COVID 19 response: An analysis of teachers’ perception on pedagogical successes and challenges of digital teaching practice during new normal

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Abstract
The purpose of this exploratory study undertaken between June and August 2020 was to capture teachers’ perspectives to explore (a) what kind of pedagogies they have successfully implemented in the face of a pandemic; (b) what hurdles and successes did they encounter while implementing virtual teaching-learning; and (c) how virtual pedagogies can be improved. Data was collected using purposive sampling via 47 social media groups and pages, using internet survey as an instrument from 141 teachers, teaching kindergarten and elementary students, from different regions (continents) of the world. Findings revealed, six success themes and eight major challenges from the voice of teachers experiencing a rapid and unprepared shift to virtual education. Suggestions for improving digital education revolve around four areas which suggest that pupils from marginal socioeconomic households were significantly disadvantaged during the COVID-driven virtual education scheme. This research is not preoccupied with identifying universal outcomes but, instead, is focused on how the real virtual teaching experience can help in informing areas of focus for reimagining the approach to education for an uncertain future.

Keywords Virtual education • Digital teaching practice • Preschool • Elementary school • COVID-19 • Education challenges • Pedagogies

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1 Introduction

With COVID-19, the world has been facing a new existential enemy and the nations contentiously must again summon its educational, moral and scientific might to fight it back because it has brought a time of social distancing, not mental (Kundu & Bej, 2020a). The coronavirus disease 2019 (COVID-19) outbreak, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was declared to be a pandemic by the World Health Organization (WHO) on 12th March 2020 (Viner et al., 2020). The COVID-19 pandemic has affected education systems across the world, and the efforts for its containment have led to the near-closure of education institutions. According to Daniel (2020), coronavirus disease is the greatest challenge national education systems have ever faced. By the middle of May 2020, approximately 190 countries closed their schools, and this closure has affected 90% of the world’s student population i.e., 1.57 billion children and youth (Giannini et al., 2020; UNESCO, 2020a, b).

In a situation (of COVID-19 outbreak) where students were stopped from going to school, as face-to-face learning ceased, many governments asked educational institutions to move from traditional to virtual education and online teaching (Rogers & Sabarwal, 2020). Kundu & Bej (2020a) further said it is a fact, harsh but true, that coronavirus disease 2019 (COVID-19) has brought online learning into the light of immense popularity and the situation is unique in that students can make a direct comparison of their courses before (face-to-face (F2F)) and after COVID-19 (online). Virtual education (Online learning and teaching) is a form of distance education where one of its defining characteristics is the separation of the learner and the teacher (Cavanaugh et al., 2004). Online learning primarily uses the internet to deliver instruction and content of education (Watson et al., 2004), and virtual school is an educational organization that uses web-based methods or the internet to offer K-12 courses (Clark, 2001). Kundu, Bej, & Dey (2020b) pointed out that access to the internet now guarantees access to universal education at the lowest cost, if not for free and is potent in bringing greater student engagement and achievement as well.

Studies in literature have supported distance and virtual learning - for example, Ash & Davis (2009) proposed that during the swine flu crisis, distance learning can be supported by technologies like phone, radio, internet, TV, email communication, or phone messages. Muirhead (2000) and Kundu & Bej (2020b) also suggest that online education is new in schools and can be considered to embellish traditional schools and homeschooling. In another study (Anastasiades et al., 2010), Interactive Video Conferencing (IVC) system design was implemented at elementary schools in Greece, and it was determined that that IVC significantly supported collaborative synchronous learning. A study, conducted by Thamarana (2016) on distance learning via E-Learning and Virtual Learning Environment (VLE), reported these methods to be effective and innovative in achieving language learning goals. During the COVID-19 pandemic, a case study on a private school using the ‘Google-Meet’ platform to implement online education shows that the quick transition to online education was successful, and the experience gained through this transition can be utilized in the future (Basiliaia & Kvavadze, 2020). As a response to the COVID-19 pandemic, around 96 countries worldwide have introduced different virtual solutions to continue the education process e.g., TV broadcasts, resources, guidelines, online libraries, online channels, video lectures (Basiliaia & Kvavadze, 2020). But this practice is altogether
new and a honeymoon period for the many developing countries across the globe (Kundu & Bej, 2021).

Although in-person schooling experience cannot be replaced fully, virtual learning education systems can engage students in productive and meaningful ways to minimize learning losses (Rogers & Sabarwal, 2020). There is a strong foundation of existing research focused on teaching practice in face-to-face environments, but there is sporadic research available on best practices in virtual schooling (Ferdig et al., 2009; Davis & Ferdig, 2018). Virtual education is wide growing in popularity in the context of K-12 education (Kundu & Bej, 2020a). However, while this area is attracting more researchers, it is still developing as a field of research (Lowes, 2014). Several studies (Boston, 2002; Hawkins et al., 2012; Kundu, 2018a; Lazarus, 2003; Murphy & Manzanares, 2008; Murphy & Rodriguez-Manzanares, 2009; Tallent-Runnels et al., 2006) have reported that the teachers’ role, pedagogical techniques, and instructional practices, used in face-to-face learning, have to be modified for virtual settings. The selected evidence cautiously suggests that virtual education and online teaching practices can be successfully used to supplement learning if accompanied by appropriate technical environments and support (Kundu, 2020a).

