

Identification and Classification of Challenges in Virtual Education Management During Crisis Conditions: A Qualitative Study Using Thematic Content Analysis

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ABSTRACT

Objective: This study aimed to identify and classify the major challenges of virtual education management during crisis conditions from the perspectives of elementary school principals in Lamerd County.

Methods and Materials: This qualitative study was conducted using thematic content analysis. The research population consisted of elementary school principals in Lamerd County, Fars Province, during the 2023–2024 academic year. Participants were selected through purposive sampling with maximum variation in terms of gender, managerial experience, and school location. The final sample included ten principals, including six women and four men, with a mean age of 42 years and a mean managerial experience of 4.5 years. Data were collected through semi-structured interviews lasting 45 to 75 minutes. Interviews were audio-recorded with participants' permission, transcribed verbatim, and analyzed using Braun and Clarke's six-phase thematic analysis framework. MAXQDA software was used to organize codes and categories. Credibility was enhanced through member checking, triangulation with school documents, peer review, and inter-coder agreement.

Findings: The analysis led to the extraction of six main categories: infrastructural and technological challenges, educational challenges, family and social challenges, managerial and organizational challenges, psychological challenges, and adaptive strategies of principals. The findings indicated that weak internet infrastructure, platform inefficiency, shortage of digital devices, and the digital divide formed the basic context of virtual education difficulties. Educational challenges included learning decline, reduced participation, weak assessment, and limited teacher-student interaction. Family and social challenges reflected economic limitations, insufficient parental support, increased family responsibility, and educational inequality. Managerial and organizational challenges included delayed instructions, centralized decision-making, weak supervision, and crisis information management. Psychological challenges included anxiety, digital burnout, and reduced motivation among teachers and students.

Conclusion: Virtual education management during crisis conditions is a multidimensional phenomenon shaped by technological, educational, social, organizational, and psychological factors.

Keywords: *Virtual education; crisis management; school principals; elementary education; thematic content analysis; digital leadership; educational challenges.*

1 Introduction

The sudden expansion of virtual education during the COVID-19 crisis transformed school management from a primarily physical, face-to-face, and institutionally predictable process into a complex form of crisis-based digital coordination. Schools were required to continue educational services while facing uncertainty, health restrictions, technological inequality, emotional pressure, and rapid administrative changes. In this situation, virtual education was not simply an alternative method of instruction; rather, it became a comprehensive managerial challenge that affected planning, communication, supervision, evaluation, family participation, teacher support, and student engagement. The crisis revealed that the effectiveness of virtual education depends not only on the availability of digital platforms, but also on the capacity of educational leaders to organize human, technological, psychological, and institutional resources in unstable conditions (Apaydin & Yalcin, 2024; Bozkurt et al., 2022; Karakose et al., 2024).

Although online learning had been discussed before the pandemic as a flexible and technology-supported mode of education, the form of education implemented during the crisis was closer to emergency remote teaching than planned online learning. Emergency remote teaching refers to the temporary use of remote instructional solutions in response to a crisis, whereas well-designed online learning requires systematic planning, instructional design, teacher preparation, technological readiness, and evaluation mechanisms (Hodges et al., 2022). This distinction is essential because many of the difficulties experienced by schools during the pandemic were not necessarily inherent weaknesses of online learning itself, but consequences of the rapid, compulsory, and crisis-driven transition to virtual environments. Therefore, the management of virtual education in crisis conditions should be examined as a special educational phenomenon shaped by urgency, limited preparation time, unequal access, and continuous uncertainty.

The global interruption of education during the pandemic showed that school systems around the world faced similar difficulties, including learning loss, limited interaction, technological gaps, teacher overload, and unequal participation of students from different socioeconomic backgrounds (Bozkurt et al., 2022). However, the intensity and form of these challenges varied depending on local infrastructure, school level, administrative capacity, family

resources, and the digital competence of teachers and students. In elementary education, these difficulties are particularly important because younger students need more direct supervision, immediate feedback, emotional support, and parental assistance. Unlike older learners, elementary school students often lack sufficient self-regulation skills to independently manage online attendance, learning tasks, digital communication, and homework completion. As a result, school principals in elementary schools faced a more complicated managerial situation, in which they had to coordinate teachers, families, students, and administrative authorities simultaneously.

