
Pedagogical Shift in Education During COVID-19 Pandemic: An SLR Approach

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Article History: Received 14 Oct. 2021; Reviewed 19 Nov. 2021; Revised 5 Dec. 2021; Accepted 4 Jan. 2022.

Abstract

This paper aims to examine the shift in modality of pedagogical approach of education during the COVID-19 pandemic and identify the challenges faced by educational institutions, teachers, student and parents, and the perception of students towards the approaches. The study is based on Systematic Literature Review (SLR) approach based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The study critically analyzed the findings of 27 research articles. The result depicted that COVID-19 pandemic had a significant impact on education due to which majority of the institutions shifted to online mode of teaching and learning. The shift was observed in both practical and theoretical studies, and also in schools who refrained from adopting digital technology prior to COVID-19 pandemic. There were numerous challenges faced by the educational institutions, such as, lack of technology, technical know-how, and experience in virtual teaching, among others. Similarly, parents felt burdensome to additional cost incurred for gadgets and internet. The study also revealed that despite the difficulties, students were positive about online teaching and learning, and thus the use of virtual methods of teaching with high inclusion of digital technologies can be considered as best alternative for future considerations in academia.

Keywords: COVID-19, education, pedagogical shift, PRISMA, virtual teaching.

Introduction

The onset of severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) or COVID-19, formally recognized as a pandemic on March 11, 2020 by the World Health Organization (WHO), brought forth severe turbulence in the world (Lai et al., 2020). In response to the pandemic, the governments around the globe undertook extreme social distancing measures in the form of nationwide lockdowns with the motive to control the spread of COVID-19. As a result, the imperative sectors of the economy were closed down which resulted in the largest economic shock experienced by the nations and different economic sectors in decades. The implementation of nationwide lockdown altered the operating methods of the world as people refrained from physical contact and group gatherings. This ensued enormous challenge to the different economic actors, and pushed them to adopting innovative operating modalities to sustain in the new normal (Reupert, 2020).

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Similar to all other sectors in the economy, education sector was also severely impacted by the wrath of the pandemic (Rajhans et al., 2020). Given the mandatory shut down of education institutions, the traditional model of teaching and learning – class-room based group learning – had to be halted and new models of remote and virtual learning had to be adopted (Almuraqab, 2020). Governments around the globe ceased physical classes, requiring the institutions to switch to online teaching or virtual teaching overnight (Daniel, 2020). While at that, the education institutions also needed to ensure that they fulfill their ethical responsibilities by sticking to their basic values, in order to maintain the direction and credibility of academic learning (Rafi, Varghese & Kittichira, 2020). Consequently, with the need to adopt a new mode of education delivery, the overall educational system in the world experienced a new paradigm shift with high inclusion of digital solutions (Maqsood et al., 2020). The educational institutions of Nepal also experienced similar effect of the pandemic and the nationwide lockdown, where educational institutions shifted towards digital approaches to teaching and learning (Gautam & Gautam, 2020).

This shift in pedagogical approach in education has unleashed new opportunities for educational institutions, where educational institutions can increase their reach and increase the overall quality of education. However, prior to leveraging the benefits accrued through digital platform it is important to understand the impact of COVID-19 on the educational sector. Likewise, to make future policy decisions regarding the new system of education introduced by COVID-19 pandemic, it is also important to learn about the challenges faced by different educational institutions and the perception of students regarding the same. Acquiring knowledge on these aspects will help policy makers as well as educational institutions to develop policies and actions that will not only address the perceived difficulty but also will facilitate towards effective delivery of education in future.

This research thus aims to answer the following questions:

- i. How did educational institutions cope with the COVID-19 pandemic?
- ii. What were the challenges faced by educational institutions while shifting their pedagogical approach?
- iii. How did the students perceive the change? Should educational institutions continue online teaching after COVID-19?

Methodology

The Systematic Literature Review (SLR) in this study has been conducted with the help of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. PRISMA is widely used for conducting systematic reviews and meta-analysis. The PRISMA declaration consists of a checklist with 27 points and a four-phase flow chart. The checklist contains items that are considered essential for transparent reporting on a systematic review (Liberati, 2009).

Data sources and search strategies

The data used in this study has been extracted from journals that are renowned for their credibility. The official website of Journal Storage (JSTOR), ResearchGate, Elsevier (Science Direct), Sage Journals, Education Resources Information Center (ERIC), and Springer Link were used to search

for relevant journal articles on pedagogical shift in education during COVID-19 pandemic. Given the occurrence of COVID-19 in 2020, all journal articles reviewed in this study are recent publications of 2020 or early 2021. This study is also highly reliant on peer reviewed journal articles. To identify the relevant journals and other researches concerning the pedagogical shift in education, Google search engine, especially Google Scholar, was used. The closest and most relevant key words like 'education post COVID-19', 'pedagogical shift in education', 'shift in education pattern after COVID-19', 'online learning post COVID-19', 'use of digital technology in education', and 'paradigm shift of education towards digital and virtual classes', were used. Relevant articles were searched with the help of reference list available on research articles selected for this study. Each reference was scrutinized and the most suitable ones were selected.