To support the achievement of learning outcomes during face-to-face learning, a teacher implements instructional practices composed of activities, strategies, and techniques (Gauthier et al., 2004). To facilitate student learning outcomes, teachers usually combine their understanding of the content area (subject matter) with the knowledge of pedagogy (how to teach) into their instructional practice. This consideration is essential for virtual education as well, where it is important to carefully direct the integration of technology based on the teacher’s knowledge of pedagogies and content (Ferdig, 2006). Therefore, online teaching requires some skills to support a teacher’s role as an intersection point for technology, pedagogy, and content (Kundu, 2018a, b; Russell, 2004; Savery, 2005). To provide quality online learning opportunities to students, the primary responsibility of the teacher is to select and coordinate the technology, pedagogy, and content (Koehler & Mishra, 2009; Kurtz et al., 2004; Olson & Wisher, 2002; Kundu, Bej, & Dey, 2020b). Adopting new online teaching strategies linked to technology, pedagogy, and instructional plan may require teachers to undergo some key changes and move away from what they have experienced during offline teaching (Lee & Hirumi, 2004; O’Neil, 2009).

With the COVID-19 outbreak, many educational institutions had little time to prepare for the remote teaching scheme as the possible preparation could have included the staff preparation and training arrangements (Daniel, 2020). According to Rogers & Sabarwal (2020) said, the emergency shift to remote learning requires teachers to learn digital skills to operate technologies and to adapt the teaching-learning materials into a synchronous or asynchronous mode. The rapid shift to remote learning during the coronavirus crisis was difficult for technology-aware teachers as well as young-adult students (Kundu & Bej, 2020a, 2021). The challenge, therefore, would have multiplied many-fold for younger children as well as technology-skill-deficient teachers. Lack of concentration, focus, and attention span are anecdotally considered as the more significant risks in a virtual environment that are much exaggerated in younger children (Kundu, 2020a, b). In order to make online learning effective for children, structured efforts are required to use a range of engagement methods and collaboration tools (Li & Lalani, 2020).
2 Research purpose

The COVID-19 pandemic has allowed teachers to reinvigorate distance learning in new ways, and this experience can be used in the post-pandemic period and similar special cases. Conversely, the current study is an attempt to explore virtual teaching practices of kindergarten and elementary school teachers (teaching age group 5–12 i.e. Kindergarten to Grade-6), during the COVID-19 pandemic, by investigating (a) which pedagogies have teachers used while teaching virtually during the pandemic; (b) what challenges and successes have teachers encountered while moving to virtual teaching practice; and (c) what are teachers suggesting for improving the quality of virtual teaching pedagogies.

This research is a pilot study, which is small-scale and can help in examining the feasibility and practicality to direct a subsequent larger and comprehensive study (Thabane et al., 2010). The purpose of the research is not to identify the universally successful pedagogies for online teaching and universal challenges and successes for implementing virtual learning but to capture practitioners’ voice to highlight (a) what kind of pedagogies they have successfully implemented in the face of a pandemic; (b) what hurdles and successes did they encounter while implementing virtual learning; and (c) how virtual pedagogies can be improved. This kind of research is not preoccupied with identifying universal outcomes (e.g., pedagogies that have worked universally for virtual learning) but more focused on how learning processes can inform virtual learning and how they can be improved. This will be supportive to start a discussion on reimagining the curriculum children need, not only during the pandemic but also for the unimagined future shaped by the new norms of working, socializing, and learning that we still have to improve.

3 Methodology

3.1 Sampling type

The purpose of the study directed the subjects of the study i.e., kindergarten and elementary school teachers. A purposeful sampling technique was used to collect data to achieve the research objectives. This kind of sampling is usually implemented to collect qualitative data to identify and select information-rich cases related to the phenomenon being investigated (Palinkas et al., 2015). In the current study, the researchers have explored a virtual teaching phenomenon during the COVID-19 pandemic, and the study was conducted from June–August 2020. The study, therefore, concentrates on what transpired, as a response, in the natural environment, without establishing any experimental design.

3.2 Data collection

During the critical period of the COVID-19 pandemic, due to school closures, it was not possible to conduct face-to-face surveys in specific regions; conversely, the data was collected online. Forty-seven groups and pages with teachers/educators were identified on social media networks (Facebook, Slack, Emails, Watsapp, and LinkedIn),
and the web-link for the internet survey (study instrument) was circulated amongst the
participants. The administrator/s of the groups and pages were requested to promote the
web-link for the internet survey. The survey was designed in a way that, after taking
consent, only teachers teaching kindergarten and elementary school using virtual
platforms during the pandemic were allowed to complete the survey. The methodology
for data collection was adapted from the methodology recommendations for the
recruitment of research participants on Facebook by Brickman Bhutta (2012).

Brickman Bhutta (2012) mentioned that the administrators of existing Facebook groups
were contacted for participant recruitment for the study stating: “all administrators
received a personal message that explained the purpose of the research and asked them
to send a message to the members of their groups with an invitation to join the research
group” (pp. 63). The current research aimed to explore the pedagogies and challenges
associated with implementing virtual education during the COVID-19 pandemic;
therefore, research participants’ access to technology was not a challenge as teachers
implementing virtual education already had access to technology.

