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Investigating the Effectiveness of Virtual Education in the Educational System During the COVID-19 Pandemic from the Perspective of Lower Secondary School Teachers in Behbahan County

ABSTRACT

The present study aimed to investigate the effectiveness of virtual education from the perspective of lower secondary school teachers in Behbahan County during the COVID-19 pandemic. This study was conducted in response to the widespread transition from face-to-face instruction to online learning environments and sought to evaluate the effectiveness of virtual education across various educational dimensions. In terms of data collection, this research employed a survey design and, in terms of purpose, was an applied study. Methodologically, it was a descriptive-survey study. The statistical population consisted of 380 teachers employed in lower secondary schools in Behbahan County. A simple random sampling method was used based on the list of teachers working in the county's secondary schools, and according to Cochran's formula, a sample size of 174 participants was determined. Data were collected using a researcher-developed questionnaire consisting of 52 items rated on a Likert scale. Content validity was assessed using the Waltz and Bausell method, with evaluations provided by eight experts. The Content Validity Index (CVI) for all questionnaire items was calculated as 0.93, indicating a high level of content validity. Reliability was assessed using Cronbach's alpha coefficient, which yielded a value of 0.90, demonstrating satisfactory reliability. To address the research questions, mean scores with a 95% confidence level and one-sample t-tests were employed. In the inferential statistics section, independent-samples t-tests and analysis of variance (ANOVA) were conducted. All statistical analyses were performed using SPSS version 26. The findings indicated that, from the teachers' perspective, virtual education was effective in the dimensions of flexibility, educational content, organization of learning materials, and practical instructional tools. However, virtual education was perceived as ineffective in the dimensions of virtual page design, feedback, assessment and evaluation, workload (assignments), support systems, and teaching-learning activities.

Keywords: Virtual Education; Educational System; COVID-19; Teacher.

Introduction

The COVID-19 pandemic created one of the most extensive disruptions in contemporary education systems, forcing schools and teachers to replace conventional face-to-face instruction with virtual education in a short period of time. The rapid spread of the disease, including its early epidemiological concerns in Iran, made school closures and physical distancing necessary educational and public health responses (1). As a result, virtual education became not merely a supplementary method but the central mechanism for maintaining instructional continuity during the pandemic. This sudden transition challenged education systems to provide learning opportunities while simultaneously responding to technological, pedagogical, psychological, and organizational limitations (2). In this context, examining the effectiveness of virtual education from the perspective of teachers

is especially important because teachers were directly responsible for implementing online instruction, adapting content, managing learner interaction, evaluating student performance, and maintaining educational engagement under crisis conditions.

Virtual education during the pandemic revealed both opportunities and structural weaknesses. On the one hand, online learning enabled educational continuity, reduced physical contact, and created new possibilities for flexible access to learning resources (3). On the other hand, it exposed inequalities in access, limitations in digital infrastructure, insufficient teacher preparation, weak support systems, and challenges in student participation and assessment (4). Studies have shown that virtual education cannot be evaluated only by whether classes were held online; rather, its effectiveness depends on the quality of educational content, the organization of learning materials, teacher–student interaction, feedback, assessment procedures, technological tools, and institutional support (5). Therefore, the evaluation of virtual education requires a multidimensional approach that considers both instructional and systemic factors.

Teachers' perceptions are central to understanding the effectiveness of virtual education because they experienced the operational realities of online instruction more directly than any other educational group. During school closures, teachers had to redesign learning activities, prepare digital content, communicate with students and families, and assess learning outcomes in unfamiliar online environments (6). Research on teachers' adaptation to online teaching during COVID-19 indicates that teacher competence, prior digital experience, and institutional support played important roles in successful transition to virtual instruction (6). Similarly, international evidence shows that teachers' experiences of online teaching were shaped by workload pressure, digital skill requirements, limited interaction, and the need to redesign pedagogical practices (7). These findings suggest that teachers' viewpoints provide valuable evidence for identifying the strengths and weaknesses of virtual education.

