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Rethinking Online Education: A Phenomenological Approach to Understanding Virtual Learning Dynamics though Puzzle Based Instruction

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The Coronavirus outbreak led to the suspension of in-person education, prompting a transition to a virtual educational system. Such a paradigm shift caused challenges in teaching and learning. To uncovers the challenges of virtual education and teachers' perceptions, a qualitative and phenomenological approach was adopted. The data were collected through purposive sampling and semi-structured interviews with 17 high school teachers using the Microsoft Teams platform. The data were analyzed with MAXQDA software, following Colaizzi's (2002) descriptive phenomenological method, to ensure a thorough examination of teachers' perceptions. After analyzing open codes, the challenges were categorized into four themes (and 19 sub-themes), including material and technological difficulties, the education governance, the hidden elements of education, and the teacher training system. The findings underscore the importance of virtual education and the challenges it presents, emphasizing the need for education administrators to take proactive steps in addressing these issues. The implications extend to both practice and policy. Educational policymakers should design context-responsive frameworks that strengthen teacher training, digital infrastructure, and parental engagement. Practitioners can then utilize these findings to develop more equitable, resilient, and pedagogically sound online teaching strategies for future blended or emergency learning contexts.

Keywords: high school teachers, online learning environments, online teaching and learning, phenomenological approach, virtual education

INTRODUCTION

The coronavirus pandemic impacted education systems, resulting in the closure of entire schools around the world. Following the closure and disruption of the in-person education system and traditional educational styles, one of the measures taken was to adopt virtual education (VE) as an alternative to in-person education, given the need to break the chain of virus transmission and maintain social distancing (Isaee & Barjesteh, 2023). In this regard, the Iranian education system also turned to VE because continuing education was only possible using remote communication tools, and teachers were

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forced to adapt their teaching styles to this new space (Huber & Helm, 2020; Mosayebi et al., 2021). E learning, the application of web networking technology and other electronic tools, is effective in teaching and creating learning experiences (Annamalai et al., 2024). In Iran, schools were closed, and teachers began adapting to the situation. Initially, they produced educational content based on their personal knowledge and skills. This content was delivered to students through cyberspace platforms. Later, the Ministry of Education provided the national media education network with alternative school content. Subsequently, the Ministry created a local application called SHAD. This social network in cyberspace enabled teachers to communicate with students in an organized manner (Mollahasani et al., 2024). Meanwhile, many challenges were posed to VE, and the importance of this research topic was also highlighted with the aim of gathering statistics on these problems and challenges.

Review of Relevant Literature

Until the coronavirus Pandemic, there has been little research on VE and its possible challenges. Jabbari and colleagues (2017) have found that E-learning and virtual learning increase students' English skills more than traditional English language methods. Additionally, Ainley and Armatas (2006) have acknowledged that virtual learning has the capacity to create opportunities for active learning experiences and enhance individual learning. In another study, Eroglu and Senol (2021) demonstrated that the use of educational media has an impact on the academic development of students. Success using this method relies not only on the content of VE but also on other factors, such as the teachers themselves and their teaching methods. Zarrabi et al. (2024) classified teachers' perceptions of educational challenges into several general themes. These include problems related to students and parents, such as low student motivation, excessive dependence on cyberspace, and inadequate parental cooperation. They also identified problems related to teachers, including stereotypical teaching methods and lack of consensus among educators. Content-related issues were another theme, including inconsistency between outdated textbooks and the new educational environment, as well as difficulties in content production. Problems with equipment were also highlighted, such as lack of high-speed internet, inadequate infrastructure, and limited access to local applications. Lastly, organizational problems were noted. These include inefficient in-service training courses, ineffective monitoring and evaluation systems, and issues with feedback and face-to-face communication. Firat and Bozkurt (2020) concluded that opportunities, such as increasing the speed of providing more accountability information for teachers, have been motivated. Factors such as slow internet speeds, reduced student motivation, the difficulty of accurately measuring learning, and unequal access to technology have also been identified as challenges. Saglam et al. (2023) classified the pros and cons of VE into five themes: Educational (i.e., continuity of education and creation of creativity, minimizing non-compliance with classroom rules), Social (i.e., students autonomy and parental oversight, defect elimination of group activity), cultural (i.e., new experience VE defect elimination of teacher charisma), economic (i.e., reduction of transportation costs defect low timing of some parents), and technical (i.e., promotion of media literacy, parents' lack of mastery of new technologies). Sargazi and Nabi Bid Hendi (2020) concluded that this crisis could be considered as an opportunity to solve the infrastructure problems of VE in

Iran. Rasmitadil et al (2020), in a study titled “Teachers' understanding of online teaching,” concluded that the weaknesses of online education can be turned into opportunities. Due to the decrease in the number of coronavirus infections and the reopening of schools and the return of the in-person education system, it is necessary to study the experience of teachers as one of the main organs of VE to measure the obstacles of online learning and its weaknesses in order to improve its weaknesses and increase the efficiency of the education system in the future. The VE is so important even in the post-coronavirus era due to repeated holidays. This issue is more important for high school in Tehran. In this regard, the present study was conducted to study the challenges of VE through the study of the experience of high teachers in VE.