Selection of studies

The studies were selected by following three prominent steps. Firstly, different journal articles that were relevant to this study were downloaded. Secondly, the abstract, methodology, and findings of the downloaded articles were studied. Thirdly, the studies which were applicable to answer the mentioned research questions and belonged to accredited journals were selected and other articles were deleted.

Data extraction, data extraction process, and quality assessment

The quality of journal articles extracted for the purpose of the study was conducted independently. For ensuring credibility, and assessing journal quality, the number of citations of each journal were reviewed, as in the case of Journal Impact Factor (JIF). Only those journals which have been cited in different research articles were used. Special consideration was given to journals based in Nepal.

Eligibility criteria

The first eligibility criteria for journals to be included in this study was relevancy of topic and abstract. The second criterion was the availability of complete journal article. The third criterion was the publishing journal name and whether the articles had been cited by other studies. The third criterion was relevancy of the journal article with specific research question of the study. The articles that did not meet the aforementioned criteria were eliminated and new articles were searched.

Constitution of the corpus of analysis

The journal articles used in this study were organized according to the year of publication and alphabetical order of the author's last name. Each article was provided with their respective serial numbers. Initially, 37 articles were downloaded from different sources. Post reviewing the articles on the basis of all three eligibility criteria and removing duplicates, 27 articles were included in the study and remaining were eliminated.

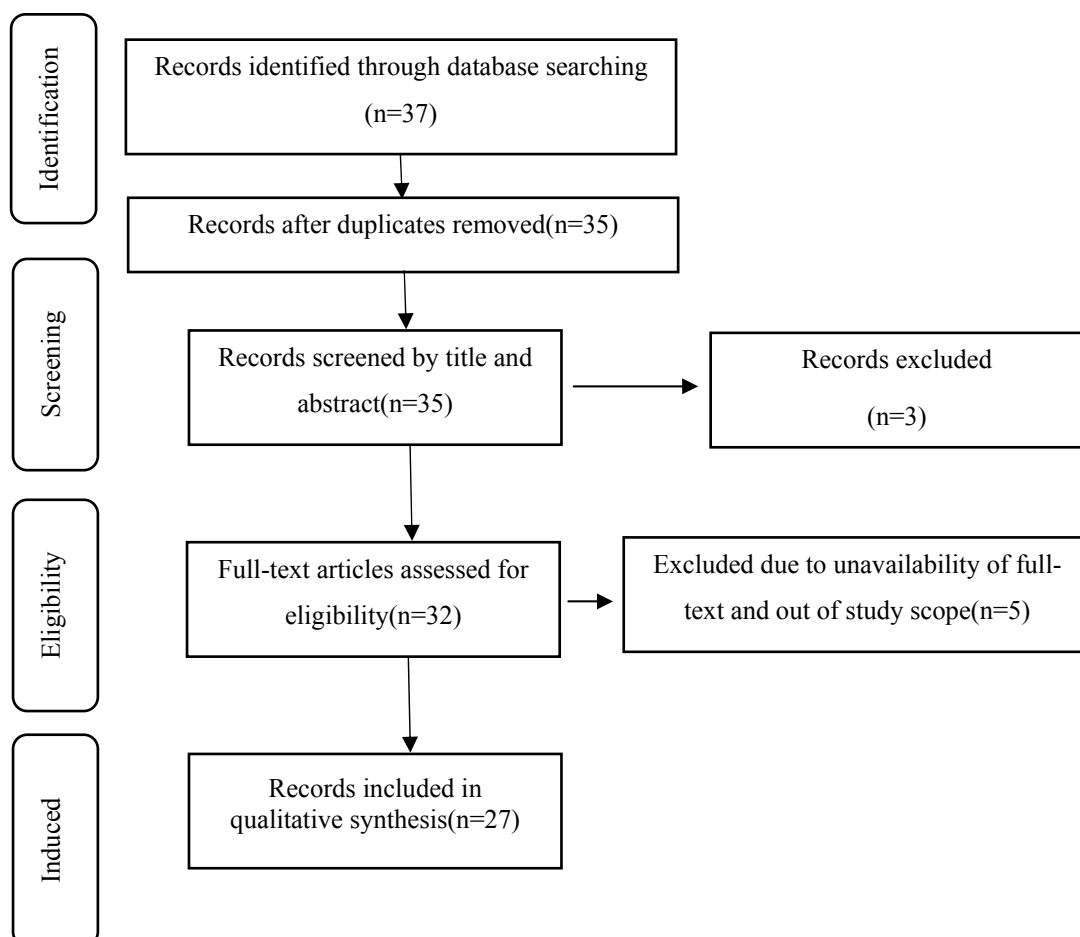


Figure 1. Reporting items for the systematic literature review as per the Preferred Reporting Items for Systematic Reviews (PRISMA).

Appendix A presents all the papers included in the systematic review (n=27) and the codification used to identify each one of the papers. The codes have been used in the result section to discuss the analysis.

Characteristics of included studies

The study focuses on analyzing the pedagogical shift in education during COVID-19 pandemic. Thus, the papers included in the study were written post 2020 after the commencement of COVID-19 pandemic. Majority of studies included in the paper belongs to the year 2020 and 18.52 percent of the studies belong to the year 2021.

