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# Disparity in Higher Education Provision Caused by Technological Capabilities of Nations during Covid-19

*Bharti Pandya, BooYun Cho and Louise Patterson*

## Abstract

During Covid-19, higher education institutions were forced to resort to emergency remote learning. The nations and higher education institutions with strong technological infrastructure and resources facilitated the provision of education and caused minimal interruption in teaching and learning. While the nations with poor technological infrastructure and non-availability of resources had to struggle to continue providing the education. This study, utilizing the job-demand resources model, provided insights into the influence of technological capabilities in providing higher education during the Covid-19 period and how a disparity is caused between different nations. The findings will benefit education policy developers and leaders of higher education institutions.

**Keywords:** pedagogical shifts, Covid-19, job demand—resources theory, disparity in higher education, technological capabilities, digital divide

## 1. Introduction

In April 2020, Covid-19 instigated reforms in higher education institutions (hereafter, HEI) across the world. Nations, students and faculty experienced sudden closure of HEIs' premises and resorted to emergency remote teaching for continuity in education [1]. In less than a month, educational technologies took precedence over physical learning spaces and suddenly online teaching platforms, learning management systems, and communication technologies found their place in homes. The HEIs that were in the market of distance education and online learning had to make minor modifications, while others experienced numerous challenges and obstacles to continue providing education. The HEIs, besides managing panic among the students and following government regulations, had to devise strategies to provide education. Many HEIs across 188 countries, surrounded by uncertainties caused by Covid-19, were forced to take drastic measures to deliver remote education. This meant undertaking a series of steps—exploring the alternatives to face-to-face teaching, reviewing the alternatives, selecting the best alternative within the constraints of

resources, and implementing the chosen approach. Also, developing or procuring the educational technologies and re-engineering the course delivery was another task. At this juncture, the nations with powerful technological infrastructures and the HEIs with resources survived the pandemic and continued to provide higher education. The HEIs with capabilities to procure/develop technologies, with capable faculty equipped with technological know-how to deliver remote classes, and with students owning devices and broadband connections continued to sustain. On the other hand, nations with underdeveloped technological infrastructure and HEIs with poor technological capabilities could not impart education. This created a disparity in higher education provision among different nations. The Covid-19 caused pedagogical shifts [1] and expansion in the faculty's workload (job demands). However, many low-income nations and under-prepared (or unprepared) HEIs could provide the resources needed to match the shifts. Limited literature is available that informs us about such disparity in higher education. This informative chapter discusses the shifts in pedagogy experienced by faculty during Covid 19, the disparity in higher education caused by not having adequate resources to fulfill the faculty's job demands, and the disparity caused by the technological capabilities of nations. The principles from the job demand-resources model are applied to understand the reasons for the disparity in higher education provision. A convex lens approach was used to comprehend how pedagogical shifts influenced the faculty's job demands-resources and how the provision of resources required by the faculty are influenced by nations' technological capabilities, causing disparity in higher education provision across different countries.

## **2. Shifts in higher education provision and pedagogical approaches during Covid-19**

A plethora of research conducted during the Covid-19 pandemic highlighted that the landscape of higher education has changed where the mode of delivery shifted from face-to-face learning to either remote learning or online learning or hybrid learning. In April 2020, the Covid-19 forced HEIs to revamp the mode of education delivery, and this was the case around the world. The world witnessed the sudden closure of HEIs, governments passed a variety of initiatives and regulations, and the decision-makers at the institutional level took swift measures. Ultimately, the responsibility to continue delivering the education in an unknown learning environment cascaded down to the faculty members. The role of faculty members enlarged as teaching and learning mode during Covid-19 changed.