Successful school leadership has always been considered a central factor in school effectiveness, but crisis conditions increase the importance of leadership because principals must make decisions under pressure, maintain organizational coherence, motivate teachers, communicate with families, and protect the continuity of learning. Contemporary school leadership literature emphasizes that successful leadership is not limited to formal authority; it involves setting direction, developing people, redesigning the organization, and improving teaching and learning conditions (Leithwood et al., 2024). During virtual education, these functions became more difficult because principals had to perform them through digital communication channels and without the ordinary routines of the physical school environment. Thus, crisis-based virtual education required principals to act not only as administrators, but also as digital coordinators, emotional supporters, instructional supervisors, and local problem-solvers.

The experience of school principals during COVID-19 indicates that the pandemic disrupted ordinary management processes in K-12 schools. Principals had to manage sudden changes in instructional delivery, monitor teachers' virtual performance, communicate with parents, address student absenteeism, respond to health-related anxiety, and interpret frequently changing official guidelines (Apaydin & Yalcin, 2024). These responsibilities required flexible leadership and rapid adaptation. At the same time, school principals were often constrained by centralized decision-making, delayed instructions, limited technological resources, and insufficient preparation for digital crisis management. A systematic review of principals' challenges during crisis management also shows that school leaders commonly face problems related to communication, resource allocation, decision-making, psychological pressure, and maintaining instructional quality under uncertain conditions (Karakose et

al., 2024). Therefore, identifying and classifying the challenges experienced by principals can provide a clearer understanding of the managerial realities of virtual education during crisis.

One of the most important dimensions of virtual education management is digital leadership. Digital leadership refers to the ability of school leaders to manage virtual spaces, support technology integration, promote digital communication, guide teachers in online environments, and create organizational readiness for technology-based education. During crises, digital leadership becomes even more critical because the school's main educational activities are transferred to virtual platforms, and principals must ensure that these platforms are used effectively and equitably (Levi-Tamar et al., 2023). Digital leadership requires more than technical familiarity; it involves strategic thinking, communication management, teacher empowerment, family engagement, and trust-building. When principals lack adequate digital leadership capacity, virtual education may become fragmented, inconsistent, and dependent on individual teachers' personal abilities rather than coordinated school-level management.

The technological infrastructure of virtual education is another decisive factor. Information technology provides the basic foundation for digital communication, content delivery, monitoring, and learning management, but its educational effectiveness depends on accessibility, usability, and compatibility with the needs of students and teachers (Mahdavi, 2021). In many school contexts, especially in rural and less privileged areas, inadequate internet access, lack of smart devices, weak platforms, and limited digital literacy created serious barriers to educational continuity. Research on cyberspace management in education has also emphasized that digital environments can produce both opportunities and harms, and that educational systems need clear strategies to manage technological risks, student access, online behavior, and instructional quality (Cheraghi & Cheraghi, 2019; Hosseini, 2020). Therefore, the crisis showed that virtual education management cannot be reduced to the simple use of a platform; it requires systematic cyberspace management at both school and system levels.

Teacher readiness is another central issue in the management of virtual education. During the pandemic, many teachers were expected to teach online without sufficient prior training in emergency remote teaching, digital pedagogy, online assessment, or virtual classroom management. Teacher education scholars have argued that

the pandemic demonstrated the necessity of training teachers for emergency remote teaching, because crisis-based instruction requires different competencies from ordinary face-to-face teaching (Trust & Whalen, 2021). Similarly, technology integration depends on teacher characteristics, knowledge constructs, ICT practices, and beliefs about the usefulness of technology in teaching (Ifinedo et al., 2023). If teachers lack confidence, digital skills, or pedagogical strategies for online instruction, principals must provide support, training, monitoring, and motivation. Consequently, human resource management becomes one of the most important managerial challenges in virtual education, especially when teachers themselves are experiencing stress, fatigue, and uncertainty.

The instructional quality of virtual education is also closely linked to learners' cognitive, metacognitive, and self-regulation skills. Virtual learning environments can potentially support these skills by encouraging independent learning, digital interaction, and flexible access to content; however, these benefits depend on proper design, guidance, and learner readiness (Mousizadeh Ahaghi, 2025). In elementary education, students often require greater scaffolding to develop self-regulation and maintain engagement. If virtual classes are poorly structured or if students lack family support, online learning may lead to reduced participation, superficial learning, and weak assessment. Studies on virtual education effectiveness during the COVID-19 pandemic also show that the perceptions of learners and educators are shaped by access, interaction, motivation, and the quality of instructional implementation (Rezaei et al., 2025). Therefore, educational challenges in virtual crisis management include not only the delivery of lessons, but also the preservation of meaningful learning, engagement, feedback, and assessment validity.