In Iran, the expansion of virtual education during the COVID-19 period was accompanied by the rapid use of national and local platforms, especially the Student Educational Network known as SHAD. While these platforms supported the continuation of schooling, they also generated new challenges related to access, usability, educational quality, and feedback mechanisms (8). Studies examining the SHAD network have reported both advantages and disadvantages, including easier communication and continuity of instruction, as well as problems related to weak infrastructure, insufficient interactivity, and limited assessment validity (9). From the perspective of teachers, virtual education was often affected by inadequate preparation, uneven student access to digital devices, internet instability, and reduced control over learning processes (10). These findings demonstrate that virtual education in Iran requires careful empirical evaluation, particularly at the school level.

One important component of effective virtual education is the quality of educational content. In online learning environments, content must be clear, structured, accessible, and compatible with students' developmental and cognitive characteristics. The production of appropriate digital content is therefore one of the foundations of effective virtual instruction (11). Inadequate content design may reduce student comprehension, increase cognitive load, and weaken motivation. Conversely, well-designed content can support independent learning and compensate partly for the lack of physical classroom interaction. Evidence from studies on virtual mathematics education during the pandemic showed that virtual courses could contribute to learning when instructional content was properly organized and aligned with learning objectives (12). Therefore, content quality is a key criterion for assessing the effectiveness of virtual education.

Another major dimension is the organization of learning materials. Virtual learning requires instructional materials to be sequenced, categorized, and presented in ways that facilitate student access and comprehension. Poor organization can result in confusion, delayed learning, and reduced student engagement. During the pandemic, many teachers had to organize materials quickly and often without sufficient training, which affected the quality of online instruction (13). The pathology of virtual education from teachers' viewpoints has also indicated that disorganized content delivery and lack of coherent instructional

planning were among the central problems of online schooling (14). These findings show that the effectiveness of virtual education depends not only on the existence of digital materials but also on how those materials are structured and delivered.

Teaching–learning activities represent another critical dimension of virtual education. In traditional classrooms, teachers can observe students’ reactions, manage participation, and adjust instruction immediately. However, in virtual environments, interaction may become limited, delayed, or superficial. Studies on online learning during the pandemic found that teachers faced difficulties in maintaining student participation and ensuring meaningful learning activities (15). In addition, students’ access to virtual education significantly affected e-learning outcomes and academic achievement, especially when differences in technology access and home learning conditions were present (16). Therefore, teaching–learning activities in virtual education must be evaluated in terms of interaction, engagement, learning opportunities, and the extent to which students can actively participate.

Feedback is also a fundamental element of effective education. In virtual learning, timely and constructive feedback is necessary to guide students, correct misunderstandings, and maintain motivation. However, during the COVID-19 period, feedback processes were often weakened due to high workload, platform limitations, reduced synchronous interaction, and difficulties in monitoring student performance. Research has shown that the expansion of cyberspace during and after COVID-19 produced educational consequences for students, including changes in learning habits, communication patterns, and dependence on digital environments (17). These consequences indicate that feedback in virtual education should be designed intentionally and continuously rather than treated as an informal or secondary process.

Assessment and evaluation were among the most serious challenges of virtual education during the pandemic. Online assessment raised concerns about validity, academic honesty, student access, technical problems, and the ability of tests to measure actual learning. Teachers often found it difficult to ensure that students completed assignments and examinations independently. International experiences also showed that distance education required new assessment strategies and flexible evaluation systems appropriate to online learning conditions (18). Without reliable evaluation mechanisms, teachers may be unable to determine whether learning objectives have been achieved. Thus, assessment quality is an essential indicator of virtual education effectiveness.

Flexibility is one of the most frequently noted advantages of virtual education. Online instruction can allow students and teachers to access educational content without strict dependence on physical location and fixed classroom time. This flexibility was particularly important during lockdowns and school closures, when maintaining educational continuity was the main priority. Studies have emphasized that the COVID-19 crisis created opportunities to rethink educational practices and use information technology more extensively in teaching and learning (19). Moreover, international policy responses, such as Japan’s emphasis on leaving no learner behind during the crisis, highlighted the importance of flexible and inclusive educational strategies (20). Nevertheless, flexibility becomes effective only when accompanied by adequate access, structured content, and support systems.

Support systems are another major determinant of successful virtual education. Teachers and students require technical, pedagogical, and administrative support to participate effectively in online learning. Weak support systems can increase teacher stress, reduce instructional quality, and create barriers for students. Studies on virtual education challenges during COVID-19 have repeatedly emphasized the importance of infrastructure, training, platform stability, and institutional responsiveness (5). In higher education, virtual leadership during the pandemic was also found to depend on organizational readiness, digital coordination, and the ability of leaders to guide educational institutions through technological change (21). Although school education differs from higher education, these findings show that successful virtual instruction requires coordinated leadership and support.

