Remote Learning and Networking Education During COVID-19: Experience and Insights from Pakistan

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ABSTRACT
This whitepaper initiates a discussion about the teaching of university-level online courses in the field of networks and systems, during the COVID-19 pandemic. The intention is to discuss issues personally faced by educators and students alike, and the broader lessons learned, that may help us to prepare ourselves for the upcoming academic years in a better manner. There are some additional challenges in conducting remote learning in the developing world due to the absence of the necessary resources and training for effective use of remote learning tools not only for the students but also for the faculty. These limitations significantly increase the challenges of teaching networking courses in particular. In this paper, we share our experience of teaching during COVID-19 as educators in Pakistan. In the light of our experience and previous work, we provide specific guidelines for instructors and students on how to effectively cope with the disruption caused by the COVID-19 pandemic and highlight some common pitfalls.

CCS CONCEPTS
• Applied computing → Computer-assisted instruction; • Networks;

KEYWORDS
Remote Learning, Networking Education

1 INTRODUCTION
For many educators across the world, the lockdowns that accompanied COVID-19 necessitated an almost overnight shift from teaching completely face-to-face sessions into teaching solely through online sessions. By and large, this meant that faculty had to jump head-first into something they were completely unaccustomed to, and for most faculty members in the developing world, this may have been their first interaction with online teaching in their lives (as either students or teachers). While maintaining the same level of student engagement is a colossal task (especially for newcomers), remote learning also offers some hidden opportunities as this form of learning in general is more accessible to people who would otherwise be unable to participate, due to issues pertaining to their work requirements, age, and geographical location.

This whitepaper attempts to describe some of the challenges faced by students and faculty in a developing country during this monumental paradigm shift, with our perspective shaped by our experiences as educators in Pakistan. Pakistan is a large country in South Asia, having a population of more than 220 million (i.e., the world’s fifth most populous country). According to the World Bank’s 2019 data, Pakistan has a per-capita GDP of US$ 1284.7, which makes it a developing country in the category of the Lower Middle Income Countries (LMIC) 1. Although Pakistan is home to numerous skilled workers, overall it suffers from many of the same problems that plague other developing nations, including limited Internet penetration—particularly in the rural and remote areas of Pakistan—which limits the effectiveness of online learning for students living in these parts of the world. The Internet penetration in Pakistan as per the latest statistics stands at around 36% with cellular penetration being higher with almost 170 million cellular subscribers (79% teledensity) 2. The provision of both Internet and mobile services in the remote and rural areas of Pakistan is scarce, which complicates the process for remote learning for students living in these areas. While smartphone penetration is increasing (approximately 16% of the total population in 2019 as per [9]), the lack of stable Internet connectivity is still a common problem.

Some public sector universities in Pakistan have tens of thousands of enrolled students and hundreds of faculty members to teach them. However, a large number of these students do not own a personal computer or a laptop in contrast to their counterparts in developed countries 3. A recent unpublished survey conducted in a large public sector university in Karachi, Pakistan, having more than 20,000 students reported that approximately 40% of the students who participated in the survey had a personal computer or a laptop at home and 67% had access to a smartphone all the time. On the other hand, out of 499 faculty members who participated in the survey, less than 90% had both a device and an Internet connection to conduct online classes. More than 35% needed training to use remote learning tools. The sudden nature of the COVID-19 lockdown gave little preparation time for these large public institutions, some of which were sparsely using any form of an online learning and administrative system previously.

In this whitepaper, our specific focus is on teaching computer science and engineering subjects such as computer networking. For such courses, the shift to remote learning also adversely affected the capability of instructors to administer lab-based exercises and assignments. Often, without access to the computer labs on campus, it is not feasible for students to use and/or learn tools like simulators and emulators, such as NS-2 [10]. These challenges and some solutions are discussed in the remainder of this paper.

2 PEDAGOGY OF ONLINE LEARNING
2.1 The Concept of “Online Penalty”
To add to the steep learning curve for both students and teachers with respect to remote learning, this was all happening under

1https://data.worldbank.org/?locations=XN-PK
3A recent survey showed that 93% of the school students in Australia have full access to a device most of the time [8].

the pandemic situation caused by COVID-19. Many students were themselves directly affected by the pandemic, in some cases personally, and in others they had either lost loved ones close within their families and friends, or were primary caregivers to those facing the illness. Some previous work has shown that the shift to online teaching and schooling takes a toll on learning resulting in what has been referred to as an “online penalty.” Researchers have shown that this online penalty is unfortunately greater for students who are underprivileged or disadvantaged (either academically or socio-economically [14]).

