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## Highlights, challenges and recommendations in virtual education on various fields during the covid-19 pandemic

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**Abstract**—The COVID-19 pandemic has affected the world in various points and obliged countries to go through lockdown. Individuals gone through different preventive measures by remaining at home, working on removing and remaining clean. The rapid spread of the coronavirus (Covid-19) outbreak has had a major effect on the education sector as well. To prevent the spread of novel coronavirus infection, most of the educational sectors avoided traditional face to face learning and adopted online learning. Online courses have proven to be the most powerful method for preserving student retention and access to learning. Even though, online learning provides an opportunity for students to pursue education during the pandemic period, it has some disadvantages as well. This research aims to identify the educational strategies practiced during the pandemic period in higher education by reviewing the research published in the pandemic period. It comprises a series of studies that have examined the advantages and drawbacks of online learning in a variety of areas, including medicine, engineering, and school education. The aim of this research is to explore the educational practices followed during the epidemic as well as the challenges encountered by students from various education sectors. The findings of this study indicate that a sudden transition from traditional education to online learning creates a considerable challenge to students in various aspects.

**Keywords:** 1 COVID-19 pandemic, 2 Education, 3 lockdown, 4 online learning.

## I. Introduction

The cutting-edge novel coronavirus disease 2019 (COVID-19) began with the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), which was first discovered in Wuhan, China, in December 2019. On March 11, 2020, the World Health Organization announced the outbreak to be a pandemic. (Donnelly & Brondani, 2020). COVID-19's failure has resulted in the closing of academic institutions all over the world. This inspected the readiness of educational institutions manage a catastrophe that requires the help of prevalent innovation which incorporates equipment and programming project to permit positive on line becoming more acquainted with (Mukhtar and colleagues, 2020).

In this scenario, many beneficial sources have been put ahead to useful resource educators accomplish their lessons on an on-line modality. (Chandrasekaran, 2020) In order to fight the blowout of corona virus, a variety of webinars are now conducted, with the assist of the IT branch of many establishments which helped them to train authorities (Atreya & Acharya, 2020) . Remote gaining knowledge of equipment's such as Zoom, Google Meet play key roles during instructing and studying things to make a digital classroom. (Chan et al., 2020).

Academic institutions around the world have been closed to limit the novel coronavirus disease (COVID-19) transmission. It affects the traditional education process of millions of learners and academicians. Neither the institutions nor the students were equipped to handle this new crisis. It is not mandatory that every student is prepared with computer as well as a stable Internet connection. It is being observed that there is a considerable inequality between urban and rural internet users in terms of internet access, speed and coverage. Based on budget, location and financial condition, an unequal access to resources exists between the students (Nassr et al., 2020).

## 2. RESEARCH METHODOLOGY

This paper reviews the benefits and challenges of the educational strategies practiced during the pandemic period in higher education. Well recognized electronic libraries were searched such as: Research Gate, Wiley, PMS (Pakistan journal of medical sciences) PKP journals) IUBMB journals, Europe PMC, ACS publications, SAGA journals, VOXEX, AQUADEMIA journals. Google Scholar was also utilized to locate open access articles and other resources. The search strategy, as depicted in fig 1.1 below, includes only the sorted database. The search did not limit to these journals only however the search for current, peer reviewed articles were conducted.

Papers were downloaded and shared among the authors to peruse and characterise. A total of 41 papers were collected from the existing literature. After that, appropriate information was extracted from the papers such as: paper name, journal name, publication year, country, benefits and results. The papers which were not applicable to the theme were excluded from the list and we considered only 21 papers for further analysis. The papers were categorized after the filtering process based on Education Sector, Year, and Region. The collected data was analysed to come up with the conclusion.:

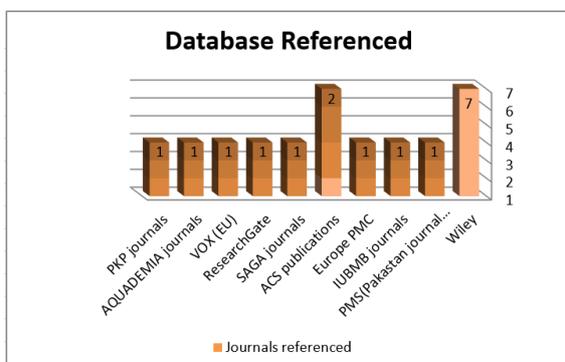


Fig 1. Sources of database

The above Fig 1 depicts the categories of papers we referred for this research. It includes maximum of high impact Journals and few conferences and webinar articles which increases the importance of this review. Thorough studies were done to ensure high quality information impact of covid-19 on education.

The papers collected were classified into medical, engineering and schools based on the educational sectors. The references related to medical sector were 8 papers, engineering included 3 papers and schools included 7 papers. The below Fig 2 represents the various fields

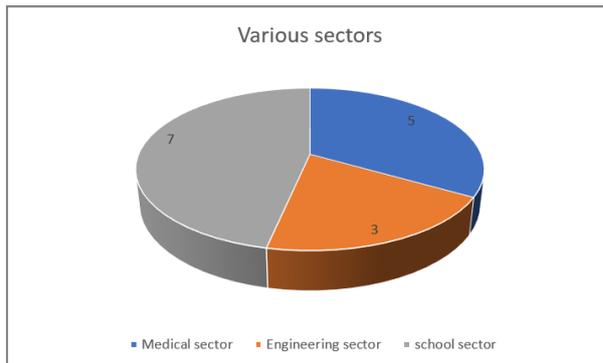


Fig 2. Education Sectors

### A. Medical Education

The COVID-19 pandemic has triggered an unexpected disorder in all aspects of medical education system. We wanted to provide a broad overview of medical students' experiences during the COVID-19 pandemic, as well as assess the challenges and benefits of electronic medical education for medical students. Given that many medical students will now miss out on important opportunities such as presentations, clinical rotations, and collaborative experiences - all of which helped previous generations become potential doctors - the question of how students will develop and integrate into the medical community arises (Ferrel et al., 2020).

The study conducted by Alsoufi et al., 2020 reveals that an acceptable level of knowledge, attitudes, and practices regarding e-learning, during the COVID-19 outbreak. The results show that it has the ability to meet medical students and change medical education. Clinical expertise, financial issues, and technological challenges, on the other hand, are major concerns of e-learning in the medical sector (Alsoufi et al., 2020). Another study done on obstetrics and gynaecology sector reports that, in comparison to traditional didactics, 88 percent of our uniqueness trainees felt more at ease raising questions through videoconferencing. It entails a reduction in public-speaking anxiety, peer support, senior intimidation, and the deconstruction of the conventional classroom. The technical issue with display sharing and voice over is difficult to resolve remotely, and this will soon decrease the enthusiasm of the educator and the learner (Kanneganti et al., 2020)].

Few studies have been conducted to evaluate the impact of COVID-19 on dental education. Findings indicate that students are experiencing increased levels of stress and feel their clinical education has suffered. Instruments, specimens and different scientific instructing aids are inaccessible due to online learning ((Hung et al., 2021). Masks, social distancing, and liberal use of sanitizers tend to be common among students who are comfortable with technology adaptations for didactic curriculum (Kakadia et al., 2020). Technical problems also stated that communications were disrupted, the meaning of images and sounds were unclear, and it took longer to re-join the room when it was left [Kakadia et al., 2020]. The majority of students believed that clinical education is the most suffered after transitioning to online.