Gap in Existing Research

Although global research has increasingly explored the pedagogical, technical, and psychological dimensions of VE, most studies have focused on students’ perspectives or have used quantitative survey-based designs that provide limited insight into teachers’ lived experiences. In the Iranian context, research has mainly examined technological readiness, infrastructural barriers, and general satisfaction, often neglecting the experiential and interpretive dimensions of teachers’ adaptation to virtual environments. Moreover, few studies have analyzed how Iranian teachers construct meaning around VE policies, negotiate hidden elements of the educational process, or interpret the evolving teacher training systems shaped by the pandemic. Consequently, there is a theoretical and empirical gap in understanding how teachers themselves experience, internalize, and respond to the challenges of VE within Iran’s distinctive sociocultural and institutional framework. Addressing this gap is crucial for developing context-sensitive policies and teacher training models that can enhance the sustainability and equity of online education in post-pandemic Iran.

Purpose of the Current Study

In response to these gaps, the present study employs a qualitative, phenomenological design to explore Iranian high school teachers’ perceptions of the challenges they encounter in virtual education. By analyzing their lived experiences through semi-structured interviews, the study seeks to identify core themes related to material and technological barriers, educational governance, hidden elements of schooling, and teacher training systems. The ultimate goal is to contribute empirically grounded insights that can inform both educational practice and policy, supporting the development of more resilient and equitable virtual learning frameworks in post-pandemic Iran.

Literature Review

The term ICT is commonly associated with "computer" and "technology"; however, *"digital technology"* or *"Web 2.0,"* as introduced by Ertmer et al. (2014) and Sadaf et al. (2012), may serve as more accurate descriptors. Toomey, as referenced in Lloyd (2006), described ICT in the context of teaching and learning as a range of tools—including hardware, software applications, and connectivity—used for accessing, collecting, processing, presenting, and sharing information. The importance of ICT lies in its

capacity to integrate multimedia, communication, and computer-based technologies, with a focus on their evolving nature and growing prevalence in education. Research on ICT integration has expanded rapidly in recent years, reflecting its increasing relevance to educational innovation. Numerous studies have examined its pedagogical effectiveness, barriers to implementation, and implications for teaching and learning. For instance, ICT has been shown to enhance teaching practices, promote learner autonomy, and improve academic outcomes by creating interactive, student-centered learning environments (Barjesteh & Isaee, 2024; Joshi et al., 2024; Karakaya, 2010; Rahimi & Yadollahi, 2011; Xu et al., 2021). While many studies emphasize the potential of ICT in enhancing learning outcomes, effective implementation often depends on teachers' readiness, attitudes, and beliefs, which are shaped by both intrinsic and extrinsic factors which focuses on teachers' perceptions, beliefs, and attitudes toward ICT (Asif et al., 2020; Akram & Yang, 2021; Dzinoreva & Mavhunga, 2022; Hassan, 2021; Murithi & Yoo, 2021; Xu et al., 2021). Teachers often serve as gatekeepers in the adoption and effective utilization of ICT in classrooms. While many studies highlight positive perceptions and attitudes toward ICT integration, they also reveal significant barriers, such as resistance to change, lack of digital literacy, and insufficient professional development opportunities (Akram & Yang, 2021; Murithi & Yoo, 2021).

Extrinsic factors refer to institutional elements such as school culture, technological infrastructure, access to training, and administrative support (Chigama & Goronga, 2022; Dzinoreva & Mavhunga, 2022). Intrinsic factors, on the other hand, concern teachers' personal beliefs, values, digital literacy, and self-efficacy in using technology (Akram & Yang, 2021; Khadka et al., 2024; Murithi & Yoo, 2021; Mrosso & Ndibalema, 2024). The interaction between these two dimensions significantly influences how teachers adopt and integrate ICT into their pedagogy. For example, educators with high self-efficacy are more likely to utilize available technological resources effectively, even in resource-limited contexts. Conversely, when confidence or digital competence is low, even sufficient extrinsic support may not translate into meaningful ICT use.

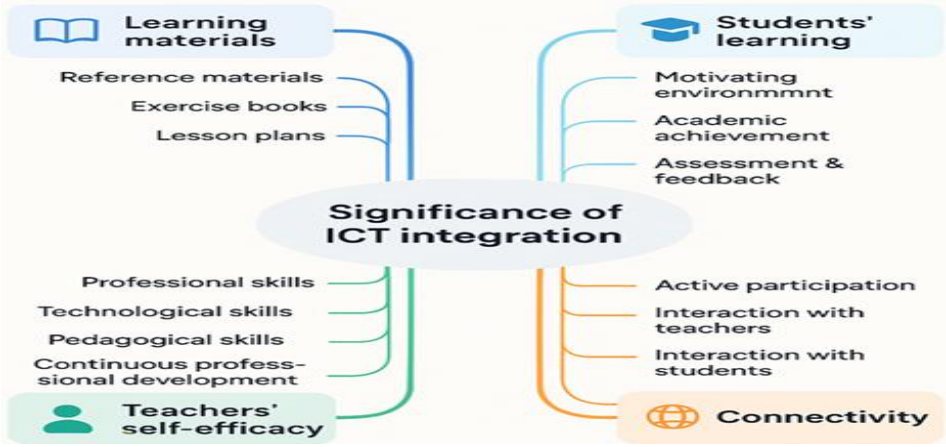

Figure 1
Implications of ICT integration in education

Building on these insights, recent studies have highlighted the need for holistic professional development that simultaneously addresses both technical skills and pedagogical orientations (Asif et al., 2020; Hassan, 2021). Challenges such as inadequate training, limited infrastructure, and resistance to change continue to hinder the effective integration of technology in classrooms. These issues are particularly salient in contexts like Iran, where teachers often face competing demands between traditional teaching practices and the expectations of digital pedagogy.