2.2 The Importance of Presence

Compared to the traditional model that relied entirely on face-to-face teaching, online learning is perceived to be more depersonalized—particularly when asynchronous methods (such as prerecorded lectures) are used—which can make these courses less effective psychologically, especially when the online learning environment has limited face-to-face synchronous contact. Prior research has shown that students are acutely sensitive and show poorer results when a lack of “presence” of the instructor is perceived [2].

2.3 Combining Synchronous and Asynchronous Elements

Traditionally in blended learning approaches, students learn from a mixture of face-to-face teaching and via electronic and online media. Due to the closure of physical teaching spaces in most parts of the world during the COVID-19 pandemic, the onus has shifted entirely to teaching using online methods. In this regard, synchronous (e.g., live online lectures) and asynchronous methods (e.g., upload of pre-recorded lectures) can be used and both have their pros and cons. Synchronous methods have the benefit of increased interactivity and perception of instructor presence but have the downside that they are not sufficiently accessible (since they require a reliable high-speed Internet connection) and flexible (they require all students to be logged on at the same time regardless of their circumstances and needs during the pandemic). It is preferable to use a hybrid of both these approaches and to offer recordings of lectures and educational resources that the students can access when it is convenient and possible for them. This is especially important where students have unreliable or intermittent connections as is common in many parts of the developing world.

2.4 Leveraging Open Educational Resources

There are various free Massive Open Online Courses (MOOCs) available on the Internet from various global and regional MOOC providers (e.g., Coursera, EdX, France Université Numérique, Edraak and FutureLearn) in different languages such as English, French, Spanish, German, Arabic, Chinese, etc [20]. Such resources can be very helpful during the pandemic and instructors and students should leverage these high-quality freely-accessible resources. A number of networking MOOCs are also available that combine course content with lab exercises as well (See Table 1 for a listing).

2.5 Flipped Learning Models

In the flipped learning approach, prerecorded videos on specific topics (be it instructor recorded or used from other resources such as MOOCs) and other educational resources are shared with students before the class with the expectation that students will go through these resources before the class, and the class time will be used for discussion around those topics. In [1], networking professor Nick Feamster provides an interesting analysis of the benefits and relevant experiences associated with the flipped classroom model. The author describes how online courses are neither better nor worse than traditional face-to-face learning—they are just different. The author also discusses some challenges in this model to work, including the need to motivate and ensure that students watch the videos before the class. In this regard, some activity (e.g., a short quiz) that tests knowledge shared in the video can be utilized. Some other channels (e.g., the author recommends Slack) can be used to enable the students to write about these topics before their scheduled class.

3 COPING WITH COVID-19: REPORT OF TEACHING EXPERIENCE FROM PAKISTAN

Here we would like to share some personal observations, given that one of the authors was teaching a computer networking course during the COVID-19 induced educational institutions shutdown across Pakistan. Universities in Pakistan sent their students home in the end of March due to the lockdown. In a developing country like Pakistan there is a large variation in the distribution of Internet facilities across students (and faculty, to some extent), due to differences in socio-economic backgrounds and geographic locations. A large number of students from under-developed rural areas have little or no Internet connectivity in their hometowns. Some of them had to travel tens of kilometers to get proper Internet connectivity. In these scenarios, live online lectures are not a feasible option. Another latent issue is the level of understanding of the English language. Most university instructors use Urdu along with English, to make things more understandable. However, poor understanding of English may limit the ability of students to self-learn new tools for online learning.

