapt their roles according to the circumstances, particularly in the context of smog. This approach, as assaulted by Bass & Riggio (2006), aims at encouraging staff and students to achieve the institution's vision of being resilient despite destructive and devastating environmental shocks. Leithwood and Jantzi (2005) observe that transformational leaders are well-positioned to address challenges by creating a positive school climate: this is especially true when what they refer to as environmental crises, like smog, are experienced. These leaders are supposed to communicate, promote collaboration, and facilitate change in their organizations, all of which become critical to maintaining a strong academic enterprise during such disruptions. Hallinger (2003), who worked on transformational leadership, suggests that it assists school leaders in effectively leading their schools to foster learners' environmental challenges. A transformational leader actively motivates others and creates an environment to work together with the community to solve problems.

Crisis management theories and the model provide a framework for understanding and responding to unexpected events that threaten organizations. They address the natural disasters and the interconnected global challenges. Furthermore, the Crisis Management Theory further asserts that individuals and organizations managing crises ought to make costly decisions and can quickly adapt to changes. Headteachers should make prompt decisions about students' health by adjusting school schedules, including an immediate shift from offline to online learning when required. According to Schechter et al. (2024), crisis preparedness and management combine short-term reactive measures and long-term proactive planning to support educational continuity during crises. Employing the transformational leadership strategies by the headmasters becomes feasible to manage educational disruptions, particularly in smog.

3. Policy and Resource Constraints

According to Amjad and MacLeod (2014), Pakistan's educational system has many problems, such as socioeconomic divide, lack of funds, and minimal state encouragement for environmental education. Saleem et al. (2020) highlight other challenges, such as a lack of adequate health protection methods, levels of awareness of physical environmental issues, and insufficient funding for school smog preventive measures. These problems leave school leaders with inadequate assistance to implement measures that reduce the effects of smog. Therefore, school leaders require not only leadership skills but also policy change, as well as funds to tackle regional health outcomes. School leaders can learn how to prepare for and address environmental crises from research conducted in other countries, like the USA and China. The rationale for choosing the United States and China is that both countries have created strong models for managing air pollution with the goal of sustaining educational activities in institutions.

If the school systems integrate the environmental policy into schools, it can strengthen the smog-related disruptions, and this is already being adopted internationally. The EPA model in the United States demonstrates how school leaders become empowered when the structured air quality management protects the students' health (Mohai et al., 2011). Similarly, in China, school-level crisis management is enhanced by coordinated policies (Sadrizadeh et al., 2022; Rawat & Kumar, 2023). These cases suggest that Punjab can also adopt similar leadership strategies.

Theoretical Frameworks

1. Transformational Leadership Theory

Transformational leadership is a style of leadership where leaders inspire and give motivation to their group with a clear vision, introducing innovation to foster personal development. The main components of the theory are building trust and enthusiasm, helping people to meet their expectations, and achieving big, positive changes. Transformational Leadership theory provides structures through which school leaders can accrue proactivity toward systematically handling environmental issues. It focuses on developing vision, establishing organizational response, and ensuring that the school staff and students are fully prepared for emergencies (Bass & Riggio, 2006). Additionally, Jacobs et al. (2020) share that the transformed leadership in education is a catalyst for fostering collaboration with other stakeholders that would help them strengthen the resilience of community student support in schools, particularly those in high-risk communities such as Southern Punjab.

2. Servant Leadership Theory

Servant leadership is moral-based leadership where leaders only fulfill the needs of the followers, i.e., employees, customers, and other stakeholders, not only meeting their personal needs. Servant leadership

prioritizes students' needs while mitigating smog's adverse effects on students' health and education (Hanif et al., 2023). The study offers valuable insights to conserve students' time, mainly when government funding for academic and infrastructure development is inadequate. Consequently, school leaders become more responsive and can present their recommendations and suggestions to educational authorities (Barrett et al., 2019).

3. Crisis Management Theory

Numerous authors from the fields of organizational management, psychology, and public administration developed the crisis management theory. The concept of this theory guides the prevention, management, and improvement of infrastructure during crises. Ian Mitroff wrote excellently on crisis management in organizations. His famous book "Crisis Management: Managing the Unexpected" explains how institutions can prepare to respond to crises effectively. Later, Gonzalez-Herrero and Pratt (1996) presented this theory. According to this theory, a crisis management model is a conceptual framework for preparing for, preventing, coping with, and recovering from a crisis (Bellei & Munoz, 2023).