As posited by Pandya et al. [1], five major areas of teaching and learning were modified on an emergency basis to continue providing education—course content, the teaching methods, assessments, the faculty's preparedness and support from educational-technologies support teams. The researchers found that during Covid-19, the frequency of conducting online teaching increased, while other collaborative activities such as group discussions, games, in-class presentations, and quizzes decreased. Also, online breakout rooms, discussion boards, students' real-time feedback, and streamed events took over the learning activities. It was also noted that the delivery approach moved from faculty-led teaching to content-led teaching. The researchers noted that despite this shift, the content did not change significantly because the time to make the content compatible with remote teaching was inadequate. Furthermore, during the shift, many HEIs were already in the middle of their academic term and

changing the content was not pragmatic. Initially, while the content did not change extensively, a significant difference was noted as HEIs reduced the frequency in conducting written and oral exams, practical exams and project work. Since Covid-19 enforced such rapid changes, faculty members underwent several professional development sessions to develop their capabilities to utilize educational technologies and deliver remote sessions. For all of these amendments, support from the technical experts was highly important. Technical support here includes responsiveness to queries and requests from the faculty, providing training sessions to the faculty regarding various educational technologies, and providing relevant technologies.

The above discussion indicates that there was an expansion in the faculty's job during Covid-19 in the form of revisions in course content, assessment strategies, assessment instruments and administrations, and delivery frameworks. To deliver the sessions remotely, the faculty had to adopt relevant educational technologies, which implied exerting additional physical and/or psychological efforts. Schaufeli et al. [2] considered this as 'job demands' that required additional resources for the faculty to not experience stress and burnout. Here, it becomes important to understand the job demand-resource model in the context of higher education provision during Covid-19.

The job demands-resources model assumes that every job is associated with factors that can be categorized as job demands and job resources [2]. Job demands are those physical, social, organizational, and psychological aspects that require cognitive and emotional efforts or skills, which incur psychological costs or physiological costs. The job resources are vital to performing the job, achieving the goals, reducing costs, developing employees, and preventing stress and burnout among employees. There is extensive literature available on the job demand-resources model because of its application to any kind of occupation. During Covid-19, the nature of the faculty's job changed and created new requirements for resources to perform the job. These changes and their influence on the provision of higher education is discussed in the next section.

### **3. Disparity in higher education caused by the faculty's job demands and resources**

During the Covid-19 pandemic, the definition of the faculty's jobs witnessed some addendums. The sudden switch from face-to-face course delivery to remote teaching expanded the nature of work [3]. These expansions came in the form of revising the content, making it compatible for remote learning, condensing it to small chunks for effective learning, and reengineering the delivery framework. All these changes were implemented to facilitate remote learning within the parameters of existing resources [4]. It was beyond HEIs' capabilities to suddenly procure or develop resources needed by the faculty to execute their newly defined jobs. Furthermore, the faculty had to quickly resort to remote teaching and they did not have sufficient time to craft the necessary skills to develop content and activities, adding to their stress and resulting in burnout.

Furthermore, Covid-19 required amendments in learning environments and faculty members needed to rethink their teaching strategies to engage students and motivate them for remote learning [5]. Baran et al. [6] suggested the faculty to be more empathetic toward students and to be creative in developing remote learning environments. Hodges et al. [7] noted that the faculty undertook the role of facilitator to support students to accept remote learning.



The faculty also had to revamp the summative and formative assessments while lockdowns were in place. The faculty members revised the assessment strategies and designed the assessments compatible with remote learning [8]. Additionally, faculty members had to turn their homes into classrooms and incur personal expenses to procure devices, furniture, and supplies. Besides these financial expenses, the faculty was under stress and isolation due to Covid-19 lockdowns. They were physically and socially separated from their peers adding to psychological and social demands. Concurrently, the social aspects of the faculty's job were suddenly transitioned to an online or remote environment. Furthermore, in some developing and underdeveloped nations, the faculty members could not fulfill their job demands because of power disconnections, weaker internet connections, and a lack of technological skills [9, 10]. Due to lockdowns, the faculty had limited to no access to campuses and other stores to buy physical goods needed to deliver the class. And to transition from face-to-face teaching to remote teaching, faculty had to invest extra time and cognitive efforts. They also experienced work-life imbalance. The increased number of Covid-19 cases among faculty's social connections added to their psychological stress and anxiety.

