# TEACHING AND LEARNING PRACTICES IN HIGHER EDUCATION: PERSPECTIVES DURING THE PANDEMIC

Edited By

**MMDR Deegahawature,** PhD

**EACP Karunarathne,** PhD

Staff Development Center
Wayamba University of Sri Lanka

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# Forward

I am delighted to send this foreword to the book titled "Teaching and Learning Practices in Higher Education: Perspectives during the Pandemic" edited by Prof. MMDR Deegahawature and Dr. EACP Karunarathne. I admire the Staff Development Center (SDC) of the Wayamba University of Sri Lanka (WUSL) for its consistent effort to bring different flavors to the center's role by publishing a series of books on contemporary themes strengthening the teaching-learning process in higher education. This book becomes another significant contribution of the center, and it certainly contributes to strengthening the academia.

The effect of the Covid-19 pandemic forced higher education institutions to rethink and change the teaching-learning process and strategies. Despite the effect of the pandemic on both teachers and learners, it was compelled to continue the education process. The different subject disciplines undergo unique issues in achieving the learning outcomes. Thus, the pandemic demanded teachers and higher education institutions to come up with novel methods and practices to face challenges and mitigate the adverse effect. Almost the entire higher education system of the country has switched to alternative forms of teaching and learning using an online platform and other alternative methods. Educators have tested novel and alternative methods of student assessment, conducting practical modules, and achieving learning outcomes effectively in a new environment.

Focussing on those novel methods and practices, this edited book presents eleven interesting chapters under four sections. Considering one of the key features in the teaching-learning process, the first section focuses on best practices that spur the effectiveness of teaching-learning practices during the pandemic. The second section focuses on different perspectives on the teaching and learning process and practices during the pandemic. One of the major challenges the HIEs faced during the pandemic was conducting practical modules. The third section is devoted to this, and it presents several cases related to the disciplines such as medicine and electronics. Forth section is dedicated to the effective assessment modes in online education during the pandemic. I believe, Educators, higher education institutions, and policy-makers will find the contents of this book are salient in uplifting higher education and achieving the higher education goals.

I take this opportunity to congratulate the SDC for its commendable involvement in uplifting the standards and competencies of all categories of staff at WUSL and other higher educational institutions, thereby contributing

to the advancement of the higher education sector in the country. Importantly, the work of this nature would add immense value to academia and strengthen the education sector thus, I appreciate the SDC. Also, I congratulate the editors and the authors of the chapters for their commitment, dedication, and interest in bringing this book out. Finally, I wish the SDC, editors, and authors very good luck in their future endeavors to serve academia.

Prof. RMUSK Rathnayake
The Vice-Chancellor
Sabaragamuwa University of Sri Lanka
Belihuloya
Sri Lanka

20th June 2022

# Preface

Higher education is one of the major sectors that has been drastically affected by the repercussions of the pandemic. With the imposed health guidelines, many education institutes were forced to close down in the middle of the academic years. This situation created huge confusion, and higher education institutes had to find alternative ways to proceed forward. Many initiatives were taken up, but it took time for students and teachers to adopt since it was a completely novel experience for all. While providing benefits, however, the sudden emergence of alternative modes of education results in many unexpected outcomes that are difficult to solve at once. Although it was a rapid transition, experiences gained through the adaptation of novel teaching-learning platforms will help the institutes gear up the education more strategically and efficiently in the future, ensuring an uninterrupted learning experience for the students.

Intending to provide inputs to institutional development and the policymakers, this book presents the chapters written based on experience gained in the higher education sector during the pandemic to provide insights on the teaching and learning practices in higher education. Particularly, this book presents a number of findings on educational practices and adopted innovative methods in different platforms under four themes.