Table 1 illustrates the common benefits and challenges of online education in medical sector:

Table1: Pros & Cons of Online Education in Medical Sector

Pros & Cons of Online education in Medical Education	
Pros	Cons
Privacy, Stage fear, Public fear, Save Time, Engagement Massive learning, Any time access, Recorded	Clinical practice, Network Problem, Loss of Enthusiasm, Lack of Voice Clarity, Digital divide, Technical Interruptions, Resource access, Technical difficulty, Natural disasters

### B. Engineering Education

Covid-19 pandemic has also affected engineering education and practice. Engineering education plays a vital role in transformation of a nation and technological advancement across the globe. Most students appear comfortable with technology adaptations for didactic curriculum. The most difficult aspect of online learning is teaching potential engineers how to work with and run actual hardware that is not readily accessible at home. Irrespective of the specialization, students faced difficulty in managing projects, labs, exams and home privacy [12,13,14]. The video conference software made it simpler to work in a group. Students assessment have been changed by means of homework over a lengthy period. Students felt that it is difficult to participate on remote group projects with distant project, when there is necessary to use and work on the software related to the course project.

It has been concluded that there is need for adequate transformation, financial and economic empowerment of educational system for achievement of sustainable development goals and smooth running of education in all tertiary institutions.

Table 2 illustrates the common benefits and challenges of online education in engineering sector:

Table2: Pros &Cons of Online Education in Engineering Sector

<b>Pros &amp;Cons of Online Education in Engineering Sector</b>	
<b>Pros</b>	<b>Cons</b>
Easy to work as group, Assessment mode has been changed to homework, No pressure for exams, No credit system, Pass/Fail, Time saving, Monitor Student activity	Difficult to access Software, Equipment/Instruments for Lab. Technical issues for uploading and downloading. Miscommunication could take place in breakout rooms.

### C. School Education

To build a dynamic learning environment in the online world, the facilitator and the students must work together. In a smart learning environment, students can use immersive learning experiences to lead to self-direction and critical thinking. (Basilaia & Kvavadze, 2020). Students can participate from anywhere in the world as long as they have access to a computer and the Internet. Physically disabled students (and teachers) have more freedom to engage in class by using the Virtual Classroom format( Basilaia and Kvavadze (Basilaia & Kvavadze, 2020).

Students can participate from anywhere in the world, provided they have a computer and Internet connection. Virtual Classroom format allows physically challenged students (and teachers) more freedom to participate in class. (Basilaia & Kvavadze, 2020).Owing to school closures, primary school students are also lacking in social skills and social knowledge. For primary school students, online teaching is an inappropriate learning atmosphere that is affected by stress, anxiety, and disease, as well as being required to learn in a process that is vastly different from what they have previously encountered (Burgess and friends, 2020)

A basic understanding of computers is required of both students and facilitators. According to a survey, there was little creative learning among students of the same age due to a lack of computer literacy among educators and students. the year 2020 (Bao). Simultaneously, technologies used in the learning and teaching process must be user-friendly and trustworthy. However, breakdowns may occur at any stage in the system. For example, the program's hosting server may crash, disconnecting all participants from the class. [nineteen] (Middleton, 2020).

Students at higher levels can monitor their own learning experience and customize class discussions to suit their own personal needs and concerns in an online environment. As a result, the success of online learning is heavily reliant on students' high-level active learning outside of class. (Bao, 2020)The key benefit of asynchronous online learning is that it enables students to engage in a high-quality learning environment with greater breadth and forethought. As a result, students can develop their learning experience in a number of ways.(Middleton, 2020).

Students who are able to access the online learning environment are needed for effective online education in schools. Students who are otherwise eligible will be unable to participate in the course due to a lack of access, whether due to financial or logistical constraints. This is a major problem in rural and low-income communities (Middleton, 2020). According to data from the National Bureau of Economic Research, a survey was conducted.This is a major problem in rural and low-income areas (Middleton,

2020). According to a survey conducted by Georgia's National Statistics Office in July 2019, 79.3 percent of Georgian homes are wired to the internet, with 86.1 percent of city residents having access and 69.9 percent of village residents having access. (Geostat, Internet Connectivity in Households, 20). In terms of computer connectivity, 62.0 percent of the population has one at home, with 74.6 percent in urban areas and just 44.7 percent in rural areas (Geostat, Share of households with computer access, 2019). The number of computers owned by families, especially in rural areas of the country, is less than half of what it should be, which can have a negative impact on online education [15]. (Kvavadze & Basilaia)