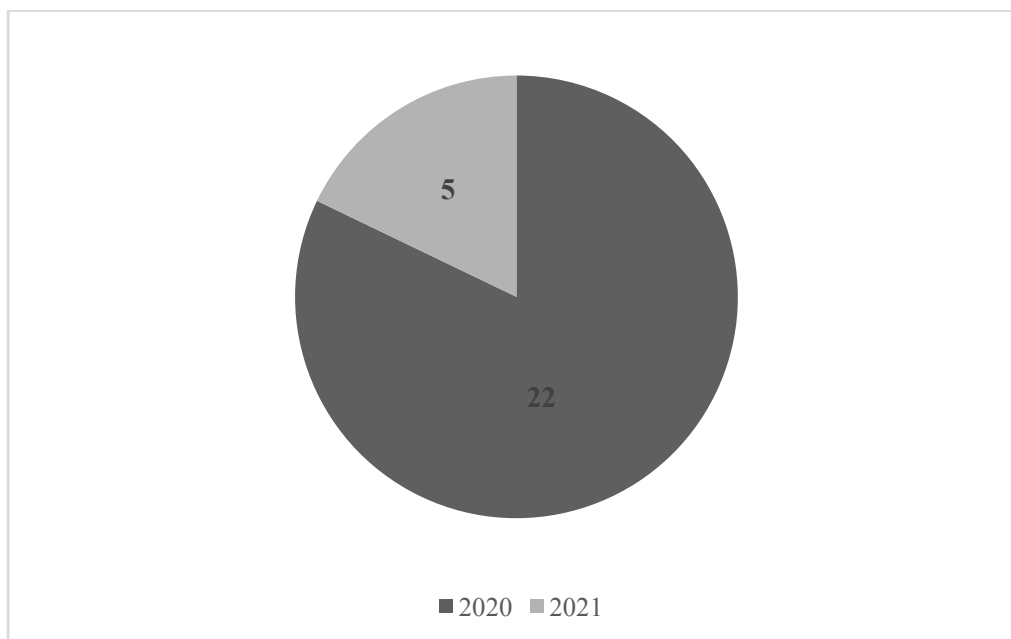


Figure 2. Frequency of publication per year.

To enhance the credibility of the qualitative data used in the study, journal articles of renowned sources of paper which have been cited by other papers were taken.

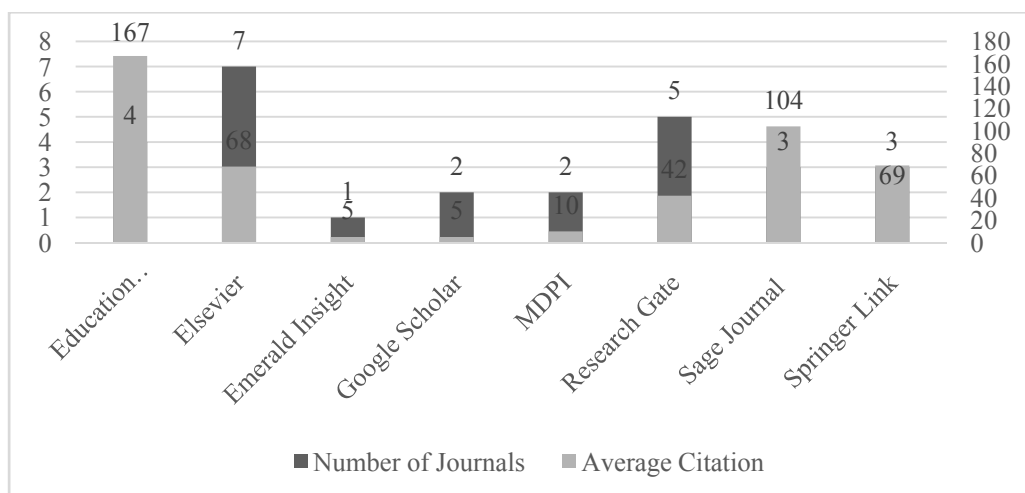


Figure 3. Sources used and average number of citations per source.

The highest number of articles were extracted from Elsevier (Science Direct) (7) followed by ResearchGate (5) and Education and Recourses Information Center (ERIC) (4). The average number of citations was highest in ERIC and Sage Journal.

Strengths and weakness

The study has incorporated PRISMA approach for conducting structural literature review. The study has been developed by identifying the most relevant documents regarding the same. The study has attempted to include a large number of studies to analyze the shift in education from different perspectives. The study has also incorporated a large number of literatures that portray the reality of different countries, including South Asia and Nepal. However, given all the studies taken have been conducted within a limited time frame – 2020 or 2021 – after the commencement of COVID-19 pandemic, the number of referral material might be limited. Additionally, papers that present more detailed analysis of different imperative aspect of pedagogical shift in education might not have been incorporated.

Results

This section consists of the findings identified through the systematic literature review of 27 articles that have been organized as per the research questions that is addresses by this study.