The role of families became much more prominent during virtual education. In face-to-face schooling, parents usually support learning indirectly through attendance, homework supervision, and communication with school. During compulsory virtual education, however, many parents were expected to provide devices, internet access, learning supervision, emotional support, and technological assistance. This sudden expansion of the parental role created pressure for families, especially those with low income, limited literacy, several school-aged children, or poor access to digital resources. The health-related and psychological consequences of prolonged online learning for children also became a concern, including screen fatigue, reduced physical activity, eye strain, anxiety, and social

isolation (Bansal, 2020). Such conditions increased the burden on school principals, who had to respond to parental complaints, family limitations, and students' emotional difficulties while maintaining the continuity of education.

Educational leadership in elementary schools already involves multiple barriers even under ordinary conditions. Research on educational leadership challenges in elementary schools has identified issues such as structural constraints, limited resources, communication problems, and difficulties in implementing school improvement processes (Mohammadi et al., 2024). Crisis-based virtual education intensified these existing barriers. For example, principals had to supervise teaching without physical classroom observation, manage teachers' attendance and performance in virtual spaces, respond to students' irregular participation, and coordinate with administrative authorities despite uncertainty. In this sense, the pandemic did not create all challenges from zero; rather, it exposed and intensified pre-existing weaknesses in educational management, infrastructure, communication systems, and school-family relations.

Virtual education also affected the social and cultural dimensions of learning. Learning is not a purely technical process; it is embedded in cultural context, teacher-student interaction, classroom norms, and local meanings. Research on learning materials developed through culturally contextualized approaches shows that meaningful learning can be improved when educational content is connected to learners' cultural and social contexts (Ginting et al., 2023). In virtual crisis conditions, however, maintaining contextualized and interactive learning became more difficult because teachers and students were separated physically and often communicated through limited platforms. For elementary students, this separation weakened the social presence of the teacher and reduced opportunities for immediate correction, peer interaction, and classroom-based motivation. Therefore, principals had to support teachers in adapting content, communication methods, and learning activities to the constraints of the virtual environment.

The pandemic also required educational institutions to rethink internal communication and organizational identity. Although research on internal branding has mostly been conducted in higher education, it highlights the importance of middle management in translating institutional values, maintaining internal coherence, and supporting organizational change (Clark et al., 2020). In school settings, principals perform a similar mediating role between

educational authorities, teachers, families, and students. During virtual education, this role became more visible because principals had to communicate official policies, maintain trust, reduce confusion, and create a sense of continuity despite the absence of physical school routines. Therefore, virtual education management during crisis can be understood as a process of sustaining organizational coherence in a disrupted educational environment.

Planning was another critical issue. During COVID-19, many schools were required to make rapid decisions about schedules, platforms, assignments, teacher responsibilities, student attendance, and communication channels. Planning for school teaching during the pandemic required flexibility, continuous revision, and coordination between technological possibilities and pedagogical goals (Gandolfi, 2020). However, when planning is imposed from above without considering local conditions, school principals may face contradictions between official expectations and practical realities. In areas with weak internet access or limited family resources, principals may need alternative strategies such as offline materials, flexible attendance, compensatory classes, or direct communication with families. Thus, crisis planning in virtual education should be context-sensitive and responsive to local limitations.

Recent Iranian studies also show that virtual education has become a major field of concern in primary education and cyber media literacy. Structural modeling of virtual education for cyber media literacy among primary school teachers emphasizes the need to strengthen teachers' digital awareness, media literacy, and capacity to work effectively in virtual environments (Saravani et al., 2025). This issue is especially relevant for elementary schools because teachers' and principals' ability to manage digital content and communication directly affects students' safe and meaningful participation in online learning. At the same time, studies on online learning problems during the pandemic have shown that learners may experience reduced interaction, communication barriers, technological problems, and difficulty participating in skill-based learning activities through online platforms (Ariani & Tawali, 2021). These findings further support the need to examine virtual education as a multidimensional managerial and pedagogical phenomenon.