Social media networks offer many research benefits like quickly identifying the
potential respondents, creating a comprehensive sampling frame, monitoring responses,
and using the referral chain to increase the individual motivation to respond to the
survey (Mirabeau et al., 2013). Mirabeau et al. (2013) also identified some threats
related to using social media networks for data collection: (a) self-selection bias - one
social media platform can be different from others. To overcome the self-selection bias,
four different social media networks were used to collect data; (b) the sampling frame
might not include all the population of interest. To overcome this challenge, data
collection was not restricted to any specific regions of the world; (c) seeding bias -
the sample might be biased towards individuals closely related to the researchers. To
deal with this bias, all researchers selected the clusters/groups of teachers instead of
selecting individuals, and the administrator/s of the groups were asked to encourage
group members within the sampling frame to be the seeds (distribution points). Despite
all these confines, social media is an effective way to get samples through chain
referrals, and, despite the limitations, there is no doubt that chain referrals have
significant value for exploratory studies targeting elusive populations (Faugier &
Sargeant, 1997; Penrod et al., 2003).

The criteria for the purposeful sampling of the 47 groups and pages of teachers are as
follows: (a) the social media group or page should include kindergarten and/or ele-
mentary school teachers; (b) the official language of the group or page should be
English, given that survey was designed in the English language; (c) the administrator
of the group or page should agree to promote the post and to encourage teachers to act
as the seed to distribute the internet survey to their network; (d) the groups/pages shall
be from different parts of the world.

3.3 Instrument for data collection

An internet survey using Google forms as a data collection instrument was designed
based on the framed research questions. The internet survey method of data collection
is becoming increasingly popular where the questions are administered, and responses
are automatically recorded (Cornwell & Hoagland, 2015). Most of the questions
included in the internet survey were qualitative (open-ended) in nature, but
demographic and informative (closed-ended) questions were also included to gather additional data about the participants. Table 1 outlines the key questions framed for data collection.

3.4 Sample size

Our data collection method allowed us to collect qualitative responses from 141 teachers. Qualitative research samples are smaller in order to support the case-oriented analysis, fundamental to its mode of inquiry (Sandelowski, 1996). The research employed purposive sampling, as opposed to probability sampling (employed in quantitative research), to select the information-rich cases (Patton, 1990) in the first place.

4 Data Analysis & Results

The data collected from 141 participants was exported to Microsoft Excel sheets. Data with closed-ended responses (mostly demographic data) was separated from data with open-ended and detailed responses. Using the content analysis technique, the content of the open-ended questions was analyzed. Content analysis is a qualitative data analysis technique used to make valid and replicable inferences (Krippendorff, 1989). Codes were developed based on content analysis, and data was segmented. Taimur & Mursaleen (2020) also utilized content analysis method to analyze the qualitative data collected via an internet survey. Each author went through the codes independently as well, to ensure the appropriateness of the codes and their alignment to the data. The data collected revealed that most of the elementary school teachers accessed the survey through Facebook (n = 66) and Watsapp (n = 57), see Fig. 1. Only 2 teachers submitted their responses accessed the data through LinkedIn.

4.1 Characteristics

Based on the location of the respondents, data was divided into six regions (Asia, Middle East, America, Africa and Europe). Most of the data came from Asia (n = 91) followed by America (n = 36) and a few responses came from the Middle-East (n = 6),

| Table 1 | Internet survey outlining the key questions |
|---------|--------------------------------------------|
| through which network/group/individual did you get access to the survey? (e.g., teach SDGs Facebook group) |
| Age, gender, and region |
| Which grade/s do you teach? |
| Did you teach online during the COVID-19 lockdown period? |
| Which pedagogies did you use while teaching virtually during the COVID-19 lockdown period? |
| Explain your experiences while implementing digital education? (both challenges and successes) |
| Specific to pedagogies, what do you think can be done to effectively deliver virtual education? Please elaborate. OR In your opinion, what do you feel is needed for virtual learning to be successful? |
Europe (n = 5), and Africa (n = 3). Figure 2, highlighting in yellow, represents regions from where responses to the survey were submitted.

The demographic characteristics of the participating elementary school teachers are presented in Table 2. From the table, it is evident that (a) of the 141 respondents, the number of female teachers (129 i.e., 91.4%) far exceeds the male teachers (12 i.e., 8.5%); (b) the minimum and maximum age of the responding teachers is 23 years and 64 years respectively.

In the collected dataset, 60% of the teachers reported teaching multiple grades (between Kindergarten and Grade 6, which is consistent with practice of teachers covering multiple grades at schools) and 14% of the teachers mentioned teaching Kindergarten only (see Fig. 3).

