



The Impact of Virtual Education on the Health of First-Grade Elementary School Students: A Qualitative Study

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Abstract

Background: Improving students' health has always been a primary mission for schools. The COVID-19 pandemic led to a shift to virtual education in schools. The present study aimed to analyze the lived experiences of elementary school teachers to explore the effect of virtual education on students' health during the COVID-19 pandemic.

Methods: This study utilized a qualitative approach and a descriptive phenomenological method to investigate the lived experiences of teachers. Semi-structured interviews were conducted with 12 elementary school teachers in West Azerbaijan province. To ensure the trustworthiness of the data, Lincoln and Guba's reliability criteria were employed including credibility, transferability, dependability, and confirmability through participant validation as well as review by non-participating experts. Purposeful and snowball sampling methods were used to recruit participants. Data were analyzed using Colaizzi's seven-step method.

Results: Data analysis revealed 47 codes, three subthemes, and one main theme. The main theme showed that, based on teachers' lived experiences, the health characteristics of students who experienced only virtual education in the first grade of elementary school in the academic years 2020-2021 and 2021-2022, were significantly different from those of students before COVID-19. The subthemes identified included the consequences for physical health and well-being, mental health, and social health.

Conclusion: Addressing the consequences of virtual education on the health of students necessitates strategic planning and careful attention.

Keywords: Physical health, Mental health, Social health, Students, Phenomenology, Virtual education

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Introduction

The COVID-19 pandemic, characterized by the rapid spread of a virus first identified in Wuhan, China, is an acute respiratory disease that was declared a pandemic by the World Health Organization (WHO) in 2020 due to its high rate of spread and impacts on an international scale (1). At the height of the pandemic, more than 1.6 billion students across over 190 countries experienced school closures (2). The shift to virtual education during this crisis highlighted existing health inequalities (3) and led to significant repercussions in various dimensions of health. Concerns abound regarding the effectiveness of virtual learning environments for elementary school children (4). The closure of schools has broader unintended consequences for child development, health, social well-being, and economic stability (5). It adversely affects families and communities through reduced parental productivity, loss of income, and increased childcare responsibilities (6). In addition, research indicates negative effects on learning progress, social interaction, and physical and mental health (7,8), with elementary school students experiencing

the most severe consequences (9). Most importantly, school closures have exacerbated inequalities in children's health and educational outcomes (10). Survey research in the UK shows that more than half of teachers believe the learning gap between disadvantaged pupils and their peers has widened. A similar increase in educational inequalities has also been observed internationally, including across Europe and the United States (11). Evidence from the Netherlands (12) and other countries underscores significant learning loss correlated with parental education and income levels (13). While the integration of new information and communication technologies in distance education can yield positive outcomes (14), optimal use of these technologies requires robust infrastructure (15). Inadequate or ineffective virtual education infrastructure may result in challenges such as lack of student motivation, diminished enthusiasm in classrooms, decreased selfconfidence, and difficulties in practical courses like science and art. Moreover, these factors hinder teamwork among students and limit their engagement (16). The incomplete process of providing education may lead



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to attitudinal challenges (17), misalignment between pedagogical methods and content, insufficient skills, and cultural challenges (18). Other prominent issues include internet connectivity problems, technical problems with electronic systems and microphones, challenges related to interaction and communication, inadequate teacher training in virtual systems, and macro-social obstacles (19). On the other hand, virtual education has not been recognized as suitable for elementary schoolaged children, and the shortcomings in virtual education infrastructure have particularly lasting negative effects on this younger demographic (20,21).

As the use of virtual education increases, it is important to recognize that ability-oriented training needs to be adapted accordingly (22). This challenge is particularly acute for first-grade students, who may struggle to grasp abstract concepts and require visual education. Besides, they are at the initial stages of concept learning, language acquisition, and literacy development. Al Lily et al reported that the mandatory implementation of remote education during the COVID-19 pandemic led to increased stress, anxiety, depression, and family violence (23). The results of the study by Haelermans et al also emphasized the necessity of targeted interventions for vulnerable students (13).