The literature also points to persistent gaps in understanding how teachers conceptualize and manage these challenges in online and virtual environments. Teachers must navigate issues of access, engagement, and assessment while maintaining the quality of instruction. However, limited empirical research explores how educators, especially within developing educational systems, experience these complexities in practice. This highlights the need for qualitative inquiry into teachers' lived experiences to better inform policy, training, and support systems tailored to their local realities. This study unveils the challenges in an online learning environment. To achieve this objective, the following research question guided the study:

RQ: What are Iranian high school teachers' perceptions of the challenges of online learning environments?

METHOD

Participants

The participants of the current research were 17 high school teachers. They were both male (52.9%) and female (47.05%) with different academic degrees, including BA (n = 6), MA (n =4), and PhD (n=7). Those who hold PhD degrees had experience in teaching high school. They were all enrolled in Farhangian University, the national teacher-education university in Iran. Farhangian University is a state-run higher-education institution responsible for training, accrediting, and providing in-service professional

development for schoolteachers. Accordingly, although all participants were practicing high school teachers, some simultaneously held academic titles (e.g., lecturer or associate professor) due to their involvement in teacher education at Farhangian University. This dual role explains the inclusion of advanced academic ranks in the demographic description. Their ages ranged from 26 to 51 (*M*= 36). A purposive sampling procedure was adopted to select the target participants. They were chosen from a readily accessible pool of teachers who met this criterion. In other words, only teachers who had direct experience with virtual instruction during the COVID-19 pandemic were invited to participate, ensuring both practicality and relevance to the study's focus. Additionally, all participants had a minimum of two years of face-to-face teaching experience before the COVID-19 era. The table below summarizes the

Table 1
Demographic profile of participants

Academic Degree	Gender	Age Range	Teaching Experience (years)	Position
BA (n = 6)	Male (n = 9, 52.9%)	26–41	15–27	Teacher
MA (n = 4)	Female (n = 8, 47.1%)	30–52	18–29	Instructor
PhD (n = 7)	—	—	—	Assistant/Associate Professor
Total	17 (100%)	—	—	—

Note. Percentages are calculated based on 17 teachers. Several participants held dual roles as high school teachers and university instructors at Farhangian University.

Instrumentations

A semi-structured interview was adopted to unveil the participants' perceptions towards the obstacles they confronted during the online environments. Based on an extensive review of the existing literature (Bartolic et al., 2021; Kebritchi et al., 2017; Singh, V., and Thurman, 2019), the researcher developed an interview framework that included key questions focusing on online environments. To address technological challenges, educational policy, and the hidden aspects of the education and teacher training system, items were initially proposed. Based on this, a draft interview guide was created and tested with three EFL professors. Feedback from this pilot study resulted in some adjustments, including the removal of six items and the addition of one, leaving a total of four core questions. Following Creswell's (2018) guidelines, the interview guide's validity and credibility were evaluated by four professors—two in technological education and two in applied linguistics. They assessed the theoretical assumptions, relevance, and clarity of each item. After confirming the content validity index, a semi-structured interview was conducted.

Procedure

To explore the primary challenges in online learning environments, 17 instructors participated in semi-structured interviews. The researcher scheduled meetings, with five interviews conducted face-to-face in quiet office settings, while the remaining 12 were held via video calls using the Microsoft Teams platform. Each interview lasted 20-30 minutes. At the conclusion, participants provided verbal consent, confirming the ethical

protocols. The interview protocol was designed to guide, but not constrain, participants' responses. After introductory rapport-building questions (e.g., "Can you describe your general experience with online teaching during the pandemic?"), The conversation followed four guiding prompts aligned with the study's objectives: (1) What were the main challenges you faced while teaching in virtual environments? (2) How did institutional policies and school administration influence your online teaching practices? (3) In your view, what hidden or less visible factors affected teaching and learning during virtual education? (4) What changes in teacher training or professional development would help improve virtual education? Follow-up questions were used to probe for clarification, examples, or emotions behind responses. Ethical considerations were upheld by explaining the study's purpose, ensuring voluntary participation, maintaining anonymity, and using the results solely to enhance education quality. The interview questions, focused on online learning environments, had been validated by experts in the field during the quantitative phase. At the end of each session, member checking was performed verbally: participants reviewed summarized interpretations of their responses to confirm accuracy and to provide corrections or elaborations where necessary. This iterative feedback strengthened the credibility of the data (Birt et al., 2016). The interviews followed Strauss and Corbin's (1998) funnel approach, beginning with general pleasantries and broad questions before narrowing down to specific issues faced by teachers in their teaching experiences. A phenomenological approach was used to capture participants' perspectives. All interviews were recorded digitally and transcribed verbatim. Throughout the process, steps were taken to minimize bias and ensure participants felt free to share their honest thoughts (Creswell, 2018). To ensure dependability, the data were analyzed using Colaizzi's (2002) seven-step method. This involved first reviewing each interview transcript as a whole, identifying key sentences, categorizing concepts, and examining their relevance to the main points. These were then grouped into main themes and sub-themes. After reviewing the interviews, specific themes emerged that aligned with the study's goals. Before the interviews, participants were provided with detailed information about the research. Afterward, their responses were summarized and checked for consistency with the identified themes, which they confirmed. A second researcher also independently reviewed the findings, further confirming the trustworthiness of the results. The primary researcher conducted multiple reviews of the data to enhance accuracy.