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**Fig. 1** Number of survey responses collected via each social media platform

**Fig. 2** Map showing the regions (in yellow) from where the responses were received
141 elementary school teachers, from around the globe, mentioned 40 different pedagogies that were successfully employed for virtual teaching during the pandemic. The pedagogies were divided into three sections based on the type of learning which occurs while implementing particular pedagogies i.e., asynchronous (implementation and learning don’t happen at the same time), synchronous (implementation and learning happen at the same time), and mixed (mix of...
Table 3 Pedagogies employed successfully for virtual teaching during the pandemic – reported by teachers

| Learning                          | Pedagogy                      | Frequency |
|---------------------------------|-------------------------------|-----------|
| Asynchronous                    | Recorded Lectures             | 11        |
|                                 | Worksheet                     | 3         |
| Synchronous                     | Presentation                  | 19        |
|                                 | Lecture                       | 19        |
|                                 | Media Supported Learning      | 14        |
|                                 | Simulation                    | 10        |
|                                 | Inquiry-Based Learning        | 8         |
|                                 | Quiz                          |           |
|                                 | Discussions                   | 7         |
|                                 | One-on-one session            | 3         |
|                                 | Games                         | 6         |
|                                 | Socratic Seminar              | 5         |
|                                 | Modeling/Demonstration        | 4         |
|                                 | Read Aloud                    | 4         |
|                                 | Movement & Activity Based Learning | 3     |
|                                 | Surveys                       | 2         |
|                                 | Peer Feedback                 | 2         |
|                                 | Flipped Classrooms            | 2         |
|                                 | Small Group Instruction       | 2         |
|                                 | Virtual Assessment for Learning | 2     |
|                                 | Flipcharts                    | 1         |
|                                 | Virtual Field Trip            | 1         |
|                                 | Contextualization             | 1         |
|                                 | Dialectical method            | 1         |
|                                 | Comprehension Reviews         | 1         |
|                                 | Drama                         | 1         |
|                                 | Organic World Language        | 1         |
|                                 | Real World connections        | 1         |
|                                 | Debate                        | 1         |
|                                 | Improvisation                 | 1         |
|                                 | Constructed Response          | 1         |
|                                 | Feedback                      | 1         |
|                                 | Jigsaw Reading                | 1         |
|                                 | Virtual Manipulatives         | 1         |
|                                 | Project-Based Learning        | 44        |
| Mixed (Asynchronous/Synchronous)| Interaction                   | 14        |
|                                 | Research                      | 5         |
|                                 | Creative Writing              | 3         |
|                                 | Reflection                    | 1         |
|                                 | Thinking Routines             | 1         |
synchronous and asynchronous) (see Table 3). Out of 40 pedagogies, 32 pedagogies mentioned by the teachers fell into the synchronous section, 6 in the mixed section, and 2 in the asynchronous section.

Based on the frequency of repetition of pedagogies in the data (see Fig. 4), it is evident that out of 141, 44 teachers (31%) used project-based learning. Presentations and lectures were repeated 19 times (each) in the data. Similarly, media-supported learning and interaction were repeated 14 times (each) in the data.

The word cloud (see Fig. 5) prepared after categorizing the data on pedagogies project-based learning as the most frequently appearing pedagogy in the data. Presentations, lectures, media-supported learning, interactions, recorded lectures, simulation, inquiry-based learning, quizzes, discussions, one-on-one sessions, and games frequently appeared (i.e., >5 times) in response data.

4.3 Successes of virtual teaching

Six success themes emerged from the voice of teachers experiencing a shift to virtual education without much preparation and are: (a) interesting experience; (b) virtual platform demonstration; (c) learning by experience; (d) adaptation; (e) connection; (f) multiple platforms. These themes are explained below:

4.3.1 Interesting experience

Teachers found virtual teaching interesting, enjoyable, and successful in gaining new knowledge in using different technologies in lessons and adapting them to teaching pedagogies. As a teacher stated: “it was interesting to bring classroom rules and norms into the video ‘classroom’ such as raising hands, being polite, asking to go to the bathroom etc.”

![Fig. 4](image.png)

Fig. 4 Frequency of repetition of each pedagogy in the data
(a) Virtual Platform Demonstration

Teachers viewed planning ahead and familiarizing students with the use of virtual platforms to be particularly helpful when applied. One of the teachers highlighted that they “spent first few days just explaining how to navigate through the platform, which was worth it. I would recommend everyone to do that as it worked out quite well.”

(b) Learning by Experience

For many teachers, the shift to virtual teaching was a phenomenal ‘learning-by-doing’ experience, not just around technology platforms but also for polishing their teaching techniques like adding snap quizzes and using multiple tools for explaining a concept. As a teacher explained: “this, for the first time without prior experience, was a challenging task but with time, when we got familiar, these resources proved to be very helpful in achieving the learning objectives.”

(iii) Adaptation

A clear win, for many teachers, was the adaptation to digital education by both students and teachers. When the adjustment happened - for the trio of teachers, students and parents - the learning process was smoother. A teacher wrote, “using digital platforms was a success in a way that students were getting more comfortable with using technology for their learning purposes and were able to experience learning at a broader level.” For another teacher, “seeing all the kids work in one place made marking of work easier.”
(iv) Connection

Teachers found ‘being able to establish connection’ as a positive windfall of the virtual education process. Virtual education has allowed students to connect at a very critical time when, perhaps, they were feeling a lack of connection with their school friends, teachers, and peers. As a teacher noted: “students were so excited to video chat at a lesson and often didn’t want to sign off... it showed they missed and still valued the connection between peers and teachers. Families said students were thrilled to have even a phone call and hear my voice”.

(e) Multiple Platforms

Multiple platforms were invoked by teachers, depending on the pedagogies implemented and the learning needs of students. According to teachers, ‘Tencent’ had the tools to engage; ‘Zoom’ facilitated crafts and interactive projects; ‘Kahoot’ was great for motivation and engagement; ‘YouTube’ videos helped maximize comprehensible input at learners’ own pace; while ‘Google classroom’ was good for organization and setting clear expectations. It indicates that not a singular platform, but a combination was necessary to replicate face-to-face teaching in an online learning environment.