The workload imposed by virtual education is another issue that affected teachers and students during the pandemic. Teachers were often required to prepare digital content, respond to students outside formal class hours, manage online communication, and design assignments suitable for virtual platforms. Students also faced increased assignments, screen fatigue, and difficulties in managing independent learning. Research on the psychological and educational effects of virtual education has shown that online learning conditions may influence students' mental health and well-being, especially when workload and stress are not properly managed (22). Therefore, workload should be considered not only as an instructional issue but also as a factor related to motivation, participation, and psychological adjustment.

The social and motivational aspects of virtual education must also be considered. The pandemic reduced direct peer interaction, weakened classroom atmosphere, and increased dependence on digital communication. Learning in such conditions required self-regulation, motivation, and creative adaptation from both teachers and students. Although not limited to education during COVID-19, research on creativity and motivation suggests that motivational intensity can influence idea generation and evaluation, which may be relevant to how teachers and students respond to new learning conditions (23). In virtual education, motivation is closely related to instructional design, feedback, perceived usefulness, and the degree to which students feel connected to the learning process.

Comparative and international studies further show that the effectiveness of virtual education varied across countries according to infrastructure, teacher preparation, policy responses, and family support. A comparison of distance learning during the pandemic in European countries highlighted differences in readiness and implementation quality (24). Similarly, the experience of online learning in Indonesia demonstrated that teachers perceived both benefits and serious challenges, including internet access, student participation, and assessment limitations (15). UNESCO's regional analysis also emphasized that educational systems needed to respond not only to immediate school closures but also to longer-term learning loss, equity gaps, and digital transformation needs (2). These studies suggest that local evaluations are necessary because the effectiveness of virtual education depends heavily on contextual conditions.

In the Iranian educational context, several studies have examined virtual education during COVID-19 from the perspectives of teachers and students. Research on elementary teachers in Zahedan evaluated the effectiveness of virtual education and emphasized the importance of teachers' viewpoints in identifying operational problems (25). Other studies examined the role of coronavirus in the virtual education of elementary students and showed that the pandemic accelerated the use of online learning while simultaneously revealing educational inequalities and implementation barriers (26). Studies on the challenges of virtual education at the elementary level also identified problems related to access, educational interaction, content quality, and support mechanisms (13). These findings provide an empirical foundation for examining similar issues among lower secondary school teachers.

Despite the growing body of research on virtual education during the pandemic, there remains a need for localized studies that examine multiple dimensions of effectiveness from teachers' perspectives. Many studies have focused on general challenges, access, or platform use, while fewer have assessed components such as flexibility, educational content, organization of learning materials, practical tools, page design, feedback, workload, support systems, teaching-learning activities, and assessment in an integrated framework. In addition, educational effectiveness may vary across school levels and regions; therefore, findings from elementary schools or higher education cannot be directly generalized to lower secondary education. Curriculum design research also emphasizes that educational models should be validated based on contextual needs and learner characteristics, which supports the necessity of local evidence for improving educational planning (27).

Given the central role of lower secondary school teachers in implementing virtual education during the COVID-19 pandemic, evaluating their perceptions can provide practical evidence for improving online education policies, instructional

design, teacher training, and support systems. The experience of the pandemic demonstrated that virtual education is likely to remain part of educational systems beyond emergency conditions; therefore, understanding its strengths and weaknesses is necessary for future planning. Based on the reviewed literature, virtual education can be effective when content is well designed, learning materials are organized, tools are practical, flexibility is supported, and feedback and evaluation are reliable. However, when infrastructure, interaction, assessment, workload management, and support systems are weak, its effectiveness may be substantially reduced.

The aim of this study was to investigate the effectiveness of virtual education during the COVID-19 pandemic from the perspective of lower secondary school teachers in Behbahan County.

Methods and Materials

This study was conducted with an applied purpose, as its findings were intended to address a practical educational issue and provide evidence that could support decision-making processes within the educational system. In terms of methodology, the study employed a descriptive-survey design. The research focused on evaluating the effectiveness of virtual education during the COVID-19 pandemic from the perspective of lower secondary school teachers in Behbahan County, Iran.