Despite the growing body of research on online learning, emergency remote teaching, and educational leadership during COVID-19, there remains a need for qualitative studies that explore the lived experiences of elementary school principals in specific local contexts. Quantitative

studies can identify general patterns, but qualitative thematic analysis can reveal how principals interpret challenges, prioritize problems, and develop adaptive strategies in real crisis conditions. This is particularly important in regions where urban, rural, and nomadic educational settings coexist and where infrastructure, family resources, and administrative support may differ substantially. By identifying and classifying the challenges of virtual education management from the perspective of elementary school principals, it becomes possible to develop a more grounded understanding of how crisis, technology, leadership, family participation, and educational quality intersect in practice.

The present study aimed to identify and classify the challenges of virtual education management during crisis conditions among elementary school principals in Lamerd County using a qualitative thematic content analysis approach.

2 Methods and Materials

The present study was conducted using a qualitative research approach and thematic content analysis. This approach was selected because it enables the systematic identification, analysis, organization, and reporting of meaningful patterns and themes within qualitative data. The research population consisted of all elementary school principals in Lamerd County, Fars Province, during the 2023–2024 academic year. Participants were selected through purposive sampling using a maximum variation strategy in order to include principals with different characteristics in terms of gender, managerial experience, and geographical location of the school. The inclusion criteria were being employed as an elementary school principal during the COVID-19 pandemic, having at least two years of managerial experience during the period of virtual education, and willingness to participate in the interview process. Based on these criteria, ten school principals, including six women and four men, were selected as the final participants. The mean age of the participants was 42 years, and their mean managerial experience was 4.5 years. The sample size was determined based on the principle of theoretical saturation; accordingly, data collection continued until the tenth interview, after which no new concept or category was added to the existing themes. Participation in the study was completely voluntary, and all participants were informed about the objectives of the research, the confidentiality of their information, and their

right to withdraw from the study at any stage. Written informed consent was obtained from all participants before the interviews were conducted.

Data were collected using semi-structured interviews. This method was considered appropriate because it allowed the researchers to explore the lived managerial experiences of school principals while also providing sufficient flexibility for participants to explain their perceptions, concerns, and examples in detail. The interview protocol was developed based on the theoretical and empirical background of the study and was revised after receiving the opinions of two professors in the field of educational sciences. The interview questions focused on the participants' managerial background, the characteristics of the school environment, their ordinary communication patterns with teachers and parents, and the changes that occurred in school management during crisis conditions and the compulsory transition to virtual education. The interviews also explored the most important technological, infrastructural, software-related, and internet-related challenges experienced in Lamerd County, challenges related to human resource management and teachers' motivation, attendance, and psychological pressure, as well as the quality of communication with parents and students through virtual platforms. In addition, the participants were asked about family concerns, parental complaints, structural barriers related to receiving official guidelines from the Department of Education, intra-school coordination problems, and the differences between managing a school during an in-person crisis and managing it in a virtual environment. At the end of each interview, participants were invited to offer managerial recommendations for other school principals who may face similar virtual crises in the future and to add any further points that had not been addressed during the interview. Each interview lasted between 45 and 75 minutes. With the permission of the participants, all interviews were audio-recorded and then transcribed verbatim for analysis. In order to strengthen the richness of the data, relevant school documents, including official circulars and performance reports, were also reviewed and compared with the interview data.

Data analysis was carried out based on the six-phase framework proposed by Braun and Clarke (2006). In the first phase, the researchers became familiar with the data through repeated reading of the interview transcripts and initial note-taking. In the second phase, initial codes were generated through open coding, and meaningful units related to the challenges of virtual education management in crisis

conditions were identified. In the third phase, similar codes were grouped into preliminary subcategories, and broader patterns were explored across the data. In the fourth phase, the emerging themes were reviewed in terms of internal homogeneity and external heterogeneity to ensure that the codes within each theme were conceptually coherent while also being clearly distinguishable from other themes. In the fifth phase, the main themes were defined and named in accordance with the conceptual content of the coded data. In the sixth phase, the final analytical report was prepared by organizing the themes, explaining their relationships, and presenting the final thematic model of the challenges of virtual education management during crisis conditions. MAXQDA software was used to organize the interview transcripts, manage the coding process, and classify the extracted codes and themes. To enhance the credibility and trustworthiness of the findings, several strategies were employed. Member checking was conducted by providing a summary of the findings to two participating principals, who confirmed the accuracy and relevance of the interpretations. Triangulation was also used by comparing interview data with school documents, including official circulars and

performance reports. In addition, peer checking was carried out through the participation of two other researchers in the coding process, and the inter-coder agreement was calculated at 87%, indicating an acceptable level of consistency in the coding and categorization of the data.