3.1 Course Content and Learning Outcomes

For a computer networking course being taught during the spring semester in 2020, one of the authors had planned to cover the following topics: the application layer, transport layer, network layer, physical layer, and advanced topics such as wireless networks, mobile networks, and software defined networking. However, ultimately some of the advanced topics were not covered, in addition to not having much recourse to programming and code examples related to socket programming. This was partially related to the fact that during the initial face-to-face encounters, some students had indicated that they did not have access to a laptop or personal computer, or they had never used Unix-based operating systems. This was an impediment given that during the pandemic, these students were not able to visit the campus, where computer labs were available. These issues also caused the inability to train students to use NS-2 [10]. In hindsight, having more clarity with respect to
computing facilities available to each student will be of the utmost importance to the instructor, so that they can plan accordingly. At a university in Mianwali, situated in a more rural location, the faculty divided their students into three categories. First, those students with good Internet connections participated in interactive sessions on Zoom. Second, those students with access to a smartphone and a mobile network connection that provided unlimited complimentary WhatsApp messages received recordings of the online sessions as shared videos. Lastly, those students with limited or no Internet connections received printouts and instructions by post. Under such circumstances, programming assignments in a computer networking course were not feasible, and the instructor adjusted by focusing instead on providing network programming concepts and examples during the lectures.

3.2 Assessments

In this subsection, we describe the practical implications COVID-19 had on the mechanism used by faculty members to assess their students during networking courses held in the Spring 2020 semester.

3.2.1 Quizzes and Assignments. During the pandemic, there was no specific change in the assignments administered to students. However, this was not the case for quizzes. All the quizzes administered were taken using the Learning Management System (LMS). Students raised objections to the nature of the initial quizzes, since these quizzes were required to be completed during class, and they said that intermittent Internet connectivity and long page load times were causing problems, leading to poorer results. It was observed that allowing students more flexibility (i.e., 12 hours) to do their quizzes (all multiple choice questions, to be done in the same limited time), gave them a better opportunity to attempt their quiz in a time more suitable for them. However, an obvious issue that this raised was the matter of academic integrity and honesty. During some faculty meetings, many instructors raised concerns about the more asynchronous modes of assessments, citing that students would be more susceptible to using unfair means. However, some senior faculty members encouraged the teaching staff to continue to be diligent with respect to different forms of unfair means, while at the same time showing empathy towards students given the stress they were going through (e.g., allowing late submissions of assignments, especially when evidence suggested serious issues were being faced by the students during the pandemic).

3.2.2 Student Presentations. Some universities in Pakistan modified the policy for grading, and asked instructors to follow specific guidelines, which decreased the weight of the final examinations, and added mandatory components such as student presentations and vivas. In some cases, the weight of the student presentations was greater than the weight of the final exam itself. It would seem that this was a policy devised to enable students to achieve reasonable grades in their courses on the basis of their performance on such tasks that were deemed less stressful in nature, and in some cases more asynchronous as well. By and large, most instructors did not take midterm exams.

3.2.3 Examinations. During the COVID-19 pandemic, examinations were held in Pakistani universities through different mechanisms. Some universities required a more synchronous approach, in which students had to also keep their cameras on during their exams. However, the majority of universities that continued their courses online, asked for instructors to take either take-home open-book final exams (a more asynchronous setting as such) or allow students to do a case study in lieu of a final exam. The duration of these open-book exams was normally twice of the duration of normal exams. While this facilitated the students, instructors have more work to do, to make sure the questions produced were of the form where less opportunities for plagiarism were involved, and then checking responses completely online (i.e., not in soft copy format) was also a new experience for many faculty members.

3.3 Student Engagement

There were very large online campaigns on social media in Pakistan urging the government to ban online classes. Often, students and in some cases teachers, from remote areas such as Gilgit Baltistan [7] demanded the postponement of online classes until the Internet services of their geographical areas were improved. These issues were talked about by Dr. Tariq Banuri, the chairman of the Higher Education Commission (HEC) of Pakistan in a detailed discussion with Musharraf Zaidi via Tabadlab³. #We_Want_Semester_Break was one of the top trends on Twitter (46,000 tweets⁴ in Pakistan during March 2020 (early days of the lockdown).

These online campaigns added a new element to the battle of winning the minds of the students, and teachers were encouraged to speak directly to their students, to guide them about what was

³https://lnkd.in/dSXyJnn
⁴https://tinyurl.com/PakStudentResponseOnlineLearn
going on, and how expectations related to exams and other forms of assessments would be modified. Most of the faculty were maintaining attendance in some form, and the statistics indicated that for some courses, attendance was continuously low (often lower than 50%). Maintaining student attendance is a prevalent practice within Pakistan, with HEC stipulating a minimum of 75% attendance for a student to be allowed to sit for the final exams of a course.