During the pandemic, many initiatives were taken by higher education institutes to continue their primary functions. The majority were given the focus on utilizing available online teaching and learning tools to facilitate the process, and this created novel and unique experience for all participants. Thus, the first section has been devoted to presenting adaptations and perspectives of higher education teaching and learning practices during the pandemic. As evidence listed, higher education institutions now have the opportunity to blend both physical and other modes of education to create a safer and healthier environment for all stakeholders. This may drive higher education to a new era. Summarizing the various factors that influence the students' engagement, chapter one presents andragogy in blended online and onsite teaching and learning processes in higher education. Chapter two proposes blended learning as the alternative due to the impact of e-learning on physical education during the pandemic. Chapter three summarizes different teaching and learning activities adopted before and during the pandemic and proposes that the use of creative and effective online teaching has become the solution to face the pandemic. Also, this chapter discusses different aspects of the teaching and learning process.

The second section discusses the methods of enhancing the teaching-learning processes in a pandemic period while facing the challenges

associated with alternative teaching-learning modes. With the adoption of different strategies, tools, and methods to enhance the effectiveness of the teaching-learning process, the way of delivering lectures was changed drastically. Thereby, understanding the best practices adopted in the teaching-learning process during the pandemic is extremely important to improve the teaching and learning process to identify blended learning opportunities even after the pandemic. While identifying the challenges, Chapter four presents opportunities and best practices of online education that help overcome the challenges. Chapter five explains how the tribrid model is useful to make the online mode of education more reliable, effective, and efficient. Also, the chapter proposes a tribrid model that includes teachers' roles, learners' roles, and continuous rating. Introducing flipped classrooms as a part of blended learning, chapter six recommends virtual flipped classrooms as an effective tool to respond to the challenges of the pandemic.

Due to the pandemic, most of the time, teachers and learners had to adapt to the online delivery for the continuation of academic activities. With the continuous effort of the educators, online delivery was gradually improved to enhance student interaction. Even though, still, a significant number of components, such as practical modules, fell behind, as there were no immediate online alternatives. Thus, the third section has been devoted to discussing several case studies which successfully implemented as an alternative mode of the teaching-learning process with special reference to the challenges when conducting practical modules. Chapter seven and eight cover specific issues in medical education. Focusing on pathology education, chapter seven presents the challenges and strategies to overcome them under several categories. Chapter eight elaborates on the effect of the pandemic on medical education especially focusing on clinical training. It shares some global experience along with local experience in clinical training. Diverting the discussion to teaching electronics, chapter nine provides an overview of using simulation software in online practical sessions. It presents a comprehensive case of teaching digital electronics on the online platform.

On the other hand, currently available technology-based tools were heavily used to enhance learner engagement and experience due to this situation. As these distant learning methods are a novel experience for all stakeholders, carrying out assessments on different platforms was another major challenge faced by academics. When assessing the learners, it is required to safeguard academic validity, reliability, and fairness. Hence, teachers have to devise alternative and creative assessment methods to promote life-long learning. Extending the discussion, the fourth section deliberates the possible effective modes of alternative assessments and several tools that help in evaluations. While presenting some inevitable issues that undermine the effectiveness of assessments particularly, this section highlights the possible applications and benefits of technology-based

tools in both formative and summative assessments. Chapter ten presents several challenges of online assessment, and some possible strategies to overcome them. Contrasting traditional assessments and alternative assessments chapter eleven presents several alternative assessment tools applicable to the pandemic situation.

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20th June 2022

# Acknowledgment

It is our duty to extend our appreciation to all those who help us bring this book out. First, we reserve a special thanks to the Vice-Chancellor, Wayamba University of Sri Lanka (WUSL), and other senior academics for their encouragement and continuance guidance. We are greatly indebted to Prof. RMUSK Rathnayake, the Vice-Chancellor of the Sabaragamuwa University of Sri Lanka, for his insightful forward. As a senior consultant and expert in academia, his words add immense value to the book. He deserves special thanks for his distinct service in higher standards in staff development in academia. Adding all resource persons of the Staff Development Center (SDC) to the list, we extend our thanks to them for their contribution to uplifting the standard of young academic staff, thereby enabling them to come up with novel ideas and practices to advance the higher education sector.