Globally, the health objectives of schools are increasingly aligning with their educational goals, highlighting that students' academic progress is inextricably intertwined with their health status (24). Ensuring student health is one of the basic functions of schools (25), and health and its various dimensions have always been a concern for schools and families (26). Interventions focusing on instructor-led physical activity have been shown to improve the physical health of students (27). Research indicates that increased physical activity and exercise correlate with better health outcomes; individuals with higher levels of physical activity show higher health status (28). Furthermore, educational deprivation leads to a decrease in access to mental healthcare, which increases the prevalence of psychological distress (29).

Currently, there is little evidence addressing the challenges schools have faced during closures and the complexities of transitioning back to in-person learning. There is a need for research to investigate the impact of school reopening not only on the pandemic curve but also on the education, health, and well-being of students and school staff (30). It is crucial to analyze the challenges schools encounter in this transition and the strategies required to return to normal conditions, showing the necessity for policy formulation and practice adaptations (31).

In Iran, the onset of the pandemic led to the abrupt closure of all schools, with a rapid shift to virtual learning through various platforms including online networks and television. The difficulties stemming from closing schools were accentuated by the lack of a structured framework for virtual education, which meant that not all students had equal access to the implemented virtual systems. Given the specific developmental needs of first-grade students, who are entering school for the first time, the curriculum must be tailored to meet their unique conditions and characteristics. This makes investigating the impact of virtual education particularly critical at this educational level, as the findings can inform health promotion plans and policies for students' health in schools. Accordingly, this study sought to explore the lived experiences of firstgrade teachers regarding the consequences of virtual education on student health during the COVID-19 pandemic.

Methods

This study used a qualitative approach and a descriptive phenomenological method to explore teachers' lived experiences regarding the consequences of virtual education during the COVID-19 pandemic in the academic year 2022-2023 in Urmia, Iran. Initially, the method for selecting participants was established based on predetermined criteria. The criterion for reaching data saturation was repeating previous codes and not extracting new codes in the interviews. The interviews continued until data saturation was achieved. The resulting data were analyzed and coded, with themes extracted from the primary codes.

The sampling method was a combination of purposeful intensity sampling and snowball sampling among elementary school teachers. Purposeful intensity sampling was employed to ensure that participants with the most significant experience and connection to the subject were selected. Snowball sampling was utilized to identify additional participants through referrals from earlier respondents based on the inclusion criteria (32). The criteria for entering the study were: (*a*) having taught in elementary school for at least six consecutive years, (b) having taught at least one academic year in the first grade during the COVID-19 pandemic, (c) holding at least a bachelor's degree, (d) having an annual performance evaluation score of no less than 90 over the last five years, and (e) working in schools with a student population of over 250 in the past five years. These criteria were established to select teachers with substantial exposure to virtual education in first-grade elementary classrooms during the pandemic, as well as in subsequent grades during the post-COVID-19 period, providing comprehensive insights into the educational experiences of these students. The lived experiences of 12 teachers regarding the impact of virtual education during the COVID-19 pandemic on students' health were investigated using semi-structured interviews. Participants entered the study with informed consent, were fully aware of the research objectives, and could withdraw from the study at any stage they wished.

The duration of the interviews ranged from 32 to 70 minutes, with an average length of 48 minutes. Interviews continued until data saturation was reached. Example interview questions included "What are your personal experiences of the effects of virtual education on elementary school students during the COVID-19 pandemic?" "What positive consequences have you experienced from the virtual education of first-grade elementary students? Would you please tell us about your experience?" "What are the negative consequences of virtual education for first-grade elementary students? Would you please explain your personal experiences" Additionally, participants were encouraged to express any thoughts or insights they felt were relevant but had not been covered in the questions.

Data analysis was conducted using a phenomenological approach, which was divided into descriptive and interpretive methods; however, the present study primarily focused on the descriptive aspect. The main objective of this method is to provide a comprehensive description of the experienced phenomenon to understand its intrinsic structure. Therefore, Colaizzi's method of analysis was employed, consisting of the following steps: (a) Carefully reading the entire content of each interview to capture the participant's essence, (b) Identifying important phrases using the language of the participant, (c) Extracting the meaning of each important phrase, (d) Organizing similar codes into categories and selecting a brief descriptive phrase for each category, (e) Merging semantically similar categories, (f) Integrating similar classes that contain a main or central concept of the research, and (g) presenting the findings to the participants for validation to ensure they accurately reflect their experiences (33).