4.4 Challenges of virtual teaching

Insights into the challenges encountered by teachers while moving to virtual teaching practice reflect a broad range of challenges around the following eight themes: (a) student engagement; (b) training need; (c) parents’ engagement; (d) access to digital equipment; (e) monitoring learning; (f) teaching difficulties; (g) systematic challenges; (h) hectic and frustrating. The description of each theme is detailed below:

(a) Student Engagement

Five aspects (see Table 4) associated with the lack of students’ engagement are:

- Interaction – teachers found it difficult to interact with students, as is possible in a classroom setting. It was particularly challenging to deliver concepts and engage young students.
- Attendance – attendance and focus, particularly after a prolonged period of virtual learning, became an issue.
- Distractions – home environment, noise, and availability of toys were sources of distraction emanated as sources of distraction exogenous to teaching pedagogies. In addition, distractions also arose from a lack of ability to manage discipline in the online classroom, when students were not following directions and purposefully causing disruptions.
- Self-directed Learning – teacher responses imply difficulty for elementary school students to engage in self-directed learning, posing a significant challenge for implementing asynchronous learning.
- Motivation and Boredom – some students “entirely disappeared from learning” owing to lack of motivation and engagement while many students were “lonely and
depressed”. Repetition of tools, routine, and lack of diversity in approach also resulted in boredom.

(b) Training Need

Teachers were extremely cognizant of being ‘ill-equipped’ to handle virtual education, both on the side of technology as well as pedagogy adaptation to digital platforms. ‘Learning by doing’ is not an efficient and optimal way of getting trained in a live education environment, where many other factors, detrimental to student-learning outcomes, are simultaneously in play. Some teachers used virtual teaching practice for the first time in their whole teaching career as one of the teachers highlighted: “I have not used any of these in 36 years of teaching”.

(c) Parents’ Engagement

A vast majority of teachers found parents to be lacking in basic knowledge and skill for adjustment to the whole virtual education scheme, resulting in them being noncooperative and frustrated. Some parents managed great strategies to keep their kids engaged in virtual learning but were only able to support teachers during the online class; they could not independently use those strategies at home. The level of engagement of parents was a key determinant of the benefit derived by their children through virtual learning. However, a key influencer in the ‘inequality in learning’ was the families’ comfort level with technology varied which led to inequality. As a teacher stated: “it really becomes a privilege issue; students who have support in their houses were much more engaged”.

(d) Access to Digital Equipment

The digital divide inequalities posed a monumental challenge owing to complete lack of or frequent disruptions in the internet connection, both for teachers and students, even for well-resourced schools and homes. In addition, access to appropriate and adequate digital devices was a major problem in relatively disadvantaged households.

(e) Monitoring Learning

The digital learning environment made monitoring a humongous task for teachers and affected the feedback loop owing to delayed or missing assignments. Particularly, below-average learners suffered. Teachers were also concerned about the integrity in examinations and assignments, thereby nullifying an objective measurement of progress in pupil learning outcomes.

(f) Teaching Difficulties

Lack of physical connection and the inability to use body language and gestures to teach emerged as an impediment in effective teaching. Altering the tone of voice was creatively used as an alternate but had limited scope for effectiveness. The difficulty in reading through “photos of students’ work” meant that “feedback on work was not always appropriate”. In addition, the limitation of the range of online teaching tools meant teaching effectiveness remained significantly hampered.

(g) Systematic Challenges

Teachers wanting to deploy a range of activities, tools, or platforms for effective learning encountered systemic constraints (either school or by local government body). These controls put an additional limitation on the creativity and effectiveness of the virtual teaching practice.
(h) Hectic and Frustrating

Epitomizing the challenge is a quote from a teacher, who acknowledged that “I found that my joy in teaching disappeared as it became a stressful slog every day that never seemed to have an end time”. An overwhelming majority of teachers found virtual teaching to be a hectic task getting in the way of work-life balance on the one hand, while requiring a number of non-educational administrative aspects on the other. As one teacher sighed: “too many passwords and websites to keep up with. I already have several windows open; can’t present and keep an eye on managerial stuff too”. Teachers found that “technology can’t handle what we are asking it to do; it is tiring, frustrating and demotivating”.

4.5 Suggestions for improvement

The themes that emerged from the data as to what suggestions teachers have for improving digital education are: (a) planning; (b) access to digital equipment; (c) school’s policy; (d) collaboration.

(a) Planning

The data clearly indicated that various aspects need planning to ensure improvements in digital teaching (See Table 5 for the supporting quotes). Those aspects are as follows:

| Table 4 | Supporting quotes from teachers regarding challenges linked to students’ engagement |
|---------|-----------------------------------------------------------------------------------|
| Aspects of student engagement | Supporting quote/s |
| Interaction | “the loss of ability to interact with students in the classroom setting.”  
“it was difficult to engage with students during online sessions.”  
“to deliver concepts and engage each and every student was a big challenge, as many students were of small age.” |
| Attendance | “students’ attendance and their focus was a challenge.”  
“students were not attending.” |
| Distractions | “the availability of toys nearby that would distract them, noise from the house as well.”  
“struggle was classroom management … I could not disable text-based chat for some students that were not following directions and purposefully causing disruptions.” |
| Self-directed Learning | “students couldn’t engage in asynchronous learning by themselves. As a result I did about 4 h of live zoom sessions with them each day with breaks in between.” |
| Motivation and Boredom | “lack of motivation from some students, some of whom disappeared entirely from learning….. many students were lonely and depressed”  
“we have to come up with something new almost every day to motivate kids.”  
“it was very hard to keep them motivated especially by the end of the term.”  
“students get bored after a while using the same tools.” |
• Synchronous teaching - teachers found synchronous teaching more effective for digital learning as compared to asynchronous teaching.