The statistical population consisted of all teachers employed in lower secondary schools in Behbahan County during the study period. According to the latest statistics provided by the local Department of Education, the total number of teachers was estimated at 380 individuals. The sample size was determined using Cochran's sample size formula, taking into account the finite population size, which resulted in a required sample of 174 participants. A simple random sampling method was employed to ensure that all members of the population had an equal chance of being selected. The sampling frame was prepared using the official list of teachers working in lower secondary schools across Behbahan County, and participants were selected randomly from this list.

Data were collected using a researcher-developed questionnaire designed to assess the effectiveness of virtual education during the COVID-19 pandemic. The instrument consisted of 52 items measured on a five-point Likert scale ranging from strongly disagree to strongly agree. The questionnaire was developed to evaluate multiple dimensions of virtual education, including flexibility, educational content, organization of learning materials, practical instructional tools, virtual page design, feedback mechanisms, assessment and evaluation procedures, workload and assignments, support systems, and teaching-learning activities.

The content validity of the questionnaire was assessed using the Waltz and Bausell method. To evaluate the relevance, clarity, and appropriateness of the questionnaire items, the instrument was reviewed by a panel of eight experts in the fields of education and educational evaluation. Based on their assessments, the Content Validity Index (CVI) was calculated for all questionnaire items. The overall CVI value was 0.93, indicating a high level of content validity and demonstrating that the questionnaire items were considered highly representative of the construct being measured.

The reliability of the instrument was examined using Cronbach's alpha coefficient. Reliability analysis yielded an alpha value of 0.90, indicating excellent internal consistency among the questionnaire items. This result suggests that the instrument possessed a satisfactory level of reliability and was suitable for measuring teachers' perceptions regarding the effectiveness of virtual education during the COVID-19 pandemic.

Data analysis was conducted using both descriptive and inferential statistical techniques. Descriptive statistics were employed to summarize the characteristics of the respondents and to provide an overview of the collected data. Measures such as frequencies, percentages, means, and standard deviations were used to describe the demographic characteristics of participants and their responses to the questionnaire items.

For inferential analysis, one-sample t-tests were used to examine the research questions and determine whether the mean scores of the effectiveness dimensions differed significantly from the theoretical average value. Mean scores were interpreted using a 95% confidence level. Additionally, independent-samples t-tests were conducted to investigate differences between groups based on demographic characteristics, while analysis of variance (ANOVA) was employed to compare mean scores across multiple groups when appropriate. All statistical analyses were performed using Statistical Package for the Social Sciences (SPSS), version 26, and statistical significance was evaluated at the conventional confidence level of 95%.

Findings and Results

To examine the effectiveness of virtual education during the COVID-19 pandemic from the perspective of lower secondary school teachers in Behbahan County, one-sample t-tests were conducted for the overall score of virtual education and its components. The criterion value for determining effectiveness was considered 70. Mean scores higher than this criterion indicated favorable effectiveness, whereas mean scores lower than 70 indicated that the component did not have desirable effectiveness.

Table 1. Results of one-sample t-test for the effectiveness of virtual education and its components

Component	N	Mean	SD	Mean Difference	95% CI Lower	95% CI Upper	t	Sig.	Interpretation
Virtual education	174	62.40	16.60	-2.60	-4.40	1.20	-2.10	0.086	Not effective
Educational content	174	71.60	13.30	6.60	4.60	8.60	6.50	0.000	Effective
Teaching–learning activities	174	64.60	16.00	-0.40	-2.00	2.30	-0.30	0.000	Not effective
Practical tools	174	69.40	17.20	4.30	1.80	6.90	3.30	0.000	Effective
Virtual page design	174	58.50	17.80	-6.40	-9.10	-3.80	-4.70	0.000	Not effective
Organization of learning materials	174	75.40	14.20	10.40	8.30	12.60	9.70	0.000	Effective
Feedback	174	43.50	16.50	-21.40	-23.90	-18.90	-17.10	0.000	Not effective
Flexibility	174	76.90	13.70	11.90	9.80	11.90	11.40	0.000	Effective
Workload/assignments	174	61.30	16.60	-3.60	-6.10	-1.20	-3.60	0.004	Not effective
Support system	174	50.80	19.03	-14.10	-16.90	-11.20	-9.60	0.000	Not effective
Assessment and evaluation	174	58.50	16.50	-6.90	-9.40	-4.40	-5.50	0.000	Not effective

The results showed that the overall mean score of virtual education during the COVID-19 pandemic was 62.40, which was lower than the criterion value of 70. The one-sample t-test result was negative, indicating that, from the perspective of lower secondary school teachers in Behbahan County, virtual education did not have a generally desirable level of effectiveness. Therefore, although virtual education was implemented as an alternative to face-to-face education during the pandemic, the overall evaluation of teachers indicated limitations in its effectiveness.

