Research Article

Effectiveness of Need-Based Teacher's Training Program to Enhance Online Teaching Quality

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The COVID-19 pandemic drastically transformed the global education system forever. To sustain the education system, e-learning has been adopted as an alternative teaching-learning strategy in most countries. Due to this sudden transition, teachers had practically no time to prepare themselves for distance learning, especially in developing countries. Consequently, teachers faced numerous challenges while teaching online. The present study aimed to explore the effectiveness of need-based teachers' training programs to address online teaching challenges faced by primary and secondary level teachers. Adopting a mixed-method research approach, this study was conducted between January and July 2021 at 6 primary and secondary level institutions in 4 different districts of Bangladesh. Primary data were collected through face-to-face surveys, electronic surveys, and one-to-one semi-structured interviews. Descriptive analysis and bivariate correlational analysis were carried out for quantitative data exploration. On the other hand, qualitative data were coded and analyzed thematically. Findings highlight that less familiarity with online teaching tools, lack of digital skills, unstable Internet connectivity, difficulties with time management, insufficient teaching materials, lack of satisfaction, heavy workload, and poor self-confidence were the key barriers to online teaching. However, in this study, a proper need-based teacher training program is found to be considerably effective in improving online teaching quality by increasing teachers' technological skills, confidence, satisfaction, motivation, time management skill, and behavioral changes. The overall findings of this study are expected to assist the devolved authorities in implementing synchronized policies to improve online teaching quality.

1. Introduction

The COVID-19 pandemic has affected every aspect of human life globally. Recognizing it as an existential threat, governments around the world have taken strict public health measures (e.g., curfews, travel bans, remote offices, lockdowns, social distancing, isolation, quarantine, etc.) to prevent the spread of the virus [1–4]. Simultaneously, e-learning has been adopted as an alternative teaching and learning strategy to traditional face-to-face education [5]. Although most technologically advanced countries have all the tools needed for online education, the least developed countries (LDCs) and developing countries have faced a huge challenge to adapt the new normal situation [6]. This is because, in most

developing countries, e-learning was underutilized before the pandemic [7] due to a lack of ICT knowledge, poor network infrastructure, weakness in content development, etc. [8]. As a consequence, developing countries that were mainly focused on traditional face-to-face instructions encountered various challenges (e.g., teachers', students', institutional, infrastructural, technological, and logistical) in this sudden transition [9–13]. However, this study primarily focuses on the challenges faced by teachers of primary and secondary level institutions in Bangladesh during the COVID-19 crisis and discusses the possible solutions.

Bangladesh is a South Asian country that emerged as an independent nation half a century ago after the bloody liberation war. From being one of the poorest nations at

birth in 1971, Bangladesh reached the lower-middle income status in 2015, intending to be an upper-middle-income country by 2031 [14]. According to the Centre for Economics and Business Research (CEBR), Bangladesh has been amongst the world's fastest-growing economies over the last decade, owing to the demographic dividend, readymade garments (RMG), remittances, and stable macroeconomic conditions [15]. At the same time, primary and secondary education in Bangladesh has also made significant strides [16]. However, the education system is still not adequately successful to meet the overall objectives of SDGs by 2030 [17]. Here, the quality of education is questionable in many ways in all levels of institutions (primary, secondary, and tertiary). According to UNICEF, the biggest drawback for the children in primary schools in Bangladesh is the quality of education (inadequate infrastructure, under-qualified teachers, lack of monitoring, and lack of accountability), leading to low learning outcomes and inevitably dropping out [18]. The problem's been made far more difficult by the presence of COVID-19.

In Bangladesh, a country-wide lockdown was imposed from 26 March, 2020, to 04 April, 2020 [19], which has been extended several times depending on the situation. At the same time, in-person education has been closed since 17 March 2020 [20] and all educational institutions (both public and private) have been forced to adopt "E-learning." This sudden declaration of the closure of educational institutions and the adoption of full e-learning have made it difficult for teachers and students to get used to this situation. To counter such undesirable situations, Bangladesh Television (BTV) has begun broadcasting an educational program titled "My School at My Home" for students in sixth through tenth grade [21]. In general, in almost all educational institutions in Bangladesh (primary, secondary, and tertiary), both students and teachers are familiar with the conventional face-to-face teaching-learning strategies where teachers play an active role [22]. Therefore, less familiarity with digital teaching-learning tools has emerged as a key barrier, particularly among teachers while teaching online [23]. Since the majority of teachers had teaching experiences in traditional classroom settings, they were not accustomed to the dynamics of online teaching [24]. Thus, despite numerous efforts of government and policymakers, several barriers and difficulties, particularly from the perspective of teachers, have been highlighted in previous studies. For instance, in a study [25], the authors discovered that the biggest obstacle that made online learning more difficult than traditional is teachers' inability to use digital teaching-learning materials and inadequate communication skills. Since the materials they had for their traditional face-to-face courses were insufficient for online settings; therefore, they faced technical problems while rebuilding those materials [26]. Thus, issues occurred when teachers were going to create interactive learning resources, present those materials online, offer feedback, and conduct formative assessments [27, 28]. On the other hand, according to studies [13, 23, 29, 30], the toughest difficulties that teachers faced during online instruction were mobilizing students' learning attention, maintaining classroom discipline, organizing classroom discussion, motivating students, and giving online feedback. Another review study [10] claimed that due to a lack of technological skills, digital equipment, expertise, management skills, limited access to digital devices, Internet, and psychological issues, teachers in India's schools, colleges, and universities faced numerous challenges when taking online classes. As the majority of teachers lacked professional training or expertise with online teaching tools (e.g., WizIQ, ClassDojo, Kahoot, Google Classroom, Zoom, etc.) [31], they were in dilemma as to whom to listen to and which tools to adopt [32]. Due to the aforementioned limits, teachers have developed negative perceptions of implementing e-learning [25]. Therefore, the majority of teachers believe that face-to-face teaching is more effective than online teaching, and a majority of them are dissatisfied with e-learning activities [33].