3.4 Safe Learning Environments

At the university where one of the authors works, a large university wide faculty meeting was held two days before classes were shifted online. During this meeting many matters came under discussion. Some faculty members, especially females, shared their apprehensions of taking video recordings for their lectures. They cited instances in the past where some of their students had shared their pictures or videos (presumably taken during class or during office hours) on social media (e.g., TikTok and WhatsApp), without their knowledge. This was a source of immense displeasure and made them apprehensive of recording their own video lectures. For similar reasons, female student participation (i.e., during class discussions) was quite low during synchronous online classes. Some positive outcomes were attained by (i) setting separate office hours for female students, in which they were encouraged to actively participate in normal class timings; and (ii) requesting all students to first raise their hand before answering questions during class.

3.5 Training for Faculty Members

Federal and provincial government organizations made efforts to train teachers about teaching online. During an interview, the Chairman of HEC Pakistan said that since the beginning of COVID-19, over 23,000 public sector teachers had taken training courses for online teaching [4]. At the university where one of the authors works, the office of technology support dedicated a team that was available around the clock, all days of the week, for over a month, to train faculty members on the use of Zoom for online synchronous classes, and the use of the incumbent Learning Management System (i.e., Moodle) for taking quizzes online. This team held live sessions multiple times a day, and were also available on phone to guide the faculty members through voice chat. This constant support system enabled many faculty members to transition into online learning.

3.6 Takeaways and Lessons Learned

In this section we try to describe the key takeaways from our work, and draw a map of what we have learned and what lessons should we take forward for the future.

3.6.1 Clarity of Learning Objectives. It is important that faculty provide clarity and conciseness with respect to the expectations of what will be achieved at the end of each lecture, module, or complete course. As mentioned in [3], each educational endeavor (whether it is a degree or a diploma) should have a clear end and the efforts of the students should be focused on attaining these ends. Some desired capabilities belong to the long-term, i.e., objectives, whereas some capabilities are more focused on the short-term, such as course learning outcomes (CLOs). Defining such objectives and outcomes will make things more tangible for the students, and will enable instructors to align their lectures and assessment instruments more closely to these objectives and outcomes.

3.6.2 Rightsizing Content. Given the circumstances, it would help students if their instructors teach them what may be called transferable skills. Such skills have a direct and tangible impact on student learning. Rather than covering a broad range of topics during their courses, a rightsizing of sorts that results in teaching fewer topics would enable students to improve retention. So, fewer topics with more depth, illustrated with practical examples.

3.6.3 Smart Use of MOOC Content. Instructors may use tutorials and MOOC content early on in the course, to decrease large imbalances in previous pedigree and knowledge in the subject matter. This need felt more pronounced at the graduate level networks course being taught by one of the authors. At times, one of the authors shared links to helpful short videos (e.g., from Nick Feamster on Longest Prefix Match) at the end of a synchronous lecture, to augment what was taught in class.

3.6.4 Training Students On Classroom Etiquette. Another important aspect to focus on is guiding all students to adhere to specific etiquette during the online classes, especially things like raising hands (something often used in Zoom sessions) before responding verbally to instructor questions.

3.6.5 Personalized Student Advisory Hours. If instructors provide a separate set of office hours for students who are observed to participate infrequently during online classes, this may encourage them to have more confidence while asking questions, and improve their chances to learn.

4 REMOTE LEARNING DURING COVID-19: WHAT IS TO BE DONE?

In this section, we present the summary of our recent works in which we looked at the actions that students and instructors should take to cope with the challenges posed by the COVID-19 pandemic. We summarize our findings for the instructors and students separately in the coming subsections.

4.1 Instructor’s Perspective

In a recent work focused on online teaching in disrupted environments [2], we proposed that instructors should follow the triple imperative of online teaching—(1) equity, (2) inclusiveness, and (3) effectiveness—to ensure that online teaching is done effectively with minimal loss in quality due to the shift to online teaching and without increasing the inequalities in student achievement.

In our previous work [2], we proposed that to ensure that the online teaching experiences are beneficial for students especially during the COVID-19 pandemic the instructors should keep in mind and adhere to the following three imperatives:

(1) The “Equity imperative” seeks to mitigate inequality that our online learning strategies do not exacerbate existing inequalities intentionally or unintentionally. In this regard, the first step is to develop an awareness that our technological
Interventions despite our best intentions can cause unintended harms to segments of the society—such as increasing inequality. The second step is to develop an awareness that there are various types of divides that can result in increasing inequalities: e.g., (1) who has or does not have access to computing devices and Internet connectivity? (2) who is affected most by the closures of schools and associated resources? and (3) who can benefit more or lag behind others when we make use of online learning?