Voice Recorder, Microsoft Teams, and MAXQDA Software

The interview discussions were recorded using Microsoft Teams and a smartphone and thoroughly transcribed for in-depth analysis. Microsoft Teams combines video chat meetings and applications to improve team collaboration in a business or educational environment. Bernard (2011) emphasized the importance of avoiding reliance on memory during interviews, advocating for the use of audio recording devices unless a participant specifically declines. To examine the credibility and reliability of the data, member checking and low-inference descriptors were utilized. The transcribed interviews were analyzed thematically using MAXQDA (Version 2021), a computer-assisted qualitative data analysis software. This tool is particularly effective for text-based case study research, helping to enhance the reliability of the coding process (Mills et al., 2010).

Data Analysis

The data analysis employed Colaizzi's (2002) seven-step strategy alongside MAXQDA 21 software. The qualitative analysis followed Colaizzi's approach, which includes steps such as familiarization, identifying significant statements, formulating meanings, creating an exhaustive description, establishing the fundamental structure, and verifying this structure. Member checking was conducted to confirm the accuracy of identified themes and sub-themes, improving the reliability of the findings (Birt et al., 2016). To ensure the trustworthiness and reliability of the coding, a second independent coder—a qualitative research specialist with experience in applied linguistics—was invited to re-code 25% of the transcripts. Discrepancies in code assignment were discussed and resolved through consensus. The inter-coder reliability was quantified using Krippendorff's alpha ($\alpha = .89$), indicating a high level of agreement. The coefficient was calculated in MAXQDA, which computes α based on the proportion of coding matches relative to all coding decisions across the two coders.

FINDINGS

Regular review of interviews and in-depth analysis of teachers ' experience of virtual teaching challenges led to the identification of four main and 19 sub-themes. The main themes include the material and technological challenges and the challenges of governance of education and the challenges of the hidden organs of education and the challenges of the teacher training system. Each of these themes has its own sub-themes, the results of which are given in Table 2.

Table 2
Themes and sub-themes of challenges in virtual education

Themes	Sub-themes	Frequency
1. Material and technological supports	Internet speed issues	15 (88%)
	connectivity disruption,	13 (76%)
	Limited access to devices	11 (64%)
	Inadequate authentication system	12 (70%)
	Issues with the national platform	14 (82%)
	Need for complementary VE support	9 (52%)
	Families' financial instability	8 (48%)
2. Top-down educational policy	Confusing directives	16 (94%)
	Mixing in-person and online modes	6 (35%)
	Centralized decision-making	13 (76%)
	Insufficient supervision	7 (41%)
3. The Hidden Foundations of Education	Principals' and assistants' low digital literacy	14 (82%)
	Poor guidance for families	17 (100%)
	Disruption of moral/educational dimension	11 (64%)
4. Teacher training system	In-service training system	15 (88%)
	Low proficiency in educational technologies	13 (76%)
	Reliance on traditional teaching	9(52%)
	Poor self-management in VE	6 (35%)

Note. Frequencies reflect teacher mentions during coding. Subthemes are not mutually exclusive; percentages may exceed 100%.

To provide a better illustration of the table above the main challenges are represented in the following figures.