It is indeed apparent to all previous studies that teachers confronted numerous difficulties due to the abrupt transition to an online teaching-learning environment. However, very few studies [34, 35] were identified focusing on teachers' needs, and a potential way to overcome this situation, particularly at the primary and secondary levels. Moreover, while some studies [26, 31, 36] have recommended potential remedies (e.g., adequate training, better technology-based skills, workshops for teacher development, etc.) to these issues, none of these studies have empirically validated any approach. At the same time, as far as researchers' knowledge, the majority of prior studies have focused on university-level teachers. To fill this void, the primary objective of this study is to investigate the challenges faced by primary and secondary level teachers of Bangladesh while teaching online and then to assess the efficacy of a need-based teachers' training program designed to address these issues during the ongoing pandemic crisis. Consequently, this empirical study will answer the following research questions:

> RQ1: How satisfied and confident are the primary and secondary teachers of Bangladesh in teaching online?
>
> RQ2: What kind of challenges do they experience while taking online classes?
>
> RQ3: How effective is the need-based teacher training program in addressing those challenges?

To address the aforementioned research questions, the present study has been divided into 3 major stages. In the first stage, training need analysis (TNA) was conducted to determine the difficulties and barriers that primary and secondary school teachers encounter while attempting to teach online. As a prerequisite for a well-designed training program, TNA is used to identify participants' shortcomings and then determine the scope and volume of training required [37]. Therefore, if training is performed without considering instructors' needs and interests, it will not be as effective [38]. In the second stage, need-based training was designed based on the TNA and conducted in the second stage in 6 distinct primary and secondary level institutions. Finally, in the third stage, the effectiveness of the teachers' training program was measured by Kirkpatrick's 4 levels Training Evaluation Model [39].

2. Materials and Methods

2.1. Study Design and Settings. By adopting a mixed-method sequential explanatory design (MSED) [40], this study was conducted between the 1st of January and the 1st of July, 2021, at 6 primary and secondary level institutions in 4 different districts of Bangladesh. To address the study objective, both quantitative and qualitative data were collected and analyzed in two consecutive phases (QUAN $\longrightarrow$ QUAL) [41]. In the quantitative phase, teachers' online teaching experience, satisfaction, confidence, and training performance, after-training feedback were evaluated. On the other hand, in the qualitative phase, teachers' perceptions of online teaching, and the perceived effectiveness of the teachers' training program were assessed using the Interpretative Phenomenological Analysis (IPA) [42, 43]. IPA is a well-known technique to gain deeper insights from semistructured interviews [44]. Here, the core objective was to explain the insights of quantitative data by qualitative evidence using the MSED model [45] (see Figure 1).

2.2. Participants and Sampling Procedure. The key participants of the study were 116 teachers (male: 79; female: 37), currently working in 6 distinct primary and secondary level institutions from 4 different districts of Bangladesh. Participants' detailed information is summarized in Table 1. Due to a large number of primary and secondary teachers in Bangladesh, it is nearly impossible to include all. In addition, depending on inclusion and exclusion criteria (specified below), the researchers had to carefully choose and approach eligible participants; therefore, purposive sampling was employed [46]. Purposive sampling is a well-known nonprobability sampling technique, frequently used in mixedmethod and qualitative research for identifying suitable information-rich samples relating to the phenomenon of interest [47, 48]. It entails identifying and selecting individuals who are particularly knowledgeable about or acquainted with that phenomenon of interest [49]. In this study, that phenomenon of interest was online teaching and the target participants were primary and secondary level teachers who were actively involved in e-learning. Therefore, the inclusion criteria included primary and secondary level teachers who were actively participating in online teaching during the study period, and were available, and willing to participate. In contrast, teachers who did not match the above criteria were excluded.

2.3. Data Collection Instrument and Procedure. The data collection instruments used in this study were a questionnaire (electronic and face-to-face) (see Appendix A), an observation scale (Appendix E), and a one-to-one semistructured interview (see Appendix C) designed by quantitative and qualitative research experts. The validity and reliability of the quantitative data collection instruments (questionnaire and observation scale) were confirmed by content validity and internal consistency reliability, respectively. Content validity was done by the judgment method. Following the recommendation of the study [50], a panel of 6 experts (practitioners from the education field) used a 5-point rating scale (see Appendix D) to evaluate the questionnaire and observation scale on dimensions such as relevance, representativeness, specificity, and clarity. To quantify the expert agreement, Cohen's coefficient kappa (k) was used as suggested in the study [51]. The kappa (k) values of the questionnaire and observation scale were .80 (significance $< 0.05^{**}$) and .671 (significance $< 0.05^{**}$), respectively, showing a substantial level of agreement [52]. Besides, to estimate the itemsinternal consistency reliability, Cronbach's alpha coefficient is considered [53]. Findings revealed that Cronbach's alpha coefficients of the questionnaire and observation scale are .708 and .852, indicating acceptable internal consistency reliability [54]. On the other hand, in terms of a qualitative data collection instrument (semi-structured interview), this study adopted a triangulation method to ensure its validity and trustworthiness [55].