Regarding educational content, the mean score was 71.60, which was above the criterion value. The positive t-value indicated that teachers evaluated the educational content used in virtual education as effective. Similarly, the organization of learning materials had a mean score of 75.40, and flexibility had the highest mean score, 76.90. These findings suggest that teachers perceived virtual education as effective in terms of access flexibility, organization of instructional materials, and the quality or appropriateness of educational content.

The results for practical tools also showed a relatively favorable condition. The mean score for this component was 69.40, and the positive t-value suggested that teachers considered the applied tools of virtual education to be effective. Although the mean was slightly below 70, the inferential result indicated a positive evaluation of this component. This finding shows that the technological and instructional tools used in virtual education were perceived as useful by teachers, particularly in supporting the continuation of education during school closures.

In contrast, several components were evaluated negatively. Teaching–learning activities had a mean score of 64.60, virtual page design had a mean score of 58.50, workload and assignments had a mean score of 61.30, the support system had a mean score of 50.80, and assessment and evaluation had a mean score of 58.50. These results indicate that teachers did not consider these aspects of virtual education to be sufficiently effective. The negative t-values for these components suggest weaknesses in instructional interaction, design quality, assignment management, technical or educational support, and online evaluation procedures.

The lowest mean score belonged to feedback, with a mean of 43.50, indicating the weakest evaluated component of virtual education. The strongly negative t-value showed that teachers perceived feedback mechanisms in virtual education as clearly ineffective. Overall, the findings indicated that virtual education during the COVID-19 pandemic was effective in the components of educational content, organization of learning materials, practical tools, and flexibility, but it was not effective in virtual page design, feedback, assessment and evaluation, workload, support systems, and teaching–learning activities.

Discussion and Conclusion

The present study investigated the effectiveness of virtual education during the COVID-19 pandemic from the perspective of lower secondary school teachers in Behbahan County. The findings revealed that the overall effectiveness of virtual education was below the predetermined criterion level. More specifically, teachers evaluated the dimensions of educational content, organization of learning materials, practical tools, and flexibility positively, whereas virtual page design, feedback, assessment and evaluation, workload (assignments), support systems, and teaching–learning activities were evaluated negatively. These findings indicate that although virtual education succeeded in maintaining educational continuity during the pandemic, several essential pedagogical and organizational components were not sufficiently effective from the perspective of teachers.

The first major finding showed that the overall effectiveness of virtual education was not considered satisfactory by teachers. This result is consistent with previous studies that highlighted numerous challenges associated with emergency online learning during the COVID-19 pandemic. Research has demonstrated that the rapid transition from face-to-face instruction to virtual environments often occurred without adequate preparation, resulting in technical, pedagogical, and organizational difficulties (4, 5). Similarly, investigations conducted among Iranian teachers revealed concerns regarding educational quality, technological limitations, and reduced interaction in virtual classrooms (10, 13). International evidence also supports these findings, suggesting that while virtual education provided an essential solution during school closures, its effectiveness was often constrained by infrastructure limitations, insufficient training, and unequal access to educational resources (2, 24). Therefore, the relatively low overall effectiveness observed in the present study appears to reflect both local and global challenges associated with emergency remote teaching.

One of the most important positive findings of this study was the effectiveness of educational content. Teachers reported that educational content in virtual environments achieved a satisfactory level of effectiveness. This result may be explained by the considerable efforts made by teachers and educational institutions to adapt instructional materials for online delivery during the pandemic. The development of digital educational resources, recorded lessons, multimedia presentations, and electronic learning materials provided students with continuous access to instructional content despite school closures. Previous studies have similarly emphasized the critical role of high-quality digital content in successful online learning experiences (11). Furthermore, evidence from virtual mathematics education during the COVID-19 period demonstrated that carefully designed online content could support student learning and educational achievement (12). The findings of Elahyari and Jahangiri also suggested that virtual educational platforms could contribute positively to learning when supported by appropriate content and

instructional resources (9). Consequently, the positive evaluation of educational content in the present study suggests that teachers were relatively successful in adapting curriculum materials to online formats.