Crisis management theory offers a framework that supplements this argument by ensuring that school leaders know how to respond to disruptions that smog creates in the short term. The integration of transformational leadership and crisis management equips school leaders with both short-term and long-term strategies to address environmental challenges, such as smog. Therefore, there will always be continuity in education. Literature shows that school leaders must play an important part in risk and intervention concerning environmental factors like smog to continue education. Mitroff's proactive and transformational leadership approach to crisis management covers incidents and recovery. Transformational leadership and crisis management are critical when

teaching school leaders to address environmental concerns like smog (Jabeen, 2018). Recognition of Ian Mitroff's books can enhance your work by providing a theoretical framework, but they also make a difference in Pakistani educational literacy.

Methodology

Qualitative Research Approach

According to Teherani et al. (2015), researchers should evaluate how one’s perspective influences the research possibilities available in any qualitative study. Contemporary qualitative methodologies indicate that the research strategy, research topic, and underlying belief system must align to guarantee the integrity of the research. This qualitative case study examined school leaders' leadership behaviours and interventions to promote instructional continuity. This research applies a case study method to examine how school leaders handle environmental issues in their practice areas and communities (DeFusco, 2021; Nadeem et al., 2024).

Research Design

This study's qualitative case study design is ideal for investigating phenomena in their real-world setting. Researchers can study complex issues in detail via case studies (Creswell & Creswell, 2017) (Yin, 2018). This study seeks to understand how school leadership adjusts to environmental changes by combining data from diverse sources. This study uses a descriptive case study to describe principals' smog mitigation and school operational measures. The study seeks to understand how school administrators handle environmental problems, view smog, protect kids, and maintain education.

Data Collection Methods

i. Semi-structured Interviews

The study used semi-structured interviews to gather data on headteachers' perceptions, experiences, and strategies for addressing smog. The interviews cover key themes such as student health and education, mitigation strategies, challenges, available resources, institutional policies, and community involvement. Online interviews are advantageous as they are flexible and can be conducted during remote work or classes. The interviews are taped and analyzed. Interviews were conducted with one female headmistress from a girls' primary school and one male headmaster from a boys' primary school to assess overall progress and efforts to continue the learning process for kids affected by smog in the Southern Punjab region.

ii. Document Review

This study involves interviews and a documentation review to understand the headteachers' work framework. Documents include school codes of conduct, health and safety regulations, and environmental management policies. These will offer ideas for start-up management, health emergencies, and regional or institutional policies to address environmental threats.

Data Analysis Procedures

Thematic Analysis

This study uses thematic analysis to analyze qualitative research data, focusing on patterns, themes, and links. The process involves coding and thematically examining interview data and document records. Thematic analysis is a widely utilized method for identifying, interpreting, and delineating patterns within data (Braun & Clarke, 2006). The findings

are organized into themes to identify relevant patterns. For example, an article titled "Leadership Responses to Smog" might include codes like *"Precautionary Measures*," *"Health and Safety*," and "*Student Turnout and Health Tracking*." Thematic analysis helps categorize data and clarify key themes related to responses to smog in an educational context.

This qualitative study employs interview and document triangulation to ensure the consistency and inclusivity of data, and examines discrepancies between headteachers' claims and actual actions. It employs participant triangulation to compare the handling of smog impacts by two headteachers. Furthermore, it evaluates data based on study questions and past studies. It narratively recounts findings, linking them to theoretical underpinnings while identifying primary challenges faced by school leaders in managing environmental catastrophes. Also, includes suggestions for adjustments to school leadership methodologies and policy implementation regarding smog.

Ethical Considerations

Ethical considerations are paramount at every stage of qualitative research. A review board member will authorize the study before its commencement. Participants must be entirely candid about their intentions, roles, and the anticipated research outcomes. All volunteers will execute a written informed consent form to ensure compliance with the regulations (Creswell & Poth, 2016). The study is significant from social, moral, and political perspectives as it safeguards the participants' privacy and dignity. The following are the probable processes and measures to be implemented in this study to ensure participant safety. The following measures will be implemented to safeguard the privacy of study participants and ensure their safety during the research. Moreover, Participants, including headteachers, will be informed about the study's objectives, methodology, and data usage. Formal consent will be used, and participants are informed that participation is voluntary and withdrawable

at any time, and their responses will remain confidential (Creswell, 2014). All school or head names will be anonymized, and no other identifying information will be shared. The researcher will have access to the raw data, but the written report will not include the subject's personal information (Yin, 2018; Creswell & Poth, 2018).