Initially, an electronic questionnaire with 10 closedended questions was sent to 116 eligible teachers of 6 institutions in early January 2021 as a part of need analysis (before training). This questionnaire had three sections. The first section was intended to collect teachers' demographic information such as age, gender, designation, educational qualification, overall teaching experience, and whether they have previous online teaching experience. The second section of the questionnaire was planned to assess teachers' confidence and satisfaction with online teaching as well as the barriers and challenges they faced while teaching online. Teachers were questioned to score their confidence and satisfaction from 0 (not at all) to 3 (highly) Likert scale. To ensure the confidentiality of data, the questionnaire was fully anonymous. Later, at the end of the training session (between March 2021 and June 2021), another anonymous questionnaire with 4 closed-ended questions (see Figure2) was distributed among the teachers to understand whether the training session was engaging, favorable, and relevant. The participants responded to each question using a 5-points Likert scale ranging from strongly agree to strongly disagree. At the same time, an assessment of six questions (see Appendix B) was also conducted to evaluate whether learners acquire the intended knowledge of the training. Lastly, to evaluate the practical results of the teacher training program, systematic online classroom observations were performed to measure teachers' behavioral changes 20 (±5) days after the training program (between June, 2021, and July, 2021). One of our online class experts evaluated 57 individual online classes from those 6 institutions using a self-developed observation scale. The constructs included in the scale were as follows: (i) proficiency with online teaching-learning tools, (ii) proficiency in online instructional planning, (iii) time management, (iv) self-confidence, (v) presentation style, (vi) student engagement, and (vii) maintaining discipline. On the other hand, teachers' confidence and satisfaction were further assessed 30 (±5) days after the training program. Here, the purpose was to identify the key differences by comparing the same group at two different time periods (e.g., pre- and post-training). Later, to explore teachers' perceptions and practical impacts of the training
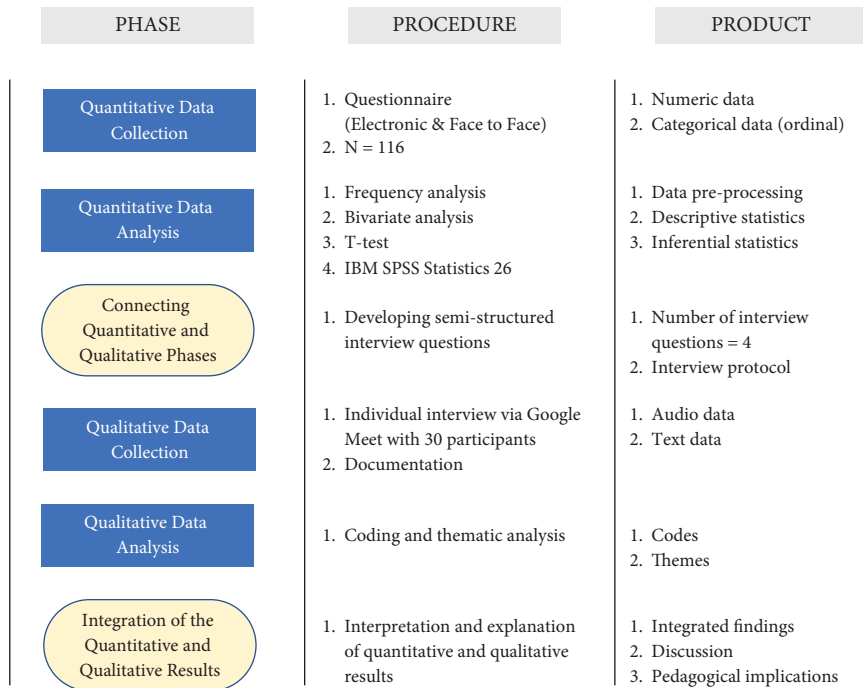
PHASE	PROCEDURE	PRODUCT
Quantitative Data Collection	1. Questionnaire (Electronic & Face to Face) 2. N = 116	1. Numeric data 2. Categorical data (ordinal)
Quantitative Data Analysis	1. Frequency analysis 2. Bivariate analysis 3. T-test 4. IBM SPSS Statistics 26	1. Data pre-processing 2. Descriptive statistics 3. Inferential statistics
Connecting Quantitative and Qualitative Phases	1. Developing semi-structured interview questions	1. Number of interview questions = 4 2. Interview protocol
Qualitative Data Collection	1. Individual interview via Google Meet with 30 participants 2. Documentation	1. Audio data 2. Text data
Qualitative Data Analysis	1. Coding and thematic analysis	1. Codes 2. Themes
Integration of the Quantitative and Qualitative Results	1. Interpretation and explanation of quantitative and qualitative results	1. Integrated findings 2. Discussion 3. Pedagogical implications

FIGURE 1: MSED model [45].

TABLE 1: Demographic information.

Profile	N = 116	%
Age		
≤25	7	6
26–35	81	69.8
36–458	18	15.5
46–55	8	6.9
≥56	2	1.8
Gender		
Male	78	67.2
Female	38	32.8
Designation		
Headmaster	5	4.3
Assistant headmaster	3	2.6
Senior teacher	12	10.3
Assistant teacher	65	56.0
Junior teacher	17	14.7
Co-teacher	14	12.1
Teaching experience		
≤5	62	53.4
6–10	28	24.1
11–15	14	12.1
16–20	5	4.3
≥21	7	6
Level of teaching		
Primary	44	37.9
Secondary	19	16.4
Both	53	45.7
Familiarity with online teaching (before COVID-19)		
Yes	7	6
No	109	94

program, a one-to-one semi-structured interview was conducted via Google Meet between April and June, 2021. In that case, a random selection was made of 30 teachers in those 6 institutions. The interviews ranged from 10 to 15 minutes, resulting in over 5.7 hours of interview data.

2.4. Statistical Analysis. The gathered data throughout the instruments were analyzed by IBM SPSS Statistics 26. Descriptive analysis was carried out for quantitative data. A bivariate correlational analysis was performed to measure if there is a relationship between factors and to determine whether this correlation is statistically significant or not, $P < 0.05$ was considered. On the other hand, paired t-tests were performed to compare the same group (eligible teachers) at two different time periods (e.g., before and after the training session). Qualitative data were coded thematically and analyzed manually as recommended in the studies [56, 57]. Besides, frequencies and percentages analyses were performed for further knowledge exploration.