• Video Lessons - producing video lessons can be time-consuming, and therefore pre-existing videos on platforms like YouTube can be used. A teacher also mentioned starting a YouTube channel for her students.

• Activities and Tools - there is a need to focus specifically on modifying teaching activities and using the right tools to make teaching more engaging and ensure that the experience is not monotonous for students.

• Class size - small class size is preferred for effective teaching in an online setting.

• Attendance - incentivizing students is needed to ensure presence in the virtual classroom.

• Social interactions, discourse, and relationships - social interactions, discourse, and relationship building is needed while teaching online, as digital learning creates a physical divide.

• Independent time - while teaching online, giving independent time to each student can make teaching more effective.

• Syllabus - syllabus is reduced while adapting it to a digital setting.

• Training - teachers and students must be trained before implementing digital education.

• Teaching material - appropriate teaching materials i.e. digital platforms and teaching resources are required to be made available to the teachers.

• Parental involvement - raising parental awareness to ensure parental involvement in digital education is necessary.

• Monitoring and Feedback Mechanism - monitoring and feedback mechanism needs to be well-thought through, while ongoing assessments are mandatory to ensure monitoring.

(b) Access to Digital Equipment

Data suggests that it is crucial to ensure that every child has access to digital equipment. Teachers mentioned the importance of access to the internet and digital gadgets to ensure digital learning does not create a learning divide, as one teacher wrote: “providing strong internet facilities and ensuring the availability of gadgets with every student is crucial”.

(c) School’s Policy

According to teachers, the design of digital teaching and learning depends on the school’s policies. Practitioners suggested giving more freedom to teachers for designing their lessons in the digital settings to ensure effective learning: “Teachers should have complete independence for conducting their lessons”.

(d) Collaboration

While implementing digital education, teachers expressed connecting and collaborating with other teachers to exchange best practices. Sharing teaching resources will also give teachers space and time to give more attention to their students and learn from each other, as a teacher noted: “promoting connection and collaboration vs. competition will be essential for everyone involved. Allowing different members of the team to do different video lessons that we can all use would maybe free us up to spend more time connecting with students and learn from each other as colleagues.”
Table 5 Supporting quotes from teachers regarding planning to ensure improvements in digital teaching

| Aspects of planning theme          | Supporting Quote/s                                                                                                                                 |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Synchronous teaching              | “My school only allowed to teach asynchronously in spring.... that didn’t work, I disliked it and began synchronous lessons in late May. I will prefer to begin synchronously with my students in September.” |
|                                  | “I will use more synchronous lessons in small groups.”                                                                                              |
| Video lessons                     | “Making and producing videos for each lesson is very demanding and time consuming, I would rather use YouTube, worksheets, and PowerPoint.”        |
|                                  | “I am preparing video lectures to upload them on my YouTube channel... from YouTube channel my students can listen my lecture anytime and they can clear their own concepts.” |
| Activities and tools              | “I would prefer to engage students in more hands-on experiences... it was lacking in online classes.”                                                |
|                                  | “... modification in teaching techniques to avoid monotony and make virtual learning a refreshing experience.”                                      |
|                                  | “... making it more creative, lively, engaging, easy to access for every student... using more enhanced strategies and resources to make it more interactive and interesting for students.” |
| Class size                        | “In order for virtual learning to be successful we need smaller class sizes ... that way teachers can make multiple groups per day and truly talk to the students and maneuver through the curriculum... students could also talk to each other and collaborate (so important), which they can’t across the huge zoom class.” |
| Attendance                        | “An incentive to make students’ attendance a surety”.                                                                                               |
| Social interactions, discourse,   | “Relationship building becomes even more important across a digital divide, so finding ways to interact with individual students needs to be a focus.”       |
| and relationships                  | “With our school’s questionnaires to students and parents it became evident that more peer connected work and more depth of lesson material was desired.” |
| Independent time/learning         | “Individual facility by uploading lectures on Whatsapp so that they can access easily.”                                                              |
|                                  | “It is important to allocate independent time for students, especially in this uncertain time.”                                                          |
| Syllabus                          | “It is important that syllabus should be cut down for making digital education effective.”                                                             |
| Training                          | “For virtual education, both teachers and students as well must learn different tools and how to use them.”                                          |
|                                  | “... we need to learn different software that work in this regard. To make it more easy for the learners to understand and even for the parents too.”     |
| Teaching Materials                | “Schools need to provide teachers with the appropriate resources they need including the apps that help enhance virtual education.”                 |
|                                  | “... more digitally interact able software to make things easy.”                                                                                     |
|                                  | “I prepared flash cards ... more apparatus should be used for young children.”                                                                    |
|                                  | “Schools can support teachers by providing appropriate resources for all subjects.”                                                                |
| Parental Involvement              | “Parental awareness is required about their responsibilities while their kids are attending classes. Parental support is highly required for successful virtual education.” |
5 Discussion

The purpose of the current exploratory research is to explore which pedagogies teachers have successfully used while teaching virtually during the pandemic; to identify the challenges and successes of virtual teaching practice; and to understand teachers’ suggestions for improving the quality of virtual teaching pedagogies.