What impact did the COVID-19 pandemic make on the educational system? [(3SL), (3RG), (2RG), (1E), (2ERIC), (1MDPI), (4E), (1SJ), (1EI), (5RG)]

The inability to conduct physical classes by educational institutions, as a result of mandatory lockdown measures adopted by governments around the world, stemmed a significant shift in pedagogical approach of education. Different academicians have attempted to study the shift from traditional methods towards modern and digital methods of teaching and learning during COVID-19. For instance, paper 3SL shed light on the fact that due to temporary closure of educational institutions to minimize the contamination curve of COVID-19, 91 percent of the world's student population have been impacted. To address the same, the paper has attempted to analyze the adaptation of innovative and new approaches by educational institutions to ensure that the right to education of students is not mired. The paper portrayed the increasing use of online education in China, which implies the penetration of internet, data, artificial intelligence, cloud-based platforms, and 5G networks in the teaching and learning process, and concluded that usage of such technologies can cause a paradigm shift in education post the COVID-19 pandemic.

Similarly, the purpose of paper 3 RG was to record and discuss intra-period university responses amidst COVID-19 pandemic and government imposed lockdown across twenty countries. Despite the portrayal of diverse responses from different universities and countries, the paper showed that majority of universities chose to maintain social distancing guidelines and conducted rapid redevelopment of curriculum and shifted towards full online educational practice. The paper highlighted that COVID-19 has initiated a significant development in pedagogical approach towards digitalization of Universities. Paper 2RG also attempted to study the transition from

classical mode of class-room based teaching to modern online-based teaching during COVID-19 pandemic. The study showed that as a result of the inability of conducting face-to-face lectures, educational institutions adopted alternative teaching practices by using G Suite products like Gmail, Classroom, Calendar, Forms, Jamboard, Drawings, Drive, Hangouts, and Open Broadcast Studio. It highlighted the sudden yet impactful shift in pedagogical approach of education after the COVID-19 pandemic.

In a similar attempt, the purpose of paper 1E was to identify the adaptation of innovative solutions in light of restrictions in in-person gatherings. It especially focused on practical education of surgical students, for whom in site learning was imperative. The paper concluded that flipped classroom models, online practice questions, teleconferencing, procedural simulation, and videos of surgery were effective in mitigating the negative effect of restrictions, opening up possibilities of virtual classes even in practical subjects. Likewise, paper 2ERIC attempted to study the different process and tools used during COVID-19 pandemic by educational institutions. The study revealed that the traditional methods of teaching in physical classrooms were being shifted towards online platforms like TV school, Microsoft Teams, ZOOM, Slack, Google Meet, among others. The paper mentioned that the quick transition towards online form of education was successful and that it could lead towards formation and implementation of new legislations and platforms, causing a paradigm shift in educational system of countries. Such transformation would make educational institutions and people more experienced and prepared for the future. Likewise, paper 1MDPI was conducted with the purpose of analyzing the new methodological approaches adopted in light of COVID-19 and to offer a solution that would optimize the work of educational professionals with the use of information and communication technologies.

Paper 4E aimed to portray the shift towards online teaching-learning during the COVID-19 pandemic and aimed to answer how existing educational resources could be effectively used to create virtual and pivotal online tools to shift the educational landscape towards a digital one. The paper also highlighted the shift towards online teaching and learning activities in educational institutions during lockdown and its link with the potential change in the entire educational system as a result of widespread use of digital technology. Likewise, paper 1SJ attempted to showcase the growth of EdTechStartups in India during COVID-19 pandemic and other natural disasters. The paper revealed that all educational institutions – even the ones who followed traditional forms of teaching without using blended learning tools like digital technologies - were pushed towards adopting online mode of teaching and learning overnight due to COVID-19, which has created a shift and opened new avenues for pedagogical shift in education.

Similarly, in the context of Nepal, paper 1EI exhibited the extensive use of digital platforms in Nepal during the COVID-19 pandemic. The purpose of the paper was to generate substantive evidence that would contribute towards efficient and effective shift towards innovative online as well as physical teaching learning practices post COVID-19 pandemic, which was already initiated during the nationwide lockdown phase. Lastly, paper 5RG aimed to emphasize on the benefits of online learning and how it could be beneficial towards future shocks of any kind. It also presented the emerging approaches of online teaching and learning as adopted by India and showed the potential of paradigm shift of education towards virtual models. The findings of the aforementioned studies revealed that COVID-19 pandemic and the subsequent social distancing measures – in the form of lockdown – imposed by the governments around the globe has had significant impact on education.

What were the challenges faced during the transition? [1ERIC,1SL, 4ERIC,3ERIC, 3E,1GS,3SJ,2E, 6E, 1E]

The shift towards adaptation of modern digital methods of teaching and learning was a phenomenal achievement in the overall education sector. However, given the shift being sudden with less preparation for adopting to online and virtual models of teaching and learning, the educational institutions, teachers, as well as students experienced different forms of challenges. The challenges that occurred during the transition were studied and recorded in different research.

The paper 1ERIC aimed at examining the perception and experience of teachers towards online teaching to identify the different forms of challenges faced by them. The paper revealed that since teachers are more experienced in teaching in traditional classroom models, delivering education online is often perceived as challenging. While teaching online there is limitation in means to engage with teacher, the sense of community or group work, and constraints in traditional models of teaching like bell schedule and classroom management. Additionally, the teachers perceive students to less motivating and less supporting. Similarly, paper 1SL focused on challenges related to pedagogical content knowledge regarding designing and organizing learning experiences for distinctive learning environment with the use of digital technologies and provide solutions for the same. Likewise, paper 4ERIC studied how COVID-19 pandemic affected higher education in Phillipines. The paper identified that both private and state-run colleges and universities were not prepared to implement online education system and thus faced challenges in delivering effective education to students. Likewise, teachers also faced challenges in using technology that hampered the education delivery process.