2.5. Ethical Considerations. The necessary approval was obtained from corresponding institutional authorities (Reference: UIU/IAR/01/2021/SE/03) as well as the local officials. As the teacher training session was physically conducted on the school campus during the COVID-19 crisis, proper safety measures were taken according to WHO's recommendations. The purpose of the study and research objectives were informed to the participants before data collection. At the same time, privacy, ethical factors,
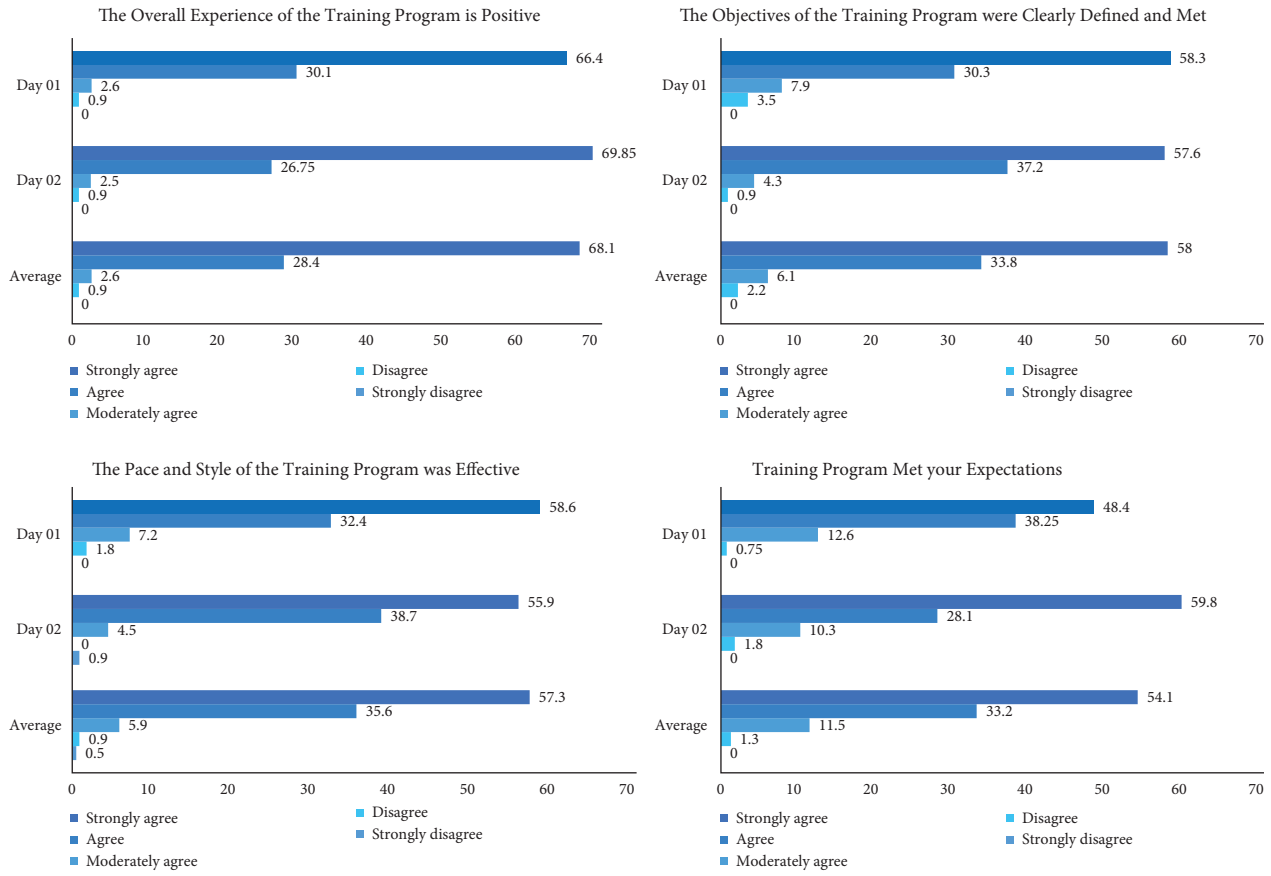
FIGURE 2: Teachers' feedback about the training session.

and confidentiality of the participants were adequately addressed to avoid confidentiality dilemmas.

3. Results and Findings

3.1. Sociodemographic Data. The sample comprised 116 teachers from 6 primary and secondary level institutions in Bangladesh, where 78 (67.2%) participants were males8 and 38 (32.8%) participants were females. The age of the teachers ranged from 22 to 68 years where the mean age was 32.86 years (Std. Deviation = 7.82). Although most teachers were experienced where the average teaching experience was 7.5 years, 94% of teachers reported that they did not have any online teaching experience before the COVID-19 pandemic (see Table 1). The findings indicate that in the pre-pandemic period, the majority of teachers were habituated to face-to-face teaching practices and were less or not familiar with online teaching.

3.2. Satisfaction and Confidence with Online Teaching during COVID-19. Descriptive analysis was carried out to evaluate teachers' satisfaction and confidence with online teaching during the COVID-19 pandemic. Results showed that 26.7% of teachers were completely dissatisfied, 55.2% were slightly satisfied, 15.5% were moderately satisfied and only 2.6% of teachers were highly satisfied with the online teaching experience (see Figure 3). At the same time, the mean
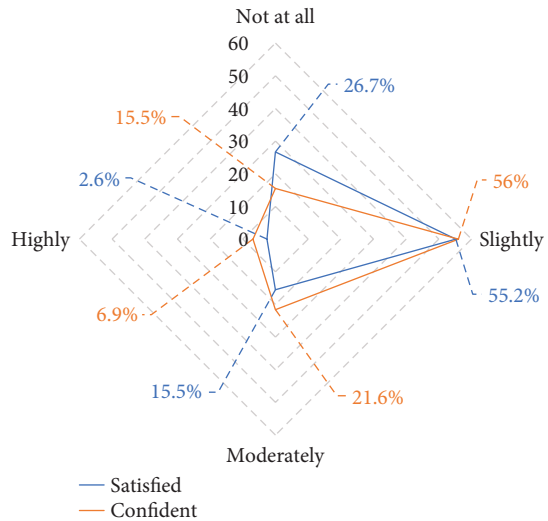

FIGURE 3: Teachers' satisfaction and confidence with online teaching.

satisfaction level was 0.94 (Std. deviation = 0.726) (see details in Table 2). We found similar results when measuring confidence where most of the teachers were less confident during online teaching. Findings showed that 15.5% of teachers were not confident, 56% were slightly confident,

Table 2: Descriptive analysis of teacher's satisfaction and confidence with online teaching.