There are many pillars behind the success of this book. We note the support that we received from the members of the SDC, including Ms. Maheshi Anupama. Also, we are grateful to Dr. AD Dharmawansa for the cover page design, and Ms. RVM Maduwanthi for typesetting and compiling the book nicely. Also, we extend our appreciation to the owner-manager and staff of the Warna Printers, Kuliyapitiya. Finally, we extend our gratitude to all authors for their untiring effort to finalize the impactful chapters.

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20th June 2022

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# Perspectives of Higher Education Teaching and Learning Practices during the Pandemic

# CHAPTER 01

# Being Effective in Teaching-Learning Process during Pandemic: A Pros and Cons of the Design of Leapfrogging Pedagogy in Higher Educational Institutes in COVID-19 Pandemics

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## Teaching and Learning of Education in an Era of Global Pandemic

COVID 19 is a contagious disease caused by a newly discovered influenzas virus, and the spreading of COVID-19 has resulted in the subsequent economic recession, which was later trickled down to hobble the other commercial, public, and cooperative activities. The corollary of communal exercise of social distancing has led to cop opted some changes in modes of delivery of higher education (HE) in state universities[1]. Although the communal exercise of social and physical distancing was primarily enforced to break the infection chain and ease the burden of public healthcare workers, the effects on the essential activities of a healthy society including enterprises, entertainment, and education of society could sooner be outstripped the good done by the exercise of social and physical distancing. The negative consequences of COVID-19 have already planted an indelible mark on all businesses, and it will not take too long to bounce back the lapses in higher education on us as an unavoidable bane. If such downstream effects had not been foreseen, higher education would have been badly affected for the generation to come[2].

The advent of the Covid-19 outbreak in Sri Lanka has affected all forms of education in the country for a better or worse one, for teachers and learners are required to accept the challenges which had suddenly been foisted on all. However, it was not until the first quarter of 2020 that the HE institutes in Sri Lanka had not deeply been conscious of the Pros and cons brought about by online education; how a teacher can achieve the outcomes of Bloom's taxonomy action verbs and activities decides the advantages and disadvantages of with online leaning practices of learner's end. Thus, the higher education systems are no exception to the great mayhem caused by the sudden abeyance of all academic activities in state universities. This

chapter was written to offer a retrospective glimpse to find out the current bearing of the teachers/learners in the issue/solution and to see the extent to which the handling of challenges has been reckoned with regulatory authorities of HE in the country for the betterment of Society[1].

## What Does Learning Epistemologically Mean?

"Learning is the process of gaining knowledge and expertise."
*quoted from The Adult Learner by Malcolm Knowles.*

There are theories about learning that explain how a person acquires, retains, recalls knowledge, and uses them to change the behaviors, and the capacity of an individual. Learning is acquiring knowledge or skills by studying, experiencing, or being taught. Not only does the learning help gaining knowledge or skills, but also it influences permanent changes of attitudes and behavior of a person toward the being better than that of the start of the journey[3].