The purpose of paper 3ERIC was to understand the experience of home learning in times of COVID-19, especially from the perception of parents. The paper revealed that in light of gap in education of children parents were supportive of online education, however, following the routine of online classes was difficult for parents who were working from home. Additionally, the requirement to have access to computers and internet created hardships for parents. Likewise, the inability to resolve technical issues also resulted in challenges which caused their children to miss out on learning. Paper 3E highlighted the paradigm shift towards digital mode of education delivery and the different challenges encountered. It revealed that social isolation and online classes had resulted in substantial mental stress amongst students. Additionally, outdated technical platforms and maintaining institutional operations like course works and exams created hindrance in effective education delivery in online platforms.

Paper 1GS aimed to explore the perception of students towards the effectiveness of synchronized online learning. The paper also presented the challenges encountered by the students, which revealed that the students faced content challenge, technological challenge, and behavioral challenge. Firstly, the students found it difficult to understand some concepts through online medium. Secondly, internet connectivity and poor utility of online tools also hindered effective learning process. Lastly, the individual behavior also created hindrances in adopting to online learning. Likewise, paper 3SJ also attempted to analyze the barriers faced by students while attending online courses in Kerala. The paper highlighted that temporary disruptions in internet and electricity hindered their online learning experiences. Similarly, another barrier was due to the attention span of students, as classes of more than 45 minutes were not as effective. The medical students also faced problems in understanding practical sessions virtually. The purpose of

paper 2E was to examine the feasibility of studying from home in Pakistan. It revealed that in low-income country where the incidence of poor people is high, accessing necessary tools like internet and computers for online education is challenging. The paper identified that the rural areas faced immense constraint in providing internet, TV, and computer to the children which hamper the online learning process of poor children or children who are residents of rural parts of the country. Likewise, it also showed a divide between the access to online education between male and female students, with females having comparatively lesser opportunity to participate in online classes. Similarly, paper 6E was conducted with the objective to identify the difference of access and use of online learning opportunities between developed and under-developed nations. The paper showed that factors like access to internet and affordability of gadgets for online learning significantly influenced student satisfaction, which was less in under-developed nations.

In the context of Nepal, paper 1EI highlighted the challenges faced by administrative staff, faculties and students of Nepal while studying online during COVID-19 pandemic. One of the major challenges was recorded as lack of preparedness and level of infrastructure for online classes. It was difficult for parents to finance the laptop and internet for their children. The student's level of satisfaction was limited as they doubted on the ability of teachers to conduct online classes. A major challenge faced by educational institutions was to maintain equity to all students as economically backward families could not afford internet and electronic gadgets or lived in areas with limited internet and electricity coverage. Lack of seriousness among students was also experienced by teachers due to absence of face-to-face interaction with students. Likewise, students were also found engaged in other activities including household chores while attending the class.

How did the students perceive the change? Should educational institutions continue online teaching after COVID-19? [5E, 1GS, 2SL, 2MDPI, 1RG, 5RG, 3SJ, 1EI, 2GS]

While the transition towards digital technology in education has been regarded as remarkable by academicians and experts, it is important to understand the perspective of students and how it has impacted their learning process. The aforementioned findings of different researches have established that despite sudden transition towards online system of teaching and learning, it is likely to be utilized even after the COVID-19 pandemic subsides. However, it is important to view it rationally from different perspectives before coming to a conclusion. To address the same, a plethora of academicians have attempted to analyze how students perceive the change in the pedagogical approach and whether it is prudent to continue online teaching.

The purpose of paper 5E was to understand the student's perception towards online learning in India by exploring the attributes of online education. The study identified that, in the face of the pandemic majority students were open towards online classes. Students preferred online classes as it provided them with greater flexibility and convenience. Based on the same, students were more attracted towards recorded classes with quiz at the end of each class. However, given the challenge of internet and electricity connectivity at rural area and the inability to conduct practical classes through online medium, the students suggested classes to be hybrid – a mixture of both

online and physical classes – for the future. Likewise, paper 1GS aimed to explore the perception of students regarding effectiveness of synchronized online learning. It analyzed educational impact, time management, challenges, and future preferences of students, and identified that online mode of teaching and learning was well received by the students as the online sessions were time saving and the students experienced an improvement in their performance. Thus, the students were open to online learning even in future academic years. Paper 2SL attempted to check the difference between male and female e-learning platform usage and accessibility. It identified that the information quality and system quality of e-learning portals had a high direct relation with user satisfaction among male students than female students.

Paper 2 MDPI also examined the perception of students towards online learning system in India. The study revealed that students were positive towards e-learning. Majority students found the different platforms user-friendly and were eager to leverage the platforms to enhance their educational performance. The study also identified that students perceived e-learning as equivalent to face-to-face learning. Likewise, paper 1RG aimed to study the student preference towards distant learning on online mediums in United Arab Emirates (UAE). The study identified that majority of students preferred learning online. While some students preferred studying 100 percent online, majority were in favor of blended learning. The paper implied that the educational institutions should prepare guidelines where they could continue a blend of distant as well as physical learning.