3 Findings and Results

In this study, ten elementary school principals participated, including six women and four men. The mean age of the participants was 42 years, with an age range of 35 to 53 years. In terms of educational level, two participants held a master's degree, seven held a bachelor's degree, and one held an associate degree. Their managerial experience ranged from 2 to 8 years, with a mean managerial experience of 4.5 years. All participants had experience managing elementary schools during the COVID-19 pandemic and the period of compulsory virtual education. In terms of school location, five principals were serving in urban areas and five were serving in rural or nomadic areas, which provided a diverse range of managerial experiences regarding the challenges of virtual education during crisis conditions.

Table 1

Results of Coding and Main Categories

Sample Concepts (Open Codes)	Subcategories	Main Categories
Slow internet, network disconnection, lack of smartphones, disruption in the SHAD system	Weakness of communication infrastructure, inefficiency of the educational platform, shortage of educational equipment, digital divide	Infrastructural and technological challenges
Learning decline, reduced participation, difficulty in assessment, reduced feedback	Reduced quality of learning, reduced academic engagement, weakness of educational assessment, limited educational interaction	Educational challenges
Economic poverty, parents' low literacy, increased family responsibilities	Economic limitations, weakness of family educational support, parental role pressure, educational inequality	Family and social challenges
Delay in receiving circulars, limited authority of principals, difficulty in supervision	Weakness of organizational communication, administrative centralization, weakness of educational supervision, crisis information management	Managerial and organizational challenges
Anxiety, digital fatigue, reduced motivation among students and teachers	Psychological pressure, digital burnout, reduced academic motivation, reduced occupational motivation	Psychological challenges
Communication with parents, offline education, psychological support, technology training	Communication strategy, alternative educational strategy, control strategy, supportive strategy, human resource empowerment, trust-based management	Adaptive strategies of principals

The first main category was infrastructural and technological challenges, which represented one of the most fundamental dimensions of virtual education management during crisis conditions. The participants repeatedly emphasized problems such as slow internet, frequent network disconnection, poor network coverage, lack of smartphones, and disruption in the SHAD educational platform. These findings indicate that virtual education in the studied context was not merely an educational issue, but was strongly dependent on the availability and quality of

technological infrastructure. The digital divide was especially evident in rural and nomadic areas, where limited access to stable internet and appropriate devices prevented some students from participating regularly in online classes. Therefore, infrastructural weakness functioned as a basic barrier that affected almost all other dimensions of school management.

The second main category was educational challenges, which referred to the direct consequences of virtual education for the teaching-learning process. The principals

reported learning decline, reduced student participation, absenteeism in virtual classes, difficulty in real assessment, and limited teacher-student interaction. These codes show that the virtual environment weakened the quality of learning, particularly at the elementary level, where students require continuous guidance, direct interaction, and immediate feedback from teachers. The difficulty of monitoring students' real learning and assessing their performance was also a major concern. In this regard, reduced academic engagement was not only related to students' access to technology, but also to their limited self-regulation and dependence on adult supervision during online learning.

The third main category was family and social challenges. The participants stated that economic poverty, parents' inability to purchase smartphones or internet packages, low parental literacy, lack of familiarity with technology, and increased family responsibilities created serious barriers to effective virtual education. In virtual education, families were expected to play a more active role in monitoring students' attendance, guiding their learning, and maintaining communication with the school. However, many families lacked the necessary economic, educational, or technological capacity to perform this role effectively. As a result, parental role pressure emerged as an independent challenge. The findings also showed that virtual education intensified educational inequality between students from urban and rural areas and between students from higher-income and lower-income families.

The fourth main category was managerial and organizational challenges, which reflected structural and administrative barriers within the education system. The principals referred to delays in receiving official circulars, slow transfer of information, limited decision-making authority, dependence on higher-level administrative decisions, difficulty in supervising virtual classes, and limited control over teachers' performance. These findings suggest that during crisis conditions, school principals needed flexibility and local decision-making authority, but they often faced centralized administrative structures. Weak organizational communication also increased uncertainty and made timely crisis management more difficult. In addition, crisis information management emerged as a new managerial responsibility, because principals had to respond to rumors, contradictory messages, and rapidly changing instructions while maintaining trust among teachers, parents, and students.