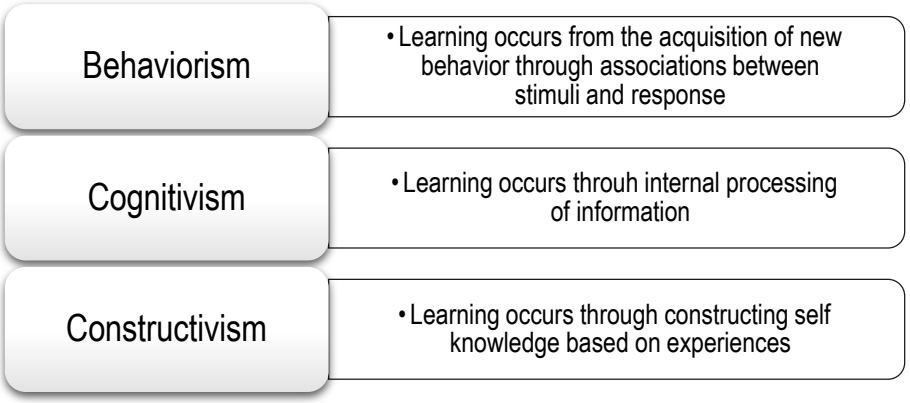


**Figure 1: Learning Theories[4]**

## The Role of a Teacher in Higher Educational Institutes in Sri Lanka

Up until the end of the last decades, Sri Lankan higher education has been slowly embracing the fast pace of global changes in HE in adopting them into the country's educational landscape of HE. For the first time in the history of the Sri Lankan education system, there has been a shift from a face-to-face teaching model to a completely online one. Due to the changes in the basics of HE in the country due to COVID-19, the three pillars of Bloom's taxonomy, which are cognitive (knowledge), affective (attitudes), and psychomotor (skills), have to face the same challenges in fulfilling its functional verbs and roles in shaping the minds of youth. The benefits of complete online teaching have become part and parcel with some costs in the experience of the learner's end where the development of affective and psychomotor domains in learning activities is yet to be pondered about for

implementing online setting of teaching. HE is instrumental in lessening the ever-expanding rift between the poor and the rich. Thus, HE is an indispensable tool to empower undergraduates with knowledge, skills, and a positive attitude on their journey to become global citizens.

The closure of HE institutes in the country put all educators in a struggle to deliver their teaching materials with meagre provisions of the internet and other resources needed to be placed in a complete online classroom. The advent of online teaching and virtual classroom has changed basic aspects of the classroom. Online education and virtual classroom practice became a new experience for both teachers and learners against the teaching-learning activities done in the physical classroom. The collaborative partnership among academics in HEs and experts in IT for the staff development to make academics learn themselves of the virtual classroom have paved a way to employ the leapfrog pedagogy in novel, imaginative ways, drawing on experiential learning into a studio-based learning environment or with video conferencing environment coupled to learning management system. Google meeting, ZOOM meeting, and Microsoft team meeting are apps employed for video conferencing. Suppose such a newly introduced LMS- video conferencing environment could not live up to the promised standards. In that case, it can result in disappointment, cynicism, and a sense of despondency in students and their output.

## The Role of a Student in HE Institutes in Sri Lanka

The online teaching environment provides a reasonably good environment for aligning the delivery methods of teaching to ensure that the intended learning outcomes had been achieved. The intermittent teacher's intervention helps guide students to the destination so that the guidance should be minimally disruptive to include the end-users in the design rather than giving a pre-done lesson; a pre-done lesson could easily ostracize concerns and qualms of students toward the online teaching. Continuous updating of teaching methods of a pre-done lesson plan is needed, and online formative assessments help the teacher make decisions for himself to student's performance.

Educationalists are increasingly learning that active student engagement is more than time on task. It is not all fairness to tell them that students are not conscious of being conscientious on academic works to become global citizenry. Moreover, academic success inspires them for a lifelong journey of learning. Sir John Daniel[5] has stressed that education in the 21st century should lead to the "nurturing of human capabilities that allow [students] the freedoms to lead worthwhile lives." Further, he has accentuated that it is not merely training individuals to become the human capital to achieve an economic production, knowing the importance of

fostering personal agency, creativity, imagination, and a sense of hope and possibility. Moreover, he advocates that contemporary education must address the issues of school retention and quality by working on it to enhance student engagement. That makes the classroom more interactive[5].

## The Design of Leapfrogging Pedagogy in HE Institutes in COVID-19 Pandemic

The challenges of adopting online teaching and learning platforms in HE institutes can be a blessing in disguise, and the challenges can be flipped into the good of all students. Such transformation accompanies a sustainable and accelerated delivery mode of knowledge and attitudinal changes of students. COVID-19 Pandemic has shown that this could be achieved by a persnickety choice of resources available to make experiential learning real. The ability to reach the teachers for any clarification needed is come in handy in the online mode of teaching in contrast to the actual classroom-based education where a student having questions tends to be more reticent, for he cannot confidentially direct the questions to the teacher. The ability to reach teachers without being seen as a student highlighted among peers protects students' privacy without revealing academic credentials, like grades. Even the prior appointments with a teacher would have been befallen unmet as it was initially planned; for many factors, such as transportation and commuting means; sudden changes of prioritization events daily planner; causes that meeting to remain as an unaccomplished event.