In short, faculty's job demands increased tremendously and they had to invest more physical, mental, and psychological efforts to meet the expanded job demands. According to Schaufeli et al. [11], such job demands should be supported through the availability of adequate resources. Mercali et al. [12] highlighted that the faculty's job demands include workload, change management, emotional demand and work-life balance demands. These demands need to be supported through work resources, organizational resources, professional development resources, and social resources. For the faculty's job, these resources include teaching tools, adequate time, academic freedom, trust, interpersonal relations, professional development, open communication, fairness, and participation in the decision-making process [12]. As per the job demand-resources model, the faculty experienced high levels of stress and burnout. The most pressing job demand for faculty was to develop and deliver remote teaching, and to fulfill this demand, the availability of two resources became necessary—educational technologies and developing competencies to use these technologies.

A plethora of studies [10, 13, 14] conducted during Covid-19 in the context of higher education suggests that HEIs fast-tracked the professional development of their faculty members' technological capabilities. Arora et al. [15] concluded in their study that besides network issues and limited access to devices, the faculty lacked the training to teach online. Pandya et al. [1] found a significant increase in faculty members' professional development sessions during Covid-19. Brooks et al. [16] surveyed the faculty's readiness to create or convert content compatible with online delivery and found that faculty were unprepared. To face Covid-19 challenges, Schildcamp et al. [17] recommended HEIs to focus their professional development sessions on educational technologies and technological knowledge. However, HEIs in lower-income countries lacked resources to provide suitable educational technologies, training, and support. According to O'Hagan et al. [18], about 50% of faculty received basic training, which did not include technological competencies. Moreover, many faculty members did not even have access to computers and the internet to receive basic training [19]. In Nigeria, even experts in information and communication technologies were not trained to facilitate remote learning [20]. Tosun et al. [21] mentioned that in Turkey, faculty provided online classes that were ineffective because they were not trained for such deliveries. Faculties with a lack of adequate training in educational technologies used for teaching remotely could not even support students during classes. In the Middle East and North African region, about 18% of countries provided training to faculty

[22]. Moreover, many countries with poor digital infrastructures experienced under-development of faculty to cope with emergency remote learning transitions. In many low-income countries, faculty members did not have access to laptops, broadband subscriptions, and technological know-how [23]. For faculty in these countries, there was an enhancement in job demands but resources remained limited.

Apparently, during Covid-19, this was the case in most HEIs. However, the resources available to faculty members varied across different HEIs types (private versus public) as well as across different nations (digitally developed nations versus digitally underdeveloped nations). The lockdowns enforced remote teaching or online teaching, and the HEIs with strong technological infrastructure could mitigate the risks of discontinuing their teaching and learning activities. However, the HEIs with poor technological capabilities experienced several challenges to continue imparting education. For clarity purpose, here, the technological capabilities comprised of educational technologies available within the HEI and the capabilities of the faculty to use these technologies. The next section discusses how the technological capabilities of HEIs caused disparity in higher education during the Covid-19 pandemic.

#### **4. Disparity in higher education caused by technological capabilities**

Educational-technologies capabilities facilitate the adoption of the best teaching and learning approach in achieving learning objectives in technology-driven learning environments [24]. During Covid-19, the learning approach shifted to remote learning, and educational technologies became the medium to impart education. Hodges et al. [7] highlighted that the challenges posed by Covid-19 were well managed by the HEIs with developed capabilities to deliver online or remote teaching. The faculty working in these HEIs already had the resources required to deliver remote sessions. Furthermore, HEIs already in the business of providing online education had minimal impact on providing education during Covid-19. They already had well-developed technological infrastructure and the faculty were competent to deliver remote education.

Zarei et al. [23] noted that developed countries transitioned rapidly to emergency remote learning because they already had technological infrastructures. This was not the case with developing countries as they lacked the technological capabilities to impart remote higher education. This created disparity in higher education provision between developed nations and developing nations. In developing countries, students and faculty faced major challenges because of the non-availability of devices such as laptops/smartphones and internet connections [25]. Bhuasiri, Abdel-Gawad, and Alqahtani [26–28] noted that the faculty in developing countries did not possess enough technological capabilities to develop and deliver virtual content. Furthermore, many HEIs lacked virtual learning management systems to communicate and teach remotely [29]. Some HEIs in developing nations resorted to social media sites to establish communication between the faculty and students, and to create an online community of faculty and students.