The fifth main category was psychological challenges. The participants identified anxiety caused by crisis conditions, family concerns, digital fatigue, eye strain, physical problems, reduced student motivation, and reduced teacher motivation as important consequences of virtual education. Digital burnout was particularly significant because both teachers and students were required to spend long periods in virtual environments. This situation reduced attention, concentration, and emotional readiness for learning. The distinction between reduced academic motivation among students and reduced occupational motivation among teachers shows that the psychological effects of crisis-based virtual education were multidimensional. Psychological pressure was especially intense in families with several school-aged children and limited access to digital devices, because these families had to manage several simultaneous educational demands with insufficient resources.

The sixth main category was adaptive strategies of principals, which included the actions used by school principals to preserve educational continuity despite multiple limitations. These strategies included continuous communication with parents, formation of information-sharing groups, use of offline education, organization of compensatory classes, supervision of virtual classes, participation of principals and deputies in online classrooms, psychological support for teachers and students, training teachers in digital skills, and building trust through transparency. These findings show that principals were not passive implementers of official instructions; rather, they acted as local crisis managers who attempted to maintain learning through flexible and context-based solutions. The core category extracted from the interviews was "principals' effort to preserve learning continuity within a context of limitations." This core category indicates that virtual education management during crisis conditions was a multidimensional phenomenon in which infrastructural and family challenges acted as contextual factors, educational and psychological challenges functioned as process-related consequences, managerial and organizational challenges shaped the intensity of the crisis, and adaptive strategies emerged as principals' practical responses to sustain education.

4 Discussion

The present study aimed to identify and classify the challenges of virtual education management during crisis

conditions among elementary school principals in Lamerd County using a qualitative thematic content analysis approach. The findings showed that school principals experienced virtual education management as a multidimensional crisis-management phenomenon rather than a simple transition from face-to-face instruction to online teaching. The extracted themes included infrastructural and technological challenges, educational challenges, family and social challenges, managerial and organizational challenges, psychological challenges, and adaptive strategies of principals. The core category, “principals’ effort to preserve learning continuity within a context of limitations,” indicates that principals were placed at the center of a complex network of technological, pedagogical, administrative, psychological, and social pressures. This finding is consistent with studies emphasizing that the COVID-19 pandemic disrupted school systems globally and created interrelated challenges in access, communication, learning continuity, and educational management (Apaydin & Yalcin, 2024; Bozkurt et al., 2022; Karakose et al., 2024). In this regard, the results confirm that virtual education during crisis conditions should not be understood as ordinary online learning, but as emergency remote education shaped by urgency, limited preparation, and unstable resources (Hodges et al., 2022).

The first major finding concerned infrastructural and technological challenges, including weak internet connectivity, repeated network disconnections, poor coverage, shortage of smart devices, disruption of the SHAD platform, and unequal access to digital tools. These findings show that technological infrastructure functioned as the foundation upon which all other aspects of virtual education depended. When students lacked devices or stable internet access, principals could not ensure attendance, teachers could not deliver lessons effectively, and families could not support children’s participation. This result is consistent with studies highlighting that the success of virtual education depends on the availability, accessibility, and proper management of information technology infrastructures (Mahdavi, 2021; Saravani et al., 2025). It also supports earlier work on cyberspace management in education, which emphasizes that educational systems must anticipate infrastructural, platform-related, and access-related barriers when using digital environments for formal education (Cheraghi & Cheraghi, 2019; Hosseini, 2020). The prominence of the digital divide in the present study is particularly important because principals in rural and nomadic areas reported that technological deprivation

directly excluded some students from the learning process. This finding aligns with the global evidence that the pandemic intensified pre-existing educational inequalities, especially among learners with fewer technological and socioeconomic resources (Bozkurt et al., 2022).

The second major finding was related to educational challenges, including learning decline, reduced student participation, absenteeism in virtual classes, difficulty in real assessment, limited teacher-student interaction, and lack of immediate feedback. These findings indicate that virtual education weakened the quality of the teaching-learning process, particularly at the elementary level, where direct interaction, classroom routines, continuous feedback, and teacher supervision are essential. The results are aligned with the distinction between emergency remote teaching and well-designed online learning; in emergency conditions, instruction is often transferred to a digital platform without adequate pedagogical design, assessment planning, or preparation for interaction (Hodges et al., 2022). The findings also support studies that reported communication barriers, reduced interaction, and participation problems as major weaknesses of online learning during the pandemic (Ariani & Tawali, 2021; Rezaei et al., 2025). From another perspective, the reduced quality of learning may be explained by insufficient development of learners’ self-regulation and metacognitive skills in virtual environments. Although virtual education can potentially strengthen cognitive and self-regulatory capacities when properly designed, elementary students require structured support to benefit from such environments (Mousizadeh Ahaghi, 2025). Therefore, the educational challenges identified in this study reflect not only platform limitations, but also the mismatch between the developmental needs of elementary students and the sudden demands of virtual learning.