Measures	Satisfaction	Confidence
Min	0	0
Max	3	3
Mean	0.94	1.20
Std. deviation	0.726	0.783
Variance	0.527	0.613
Skewness	0.509	0.520
Std. error of skewness	0.225	0.225
Kurtosis	0.254	0.140
Std. error of kurtosis	0.446	0.446

21.6% were moderately confident and only 6.9% of teachers were highly confident with the online teaching experience (see Figure 3). The mean confidence level of teachers was 1.20 (Std. Deviation = 0.783) (see details in Table 2). This is clear from the findings that most teachers were not comfortable with online teaching. As a consequence, the majority of the teachers were less satisfied and less confident while teaching online.

A bivariate correlational analysis was carried out to measure if there is a relationship between teachers' prepandemic online teaching experience, gender, online teaching satisfaction, and confidence during COVID-19. Findings showed that there was no significant correlation between gender and other factors. However, teachers' prepandemic online teaching experience was positively correlated with teachers' confidence and satisfaction with online teaching. This finding highlights that teachers having prepandemic online teaching experiences were likely to be more confident and satisfied with online teaching during the COVID-19 crisis. Simultaneously, we found a substantial positive correlation between teachers' satisfaction and teachers' confidence during online teaching (see details in Table 3).

3.3. Major Challenges Faced by Teachers during Online Teaching.
Teachers were asked about the challenges they faced while taking online classes. The question allowed respondents to choose more than one challenge (because teachers might have faced multiple challenges while taking online classes); thus, the sum of the percentages would not equal 100. Figure 4 summarizes the major challenges and barriers faced by teachers during online teaching. About 58.6% of teachers indicated difficulty with online teaching due to their less familiarity with online teaching tools. In parallel, 54.3% of teachers felt a lack of technical and technological skills while 51.7% of teachers claimed insufficient/unstable Internet connectivity. Findings also showed that teachers faced issues with time management (42.2%), insufficient teaching materials (37.9%), difficulty with maintaining discipline (36.2%), technical issues (35.3%), inappropriate home environment (34.5%), difficulty with motivating students (33.6%), heavy workload (31.9%), distraction (26.7%), and lack of laptop/computer (25%) during online teaching. The abovementioned findings give us a clear understanding of the challenges teachers had with online

instruction during the COVID-19 crisis. The majority of the teachers identified that less familiarity with digital teaching tools and inadequate IT skills were the key barriers to providing effective online teaching.

3.4. Design and Conduct of Need-Based Training.
Training Needs Analysis (TNA) was performed to design an effective training program to alleviate the online teaching challenges. The key objective of TNA was to assess the training required to fill the gap between what skills and knowledge are currently possessed by teachers, and what ought to be possessed. Based on the TNA, a 2 days long training session was performed in each institution (see details in Table 4) aiming at teachers' professional development (PD) in online teaching. The training session was mainly focused on the following objectives:

(i) Familiarizing teachers with necessary technological skills (taking live classes, assigning homework online, and taking attendance online) to enhance online teaching efficiency.

(ii) Enabling teachers to use digital platforms (Zoom, Google Classroom, and Learning Management System) for instruction.

(iii) Building teachers' self-confidence in a distance learning environment.

(iv) Enabling teachers to understand the significance of individual differences of students and to take appropriate steps for their learning motivation.

(v) Improving the quality of online teaching through proper time management.

3.5. Training Effectiveness Evaluation.
To measure the effectiveness of the teacher training program, this study adopted the Kirkpatrick Four-Level Training Evaluation Model [39]. The four levels are reaction, learning, behavior, and results (see Figure 5). By analyzing each level, we can determine how effective the training initiative was.

3.5.1. Level 1: Teachers' Reaction to the Training Program.
After-training reaction analysis is a well-known way to determine whether training is successful or not. As a consequence, a questionnaire with 4 questions was given to all the participants to assess their reaction (experience, acceptance, expectations, etc.) regarding the training session. Figure 2 summarizes the findings of teachers' feedback about the 2 days long training session. Most of the teachers (68.1%) strongly agreed that the overall experience of the training session was positive. In addition, 58% of teachers strongly agreed that the objectives of the training program were clearly defined and met. Further, on average, 57.3% of teachers strongly voted that the pace and style of the training program were effective. On the other hand, 54.1% of teachers strongly agreed that the training program met their expectations. The abovementioned findings indicate that teachers' training experience was good and they were positive about the training program.