Paper 5RG also attempted to understand the perception of learners towards online learning. The paper revealed mixed result. Some of the online learners were highly satisfied towards virtual classes and requested for virtual platforms to learn practical subjects as well. Whereas, other online learners felt that online learning was not as effective as face-to-face learning. Students also sensed loneliness while learning online as interaction with peers were limited. Thus, they requested for physical classes post the pandemic. Similarly, paper 3SJ also attempted to record responses of students regarding their online learning experience. The paper identified a positive response from students. However, the students also provided a few suggestions regarding the need of recorded classes and limiting the duration of class from 30 minutes to 45 minutes. The students also felt that practical lessons could not be learned virtually and thus appealed for a blended approach where students can experience both virtual and physical learning.

In the context of Nepal, paper 1EI attempted to explore the factors that contributed to effectiveness of online classes by analyzing the perception of faculties and students. The study identified that majority students believe that online classes are more effective due to time flexibility and were positive about learning online. The students found online classes to have contributed positively to their performance due to higher interaction with teachers and inclusion of digital learning materials like videos and audio. However, the students faced problems regarding numerical subjects and short attention span. Similarly, paper 2GS attempted to analyze the satisfaction towards online learning amongst students in medical colleges of Nepal. It revealed that majority of students were satisfied with the online learning modality. The aforementioned literatures point towards the fact that majority of students are satisfied with online teaching and learning process, especially due to time flexibility and use of innovative and digital methods for education. The students prefer classes with duration of not more than 45 minutes, and they find it difficult to comprehend numerical subjects through online class. Likewise, while most students felt positive towards online classes, they prefer blended mode of education where theoretical

subjects are run through online medium and practical subjects through physical classes or hands-on experience. For the continuity of online classes post COVID-19, students prefer blended or mixed modal.

Discussion

This paper is conducted with the objective to examine the shift in pedagogical approach of education during the COVID-19 pandemic. The paper focuses on analyzing the shift in modality of teaching and learning during COVID-19 pandemic, and the challenges faced by educational institutions, teachers, and student. The paper starts by analyzing the impact of COVID-19 pandemic on education sector by referring to different researches conducted worldwide. Likewise, the paper is also based on studies that explored the challenges and perception of students towards the pedagogical shift in education. Firstly, the paper conducted an in-depth review of literatures that portrayed the shift in education delivery methods during the COVID-19 pandemic to understand its impact on education. The review of literatures revealed that the COVID-19 pandemic had a significant impact on educational institutions, as schools, colleges and universities were unable to open during the time (Zhu, 2020; Crawford, 2020). Consequently, the educational institutions were left with no option than to explore for ways to deliver education remotely. As a result, majority of educational institutions around the globe adopted digital approach and started conducting virtual classes. It resulted in a significant breakthrough in the field of education (Dawan, 2020; Espino-Diaz, 2020; Lebni, 2020).

In most of the countries around the globe, including Nepal, education was largely traditional which included classroom based teaching and learning (Gautam&Gautam, 2020). However, given the restrictions on such methods of operation of educational institutions, majority of schools, colleges and universities shifted to online or digital delivery of classes. Such patterns were not just noticed on theoretical subjects, but practical subjects needing on-site practice also were conducted via virtual platforms (Chick et al., 2020; Basilaia&Kvavadz, 2020). The shift in pedagogical approach of educational institutions occurred in a short span of time, with institutions being quick on redeveloping courses that was suitable for virtual platforms. This initiated a new wave of reform in the teaching-learning process in almost all countries around the globe. The COVID-19 pandemic has indeed caused significant changes in the method of education delivery and made the world more prepared and experienced in online delivery as well as intake of classes (Basilaia&Kvavadz, 2020). It has opened new avenues for education and new tools as well as platforms for education are being developed. Education sector post the COVID-19 will likely experience a paradigm shift with it being more inclusive of digital technologies and tools (Mishra, Gupta & Shree, 2020).

Despite the phenomenal change in education sector during COVID-19 pandemic, education institutions, teachers, parents, as well as student faced numerous problems while shifting towards online system of teaching and learning. The review of different research papers also depicted the different form of problems faced by different groups while adopting with the change. Educational institutions lacked digital infrastructure as well as experience to conduct online classes which to some extent hampered their management of effective education delivery (Toquero, 2020). Likewise, parents also experienced difficulty with the requirement to dedicate additional time to their children's education. Parents also faced extreme problems while managing finance for

internet and other gadgets that are imperative for online education (Bhamani et al., 2020). Likewise, teachers who had immense experience on traditional form of teaching found it less satisfactory to teach online as the intimation with students like in the case of face to face learning is less. Teachers also had problems in conducting online classes due to limited technological knowledge. Similarly, students also had problems in shifting to online classes due to poor quality of internet, and inability to purchase important gadgets (Rapanta et al., 2020). Students also found it difficult to comprehend numerical classes. Additionally, the short span of attention and the lack of trust regarding the ability of teachers to conduct virtual classes further created challenge for students. The aforementioned challenges were mostly felt in under-developed or less developed countries or regions, as challenges related to smooth supply of electricity and internet applied in the said areas. The economical backwardness in the remote or less developed areas also created challenges of equity in education. In such areas, disparity between male and female satisfaction regarding education was also felt (Hasan, Rehman& Zhang, 2020).