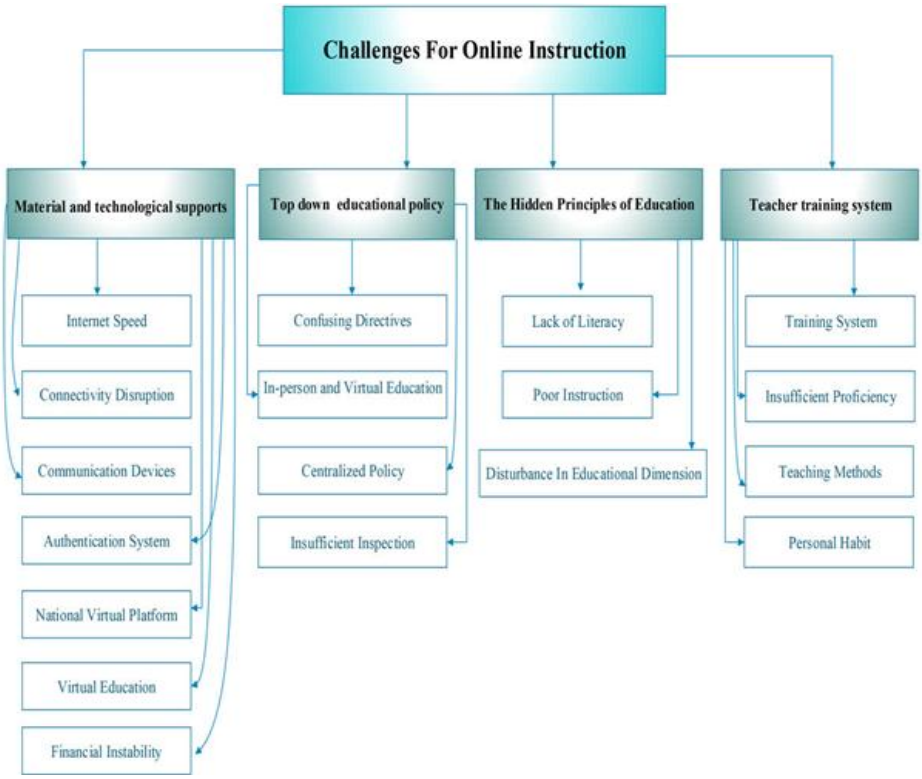

Figure 2
Structural and technological challenges in virtual instruction

The network visually emphasizes how structural, technological, and policy issues collectively impact educational effectiveness.

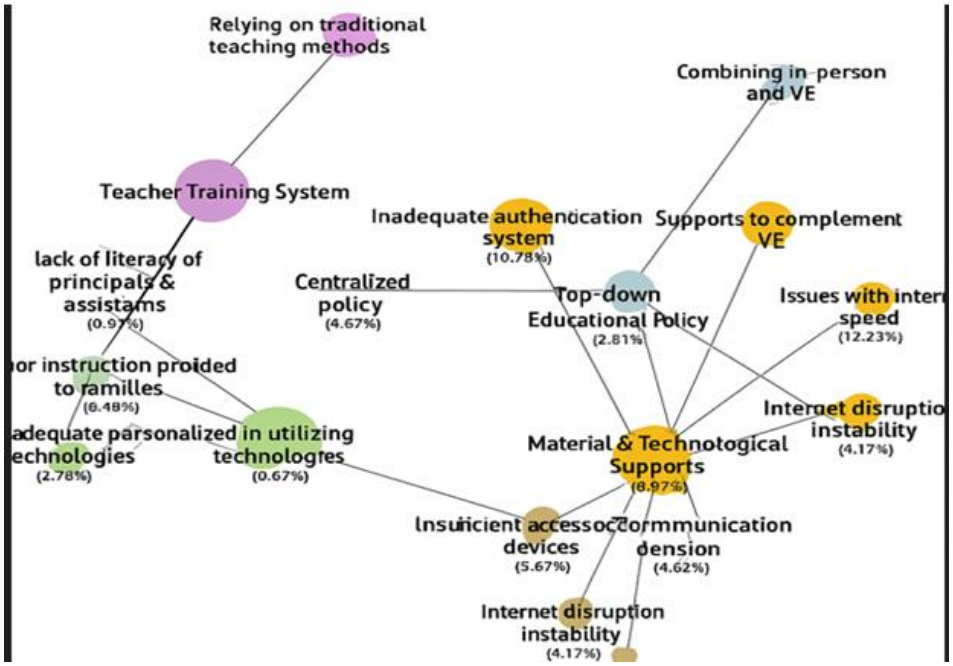

Figure 3
The impact of structural, technological, and policy issues on educational effectiveness

Besides, all the sub-scales for the online challenges are illustrated in the following line graph in terms of the highest and lowest scales.