According to the results, teachers highlighted 40 different pedagogies which they successfully implemented in the virtual settings. Among these 40 pedagogies, project-based learning appeared most frequently in the data. According to Krajcik & Blumenfeld (2006), project-based learning allows students to learn by doing and applying ideas, and it is based on the constructivist approach where students construct their understanding by working with or using different ideas. In project-based learning, students usually investigate questions, propose hypotheses, construct ideas, challenge each other’s ideas, and try new ideas. In a virtual setting, the main alternative to improve students’ capabilities is online project-based learning (Edy et al., 2020). In the article titled, “project-based learning gets its moment during the coronavirus”, Mathewson (2020) highlighted that implementing project-based learning has led to increased student engagement, nurtures critical thinking and collaboration, and offers opportunities for interdisciplinary learning. According to Mathewson (2020), project-based learning was employed in Shelby County’s public schools during the coronavirus lockdown: it resulted in enhanced engagement of students, and teachers found the method to be academically rigorous and helpful in promoting deep understanding of the class topic. Blog posts by Beach (2020) and PBL works (2020) also indicated the efficacy of project-based learning in an online setting.

After project-based learning, lectures and presentations frequently appeared in the data (19 times), which indicates that the digital transformation of education, in some cases, has made education transmissive. Bligh (2000) suggested that during the lecture, a speaker wants an audience to learn something through a series of expositions. Given that the lecture is an effective method to transmit information, most lectures are ineffective to: (a) promote thought; (b) change attitudes or values; (c) teach behavioral skills. According to Bates (2015), in digital education, lectures are still going to dominate for the next ten years as the content can be easily digitized while using lectures and be made available at low cost.

When the COVID-19 pandemic hit, most teachers were not prepared on the one hand, and on the other, the schools and governments were not ready to allocate resources for digital education at kindergarten or elementary school levels. The problem found more hardened in the developing nations as found in several past

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Table 5 (continued)

| Aspects of planning theme | Supporting Quote/s |
|--------------------------|--------------------|
| Monitoring and Feedback  | “I would like to educate parents through virtual workshops .. to ensure best learning of their kids.” |
| Mechanism                | “... figure out new ways to provide feedback and how to do that without taking more hours than I was actually teaching.” |
|                          | “... make ongoing assessment as its integral part. Depending only on summative assessment makes learning uncertain.” |

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studies in Asian context like Kundu & Bej (2020a) and Kundu & Bej (2021). As synchronous and asynchronous lectures and presentations are cost-effective and easy ways to digitize content while making sure that learning losses are reduced (as content knowledge is being transmitted), many teachers used lectures and presentations for virtual teaching during the COVID-19 instigated school closures. Carrying out a task professionally means doing it thoroughly, competently, and in a morally correct manner. Professionalism is an aspirational ‘ideal’ to provide a high-quality service (Hoyle, 1995). People have inherent strength and capacity that needs to be harnessed through a targeted effort toward their development (Ebersohn & Eloff, 2006). Methodical preparation for undertaking ‘virtual education’, as opposed to inadvertent experience, is better poised to prepare effective teachers (Davis & Ferdig, 2018).

From the results of the successes of virtual teaching experience, it can be deduced that teachers found the experience interesting and used multiple virtual platforms to maximize the learning experience for their students. Teachers also recognized the “need for connection” for their students during the pandemic and tried their best to utilize the virtual teaching opportunity to maintain the connection between students and with students. UNICEF (2020) asserted that the COVID-19 pandemic, and ensuing protective measures against the risk of infection, can have significant impact on people’s emotional wellbeing - for example, school closures and distance from peers can lead to increasing anger, sadness, fear and anxiety.

The results depict that teachers made a significant effort to adapt face-to-face teaching to an online setting and were generally successful in making the transition. As an outcome of this adaptation, teachers were able to learn through their own experience of converting face-to-face teaching practice into virtual teaching practice. According to Roberts et al. (2005), teachers can be contextually extraordinary by deliberately achieving a fundamental state of leadership through putting themselves out of the comfort zone; determining what needs to be created; and identifying what will it take (in virtues; commitment span; and willingness to learn afresh) to get it done. Willingness to learn, and virtuously getting it done by delivering positive human influence, hold purchase, as a necessary ingredient, for a ‘virtual education scheme’ to be successful.

While teachers highlighted successes associated with digital teaching practice, these successes did not come without challenges like lack of student engagement; the need for training; lack of parents’ engagement; lack of access to digital equipment; undefined monitoring mechanism, and other systematic challenges. Using Blundell et al.’s (2015) framework of intrinsic (internal) and extrinsic (external) influences on digital technologies in teaching practice, we deem all these highlighted challenges to be extrinsic in nature. Intrinsic challenges are associated with teachers’ own attitudes and beliefs; innovation routine; knowledge and skills; vision and design thinking (Blundell et al., 2015), which was not a fundamental issue in digital teaching practice during the COVID-19 pandemic.