Despite the numerous challenges the different education actors responded positively to the shift towards online mode of education delivery. This implies that attention to addressing the challenge can open up new avenues for the education sector. Majority of challenges, reported by different studies also applied to Nepal. Thus, focus on bringing conducive policies to facilitate digital education by both policy makers and educational institutions can help the education system of Nepal improve. For the same, gigantic as well as small reforms in areas that focus on increasing access to electricity and internet or making digital gadgets more affordable is essential (Hasan, Rehman& Zhang, 2020). The different studies portrayed different benefits of online mode of education, the most popular being – ability to learn remotely, access to education during natural disasters and pandemic, time flexibility to conduct different activities whilst learning, introduction of more innovative methods of learning like videos and other tools, unleash new interaction platform and enhanced teacher-student communication, among many (Archambault&Crippen, 2020; Bhamani et al., 2020; Rafi, Varghese &Kuttichira, 2020). Nepal could leverage the benefits to improve the overall educational outcome of Nepal and to increase access to education amongst wider group. However, prior to realizing the benefits, it is important to address the identified challenges.

The perception of students towards online education also support the fact that addressing the different challenges that persist in delivering online education could help improve the educational performance. Students perceive online education positively and they believe that it has helped their educational performance. Students however prefer short classes. The perception of students towards continuing online classes in future was positive, however they prefer blended classes where they get to learn numerical and practical subjects physically (Mishra, Gupa& Shree, 2020; Khan, et al., 2020). Additionally, for online classes students prefer recorded classes (Muthuprasad et al., 2021). The responses of students depict that the future of digital educational method of teaching and learning has high prospects. However, educational institutions as well as teachers have to incorporate few changes. It can be assumed that educational institutions should adopt to digital tools and techniques of teaching even after COVID-19 pandemic and mix it with physical or traditional models to innovate the pedagogical approach of education. For the same, Gautam and Gautam (2020) suggested that the educational institutions need to do research on personal characteristics of students, self-control and time management, willingness to study, student attention, ability to concentrate, attitude of faculties, teaching attitude, among others to enhance

the effectiveness of online mode of education. Likewise, Khalil et. al. (2020) suggested that the education institutions should research on effective models of education that focus on providing education through integration of both online and physical education for future. Mishra, Gupta and Shree (2020); Khan et al. (2021); Rafi, Varghese, and Kuttichira (2020) also provided the similar suggestions. Rajhans et al. (2020) recommended that it is important to identify perceived gap in teaching skill and develop more engaging and novel teaching methods. Rapanta et al. (2020) highlighted the importance of investment in professional development of teachers and faculty member towards effective pedagogical methods by using online technologies. Some studies also suggested governments to invest in digital infrastructure and other schemes to provide cheaper access to internet and electricity in remote areas (Hasan, Rehman & Zhang, 2020).

Lastly, post the COVID-19 pandemic the education system has experienced a significant shift in its pedagogical approach with it being highly inclusive of digital and virtual mode of teaching and learning. Addressing the challenges that persist in the shift towards online education can help the education sector unleash new avenues. Both policy makers and educational institutions should thus prioritize on reforms that is conducive to facilitating digital mode of education.

Conclusion

The COVID-19 pandemic ensued enormous challenge to the different economic actors, and pushed them to adopting innovative operating modalities to sustain in the new normal. Similar to all other sectors in the economy, education sector was also severely impacted by the wrath of the pandemic. Governments around the globe ceased physical classes, requiring the institutions to switch to online teaching or virtual teaching overnight. In light with the same, this study attempted to identify the impact of COVID-19 on education, challenges, and students perspective on continuation of virtual classes. The findings of this study revealed that COVID-19 pandemic had a significant impact on educational institutions, as schools, colleges and universities were unable to open during the time. The shift in pedagogical approach of educational institutions occurred in a short span of time, with institutions being quick on redeveloping courses that was suitable for virtual platforms. This initiated a new wave of reform in the teaching-learning process in almost all countries around the globe. However, educational actors also faced numerous challenges in the form of lack of access to digital infrastructure and gadgets, limited attention span, limited technological knowhow, and inability to comprehend numerical and practical subjects online. Additionally, given limited experience of educational institutions and teachers regarding online teaching and learning, the education delivery process was hindered. While at that, majority students perceive online education positively, however they expect a few reforms in the modality like short classes, recorded classes, and blended classes for the continuation of digital teaching and learning process.

It is thus recommended that educational institutions should conduct research on different aspects related to the unique characteristics of its institutions and stakeholders involved and develop future plans accordingly. The institutions as well as policy makers should identify perceived gap in teaching skill and develop more engaging and novel teaching methods. Likewise, immense focus should also be given to ensuring equity amongst student by providing cheap access to digital gadgets and internet facility.