To ensure the trustworthiness of the data, i.e. the extent to which one can rely on qualitative research and its results, the four criteria proposed by Lincoln and Guba including credibility, transferability, dependability, and confirmability were utilized (34). This study used two methods for validation: feedback from 11 participating teachers and review by three non-participating experts. Following the incorporation of their feedback, the final findings were refined and presented.

Results

The study findings regarding the demographic characteristics of the participants showed that 8 individuals held a master's degree, 1 held a Ph.D., and 3 had a bachelor's degree. The sample consisted of 10 women and 2 men. Among the participants, 2 worked in private schools, while 10 were in public schools. Besides, 5 participants reported having more than 15 years of work experience, 6 had 10 to 15 years of experience, and 1 had 6 to 10 years of work experience.

Coding the interview texts and notes using Colaizzi's analysis method led to the identification of 42 codes,

one main theme, and three sub-themes. Based on the codes extracted from the teachers' lived experiences, it was revealed that students who experienced only virtual education in the first grade of elementary school in the 2020-2021 and 2021-2022 academic years, exhibited significantly different health characteristics compared to students before the COVID-19 pandemic. The main theme and subthemes are as follows:

Main Theme: According to teachers' lived experiences, virtual education during the COVID-19 pandemic had direct positive and negative effects on the health of elementary school students.

Subthemes: Three subthemes were identified regarding the impact of virtual education on first-grade elementary school students during the COVID-19 pandemic including consequences for physical health and well-being, mental health, and social health.

Consequences for physical health and well-being

This subtheme focused on teachers' lived experiences regarding students' sports tendencies and their attention to physical fitness and activity. Participants believed students who only experienced virtual education in the first grade of elementary school had less physical activity and a reduced interest in physical activities compared to students before the COVID-19 pandemic.

For instance, participant 5 stated, "Before the pandemic, first graders were very lively. Their enthusiasm was evident almost up to the fourth grade... Now students in the second and third grades seem less engaged ... perhaps this is due to virtual education and lack of school attendance". Participant 7 said, "COVID-19 itself changed the styles; let alone quarantine and staying at home. Daily physical activities were replaced by media and screen time, leading to decreased movement". Participant 12 believed, "children's movement patterns have also changed... the sports they like have changed from football and... to golf and modern sports...". Participant 9 mentioned, "instead of being active, they are more emotional... they like to experience danger... or show themselves as a danger...".

Consequences for mental health

This subtheme pointed out the health and psychological characteristics of students. Participants highlighted fears, hopes, worries, and special interests among students.

A participant remarked, "Children now talk more about themselves... their likes, dislikes, wishes, etc. It's very good, the embarrassment is coming to an end" (Participant 6). Another participant elaborated, "Before the pandemic, they restrained their behavior, for example, they laughed secretly, and... now they easily spill out. For some teachers, it is possibly considered rude, but I think it's not bad" (Participant 3). Participant 4 pointed out, "Seclusion and distance from the crowd have increased... it will take time for elementary school students to enjoy being together

Consequences for social health

This subtheme focused on students' interpersonal and group interactions and relationships. Participants noted stark differences between students in second and third grades before and after the pandemic, attributing these shifts to the impact of virtual education. Both negative and positive consequences were attributed to virtual education.

Participant 1 stated, "Now the second-grade children are more committed to mutual respect... wherever they encounter a positive attribute, they try to show they recognize good and bad". Participant 2 stated, "Virtual influencers have become role models for children, making those who have more followers more effective for them... it is too soon for them... but it is over". Another participant asserted, "Their expectations are different... they have much higher expectations... sometimes they show unusual collective resistance... we should not show too much sensitivity" (Participant 11). Moreover, participant 8 noted, "Previously, we had a large number of applicants for poetry, hymns, reading stories, etc., because the morning ceremony was divided between the classes, I came across this issue... the previous interest is not there now". Another participant mentioned, "They show less desire for group work ... of course, it was before, but it has increased" (Participant 10).

Table 1 presents the subthemes and open codes derived from the teachers' lived experiences regarding the consequences of virtual education on students' health, as analyzed through Colaizzi's method.