(2) The “Inclusion imperative” seeks to involve the students in the education process as co-owners and aims to develop a learner-centered environment. This imperative aims to involve and empower students in the learning process and entails a special consideration for the constraints (technical or otherwise) when instructional choices are made. As an example, not everyone may have high-speed always-on dedicated Internet connectivity, especially in a developing country like Pakistan, and there is therefore a need to also cater for students who will access the educational resources using low-bandwidth devices including phones. This imperative suggests a need for a model that combines asynchronous instruction (e.g., video recordings shared on a server) complemented by in-person live synchronous sessions.

(3) The “Effectiveness imperative” seeks to ensure that the quality and coverage of the learning is not affected by the shift to online learning (i.e., the students do not suffer a significant online penalty). In this regard, it is important to see the wisdom of the phrase “Maslow Before Bloom” that has become popular in educational circles, which indicates that instructors must prioritize the physical and emotional well-being of students and their more fundamental needs over increased learning effectiveness. It is argued that in the current climate, instructors can become more effective by focusing on important transferable skills and on developing authentic skills in the students through appropriate curricular and assessment choices.

We note that these imperatives have been selected based on a synthesis of various recommendations made by prominent educational experts and a review of the emerging literature on education during and beyond COVID-19 era [2]. While the three described imperatives serve as objectives that have to collectively pursued, it should be noted that in certain cases, there may be a tradeoff between two imperatives (e.g., equity vs. efficiency). In such cases, some experts recommend a prioritization of the equity imperative over efficiency, particularly in the context of the COVID-19 pandemic, as online learning accentuates existing divides. However, it is also possible and always preferable to improve both equity and efficiency wherever possible.

4.2 Student’s Perspective

While acknowledging the fact that there are numerous factors outside the control of students (e.g., the pedagogical approach adopted by the instructor or the policies adopted by the institute and state), it is argued in our recent paper [3] that students can achieve much more than is commonly believed to be possible and thrive in the volatile, uncertain, complex, and ambiguous (VUCA) environment that the current pandemic situation fully characterizes.

If they can make some changes that depend on their own mindset and actions. These steps (seven in all) that students can use to thrive in these times of disruption are listed in Table 2 and detailed in [3]. We briefly summarize them next.

Table 2: Seven Steps to Thriving in Education During and Beyond COVID-19 [3]

<table>
<thead>
<tr>
<th>Step 1: Be...</th>
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<tr>
<td>A. Knowing The Educational Objectives and Learning Outcomes</td>
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<tr>
<td>B. Aligning Effort With Goals, Objectives, and Outcomes</td>
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<td>C. Motivation, Self-Efficacy, and Learning How to Prioritize</td>
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<th>Step 2: Upgrade Your Metacognitive Skills</th>
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<td>A. Types and Levels of Learning</td>
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<tr>
<td>B. Avoiding Common Learning Mistakes</td>
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<tr>
<td>C. Learning 101: Learning How To Learn</td>
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<th>Step 3: Aim for Holistic Learning</th>
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<td>A. Become A System Thinker</td>
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<tr>
<td>B. Building A Lattice Work of Models</td>
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<td>C. Be Well-Rounded</td>
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<th>Step 4: Become Coachable</th>
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<td>A. Seek Formative Assessment</td>
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<td>B. Learn to Think Like An Assessor</td>
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<td>C. Develop Self-Assessment Skills</td>
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<th>Step 5: Take Ownership of Learning</th>
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<td>A. Active Learning</td>
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<td>B. Leverage What Can Be Leveraged</td>
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<tr>
<td>C. Collaboration &amp; Teamwork</td>
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<th>Step 6: Focus On Developing Authentic Skills</th>
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<td>A. Develop An “Understanding” of the “Big Ideas”</td>
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<td>B. Transfer of Learning</td>
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<tr>
<td>C. Uncoverage Rather than Coverage</td>
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<th>Step 7: Become A Lifelong Learner</th>
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<td>A. Develop A Mindset For Continuous Lifelong Learning</td>
<td>§8</td>
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<tr>
<td>B. Master The Instrumental Knowledge For Lifelong Learning</td>
<td>§8</td>
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<tr>
<td>C. Develop by Practice the Skills for Lifelong Learning</td>
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For more details, interested readers are referred to [3].