Cooperative Learning (CL) was made possible in interactive settings thanks to the Virtual Classroom. It enables students to build a world that includes everything they can imagine, such as the ability to access lectures, course materials, and class discussions at any time. This is especially useful for those who need to reread a lecture or spend some time focusing on a subject before moving on to the next step. However, a well-trained facilitator of online delivery and methodologies is a vital component of online education's performance. If facilitators are not sufficiently trained to work in the Virtual Classroom, the online education system would be undermined. (Bao, 2020). The Education Management Information System in Georgia has developed accounts for all teachers as a result of this lack of online qualities. There are 55000 teachers and 530100 students in this school. Teachers and students were given additional online guidance about how to use the method. (MES 2020, Ministry of Education, Science, Culture and Sport of Georgia to strengthen distance learning methods). (Basilaia & Kvavadze, 2020).

Through the online learning process, dynamic resource sharing and continuous synergy are created. Each student will participate in class discussions and make comments on other students' work. One of the most distinctive and important characteristics of the online learning format is the synergy that occurs in the student-centered Virtual Classroom. During the pandemic, several nations, such as Zambia, adopted different solutions to continue the education process using the internet. Online archives, TV broadcasts, guidelines, tools, video lectures, and online channels are all available to students. To broaden the reach of school lessons to the general public, some countries have begun broadcasting live lessons on various subjects across the country through television channels. (Sintema, 2020). In virtual worlds, time management is a strength to count.

Table3: Pros & Cons of Online Education in School Education

Pros & Cons of Online Education in School Education	
Pros	Cons
<ul style="list-style-type: none"> <li>• Creative teaching, anywhere learning</li> <li>• Student centered</li> <li>• High quality Dialog</li> <li>• Access to resources</li> <li>• Any time ,Any Pace</li> </ul>	Computer Literacy, Lack of Essential Online qualities Levels of synergy The Curriculum Limitations of Technology

### 3. RECOMMENDATIONS TO MANAGE THE ISSUES VIRTUALLY

Interactive Q/A sessions, quizzes and brainstorming sessions has to be conducted to ensure the students attention in online class. Constructive comments on their overall performance is given right away to right misconceptions and to optimize learning. An ecosystem of encouragement is created to invite questions and communicate from the students.

Since online experiments aren't feasible, data can be gathered over a few months and analyzed, mapped, and discussed in virtual lab meetings. Students should look over previous research to assist them in writing research papers for their final project submissions. They might be given new research papers and invited to present in groups as part of on-line lab meetings. This keeps them up to date on research on the web interaction sketch, which will help them connect with students off campus and keep their passion for research alive.

### 4. CONCLUSION AND FUTURE WORKS

The COVID-19 pandemic has transformed the education process worldwide. Its impacts on education draws tremendous attention of researchers. The purpose of this research is to look into the educational practices that were used during the pandemic, as well as the challenges that students from various educational sectors faced. The analysis provides insight into how the educational process worked during a time of rapid and widespread change in the higher education system. Neither the institutions nor the students were prepared to deal with the situation. The majority of the students tend to be comfortable with technological changes. According to the literature, students claim that the advantages of online learning include privacy, time savings, anytime access, lack of stage and public anxiety, massive learning, and recordings.

However, it is being observed that budget, geographical location, financial situation, urban vs. rural, family circumstances, access to infrastructure, and internet speed are some of the common challenges that students face. In terms of access, speed, and coverage, there is a significant gap and digital divide between urban and rural internet users. Students also need to have access to labs and equipment to conduct assignments or experiments, which is almost impossible to be done online [15]. Medical students were most concerned with gaining clinical experience. Students struggled to manage stress, isolation, anxiety, and psychological wellbeing regardless of their discipline. Online learning, on the other hand, is the only way to ensure that schooling and graduation do not have to be delayed for several months.

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