Limitations of the Study

This case study looks at the strategies developed by school administrators in southern Punjab to ensure seamless learning. However, administrators in other Pakistani schools or smog-prone areas cannot generalize the findings. The small sample size of the study may limit its reach, and the self-reported assessments of participating headteachers may be biased. The study's findings may be overly generalizable due to the small sample size (Khalid et al., 2024).

Discussion

This section integrates the findings with the previous research and theoretical perspectives that emphasize how leadership strategies mitigate the impacts of smog on educational activities. The data for this study are based on interviews with two headteachers of government elementary schools in Southern Punjab, Pakistan. The headteachers were chosen because they directly manage their schools, especially during the winter months when smog is most common. The results are organized around the following data-driven themes: perceptions of smog, techniques for minimizing its influence on education, smog-related leadership issues, and policy applicability. Analyses of sample school codes of conduct, health and safety regulations, and environmental management standards back up the findings.

1. Perceptions of Smog and Its Impact on Education

The school administrators discussed pollution's harmful health effects, particularly for children. The interviewees described smog as a current issue that hurts pupils' health and academic performance. Students reported coughing, eye irritation, and dyspnea, forcing them to miss school during periods of high smog. One of the headmasters stated, *"We are extremely concerned about the smog problem."* The issue is not with airborne pollution but with the well-being of our student population. Some of them feel ill and cannot attend school as previously scheduled.

The two headmasters observed that smog caused short-term memory loss in children, notably at school and during high smog density. Another headmaster observed, "*Students cannot concentrate in class when the air quality is poor."* Their concentration is weakened, demanding more frequent breaks. There is always the question of how to engage individuals. These findings are consistent with earlier research showing that smog and other air pollution harm children physically and intellectually. Participants remarked that while smog hurt both physical and mental health, pupils from young children's classrooms who were struggling with learning looked to be the most seriously affected. All of the headteachers underlined the importance of balancing students' medical needs with the need to sustain efficiency in educational delivery, especially in light of class interruptions for various reasons.

2. Strategies to Reduce the Impact of Smog on Education

Both school administrators used various techniques to reduce the impact on students' health and academic performance. Both approaches were tailored to meet the needs of the local environment, such as harsh research circumstances, existing resource constraints, and environmental disaster modifications to academic timetables. Of all the smog mitigation techniques, it was decided to change the hours of student exposure to

smog. Both headmasters stated that the program resulted in an earlier school start time and modified break durations to limit physical activity during high pollution levels. A headmaster commented, "To *engage in outdoor activities, we strive to complete these exercises before the rise in pollution levels."* Our courses begin in the early morning. As a result, students leave class early to avoid exposure to afternoon air pollution. These changes allowed students to devote more time to learning in class, especially during periods of low air pollution, which reduced their exposure to smog.

Internal health management practices were implemented in both schools, which included daily health exams for pupils. Students were urged to notify teachers if they experienced respiratory disease symptoms or smog-related difficulties, such as tiredness or difficulty breathing. Nonetheless, one headmaster stated, *"We have a system in which teachers assess students every morning."* When students appear ill, we excuse them from class and advise them to return home or visit a nearby clinic. The project sought to apply early symptom-control measures by discouraging ill people from going to work or public places in order to decrease disease transmission and prevent further worsening of health. Headteachers collaborated with health officials to reduce the socioeconomic effects of smog. They worked together on information dissemination activities such as sending out health alerts to parents, holding meetings to discuss the dangers of smog, and hosting seminars on managing respiratory illnesses. Another headmaster stated, "*We maintain an excellent rapport with the health offices."* They help us provide informational materials to both staff and parents, and we work together to guarantee that children who have been exposed to pollution receive treatment.

3. Obstacles For Educational Leaders

Headteachers recognized the following key obstacles in managing smog at educational institutions: insufficient funding, little community awareness, and inadequate government support.

Insufficient Resources: Both headteachers identified the key difficulty as a lack of resources to fund and implement comprehensive smog-protection initiatives for students. While attempting to implement preventative measures such as altering class schedules and doing health assessments, teachers could not purchase air filters or provide masks for their students due to a lack of funds. According to one headteacher, we cannot provide enough air purifiers or masks for the pupils in the classroom. The problem lies in the scarcity of resources. This constraint severely limited the group's ability to protect children from the impacts of smog on a large scale.

Insufficient Community Awareness: Another issue was that the general public, particularly youngsters, had an insufficient understanding of the long-term effects of smog on health and education. Typical working parents, particularly in rural areas, were unaware of the risks linked with poor air quality. Another headmaster commented, *"They are unaware of how smog affects their children."* To some, it is just another cyclical problem that will ultimately resolve itself. Due to a lack of understanding, school officials could not garner comprehensive community support for their health-related efforts. At the same time, parents failed to adopt the necessary supervision and procedures to protect their children's health at home.