The third finding concerned family and social challenges, including economic limitations, parents’ low literacy, lack of parental familiarity with technology, increased responsibility of families, parental dissatisfaction, and perceived educational inequality. This finding shows that the transition to virtual education transferred a significant part of the educational burden from school to the family. Parents were expected to provide devices, pay for internet access, monitor attendance, help children use digital platforms, and in many cases compensate for the reduced presence of the teacher. However, many families lacked the economic, educational, and technological resources needed for this role. This finding is consistent with research indicating that online education during the pandemic created new pressures

for children and families and affected students' physical, psychological, and educational conditions (Bansal, 2020). The finding also supports studies emphasizing that virtual education effectiveness is influenced by the interaction of technological access, learner readiness, educator capacity, and family support (Mousizadeh Ahaghi, 2025; Rezaei et al., 2025). In the present study, parental role pressure emerged as an independent challenge, suggesting that families were not merely external supporters of schooling, but became informal co-managers of the learning process. This result is especially important in elementary education because young learners depend heavily on adult guidance, and unequal family support can quickly produce unequal educational outcomes.

The fourth finding was related to managerial and organizational challenges. Principals reported delayed receipt of official circulars, slow information transfer, limited authority, dependence on higher-level decisions, difficulty supervising virtual classes, limited control over teacher performance, and the need to manage rumors and contradictory information. These findings indicate that school principals were required to manage a crisis while operating within centralized and sometimes slow administrative structures. This result is consistent with studies showing that school principals during COVID-19 encountered serious difficulties in planning, communication, supervision, decision-making, and coordination (Apaydin & Yalcin, 2024; Karakose et al., 2024). It also aligns with research on educational leadership barriers in elementary schools, which has shown that structural constraints, limited resources, and organizational communication weaknesses can restrict principals' effectiveness (Mohammadi et al., 2024). From the perspective of leadership theory, the findings confirm that successful school leadership requires setting direction, developing people, redesigning organizational conditions, and improving teaching and learning processes (Leithwood et al., 2024). However, in virtual crisis conditions, these leadership functions became more complex because principals had to perform them without the ordinary tools of physical school management. Therefore, the managerial challenges identified in this study reflect both crisis-specific pressures and deeper organizational limitations in educational administration.

The fifth finding concerned psychological challenges, including anxiety caused by crisis conditions, family concerns, digital fatigue, eye strain, physical discomfort, reduced academic motivation among students, and reduced occupational motivation among teachers. This finding

demonstrates that virtual education during crisis conditions had hidden psychological costs that affected all school actors. Digital burnout emerged as a particularly important theme, showing that long-term presence in virtual environments reduced concentration, motivation, and emotional readiness for learning and teaching. This result is consistent with studies reporting the negative effects of prolonged online learning on children's health, fatigue, and well-being (Bansal, 2020). It also aligns with literature showing that crisis conditions increase psychological pressure on school leaders, teachers, families, and students (Apaydin & Yalcin, 2024; Karakose et al., 2024). The distinction between reduced academic motivation and reduced occupational motivation is theoretically meaningful because it shows that the crisis affected both the learner side and the teacher side of the educational process. When students become disengaged and teachers become exhausted, the principal's role expands from administrative coordination to emotional and motivational support. This finding supports the argument that virtual education management in crisis conditions requires psychological sensitivity in addition to technological and instructional competence.

The sixth finding concerned adaptive strategies used by principals, including continuous communication with parents, formation of information-sharing groups, use of offline education, compensatory classes, supervision of virtual classrooms, psychological support, teacher technology training, and trust-based management. These strategies indicate that principals were not passive implementers of official instructions; rather, they developed local and context-sensitive responses to preserve learning continuity. This finding is consistent with research on digital leadership, which emphasizes that school leaders must manage virtual spaces, support teachers, coordinate digital communication, and create trust during crisis conditions (Levi-Tamar et al., 2023). It also supports the view that teachers should be prepared for emergency remote teaching and that school systems need to strengthen teachers' digital pedagogical capacity (Ifinedo et al., 2023; Trust & Whalen, 2021). The use of offline education and compensatory classes also reflects adaptive planning, which is consistent with the idea that school teaching during COVID-19 required flexible, context-responsive planning rather than rigid reliance on standard online delivery (Gandolfi, 2020). In this regard, principals acted as local crisis planners who modified educational delivery according to infrastructure, family capacity, teacher readiness, and student needs.