Discussion

The results of the current phenomenological study showed that providing only virtual education to students in the first grade of elementary school during the COVID-19 pandemic significantly influenced their physical health and well-being, mental health, and social health in the post-COVID-19 era.

The findings from this study align with some aspects of recent studies while revealing gaps in existing literature for certain subthemes. Researchers have reported a range of consequences associated with virtual education during the pandemic. For instance, Al Lily et al, (23) demonstrated increasing disparities in learning, health, well-being, and inequality, while Marchant et al (10) pointed out a widening gap in health. Furthermore, Haelermans et al (13) and Fisher et al (35) noted that anxiety and depression have become more prevalent, and Ashta et al (36) reported an increase in student anxiety. The results of the study by Christakis et al (4) indicated that reopening schools could be more beneficial than maintaining closures, suggesting that decision-makers should consider the long-term health consequences of school closures on children. In the study conducted by Fattahiyan et al (37), various mental health issues were identified as consequences of virtual education during the COVID-19 era, including the availability of virtual space and its psychological dangers, fatigue and boredom derived from prolonged use of virtual space, mental health problems resulting from school closures, fear and anxiety of contracting the disease, and increased workloads for teachers. Similarly, Shah et al (3) reported health inequalities caused by the COVID-19 pandemic. Other studies also supported the notion that virtual education during the pandemic adversely affected children's growth, as well as their physical and mental health (38-40).

It is reasonable to conclude that elementary school children experienced the least effective education through virtual means (4). Evidence suggests that the absence of inperson schooling has detrimental effects, with long-term school closures correlating with consequences that extend to mortality and life expectancy (41). In contrast, regular school attendance and school-based physical activities promote health and motor skills (42). Reports on school reopening also underscored the urgency for regions to prioritize the return of elementary school children to faceto-face learning environments (43).

According to the results of the current study, intervention programs aimed at improving student health are essential, and leveraging the experiences of other countries could be beneficial. For example, South Africa, emphasizes enhancing various healthcare skills through collective activities, such as student clubs (44). Likewise, the Zvandiri program in Zimbabwe trains teachers and staff to implement more evidence-based psychological interventions (45). Moreover, due to students' tendency to use smartphones, the integration of the World Health Organization's digital mental healthcare program (46) could complement other initiatives.

In interpreting these findings, it is essential to consider three factors that may have significantly influenced the health consequences of virtual education for students. The first factor refers to quarantine policies and the social anxiety and panic stemming from the unknown nature of the pandemic. The second factor pertains to the widespread adoption of virtual platforms. The lack of adequate infrastructure for virtual education led to dissatisfaction among families and students, casting doubt on the professional credibility of schools for first-grade students. In addition, the high accessibility and appealing features of various virtual social networks and their userfriendliness exacerbated the comparative shortcomings of schools against new digital developments. Additionally, the reduction in community interactions accompanied by extensive virtual communication on social networks may have contributed to detrimental health effects for students. The third factor relates to the developmental characteristics of first-grade students. This age group is

 Table 1. Subthemes and open codes extracted from teachers' lived experiences of the consequences of virtual education for students' health

Subthemes	Open Codes		
Consequences for physical health and well-being	Sports celebrity culture		
	Low physical activity during recreation		
	Increased inclination for adventure		
	Decreased coordination in sports activities		
	Premature fatigue		
	Higher obesity rates		
	Reduced participation in team sports		
	Interested in activities with low physical activity	_	
	Interest in certain sports (e.g., golf, bowling, horse riding)	Consec for me	quen ntal
Consequences for mental health	Increased self-disclosure	health	
	Higher expectations for rewards		
	Greater expression of emotions		
	Increased interest in arts and aesthetics		
	Enhanced cynicism		
	Lower tolerance threshold		
	More isolation		
	Less tendency to answer or ask questions		
	More individualism		
	Increased idealism		
	Higher anxiety		
	Monotonous behavior		
	Bullying		
	Concerns about the future		
	Feelings of insecurity		
	Low self-confidence	_	
	Lack of variety in verbal responses	Consec for soc	Consequen for social health
	Dispersed and unfocused responses	health	
Consequences for social health	More explicit expression of dissatisfaction		
	Greater appreciation versus satisfaction		
	Respect for desirable behaviors		
	More insistence on demands against the school system		
	Decreased alignment with teachers as role models		
	More arbitrary decision-making		
	Negative reactions or inaction toward warnings from school officials		
	Less adherence to regulations and norms	crucially journey, in essen acquisitio Notably, exposure The r methodo	
	Fear of public speaking		
	Lower morale in collaborative academic activities		
	Decreased competitiveness		
	Distrust of others		
	Interest in certain lifestyles		
	Higher expectations from the community	to tak	suo te i
	Increased admiration for celebrities and online influencers	chara	cter