TABLE 3: Relationship between the factors

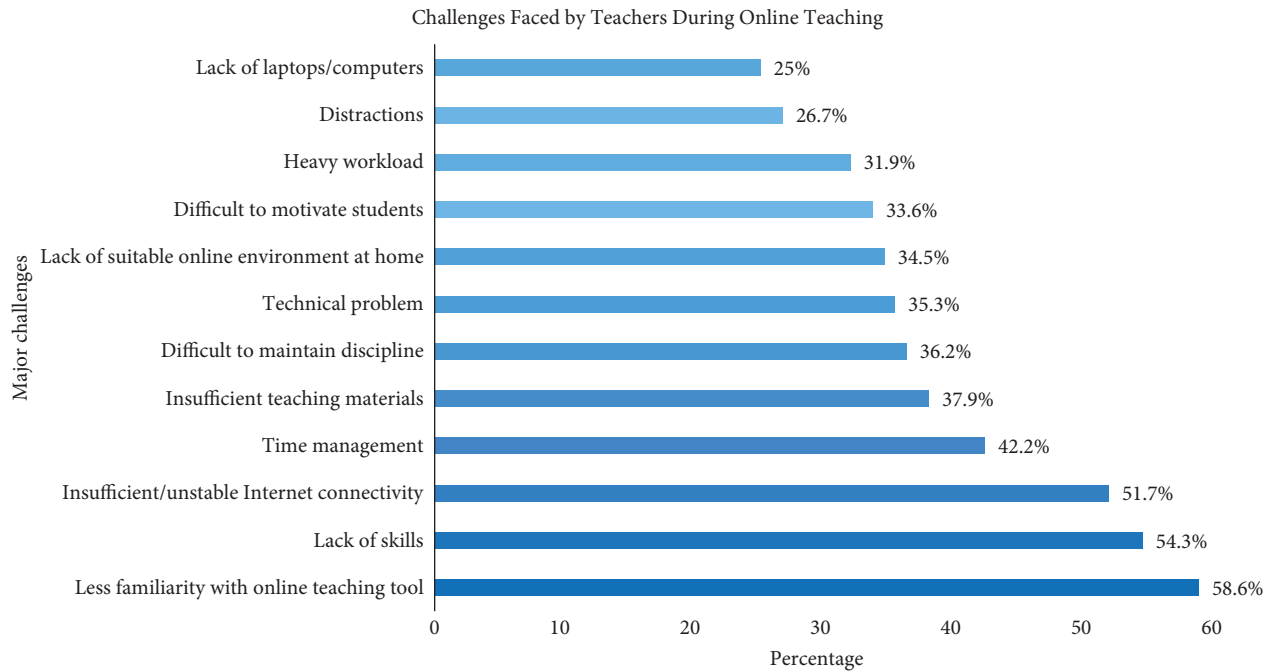|	Gender	Pre-pandemic online teaching experience	Satisfaction	Confidence
Gender	1	−0.055 P value = 0.561	0.069 P value = .463	0.036 P value = .700
Pre-pandemic online teaching experience	−0.055 P value = 0.561	1	**0.422** ** P value < **0.001**	**0.354** ** P value < **0.001**
Satisfaction	0.069 P value = 0.463	**0.422** ** P value < **0.001**	1	**0.695** ** P value < **0.001**
Confidence	0.036 Value = 0.700	**0.354** ** P value < **0.001**	**0.695** ** P value < **0.001**	1

FIGURE 4: Challenges faced by teachers during online teaching.

TABLE 4: Training details.

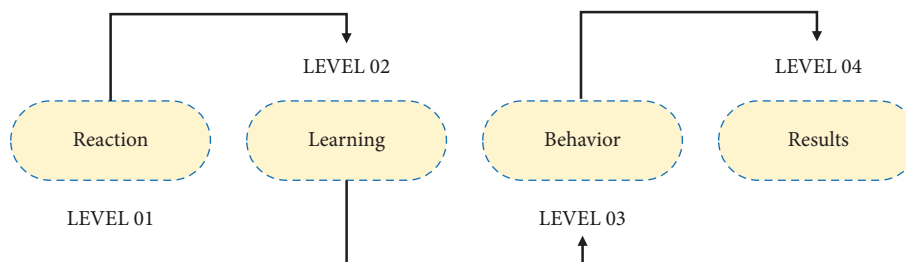| SL	Participatory institutions	Number of teachers	Training date
1	School: A	19	23–24 March, 2021
2	School: B	36	31 March–1 April, 2021
3	School: C	17	14–15 May, 2021
4	School: D	17	2–3 June, 2021
5	School: E	19	10–11 May, 2021
6	School: F	8	18–20 May, 2021
		Total teachers = 116	Number of days = 12

FIGURE 5: Kirkpatrick Four-Level Training Evaluation model [39].

3.5.2. Level 2: Teachers' Learning after the Training Program. The goal of this level was to determine whether the participants have acquired the desired knowledge, skills, and attitudes through the training program. As a consequence, an assessment of six questions was conducted immediately after the training program. The questions were designed based on the core learning objectives of the training program and were divided into two categories: (i) strategies for managing online classrooms using digital platforms and (ii) online class activities and demonstrations. Table 5 demonstrates the results of the assessment. The finding shows that on average 69.19% of teachers answered correctly, while 30.81% of teachers answered incorrectly.

3.5.3. Level 3: Teachers' Behavioral Changes after the Training Program. The purpose of this level-3 was to determine whether the training program influenced the learners' behavior. To do so, systematic online classroom observations were performed to measure teachers' behavioral changes. Table 6 presents the results of after-training teachers' behavioral changes. Findings show that teachers built strong proficiency in online teaching-learning tools and online instructional planning. The findings also revealed that the majority of teachers were confident when teaching online and their presentation style, time management ability, student engagement ability, and ability to maintain discipline were significantly improved (see Table 6).

3.5.4. Level 4: Teachers' Confidence and Satisfaction with Online Teaching after the Training Program. This level-4 aimed to find out the practical impact of the training program on teachers' satisfaction and perceived confidence during online teaching. Findings of the paired *t*-test showed that teachers' post-training satisfaction and confidence have significantly (P value < 0.001) increased (see Tables 7 and 8) while taking an online class.

3.6. Teachers' Pre- and Post-Training Perception. This section summarizes the teachers' perceptions from 30 interviews using IPA. The findings have been grouped into two key themes "teachers' pre-training online teaching experience" and "teachers' post-training online teaching experience".