Even within a particular country, developed or developing, researchers like [30] found the disparity in higher education among students from different income groups. The students from low-income groups were deprived of higher education as they could not afford learning devices and broadband subscriptions. For instance, in California, USA, only 56% of students from lower-income households had a broadband connection. Some students used their smartphones, and due to not being able to afford data packages, they experienced dropping from the ongoing session. Zhang

and Tadesse [19, 31] emphasized that for successful remote teaching, accessibility to learning devices and the internet is essential.

Hence, instead of focusing on developed and developing economies, it is advisable to consider whether the technological capability of a particular nation is developed or underdeveloped. Li et al. [32] reported this through the digital divide found in different countries. OCED [33] defined digital divide as “the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies (ICTs) and to their use of the Internet for a wide variety of activities” (p. 4). A similar definition is provided by Soomro et al. [34] wherein the digital divide is “the gap between people who have adequate access to ICT and those who have ‘zero’ or poor access to ICT” (p. 1). Tosun et al. [21] reported that in Turkey, the faculty and students did not have access to devices and the internet. Similar reports were shared for students from Palestine [35] where students reported non-availability of technological infrastructure. Sun et al. [36] discussed that 90% of countries with high income delivered online education during Covid-19, while about 66% of countries with low income provided either online education and/or broadcast education. This created disparity in providing higher education across the world. For instance, around 28% of African countries provided higher education through radio and television and 22% through blending online and broadcasting, while countries from Europe, East Asia, Latin America and the Pacific provided remote learning through online platforms or combined it with broadcasting channels for rural students.

Irrespective of the efforts from the digitally underdeveloped nations and their HEIs to deliver remote learning, students did not receive the classes. Some of the reasons mentioned by Winthrop et al. [37] included students not having computers or television or radios or smartphones. The large family size complicated the issue, as the learning environment was either noisy or devices were shared among the siblings. In India, though 70% of students joined online classes, most of them used their smartphones [23]. Adedoyin et al. [3] postulated that smartphones are not ideal for online learning, as the content and activities are not compatible with smartphones. On the other spectrum is the easy accessibility of devices among students from the United States. Galanek et al. [38] highlighted that in the United States, 95% of students had access to a smartphone and around 91% of students owned a laptop. Furthermore, students from high-income households own more than one device. This created a new digital divide segregating students based on income groups. Students from high-income households own multiple devices and have easy access to broadband services while students from lower-income households struggle with old devices and no broadband subscriptions at home. McKenzie et al. [39] pointed that there exists a new digital divide in the United States, wherein students from lower-income households own a device, but these devices miss keys, or the batteries cannot hold power, or the data packages are limited. Moreover, the limited access to broadband subscriptions, low network coverage, and costly data access created a new digital divide among various nations in providing higher education. According to the data published by UNCTAD in April 2021, 36 countries are classified as least developed countries for having low network coverage and expensive data access. Most of these countries are from the African continent and Indian sub-continent (Bangladesh, Bhutan, Nepal, Afghanistan). The Digital competitiveness ranking by the IMD world-ranked top ten countries—the United States, Singapore, Denmark, Sweden, Hong Kong, Switzerland, Netherlands, Korea Repl., Norway, and Finland. Notably, the digital divide defined the technological capabilities of a nation that further influence the technological capabilities of an HEI within that nation.



## 5. Discussion

In light of the literature discussed above, the disparity in the provision of higher education during Covid-19 is evident across several nations. The nations with advanced technological infrastructures housed the HEIs, which continued to provide education during the Covid-19 pandemic with minimal disruption. One can interpret that the technologically advanced countries supported HEIs by providing them infrastructure that is much needed for conducting remote teaching during emergency lockdowns. The broadband networks, easy accessibility to the learning devices, and advanced communication technologies facilitated an easy transition from face-to-face teaching and learning to remote sessions. The landscape of providing higher education in underdeveloped nations during Covid-19 witnessed broadcasted sessions and, in many cases, a temporary halt in teaching and learning. In a bigger context, we can assess that at the national level, despite having national resources, technologically underdeveloped countries could not support HEIs and in turn, the faculty and students were not supported with basic resources needed for emergency-remote teaching and learning. OCED [33] reported that the digital divide was already existing before Covid-19, but this study established that this digital divide further created an education divide, the effect of which will be witnessed in a few years. This is because human capital development continued in technologically advanced nations, while it diminished in the underdeveloped nations.