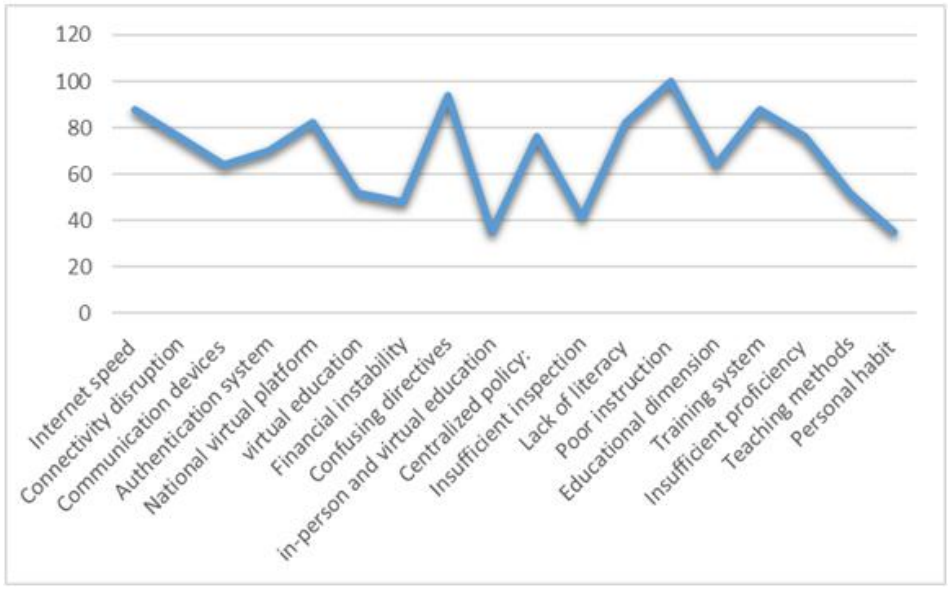

Figure 4
Frequency of subthemes in online education challenges

Material and Technological Supports

A common theme highlighted by teachers revolved around materials and technological issues which encompass the following subthemes: (1) Issues with internet speed: The internet is one of the most important infrastructure issues that is one of the basic requirements of VE. Balanced internet speed can cover online classes and transmit teacher and student audio and video to each other and this problem can be seen in most parts of the country, as one of the teachers [T5] mentioned that the internet was weak in the classroom, the students didn't have strong internet, some people didn't have any devices at all. The problem of poor internet speed was a problem that eight of the interviewees had addressed. (2) internet connectivity disruption: Interviewee [T8] sadly said that it also had some disadvantages, not all internet connections were fast, especially in our area, and it would be interrupted. (3) insufficient access to communication tools (i.e., cell phones and tablets): Another basic requirement of VE is to have a smart device to participate in classes and send assignments from the student and transfer content from the teacher, which can be done by cell phone, tablet or computer systems. Many families, especially in elementary school, had not prepared such a smart device for their child before the virtualization of Education, which emerged with great intensity during the coronavirus era and became a problem for many families and classrooms. In this regard, one of the teachers mentioned "not all students had enough facilities, for example, not every student had a dedicated phone and tablet" [T13]. (4) Inadequate authentication system: This has been important for the interviewee [T16], as he referred to it as the first topic of the interview and it was clear from the tone of speech and facial expression that he was upset and somewhat angry

about this issue and considered it one of the main reasons why students remain illiterate during VE. He said, “VE is not good, often the parents do assignments instead of the students, it's not clear who does it anymore, so the score is not the student's score.” (5) Issue with national platform that was made available to VE as the main platform for student teacher communication. It has faced numerous challenges from teachers’ viewpoints. Interviewee [T7] stated that we were required to use an application that we were unfamiliar with. The students faced lots of interruptions, as they missed the rest of the class. The need for in-person supplementation for VE Interviewee number five said, "when I taught, I saw what happened to the students in that area, they did not learn anything online, they did not learn anything, they need someone to help them.” (6) Families' financial instability: In the issue of financial problems and infrastructure, the sub-theme of financial weakness of families is addressed in another way, and that is the low financial ability of families to provide smart devices such as cell phones and tablets for students to use VE, and the severity of this issue has been high in the suburbs of Tehran. Interviewee [T14] said that not all students can afford a cell phone.

Challenges of Top-Down Educational Policy

Top-down educational policies, where decisions are made at higher levels of government or administration and implemented at local or classroom levels, face several challenges. The distinction highlighted by the interviewee who examined education in its general sense versus the others focusing on the ministry's management system points to a key issue in educational reform. The former may be addressing the broader principles of education—developing critical thinking, fostering creativity, and building knowledge systems-while the latter critique the operational aspects of education policies as governed by the Ministry of Education. This highlights a few key challenges: (a) confusing directives: Interviewee [T11] said: "the other problem is that the Ministry of Education did not assign tasks", it means the Ministry of Education didn't determine that six months was only virtual, but to give up that it was in person from the next month caused disorder and anxiety with anything else. (b) problems of combining in-person and virtual education: Interviewee [T2] said that all students in a family should use one device, it was so difficult, especially when one or two students had combined training. This situation led to academic failure. (c) centralized policy: One of the important issues that participant [T15] mentioned was the discussion of dramatic policy making in the administrative body of the Ministry of Education. He believed that many of the decisions and rapid changes made in education during the coronavirus era were not because of planning-backed decisions, but the result of managers' willingness to expose their decisions to public opinion. He said that this is the opening of schools without planning. It's definitely thoughtless and unplanned. For example, the TV shows that they're spraying school, they're fixing school coolers, they're fixing classroom ventilation, they're fixing a few of our schools right now. Then they say on TV that ninety-two percent of our schools are ready, whereas ninety-eight percent of our schools are not ready for that. These are problems, there are no facilities. (4) insufficient office inspection. Each district in the education management system is governed by an administration, and these departments have an inspection body that is responsible for schools and teachers in particular to meet the standard of Education. In terms of interviewee [T8], inspections have weakened a lot in recent years, especially

since the early 1390s, and as a result, the teaching situation of teachers has also faced a decline in quality. He said that the department asked the students some questions. If they had done this, we wouldn't have the decline that it is now, because the teacher had to work, he had no choice but to provide work.

The Hidden Foundations of Education

The Hidden foundations of education refers to the underlying principles, values, and structures that support and shape educational systems but are not always visible or directly discussed. These can include societal expectations, cultural norms, power dynamics, and unspoken rules that influence how education is delivered and received. Understanding these hidden foundations is essential to recognizing how they impact teaching methods, student outcomes, and overall educational development (Barjesteh and Frouzandehfar, 2022). There are different beneficiaries involved in the issue of VE, all of which need to be investigated because neglect of either side will lead to a mistake in the conclusion. The parties involved include students, teachers, families of students, the teaching staff of schools, education departments, and the management system of the Ministry of Education. All these beneficiaries involved in virtual training must be justified in relation to their tasks and how they communicate with each other in order to move towards increasing the efficiency of virtual training. (a) Lack of literacy of principals and assistants of schools: In the post-inspection phase of the departments, the principal and the school's assistants are also tasked with supervising the classrooms and its teacher. Interviewee [T16] believed that the principals and school assistants are not literate in this inspection, and this is one of the weaknesses of the school structure. Another issue, he said, is that teachers are completely abandoned in VE. It was better that the teacher was monitored, not by the principal and the assistant, like in our school, my assistant didn't know what problems I had faced in my teaching, and he didn't know what I was doing. (b) poor instruction provided to families: Interviewee [T 9] said: "everything that happened was the idea and invention of the teachers themselves, and the decline was the fault of both teachers and families." The need to teach students how to learn. Interviewee [T 3] made a good point in this regard. He said that the students should be taught how to learn like the university students. This is so important especially in virtual learning. (c) Disturbance of the breeding dimension: Interviewee [T11] pointed to the disruption in the breeding dimension during VE, and in his opinion, the social, moral and educational development of students was one of the neglected and unnoticed points in VE, which the parties involved did not realize its importance. He also believed that there is no proper interaction between the students and teachers.