Regulatory and Policy Limitations: The headmasters, for example, reported problems with government policy and assistance. These laws, intended to safeguard environmental health and safety, either lacked specific guidelines for managing smog in educational institutions or enforced them ineffectively. Another headmaster commented, *"There are policies; however, they are impractical for our rural school of this nature.*"

Significant issues need the development of specific techniques for dealing with smog-induced disturbances. Both headmasters stated that their schools do not receive adequate government funding to address environmental issues, which impedes their efforts to establish sustainable environmental practices. This was a big challenge as schools attempted to safeguard pupils from the adverse effects of smog, but an ineffective government failed to address its root causes.

4. The Significance of Educational Policies

The school documents examined in this research study included the school manuals, health and safety regulations, code of conduct, and environmental management policies of both institutions, revealing the existence of general measures aimed at mitigating the impact of smog on students. Nonetheless, these rules were frequently prescriptive and lacked site specificity, making them ineffective in addressing the issues of smog reduction.

Health and Safety Regulations: Every school we visited had health and safety rules and procedures to address poor indoor air quality, including warnings to children to stay indoors during periods of high pollution. Nonetheless, the regulations lacked specific direction on schools' actions to keep operations running during pollution emergencies. One headmaster commented, *"The policies are beneficial, but none explicitly outline how to combat severe pollution."* The process primarily involves trial and error. Compared to other physical interruptions children encounter in their daily learning experiences, the lack of detailed rules made it difficult for school officials to manage smog-related disturbances properly.

Policies for environmental management: The study found that both schools had environmental management strategies, with the key issues being trash disposal and water conservation. In this aspect, neither

institution has a policy on air quality, let alone smog. For example, one of the headmasters observed, *"There is a policy regarding garbage and water, but not for the air we breathe."* The main issue is throughout the winter. The absence of this policy implies a need for more targeted efforts to manage air pollution in schools and educational institutions.

Findings

This study reveals that headteachers consider school closures inappropriate; instead, they advocate for more substantial government support, particular legislation, and increased collaboration among stakeholders. They believe students become lazier at home as the haze persists uniformly across regions. To some extent, headteachers were found to be proactive before the onset of the smog season, making essential provisions for uninterrupted learning; nonetheless, they mostly regarded it as a governmental obligation. Limited accountability has been seen in headteachers' initiatives, as each attempt necessitates assistance from the department and balanced strategies from the government. There is a conflict between government strategies and the localized strategies of headteachers.

Likewise, technology is essential for better alignment in addressing the issue and facilitating online lessons. In this context, it remains necessary to cultivate soft skills in teachers to deliver lessons to students at home effectively. Guardians—Effective coordination is crucial to engage children in attending classes rather than spending time playing games, since parents sometimes take this for granted during vacations. In truth, this season is optimal for educational activities, and students will soon need to prepare for tests after February. Headteachers urge authorities to provide alternate educational strategies and prioritize children's health, as the lifting of smog leads to an abrupt surge in academic pressure, resulting in challenges for instructors.

Moreover, finding of this study provides a descriptive insight into the impact of smog on children's health and learning sustainability in southern Punjab, India. School leaders have identified smog as a significant challenge affecting students' cognitive and physical health. This aligns with research that shows air pollution affects chronic diseases such as respiratory illnesses and cardiovascular diseases, thus affecting school attendance.

The cognitive impacts of smog are supported by research from around the world that shows that air pollution impedes children's aptitude to learn, think, and achieve at school. This means that smog affects both people's physical health and education quality. Notably, local policymakers and the public underrate the cognitive effects of smog, which is why more specific awareness-raising initiatives should be launched with parents and policymakers to inform them about the adverse effects of smog on children's learning outcomes in the long run.

An analysis of the approaches adopted by school leaders to address the impact of smog on students' health and learning shows that the practice is emergent and likely to have been devised based on availability and necessity in local contexts. The idea of headteachers changing the school timetable to reduce children's exposure during periods of high pollution is a practical measure that has been initiated in other countries experiencing similar environmental problems. However, the fact that such schools often have limited access to funds and are often situated in rural areas posed a significant problem in carrying out more elaborate measures, such as purchasing air purification equipment or distributing security masks.

In Southern Punjab, all the headmasters mentioned that they still had to rely on rather simplistic strategies, such as health checks and changing outdoor activities, as the schools were not equipped to provide more technological approaches. This goes to the question of resource availability in public education systems in the developing world, whereby

funding is inadequate to meet many environmental and health challenges. Moreover, the strategy of health monitoring can be considered as the investigation, as there was no well-developed system of smog-health-related problems in schools, which seems insufficient and requires supplementation with more concrete policies and norms corresponding to the situation in the given region.