Increased self-disclosure Higher expectations for rewards Greater expression of emotions Increased interest in arts and aesthetics Enhanced cynicism Lower tolerance threshold More isolation Less tendency to answer or ask questions nces More individualism Increased idealism Higher anxiety Monotonous behavior Bullying Concerns about the future Feelings of insecurity Low self-confidence Lack of variety in verbal responses Dispersed and unfocused responses More explicit expression of dissatisfaction Greater appreciation versus satisfaction Respect for desirable behaviors More insistence on demands against the school system Decreased alignment with teachers as role models More arbitrary decision-making Negative reactions or inaction toward warnings from school officials ices Less adherence to regulations and norms Fear of public speaking Lower morale in collaborative academic activities Decreased competitiveness Distrust of others Interest in certain lifestyles Higher expectations from the community Increased admiration for celebrities and online influencers

Table 1. Continued.

Open Codes

Subthemes

crucially positioned at the beginning of their educational journey, entering a new environment where they engage in essential learning objectives, including language acquisition, reading, writing, and arithmetic skills. Notably, many students at this level do not have prior exposure to preschool education.

The main limitation of this study lies in the methodological constraints. Therefore, it is necessary to take into account the cultural, social, and economic characteristics of the studied area when attempting to transfer these findings to other contexts.

Conclusion

The findings of the present study indicated that the transition from face-to-face education to virtual learning for first-grade students was a hasty and ill-considered response that did not adequately account for the cognitive and emotional characteristics of this age group. The absence of a tailored program and the inadequate infrastructure for virtual education resulted in a range of negative consequences for schools, families, and students. A primary concern affecting students' health stems from the inadequacy of infrastructure for virtual education and the incompatibility of the systems used with the characteristics of these students. To address these shortcomings, it is essential to adapt virtual education systems to align with the characteristics of first-grade students and to integrate in-person instruction with virtual learning. This hybrid approach can mitigate the limitations inherent in purely virtual education. Based on the findings of this study, it is recommended that schools develop appropriate programs to bridge the gaps created by virtual education, thereby working toward alleviating its negative impacts. Moreover, enhancing the infrastructure for virtual education could facilitate the effective combination of online and face-to-face learning for appropriate courses and contexts. Through promoting collective healthcare activities, leveraging new technological applications, and implementing behavioral interventions and psychological techniques, it is possible to help improve the physical, psychological, and social health of students. Future studies are recommended to investigate methodologies for adapting virtual or hybrid education for first-grade elementary students, as well as strategies to address and mitigate the negative consequences of purely virtual education pursued during the COVID-19 pandemic for the post-COVID-19 context.

Authors' Contribution

Conceptualization: Behnam Talebi. Data curation: Masome Keyvani. Formal analysis: Masome Keyvani, Behnam Talebi. Funding acquisition: Masome Keyvani. Investigation: Behnam Talebi, Yosef Adib. Methodology: Masome Keyvani, Yosef Adib, Behnam Talebi. Project administration: Behnam Talebi. Resources: Behnam Talebi, Yosef Adib. Software: Masome Keyvani, Behnam Talebi. Supervision: Behnam Talebi, Yosef Adib. Validation: Behnam Talebi, Yosef Adib. Visualization: Behnam Talebi, Yosef Adib. Writing–original draft: Behnam Talebi, Yosef Adib, Yosef Adib. Writing–review & editing: Behnam Talebi, Yosef Adib.

Competing Interests

The authors declare no conflict of interest.

Ethical Approval

This study received ethical approval IR.IAU.TABRIZ.REC.1401.168,

ensuring that ethical considerations, including the informed consent of the participants and the confidentiality of their responses, were strictly upheld.

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