Challenges of the Teacher Training System

Teachers themselves are community educators but neglecting to teach teachers and keeping them up to date will have detrimental long-term outcomes. Teachers are taught how to teach and its content from the beginning of the educational system at the University of culture, and then they are taught to enter schools, and while serving in the educational system, they receive new teaching methods that can update the knowledge of teachers so that they are up to date and can attract students to learn based on the new teaching styles and new content. (1) Significant shortcoming weakness of the in-service

training system: The in-service system is a system created by the Ministry of Education to keep teachers up to date and continue their education in order to improve education. The system was mostly in person in the past and until the early 1990s and then it became an online system in this regard the interviewee (No. 1) presented an interesting comparison of these two periods and said: "Teaching in online system is in this way that the teachers upload the thirty or forty hours that they have to teach on the site, and every student answer the questions randomly or pay money to someone else for answering them." We have an evaluation, and in this evaluation, everyone has to spend forty hours in service. We used to go to class and learn from the teacher, take the exam in person, and get a grade. But now the video is uploaded on the site which often is disrupted. If it works, you'll have to use a lot of internet to download the video. So, it doesn't worth. Therefore, the students pay someone else to take the exam instead of them. The teacher doesn't receive the train at all. Education is completely abandoned because we don't have an inspection. Earlier, the teachers had in-service training and they were so professional. (2) Insufficient proficiency in utilizing educational technologies: Interviewee (No. 11) said: The content production and the method of using cyberspace for teaching is important for encouraging the students for class participation and their monitoring in a way that their self-confidence doesn't decrease. (3) Relying on traditional teaching methods: In this regard the interviewee (No. 7) said: The teachers didn't have a single method for VE. They taught the same in-person teaching, and they didn't work based on the book which should be taught. Their teaching methods were wrong and they were not monitored. (4) Inadequate personal habit of a teacher in online education: In this regard, the interviewee (No. 7) said: "virtual education is not bad, provided that the time schedule is managed the same as the in-person education."

DISCUSSION

This study explored Iranian high school teachers' lived experiences of virtual education (VE) during and after pandemic-related disruptions. Four interrelated themes captured the core challenges: (1) material and technological supports, (2) top-down educational policy, (3) hidden foundations of education, and (4) teacher training systems. Below, we interpret each theme in light of prior research, then synthesize cross-cutting insights, practical implications, and study limitations.

Material and Technological Supports

Teachers consistently emphasized infrastructural barriers—unreliable internet speed and stability, intermittent connectivity, limited access to devices, and platform limitations—which collectively constrained instructional quality and equitable access. These findings echo prior reports identifying bandwidth issues and device scarcity as primary obstacles in online and blended contexts (e.g., Firat & Bozkurt, 2020; Saglam et al., 2023). The concern over inadequate authentication and assessment integrity (e.g., parents completing tasks) extends beyond technical glitches to questions of validity and fairness in VE, aligning with research that highlights monitoring and academic honesty as persistent pain points (e.g., Haji et al., 2021). Finally, teachers' calls for in-person supplementation in specific contexts resonate with work recommending multimodal, context-responsive delivery—particularly in underserved areas where digital divides are

acute (e.g., Chigama & Goronga, 2022). Together, these patterns suggest that technical provision (devices, bandwidth, stable platforms) is necessary but not sufficient; it must be paired with assessment redesign and support structures that safeguard authenticity and equity.

Top-Down Educational Policy

Participants described policy rollouts as confusing and rapidly shifting, especially when oscillating between in-person and online modes without adequate lead time or resourcing. This perception aligns with scholarship noting the strain that high-velocity policy changes place on local implementation, monitoring, and teacher workload (e.g., Huber & Helm, 2020). Accounts of "centralized directives without effective inspection" reflect a governance gap: decisions made at ministerial levels did not consistently translate into actionable, supported school-level practices (see also Haji et al., 2021). The result, according to teachers, was intermittent compliance, uneven quality, and heightened anxiety for educators and families. These observations underscore that crisis-responsive governance requires not only decisive policies but also transparent communication, phase-in timelines, and formative monitoring oriented toward guidance rather than punitive oversight.

Hidden Foundations of Education

Teachers pointed to less visible—but consequential—factors: limited digital and supervisory literacy among school leaders, insufficient parental orientation to VE roles, and disruptions to the "breeding/educative" (social-moral) dimension of schooling. These insights dovetail with studies showing that VE challenges are as much social and relational as they are technical: weak home–school partnerships and reduced opportunities for purposeful interpersonal interaction can erode engagement, belonging, and socio-emotional development (e.g., Mehall, 2020; Saglam et al., 2023). Teachers' calls to "teach students how to learn" online highlight the hidden curriculum of self-regulation, metacognition, and digital citizenship—competencies rarely formalized but crucial for success in VE. Viewed together, this theme reframes VE not merely as a platform problem but as a whole-ecosystem issue shaped by leadership capacity, family readiness, and student learning strategies.