Another focal area that emerged in this chapter is the drastic expansion in the faculty's job demands and the influence of resources on the disparity in higher education provision during the pandemic. The nations with advanced technological infrastructure hosted HEIs that further offered resources to the faculty to build their technological capabilities. The faculty in these nations were facilitated with access to devices and broadband connections, intense professional development sessions and readiness to remote-teaching transition, and availability of educational technologies as well as technical support. This was not the case in underdeveloped nations. The HEIs and the faculty were far from being ready to face the challenges posed by the Covid-19, to continue providing higher education. The value of making adequate resources available to the faculty for performing their job with reduced stress levels and burnout appeared on the surface during Covid-19; this was not discussed in depth before the pandemic. This further will probe the policy developers, curricula designers, and academic managers to identify and balance the job demands and resources equilibrium for the faculty's role.

A noteworthy point in the literature, beyond the digital divide, was the concept of the 'new digital divide,' which is experienced by students in technologically advanced countries. In this context, the concern for resources moved from possessing devices and the internet to owning multiple learning devices and the accessibility to broadband connections or bigger data packages. Though Sommro et al. [34] finds this new digital divide creating a disparity in receiving higher education, viewing it in an international context will indicate the advent of wider division in the student body, ranging from students with no access to any device and internet to students owning multiple devices and faster connections to receive an education.

Such divisions, as indicated by O'Hagan, Zarei, and Castro [18, 23, 32], already existed before Covid-19 but surfaced during the pandemic. The disparity in education provision has existed for centuries; Covid-19 changed its form to providing education remotely or online through digital channels. Now, the divide is not based on economic standing but based on technological capabilities. Researchers concur that Covid-19



posed challenges to HEIs for rapid transformation to remote teaching [13, 18, 20]. It also provided opportunities to HEIs [39] to develop their technological capabilities, that otherwise would have taken over a decade.

## **6. Conclusion and recommendation**

The disparity in providing higher education during Covid-19 is evident from the discussion recorded in this chapter. The global pandemic instigated governments and HEIs to resort to emergency remote teaching and learning. Like peeling the layers of an onion, we uncovered that the world as such is divided into two categories—countries with advanced technological capabilities and countries with underdeveloped technological capabilities. The countries with advanced capabilities supported their HEIs, faculty, and students. The faculty, in these countries, were in a better position to receive needed resources to fulfill their job demands and were able to continue providing higher education. On the other hand, the countries with poor technological capabilities were unable to facilitate remote teaching. This created a disparity in higher education provision among different nations. One can anticipate the impact it will make on the future national workforce. The advanced nations will continue to have qualified graduates produced by their HEIs, while underdeveloped nations will not be in a position to develop quality graduates. This will further influence the quality of new entrants in the workforce.

It is crucial for nations to build their technological capabilities and for HEIs to redefine the faculty's job description and allocate the resources necessary to carry out their duties. It is recommended to the policy developers to develop contingency plans for such pandemics and develop policies, processes, and systems to avoid discontinuation of higher education. The governments are suggested to provide free internet wireless access for students and teachers located at community places like open parking spaces or city halls, especially in areas populated with low-income households [38]. The lack of access to a device can be overcome by lending laptops on a short-term basis to public libraries or institutional libraries. The leaders of HEIs are suggested to provide academic freedom to the faculty to develop and deliver content compatible with remote learning and to choose from the available technologies. This will reduce the psychological stress and encourage the faculty to devise the course to achieve learning outcomes [10]. Lastly, HEIs can embrace an integrative approach with students, faculty, educational technology support department, and curriculum experts as constituents engaging in a dialog process to overcome the challenges.

## **Conflict of interest**

There is no conflict of interest to declare. There is no financial interest to report.

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