Addressing the repercussions of smog in educational institutions has proven challenging, similar to the demonstrated limitations of school leaders in environmentally detrimental areas. This study identified a significant issue: insufficient resources, particularly the financial means required to enhance air quality management. The community lacked awareness of the impact of smog on their long-term health and academic performance. When school administrators endeavored to educate parents and children about the numerous health implications, they encountered significant hostility and apathy from specific segments of the community lacking sufficient health knowledge.

Southern Punjab is impacted by their government's failure to invest in public health within educational institutions. Financially motivated policies and decisions made by administrators hinder schools from obtaining the necessary funds to address environmental health issues. The report recommends increased government involvement and sufficient funding to mitigate the adverse effects of smog on educational institutions and students.

Limitations:

This study interviewed only two headteachers from primary schools in South Punjab due to the scarcity of research in the region; yet, it will establish a foundational basis for future investigations in analogous situations throughout other areas of the province. The substantial scale of the investigation constrains it.

Results & Conclusion

Despite the proactive and transformative strategies implemented by headteachers, they are hindered by insufficient resources, inadequately designed regulations, and a lack of community understanding concerning student safety from the adverse effects of smog. Although headteachers exert much effort to discover innovative methods for maintaining the continuity of educational delivery, their endeavors are undermined by an absence of essential institutions and statutory frameworks. The analysis points out that establishing and executing effective health and safety protocols to mitigate the effects of smog on children's health and academic achievement. The absence of various efficient, specialized measures aggravates the situation, rendering schools susceptible during annual haze periods. Moreover, numerous participants underscored the necessity for increased governmental intervention: financial assistance, commencing with the provision of air purification devices for educational institutions; appealing grants and subsidies for the acquisition or leasing of air purification equipment; and, arguably most crucially, the creation and execution of a specialized smog curriculum for educators and faculty in schools and universities. Community engagement is essential for enhancing awareness of the consequences and obligations related to environmental risks to education.

Therefore, addressing the annual environmental issues of smog in Punjab necessitates the cooperative endeavors of educational institutions, governmental bodies, and community organizations. Policymakers in governmental and non-governmental organizations must formulate policies to foster a sustainable environment that promotes learning. These solutions would mitigate the effects of smog on kids' cognitive functions and health while also leading to more resilient schools, thus ensuring the long-term sustainability of children's education. By implementing all the aforementioned precautions, students in smog-affected regions can prevent being stuck, being forced to attend classes in poor health, or obtaining substandard education due to interruptions.

Beyond Pakistan, the findings highlight a universal lesson: Educational leaders must incorporate environmental risk management into school governance. To maintain education in the face of climate change disruptions, headmasters in Punjab must set an example of crisis-prepared leadership, as evidenced by their adaptable tactics. Countries like India, Bangladesh, and Indonesia can implement comparable techniques to ensure academic continuity during environmental crises.

Recommendations

Based on the above findings, this study has the following recommendations:

1. Proactive policies should be established to address the upcoming challenges posed by smog, with an emphasis on developing sustainable solutions like smog-altering systems, accessible air purification systems, and green practices in schools.
2. Reactive policies should be implemented to reduce disruptions during the pollution season. Establishing emergency measures, giving healthcare support to affected children, and implementing short-term remedies such as temporary school closure with online classes are all necessary.
3. To address the issues, school-based regulations such as health exams, outdoor exercise guidelines, and room air quality management strategies can be very beneficial.
4. Technology integration is required to support distant learning during smog-induced closure; this is pre-training for teachers and students. Continuous learning requires awareness and proficiency with digital resources.
5. To educate parents and the community about the negative impact of smog on children's health and education and to promote air pollution reduction and support school initiatives.

6. Flexible school schedules minimize pollution exposure. Schools might reduce outdoor activity during high pollution hours and reschedule exams.
7. This is the primary recommended strategy for establishing collaboration between authorities and parents for emergency health departments, local primary health care units, and even local private clinics where public dispensaries are unavailable. Joint dissemination of information, improved healthcare access, and coordinated responses to smog situations are all required.
8. To improve leadership skills to address emergencies, there is an urgent need to work with headteachers, particularly in managing the pollution crisis. The government should combine professionals from the health, education, and school authorities to provide training, as controlling smog in Punjab appears to be challenging. Therefore, prevention is preferable to cure.

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