3.6.1. Theme 01: Teachers' Pre-Training Online Teaching Experience. In response to pre-training online teaching experience, most of the teachers (73.3%) uttered that the concept of online education is still a relatively new phenomenon to them. Although they had the basic knowledge of information technology (IT), almost all of them claimed that this sudden transition of teaching pedagogy from traditional to online mode has created numerous challenges. In this regard, a 43 years old male teacher expressed his view as follows:

"I used to take face-to-face classes using a projector in our school's digital classroom. However, I always faced challenges while taking online classes because I did not have any previous idea of how to use the online learning platforms efficiently"

Another 38 years old male teacher shared as follows:

"Online teaching-learning is new to us (both for students & teachers). So, it was difficult for me to maintain discipline, manage class time and keep students focused during online class"

Furthermore, less familiarity with online teaching-learning tools, unstable Internet, poor technological competence, and a lack of professional development programs, all had a detrimental impact on teachers' satisfaction and confidence while teaching online. In this regard, a 36 years old female teacher stated as follows:

"I have no prior experience in online education. Although I have basic IT skills, I did not know how to take classes online. I did not even have an idea about online teaching-learning tools. As a result, I was always less confident in taking online classes"

Another 33 years old male teacher expressed his thoughts as follows:

"While taking classes online, I often encountered various technical problems for which it was not possible to take classes properly. Most of the time, the interaction between me and the students was disrupted by the unstable internet. It seems to me that I waste more time solving these problems than taking classes. That is why I was never satisfied with online teaching"

The abovementioned statements highlight the grim reality of online teaching during the COVID-19 crisis, particularly in primary and secondary schools. Teachers had almost no time to prepare for this abrupt transformation, and eventually, they started to encounter a slew of issues that impeded their online teaching severely. Consequently, many of them were unsatisfied with online teaching and lacked confidence was also evident.

3.6.2. Theme 02: Teachers' Post-Training Online Teaching Experience. In response to post-training online teaching experience, teachers were found to be more confident and satisfied with online teaching. Most of the teachers (80%) mentioned that the training program has assisted them in overcoming their limitations and making online teaching comfortable for them. As evident in the statement of a 45 years old male teacher:

"This training session has made it much easier to conduct classes in an orderly manner, use the online platform efficiently, bring back motivation among the students, and helped me to adapt to the new environment. So, I feel more comfortable taking online classes than ever before."

In this regard, another 43 years old teacher (who completed the training session) expressed his views as follows:

TABLE 5: After training assessment results.

Category	Question	Avg. correct answer (%) N = 116	Avg. wrong answer (%) N = 116
Strategies for managing online classrooms using digital platforms	Q1 Q2 Q3	70.48	29.52
Online class activities and demonstration	Q1 Q2 Q3	67.9	32.1
Both	Q1 Q2 Q3	69.19	30.81

TABLE 6: After training teachers' behavioral changes.

Factor	Number of online classes: 57				
	Very good (%)	Good (%)	Acceptable (%)	Poor (%)	Very poor (%)
Proficiency with online teaching-learning tools	22.8	38.6	17.5	15.8	5.3
Proficiency in online instructional planning	21.1	31.6	28.1	15.8	3.5
Time management	19.3	45.6	26.3	7.0	1.8
Self-confidence	15.8	49.1	26.3	8.8	0
Presentation style	17.5	43.9	22.8	14.0	1.8
Student engagement	21.1	52.6	19.3	3.5	3.5
Maintaining discipline	21.1	47.4	24.6	7	0

TABLE 7: Paired samples statistics.

Pair		Mean	N	Std. deviation	Std. error mean
01	Pre-training satisfaction	0.94	116	0.726	0.067
	Post-training satisfaction	2.14	116	0.697	0.065
02	Pre-training confidence	1.20	116	0.783	0.073
	Post-training confidence	2.14	116	0.603	0.056

TABLE 8: Paired samples test (paired differences).

Pair		Mean	SD	SEM	Lower	Upper	t	df	P value
1	Pre-training satisfaction Post-training satisfaction	−1.198	0.989	0.092	−1.380	−1.016	−13.05	115	**<0.001**[**]
2	Pre-training confidence Post-training confidence	−0.940	0.935	0.087	−1.112	−0.768	−10.82	115	**<0.001**[**]

[**]SD = Std. deviation, SEM = Std. error mean.

"Doing this teacher training program has given me the confidence to take classes on online platforms. Now the problem is not so much as before so I can concentrate more on teaching in class and it gives me satisfaction."

Furthermore, a substantial number of teachers (57%) stated that this training session improved their skills in operating online teaching tools, class organization, time management, educational technology expertise, and strategies to better motivate students. In this regard, a 39 years old female teacher shared her opinion as follows:

"The training session has been very useful for me. I can take much more organized classes than before. It improved my time management skill while online teaching. Even, I don't become anxious now. Because, I know how to manage an online platform efficiently, and I'm much more confident and motivated than before."

The abovementioned findings indicate the positive aspects of the need-based teacher training program.

4. Discussion

COVID-19 has changed the global education system forever. Countries around the world have been forced to adopt e-learning instead of a face-to-face education system. Although distance teaching-learning strategies showed a consistent growing tendency due to COVID-19, teachers were not prepared enough to teach online due to this sudden transition. Consequently, this sudden shift from a conventional face-to-face teaching-learning environment to a

completely online environment has not been easy [58]. However, to keep students involved in learning, the rapid transition to online mode has resulted in significantly increased workloads for teachers, as well as hardship and struggle to adapt to this "new normal" situation across the globe [59]. The existing literature on COVID-19's impact on the education sector is mostly descriptive and focuses on the challenges that teachers faced when transitioning to online teaching, primarily in the higher education sector [22, 60–63]. This study intended to explore the challenges faced by primary and secondary level teachers of Bangladesh while teaching online and a potential way to address those issues.

The obtained outcomes of this study show primary and secondary level teachers have faced significant challenges (e.g., less familiarity with digital teaching tools, inadequate IT skills, insufficient teaching materials, unstable Internet connectivity, difficulty maintaining discipline, difficulty with time management, technical problems, and lack of devices and environmental issues) that hinder teaching online. Qualitative findings also revealed, despite having a basic understanding of IT, almost all teachers experienced difficulties as a consequence of the abrupt shift in teaching pedagogy from traditional to online modes. This is because teachers hardly had time to get ready for this sudden change.