The effectiveness of the organization of learning materials represents another noteworthy finding. Teachers perceived the organization and sequencing of educational materials as one of the strengths of virtual education. This result may reflect the structured nature of digital learning environments, where instructional resources can be categorized, archived, and accessed systematically. Compared to traditional classrooms, online platforms often allow students to revisit educational materials repeatedly, facilitating self-paced learning and review. Previous studies have emphasized that effective organization of digital resources improves accessibility, reduces learner confusion, and supports educational engagement (14). Similarly, curriculum and educational design research has highlighted the importance of coherent instructional structures in promoting learning effectiveness (27). Therefore, the favorable evaluation of this dimension suggests that teachers perceived online educational materials as relatively well organized and accessible.

The findings also indicated that flexibility was one of the strongest dimensions of virtual education. This result is consistent with the literature describing flexibility as a major advantage of online learning environments. Virtual education enables learners and teachers to access educational content regardless of geographical location and, in many cases, according to individualized schedules. During the COVID-19 pandemic, flexibility became particularly important because it allowed educational systems to continue functioning despite social distancing measures and school closures. Previous studies have similarly identified flexibility as one of the principal benefits of virtual education (3, 19). International educational policies during the pandemic likewise emphasized flexible learning opportunities to ensure educational continuity and inclusiveness (2, 20). The high effectiveness score for flexibility in the present study therefore aligns closely with existing evidence and highlights one of the most valuable contributions of virtual education.

The practical tools used in virtual education were also evaluated positively. This finding suggests that teachers generally perceived educational technologies, communication platforms, and digital instructional tools as useful for supporting learning activities. The availability of video conferencing applications, educational networks, messaging platforms, and multimedia tools enabled teachers to continue instruction under unprecedented circumstances. Similar findings have been reported in previous studies, which found that educational technologies facilitated communication, content delivery, and instructional continuity during the pandemic (8, 19). Moreover, studies conducted in higher education settings demonstrated that technology-mediated learning environments could effectively support teaching when adequate technological resources were available (18). The positive perception of practical tools in the present study may therefore reflect the successful integration of digital technologies into teaching practices during the pandemic.

Despite these positive findings, several dimensions of virtual education were evaluated negatively. One such dimension was teaching–learning activities. Teachers reported that virtual environments were not sufficiently effective in facilitating instructional interactions and learning activities. This finding may be attributed to reduced face-to-face communication, limited opportunities for classroom discussion, and challenges in monitoring student engagement. Online learning environments often restrict spontaneous interaction and make it more difficult for teachers to observe students’ understanding and participation. Previous studies have similarly reported difficulties in maintaining active student engagement during online instruction (7, 15). Research examining teachers’ adaptation to online teaching also found that instructional interaction was among the most challenging aspects of virtual education (6). Therefore, the negative evaluation of teaching–learning activities appears consistent with the broader literature on online learning challenges.

Another significant finding was the negative evaluation of virtual page design. Teachers believed that the design of virtual learning environments did not adequately support educational objectives. Poor interface design, limited usability, navigation

difficulties, and inadequate visual organization may have contributed to this perception. Previous research has indicated that educational platforms developed rapidly during the pandemic often lacked optimal user-centered design features (8). In addition, studies focusing on virtual education challenges in Iran reported concerns regarding the usability and functionality of educational platforms (5, 10). Consequently, the negative findings regarding virtual page design suggest a need for more sophisticated and learner-centered digital learning environments.

Feedback emerged as the weakest dimension of virtual education in the present study. Teachers reported substantial difficulties in providing effective feedback to students. This finding is understandable given the limitations of virtual communication, increased teacher workload, and reduced opportunities for direct interaction. Effective feedback requires timely communication, continuous monitoring of student progress, and meaningful dialogue between teachers and learners. However, virtual environments may hinder these processes, particularly when large numbers of students are involved. Previous studies have similarly emphasized the challenges associated with maintaining effective communication and feedback in online learning contexts (13, 17). The exceptionally low evaluation of feedback in the present study highlights the importance of developing more interactive and responsive virtual learning systems.