Teacher Training System

Finally, teachers described systemic shortcomings in pre-service preparation and in-service development: limited hands-on training with educational technologies, reliance on traditional methods transplanted into online spaces, and perfunctory or externally completed online "courses." These concerns mirror earlier work cautioning that teacher beliefs, self-efficacy, and practical pedagogical repertoires are decisive for meaningful ICT integration (e.g., Asif et al., 2020; Hassan, 2021). Reports of weak inspection and low instructional payoff from in-service programs echo findings that credentialing without coaching rarely changes practice (e.g., Haji et al., 2021; Raofi & Tarikhi Ghochani, 2005). The through line is clear: capacity building must be experiential, mentored, and sustained—linking design for engagement, assessment integrity,

feedback, and online classroom interaction rather than focusing narrowly on tool familiarization.

Cross-Cutting Synthesis

Across themes, a consistent pattern emerges*:* infrastructure (Theme 1), governance (Theme 2), human and socio-cultural capacity (Theme 3), and professional learning (Theme 4) are mutually reinforcing. Weakness in any one domain can neutralize gains in the others. For example, even with stable platforms, unclear policies and low parental orientation can undermine attendance and assessment integrity; conversely, strong leadership and family engagement cannot compensate for chronic bandwidth or device gaps. This interplay suggests a systems perspective: durable improvement in VE depends on coordinated actions across policy, infrastructure, pedagogy, and stakeholder readiness.

Implications for Policy and Practice

strengthen virtual education, systems should first stabilize the basics by guaranteeing minimum bandwidth and device-access standards, hardening national platforms, and embedding identity-verification and assessment-integrity features alongside low-tech contingency plans. Governance should then shift from compliance to capacity: announce modality changes with clear timelines, provide implementation playbooks, and use formative monitoring that prioritizes coaching over fault-finding. The hidden curriculum must be made explicit through brief, plain-language guides for parents and micro-modules for students on self-regulation, academic honesty, and online communication norms. Teacher learning should be rebuilt as practice-centered, replacing passive, video-only in-service with coached design cycles (plan–teach–reflect), peer observation, and artifact-based assessment (e.g., engagement plans, feedback routines, and integrity-aware assessments). Finally, equity demands targeted supports—such as connectivity grants, device lending, and community learning hubs—directed to low-income communities, with in-person touchpoints supplementing VE where feasible. By foregrounding teachers' voices within a phenomenological design, this study contributes context-specific insights into how VE challenges are experienced and interpreted. However, the Tehran-based sample and teacher-only perspective limit generalizability. Future work could triangulate teacher accounts with students, parents, and policymakers, employ mixed methods to quantify the prevalence and impact of identified challenges, and use longitudinal designs to evaluate reforms in teacher learning, platform stabilization, and family engagement.

CONCLUSION

This study contributes to post-pandemic scholarship on VE by reframing its quality as a socio-technical system in which four dimensions (i.e., material/technological supports, governance practices, hidden social-educational foundations, and teacher learning) operate interdependently. Beyond confirming well-documented access issues, the data analysis offers three novel insights. First, it foregrounds assessment integrity and identity verification as equity issues, not merely technical obstacles, with downstream effects on validity and trust. Second, it surfaces the hidden curriculum of VE (i.e.,

students' self-regulation, families' role literacy, and leaders' digital supervision) as a decisive but under-specified driver of engagement. Third, it shifts attention from policy compliance to capacity-building governance, demonstrating how timeline clarity, playbooks, and formative monitoring facilitate classroom-level enactment. These contributions provide a practical blueprint for policy and teacher education frameworks in the post-pandemic era. For policymakers, the findings argue for (a) stabilizing infrastructure baselines and hardening platforms with built-in integrity features; (b) transition protocols that announce modality changes with clear timelines; and (c) formative oversight oriented to coaching rather than fault-finding. For teacher education, the study supports practice-centered professional learning, including the plan–teach–reflect design, peer observation, and artifact-based assessment (e.g., engagement plans, feedback routines, integrity-aware assessments). Finally, to operationalize the hidden curriculum, systems should provide concise, vernacular guides for parents and micro-modules that cultivate students' self-management and digital citizenship, complemented by targeted equity supports (device lending, connectivity grants, local learning hubs).

While the study focus on the teacher-centered context, it may predispose interpretations of the evidence toward classroom delivery and workload concerns, potentially underrepresenting students' motivational dynamics and parents' home-support constraints. Excluding students and parents may have inflated reports of assessment misconduct (e.g., assistance at home) without capturing families' rationales or students' self-reported strategies; it may also understate socio-emotional outcomes that learners themselves could articulate (e.g., belonging, anxiety). These limitations caution against overgeneralization and help explain the strong emphasis on governance and teacher training observed here. Future research should triangulate across multi-stakeholder samples, pair qualitative accounts with mixed-methods measures of engagement and integrity, and evaluate the longitudinal impact of capacity-building policies and practice-centered training on equity, learning, and well-being.

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