The overall pattern of findings suggests that the challenges of virtual education management were interdependent rather than separate. Infrastructural weaknesses intensified educational problems; family limitations increased student absenteeism and inequality; managerial centralization reduced local flexibility; and psychological pressure reduced motivation among teachers and students. At the same time, adaptive strategies were shaped by the interaction of these challenges. For example, continuous communication with parents emerged because family participation had become essential; offline education emerged because digital infrastructure was inadequate; teacher technology training emerged because digital competence was uneven; and trust-based management emerged because uncertainty and rumors threatened organizational coherence. This interpretation is compatible with studies emphasizing that crisis leadership requires coordination across multiple domains, including communication, planning, emotional support, and instructional continuity (Karakose et al., 2024; Leithwood et al., 2024). It also resonates with the role of middle management in maintaining internal coherence during organizational change, because principals had to translate external policies into practical school-level actions while preserving trust among teachers and families (Clark et al., 2020). Moreover, the need to adapt learning to local realities is consistent with studies emphasizing the importance of contextualized educational materials and culturally meaningful learning processes (Ginting et al., 2023). Therefore, the present study contributes to the literature by showing that virtual education management during crisis is a situated, relational, and multidimensional leadership process.

5 Conclusion

The findings also have important implications for understanding the difference between technology use and technology management in schools. Merely introducing a platform or requiring online classes does not guarantee educational continuity. Effective virtual education requires infrastructure, digital leadership, teacher readiness, family engagement, psychological support, assessment mechanisms, and organizational flexibility. In the present study, the weakness of any one of these elements affected the whole system. This supports the argument that educational cyberspace requires active management to reduce harms and turn threats into opportunities (Cheraghi

& Cheraghi, 2019; Hosseini, 2020). It also confirms that digital literacy and cyber media literacy among teachers and school leaders are essential for the effective use of virtual education in primary schools (Saravani et al., 2025). Therefore, crisis-based virtual education should be treated as a strategic field of school management, not as a temporary technical solution. The findings suggest that future preparedness requires investment in digital infrastructure, professional development, decentralized crisis decision-making, family-school communication systems, and psychological support mechanisms.

This study had several limitations that should be considered when interpreting the findings. First, the research was conducted with ten elementary school principals in Lamerd County, and although theoretical saturation was achieved, the findings may not fully represent the experiences of principals in other regions, educational levels, or administrative contexts. Second, the data were collected through interviews, and therefore the findings depended on participants' self-reported experiences and retrospective interpretations of crisis management. Third, although school documents were used for triangulation, direct observation of virtual classes, teacher practices, or family interactions was not possible. Fourth, the study focused on principals' perspectives and did not include the voices of teachers, parents, students, or educational administrators, whose experiences could provide additional dimensions of the phenomenon.

Future studies should examine the challenges of virtual education management in different provinces, school levels, and socioeconomic contexts in order to compare the experiences of urban, rural, and nomadic schools more systematically. Mixed-methods studies are also recommended to combine qualitative insights with quantitative measurement of the prevalence and intensity of the identified challenges. Future research may also investigate the perspectives of teachers, parents, students, and education officials to develop a more comprehensive model of crisis-based virtual education management. In addition, longitudinal studies can examine how schools' digital leadership capacities, infrastructure readiness, teacher competence, and family-school communication systems evolve after crisis periods and whether the adaptive strategies developed during the pandemic become sustainable managerial practices.

Based on the findings, educational authorities should develop a clear crisis-management framework for virtual education that gives school principals sufficient authority to

make context-based decisions. Schools should be equipped with stable digital infrastructure, alternative offline learning mechanisms, and practical protocols for student attendance, assessment, teacher supervision, and communication with families. Principals and teachers should receive continuous training in digital pedagogy, virtual classroom management, online assessment, cyber media literacy, and psychological support. Special attention should be paid to low-income, rural, and nomadic families through device-support programs, subsidized internet access, and parent training. Finally, school management in virtual crisis conditions should be based on trust, transparency, flexible planning, and continuous communication among principals, teachers, families, and educational authorities.

Authors' Contributions

All authors have contributed significantly to the research process and the development of the manuscript.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were observed.

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