Assessment and evaluation were also perceived as ineffective. This result aligns with numerous studies identifying online assessment as one of the most problematic aspects of virtual education during the pandemic. Concerns regarding academic integrity, test validity, technological difficulties, and limited monitoring capabilities often reduced teachers' confidence in online assessment outcomes (18). Similar challenges have been reported in Iranian educational settings, where teachers expressed concerns about the accuracy and fairness of virtual examinations (5, 14). The negative findings concerning assessment suggest that although instruction could be transferred online relatively quickly, effective evaluation systems were more difficult to implement.

The findings regarding workload and assignments further demonstrate the challenges of virtual education. Teachers perceived the volume and management of assignments as ineffective. During the pandemic, many educators compensated for reduced classroom interaction by increasing the number of assignments, which often created excessive workloads for both students and teachers. Increased workload may contribute to fatigue, reduced motivation, and lower educational satisfaction. Previous studies have noted that online learning frequently increases demands on teachers and students, requiring additional time for communication, content preparation, and task completion (7, 22). Therefore, the negative evaluation of workload may reflect difficulties in balancing educational expectations with the realities of virtual learning environments.

The support system was another dimension evaluated negatively by teachers. Effective virtual education depends heavily on institutional support, including technical assistance, professional development, administrative coordination, and access to digital infrastructure. The findings suggest that teachers perceived deficiencies in these support mechanisms. Previous studies have repeatedly identified inadequate support systems as a major obstacle to successful online learning implementation (10, 13). Furthermore, research on virtual leadership in educational institutions emphasized the importance of organizational readiness and coordinated support during periods of educational disruption (21). The negative evaluation of support systems in the present study therefore highlights a critical area for educational improvement.

Overall, the findings suggest that virtual education during the COVID-19 pandemic functioned more successfully in areas related to content delivery, flexibility, organization, and technology utilization than in areas requiring interaction, support, feedback, and evaluation. This pattern is consistent with international experiences during the pandemic, where educational systems generally succeeded in maintaining instructional continuity but struggled to replicate the interpersonal, motivational, and evaluative functions of traditional classrooms (2, 24). The results also support previous Iranian studies demonstrating that while virtual education created valuable opportunities for educational access and continuity, substantial challenges remained

regarding quality, interaction, infrastructure, and educational effectiveness (16, 25, 26). Consequently, improving virtual education requires a balanced approach that preserves its strengths while addressing weaknesses related to communication, assessment, support, and instructional engagement.

Several limitations should be considered when interpreting the findings of this study. First, the study was conducted exclusively among lower secondary school teachers in Behbahan County, which may limit the generalizability of the findings to other educational levels, regions, or populations. Second, the study relied on self-report questionnaire data, making the results subject to response bias and individual perceptions. Third, the cross-sectional design captured teachers' viewpoints at a specific point in time and did not allow for examination of changes in perceptions over the course of the pandemic. Finally, the study focused solely on teachers' perspectives and did not include the views of students, parents, school administrators, or educational policymakers.

Future studies should investigate the effectiveness of virtual education across different educational levels and geographical regions to provide a broader understanding of online learning experiences. Comparative studies involving teachers, students, parents, and administrators could offer a more comprehensive evaluation of virtual education systems. Researchers are also encouraged to employ mixed-methods designs that combine quantitative and qualitative approaches to explore the underlying reasons for perceptions of effectiveness and ineffectiveness. Longitudinal studies examining changes in virtual education practices and outcomes over time would further contribute to understanding the long-term impact of digital learning environments.

Educational authorities should strengthen technical and pedagogical support systems for teachers and students participating in virtual education. Greater attention should be devoted to improving the design and usability of learning platforms, developing more effective feedback mechanisms, and implementing reliable online assessment procedures. Professional development programs should be provided to enhance teachers' digital competencies and instructional strategies for online learning. In addition, efforts should be made to manage student workload appropriately, promote interactive teaching–learning activities, and ensure equitable access to technological resources. Such measures can help maximize the benefits of virtual education while minimizing the challenges identified in this study.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

All ethical principles were adhered in conducting and writing this article.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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