A study conducted by Ertmer et al. (2001) concluded that the disparity between the practices and constructivist beliefs of the teachers, while implementing digital education, is due to those external barriers. Ravitz et al. (2000) also identified that, in a virtual learning environment, the limitations on the implementation of teachers’ constructivist beliefs are linked to balancing multiple objectives, meeting the needs
of individual students in a big classroom (student engagement) and dealing with external forces and expectations. According to Ertmer et al. (2012) the key external barriers to digital teaching practice include: hardware and internet access, access to software and tools, training, support (administrative, technological, professional and peer) and similar challenges are highlighted by the results of the current study.

Pupils from marginal socioeconomic households are ‘disadvantaged universally’ (Reay, 2017), and this reality came to the forefront on account of the challenges posed by the COVID-driven virtual education scheme. Data analysis clearly highlighted challenges teachers faced during virtual teaching practice due to inequality in access to digital equipment and parental support. Recognizing the need for ‘social justice’ i.e., all children deserve equal chances to participate; and that ‘parents’ are not homogeneous and face widely differing factors influencing their capacity for support (Maringe et al., 2015) is critical in a situational response. Education leaders being ignorant of these realities, while dispensing education to a vastly diverse cohort of pupils, is an abdication of responsibility (Lumby, 2010).

The overarching responsibility of educational leaders is to provide ‘student-centered leadership (SCL)’. Quality enactment of student-centered leadership (SCL)’s five dimensions (to follow Robinson, 2019) requires: clear goal-setting; strategically resourcing; quality of teaching using planning and monitoring tools; teacher learning and development; and ensuring an orderly and safe environment. Excellence is measured, not just by the learning outcomes but also by the virtues employed in achieving them (Robinson, 2019). Bridging the gap between achieving learning outcomes and doing so while invoking ‘virtues’ and ‘SCL’ will require a lot of training and practice before becoming applicable in a ‘virtual education’ environment. Teachers and education leaders’ motivation of ‘in it for the children’, while essential, is inadequate to meet present and future challenges facing the next generation. Effective school leaders’ foremost priorities, while invoking a ‘virtual education scheme’, must be to embed a culture of teaching and learning (Mestry & Grobler, 2004) through: education standards; effective parent engagement; conflict management; and accountability.

Given that challenges faced by the teachers were external in nature while implementing digital education, most of the suggestions associated with improving digital teaching practice, in the context of pedagogy, were linked to dealing with external barriers to digital teaching practice e.g., proper planning, access to digital equipment, flexible school policies and collaboration. Leading education against odds, emanating from socio-economic disparity, can be overwhelming and emotionally exhausting to a point of being ‘wicked’ (Grint, 2010). ‘Wicked’ problems may not have a solving point i.e., stopping may be untenable where the missing pieces are vital information; nature of causality; and a clear path to gaining full understanding. COVID-19 response, needed by teachers around the world, is considered a ‘wicked’ situation.

To ensure the effectiveness of digital learning in the future, UNESCO (2020a, b) proposed preparedness in the context of technological readiness (capacities and equipment), content readiness (teaching and learning materials), pedagogical and home-based learning readiness (teachers’ and family readiness) and monitoring and evaluation readiness. While highlighting the preparedness of teachers for pedagogical shifts UNESCO (2020a) quoted:
“Key to successfully shifting to distance learning is not only to train and support teachers, but also to promote collaboration among teachers. Engaging teachers in the design of massive distance learning programmes, especially TV or radio programmes, can lead to best possible integration of technology and pedagogical methodologies. Teachers should be supported on how to find solutions to common challenges such as supporting learners overcome distance and disengagement, adjusting instructional design to motivate students and maintain engagement, and developing and sharing teaching and learning resources and best teaching practices.” (UNESCO 2020a, pp. 3).

6 Conclusion

Digital adaptation associated with pedagogies in teaching practice during the unprecedented crisis posed by the COVID-19 pandemic, captured from teachers’ perspectives, have highlighted that the respective education systems were not prepared for this transformation. Conducted with an aim to explore what happened with kindergarten and elementary school education during the Corona virus-instigated school closures, our study reveals that there was a successful effort by teachers to partly implement multiple pedagogies. While implementing these pedagogies in a virtual setting, teachers faced multiple challenges and most of these challenges were extrinsic in nature. The current study also sheds light on the insightful suggestions for improvement, from teachers’ perspectives, that can be used to inform virtual learning and bring about an improvement in the digital teaching practice. Bridging the gap between achieving learning outcomes, while invoking virtues, will require a lot of training and practice before virtual education pedagogy can be deemed universally effective for young children across all segments of society.

6.1 Limitation

The current study was pilot research, undertaken during the peak COVID-19 pandemic period when schools were closed. Conversely, it has three key limitations, which are as follows:

1. Although we took specific measures to remove the seeding bias while collecting the data via social media, it is uncertain that it has been completely eliminated;
2. The purpose of the current study is to explore what happened on the ground, during the COVID-19 induced school closures, in the context of virtual teaching practice. Consequently, purposeful sampling has been used, which made the sample size small and limited;
3. The sample was collected via social media. It has neither been uniformly collected nor fully represents all the regions providing data input. Therefore, while the results cannot be generalized, insights from the study can be contextualized and used to inform virtual teaching practice.
Declarations

Conflict of interest  The authors hereby declare that there have no conflicts of interest.

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