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Appendix A

Table A1

Codification of papers included in systematic review

Code	Year	Author	Journal Name	Title	Source
1ERIC	2020	Archambault, L. &Crippen K	Journal of Research on Technology in Education	K–12 Distance Educators at Work: Who’s Teaching Online Across the United States	Education Resources Information Center
2ERIC	2020	Basilaia, G., &Kvavadze, D.	Modestum Journals	Transition to Online Education in Schools during a SARS-CoV-2 Coronavirus (COVID-19) Pandemic in Georgia	Education Resources Information Center
3ERIC	2020	Bhamani, S., et al.	Journal of Education and Educational Development	Home Learning in Times of COVID: Experiences of Parents	Education Resources Information Center
4ERIC	2020	Toquero, CM	Modestum Journals	Challenges and Opportunities for Higher Education amid the COVID19 Pandemic: The Philippine Context	Education Resources Information Center
1E	2020	Chick, R. C. et al.	Journal of Surgical Education	Using Technology to Maintain the Education of Residents During the COVID-19 Pandemic	Elsevier
2E	2021	Hasan S. M, Rehman, A., & Zhang, W.	World Development	Who can work and study from home in Pakistan: Evidence from a 2018–19 nationwide household survey	Elsevier
3E	2021	Maqsood A., et al.	Current Research in Behavioural Sciences	The paradigm shift for educational system continuance in the advent of COVID-19 pandemic: Mental health challenges and reflections	Elsevier
4E	2020	Mishra L., Gupa T., Shree A	International Journal of Education Research	Online teaching-learning in higher education during lockdown period of COVID-19 pandemic	Elsevier

5E	2021	Muthuprasad T., et al.	Social Sciences&Humanities Open	Students' perception and preference for online education in India during COVID -19 pandemic	Elsevier
6E	2020	Quazi, J. et al.	Children and Youth	Conventional to Online Education during SARS-CoV-2 Coronavirus (COVID-19) Pandemic: Do developed and underdeveloped nations cope alike?	Elsevier
7E	2020	Rajhansa, V., et al.	Journal of Optometry	Impact of COVID-19 on academic activities and way forward in Indian Optometry	Elsevier
1EI	2021	Gautam, D.K. &Gautam, P. K	Journal of Research in Innovative Teaching and Learning	Transition to online higher education during COVID-19 pandemic: turmoil and way forward to developing country of South Asia-Nepal	Emerald Insight
1GS	2020	Khalil, R. et al.	BMC Medical Education	The sudden transition to synchronized online learning during the COVID-19 pandemic in Saudi Arabia: a qualitative study exploring medical students' perspectives	Google Scholar
2GS	2020	Sharma, K., et al.	Kathmandu University Medical Journal	Online Learning in the Face of COVID-19 Pandemic: Assessment of Students' Satisfaction at Chitwan Medical College of Nepal	Google Scholar
1MDPI	2020	Espino-Diaz, L., et al.	Sustainability Journal	Analyzing the Impact of COVID-19 on Education Professionals. Toward a Paradigm Shift: ICT and Neuroeducation as a Binomial of Action	MDPI
2MDPI	2021	Khan M.A., et al.	Sustainability Journal	Students' Perception towards E-Learning during COVID-19 Pandemic in India: An Empirical Study	MDPI

1RG	2020	Almuraqab, N. A.	International Journal of Advanced Research in Engineering and Technology	Shall Universities at the UAE Continue Distance Learning After the COVID-19 Pandemic? Revealing Students' Perspective	ResearchGate
2RG	2020	Basilaia, G., et al.	International Journal for Research in Applied Science & Engineering Technology (IJRASET)	Replacing the Classic Learning Form at Universities as an Immediate Response to the COVID-19 Virus Infection in Georgia	ResearchGate
3RG	2020	Crawford, J., et al.	Journal of Applied Learning and Teaching	COVID-19: 20 countries' higher education intra-period digital pedagogy responses	ResearchGate
4RG	2020	Cuschieri, S., & Agius, J. C.	Anatomical Sciences Education	Spotlight on the Shift to Remote Anatomical Teaching During Covid-19 Pandemic: Perspectives and Experiences from the University of Malta	ResearchGate
5RG	2020	Jena, P. K.	International Journal of Multidisciplinary Educational Research	Online Learning During Lockdown Period for COVID-19 in India	ResearchGate
1SJ	2020	Dawan, S.	Journal of Education Technology	Online Learning: A Panacea in the Time of COVID-19 Crisis	Sage Journal
2SJ	2020	Lebni, J. Y., et al.	International Journal of Social Psychiatry	How the COVID-19 pandemic effected economic, social, political, and cultural factors: a lesson from Iran.	Sage Journal
3SJ	2020	Rafi, A. M., Varghese, P. R., Kuttichira. P	Journal of Medical Education and curricular Development	The Pedagogical Shift During COVID 19 Pandemic: Online Medical Education, Barriers and Perceptions in Central Kerala	Sage Journal
1SL	2020	Rapanta C., et al.	Post Digital Science and Education	Online University Teaching During and After the Covid-19 Crisis: Refocusing Teacher Presence and Learning Activity	Springer Link

2SL	2020	Shahzad A, et al.	Quality and Quantity	Effects of COVID-19 in E-learning on higher education institution students: the group comparison between male and female	Springer Link
3SL	2020	Zhu, X., & Liu, J.	Postdigital Science and Education	Education in and After Covid-19: Immediate Responses and Long-Term Visions	Springer Link