Hence, this finding complies with the previous studies [10, 23, 26, 33] which claimed that teachers faced similar constraints due to the abrupt change from face-to-face to online medium which hindered their online teaching efficiency. Though teachers have tried to use various platforms (e.g., digital and social media) more than ever to connect and move their work forward, they are finding that these modalities of interaction bring their own sets of limitations [64]. As evident in studies [28, 65], due to a lack of technical/software knowledge, lack of motivation, insufficient training and professional development courses, guidance, or resources, teachers were unprepared to teach online, which exacerbated the problem.

Furthermore, the bivariate correlational analysis showed that teachers' pre-pandemic online teaching experience had a significant positive correlation with teachers' confidence ($r = 0.354$, P value $<0.001^{***}$) and satisfaction ($r = 0.422$, P value $<0.001^{***}$) with online teaching, meaning, teachers having pre-pandemic online teaching experiences were likely to be more confident and satisfied with online teaching during the COVID-19 crisis. However, this study found most of the teachers were habituated to face-to-face teaching practices and almost 94% did not have any online teaching experience prior to the COVID-19 pandemic. It, therefore, implies that teachers were less satisfied and less confident while teaching online. This result corroborates the position of Pham et al. [66] who argued that abrupt changes in daily routine and teaching habits, and anxiety had a significant negative impact on both teacher satisfaction and online teaching effectiveness. The finding also coincides with [35], where the author claimed that teachers' levels of satisfaction dropped and that they experienced rapid mental fatigue with the online teaching process. Finally, to alleviate all those

issues, existing studies [67–71] recommended identifying areas (e.g., lesson planning, teacher's digital skills, technological pedagogical knowledge, time management, digital competence, digital teaching styles, and communication skills) where teachers need training and workshops for ensuring effective online teaching.

Finally, to identify such areas, a TNA was performed to design an effective training program. Based on the TNA, a 2 days long training session was performed in 6 primary and secondary level institutions aiming at teachers' professional development (PD) in online teaching. Quantitative findings revealed that the training program has had a positive effect on teachers to improve online teaching. Teachers' behavioral changes while taking online classes were measured by after-training systematic online classroom observations. Qualitative findings also showed that attending training sessions helped teachers become more proficient in using online teaching tools, organizing their classes, managing their time, using educational technology, and developing techniques to better encourage students. Furthermore, it is found that the majority of teachers were confident while teaching online and their digital literacy, presentation style, time management ability, student engagement ability, and ability to maintain discipline were significantly improved. At the same time, paired t-tests were performed to compare the same group (teachers) at two different periods (e.g., before and after the training session). Findings demonstrated that teachers' posttraining satisfaction and confidence have significantly (P value <0.001) increased while taking an online class. The results are consistent with the studies [34, 72] in which the authors demonstrated how teacher training can help teachers deal with stress, prevent burnout, and improve their ICT proficiency.

5. Pedagogical Implications

Based on the findings of the present study, the following pedagogical implications are suggested in the paper to boost the online teaching quality at primary and secondary level institutions in the countries like Bangladesh:

   (i) Professional development (PD) on distance learning (e.g., need-based teacher training program) should be considered a prerequisite for online teaching, especially in primary and secondary schools.

  (ii) Before designing a teacher training program (especially for distance learning), a need analysis should be conducted to achieve higher efficiency.

 (iii) Teachers should be equipped with digital literacy, technical expertise, professional training on digital learning tools, and relevant gadgets [73], especially those who teach online.

  (iv) The government as well as the devolved authorities should come up with synchronized policy support to spend more on PD such as need-based teacher training programs.

   (v) To successfully incorporate an e-learning-based education system, developing countries like Bangladesh should adopt strategic development and

ensure adequate ICT-based academic infrastructure, especially at the primary and secondary levels.

(vi) To ensure the quality of online teaching, proper quality assurance and monitoring systems should be introduced such as references [74, 75].

(vii) Above all, both teachers and students must be supported in their transition from conventional teacher-centered teaching and learning to the new normal situation.

6. Conclusion

Among the various studies on pandemic-driven online education, this study is the first to investigate the issues encountered by primary and secondary level teachers in Bangladesh while teaching online and evaluate the efficiency of need-based teacher training programs to meet those challenges. This study found that the key barriers to online teaching were less familiarity with online teaching tools, lack of digital literacy, unstable Internet connectivity, difficulties with time management, insufficient teaching materials, lack of satisfaction, heavy workload, and poor self-confidence. However, it was shown that a well-designed, need-based teacher training program improved online teaching quality by enhancing teachers' technology abilities, confidence, satisfaction, motivation, and behavioral change. This study's overall findings are expected to aid devolved authorities in implementing synchronized policies to improve online teaching quality, especially in developing countries. This study has some potential limitations. First, this study was conducted in only 6 primary and secondary level institutions in Bangladesh due to a lack of enough funding. Second, the sample size was not as expected, and the lack of analysis of other variables (e.g., gender, participants' area of living, culture, etc.) might influence the results. So, future research should include more participants from a variety of teaching backgrounds and include more influential variables. Third, the lack of prior research studies was another constraint. So, in the future, additional longitudinal studies need to be done including more institutions to enhance the understanding.

Data Availability

The data used to support the findings of this study are available on request from the authors.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

Supplementary Materials

1 Appendix A. Training Need-Analysis Questionnaire 2, Appendix B. After-training Assessment Questionnair 3, Appendix C. Semi-structured Interview Questionnaire 4, Appendix D. Expert opinion about the questionnaire and observation scale 5, Appendix E. Factors considered for observation scale. (*Supplementary Materials*)

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