(1) The first step is to “begin with the end in mind” and clearly know the important (course or program end) learning outcomes that the students are expected to master and to work towards them. By focusing on these issues, the students have greater prospects for success.

(2) The second step (“upgrade your metacognitive skills”) focuses on upgrading one’s metacognitive skills and to learn about types and levels of learning. It is especially in this regard to avoid common learning mistakes (such as those listed in [17]) and to use optimal evidence-based learning techniques (such as those summarized in [16]).

(3) The third step (“aim for holistic learning”) is useful not only during pandemics but is broadly speaking an essential 21st century competency for all effective engineers and
5 SOME TIPS FOR NETWORKING EDUCATION

One of the biggest challenges facing networking education is to figure out an effective way of completing lab work in a virtual space through remote access. The use of virtual laboratories is not new in science, technology, and engineering and a detailed review of the tools available can be seen in [3, 19].

5.1 Open Source Networking Projects

Computer networking course instructors can make use of available open source projects that provide lecture material, complete code repositories, code examples, demos and assignments. The Packet Pushers website provides a detailed list of open source networking projects [12], which lists initiatives such as the OpenFlow API; Quagga (providing implementations of popular routing protocols such as OSPF, RIP and BGP); OpenSwitch (virtual switch); NRE Labs (providing skills for the path of network reliability engineer); and OpenDaylight (a popular SDN controller). Instructors can use such resources to enable their students to become comfortable with practical examples of well-known networked systems.

Another useful resource is the P4 Learning repository developed by the Networked Systems Group at ETH Zurich [11], for a more advanced course in networking, that intends to teach students about programmable switches.

5.2 Content Delivery

Instructors would benefit from the use of annotations and whiteboards, since it was personally observed that students showed greater interest when concepts like routing, network address translation (NAT), subnet masking and longest prefix matching were taught using the whiteboard and annotations along with PowerPoint slides. This finding corroborates what researchers found in [15], i.e., students learn better by having information presented through multiple modalities.

5.3 Leveraging Existing Resources

A number of networking-related open educational resources are freely available online as listed in Table 1. Dubbing well-known video content (e.g., from popular MOOC courses from top universities) into local languages (e.g., Urdu for Pakistan) or alternatively adding subtitles can accelerate their adoption and increase their utility especially for students from underprivileged backgrounds. In this regard, state-level higher education authorities (such as HEC in Pakistan) can proactively curate such resources and make them more broadly available. Existing regional resources (such as the content created by the Virtual University of Pakistan [6]) can also be leveraged but in certain cases, given the recent changes in our field, some content needs to be updated and made more attractive to students.

6 CONCLUSIONS

In this paper, we have presented a report of our experience related to teaching during the COVID-19 pandemic as educators from Pakistan. Based on our experiences, and our previous work, we provide some insights and recommendations for instructors as well as students and highlight some potential pitfalls. The role of students in the success of a remote learning program is pivotal. More specifically, we identified the following seven specific steps that students can take to succeed in these times of disruption: (1) begin with and always keep the end in mind; (2) work on upgrading their metacognitive skills; (3) aim for holistic well-rounded learning; (4) become coachable and develop the skills of self-assessment; (5) take ownership of their learning; (6) focus on developing ‘authentic’ real-world skills; and (7) develop proficiency of being a lifelong learner. As far as the instructors are concerned, we recommend that instructors adhere to the triple imperatives of online teaching during COVID-19: i.e., (1) the equity imperative, which seeks to mitigate actions that intentionally or unintentionally widens inequality; (2) the inclusion imperative, which seeks to actively engage all learners and create a learner-centric environment; and finally (3) the effectiveness imperative, which seeks to ensure that the quality and coverage of learning is not compromised as much as is possible. Based on our experiences, we recommend that instructors should combine synchronous and asynchronous learning; explore different modes of instruction; and obtain training on online teaching from people with relevant expertise such as instructional designers. Particularly for networking education, instructors can leverage existing MOOC content and available open source networking projects to provide a more accessible well-rounded course, with elements of practical implementation involved. Finally, instructors have to provide motivation and encouragement to students to overcome the loss of the opportunity to connect at a personal level when face-to-face teaching is conducted.