Another Inherent drawback of the physical classroom is that the classroom space becomes crowded and stuffy with tables and chairs. Online teaching mode has been utilized as a means of "leaping over" conventional approaches and/or technologies and moving directly to more appropriate and often more advanced options available in online teaching. The leapfrogging has utilized the existing challenges in HE that are constraining innovative practice to create a better environment for the learners. A pedagogical example of leapfrogging in challenging contexts of the COVID-19 Pandemic would be the adoption of online teaching and the authentic use of the digital environment as a teaching resource. Instead of spending time and money trying to equip the schools in configuration favouring a teacher-centred delivery, online learner-centred delivery solves contextual issues with a local solution. This approach would help leapfrog traditional classroom practices, both the pedagogy and physical design of the actual learning environment, allowing educators to embrace the changes that are demanded by the COVID-19 pandemic[6].

## Factors Governing the Student Engagement in Higher Education

The level of attention, interest, optimism, and passion that a student shows when he or she is learning or being taught is called student

engagement[7]. Student engagement is imperative for the teacher to make studying progress in accomplishing outcomes of three domains of Bloom's taxonomy. Student motivation is key to effortless learning; lack of motivation forfeits the internal urges to learn and progress in their education.

In the 1980s, six main assumptions regarding andragogy by Malcolm Knowles cited are as follows: 1. Adults are internally motivated and self-directed. 2. Adults relate their life experiences and knowledge to learning experiences. 3. Adults are goal-oriented. 4. Adults are relevancy-oriented. 5. Adults are practical-oriented. 6. Adults have to be respected[8].

The rule of thumb of effective teaching and learning occurs when both teacher and student actively engage in learning activities. The same is true for online-based delivery too. According to studies of Fredericks *et al.*[7] student engagement is categorized into three subparts:

***Behavioral engagement:*** students' participation in academic, social, and extracurricular activities in their institute

***Emotional engagement:*** students' emotional reactions within the classroom and the institute (a sense of belonging or connectedness to the institute)

***Cognitive engagement:*** students' investment in their learning (motivation and self-regulation)

Three kinds of student engagements identified for traditional classroom teaching and learning activities can also be applied for student engagement for the ongoing online teaching and learning activities.

In addition to student engagement in teaching and learning activities, there are some factors that influence students to participate in lectures. Five factors have been identified.

***The curriculum and resources factor*** is governed by the availability and type of learning resources, including technology, dimensions of the learning tasks (level of difficulty, interest, meaningfulness to the learner), task design, learning goals and objectives, and assessment approaches.

***Classroom factors*** represent the physical settings like classroom arrangements, noise levels, lighting, etc., and consistent and structured approaches to providing student support and disciplinary actions.

***Teacher factors*** become the cornerstone of teacher's interaction styles (cheerfulness and shared attention, support, responsiveness, directness, verbal compliment), behavioral and academic expectations.

***Student factors*** include students' physical, emotional, cognitive, and behavioral state, including health issues and disability, peer relationships.

***Family and community factors*** are needed to persuade the HE journeys with students' residential circumstances along with the family support for involvement in education and relationships with their family.

The lack of fulfillment of the above factors causes students to depart from learning and teaching activities. Moreover, the sudden shift of learning and teaching activities of HE institutes attributed to the spreading of the COVID-19 Pandemic intensify the sensitivity of factors toward the teaching and learning experiences. Whereas the online teaching and learning activities in HE uses the strategy of leapfrogging to make use of the challenges of the online platform, there are some irreplaceable activities that students need to learn and change the way student comport himself in society. Those areas that cannot easily be exonerated from HE are somehow required to add to leapfrogging pedagogy.

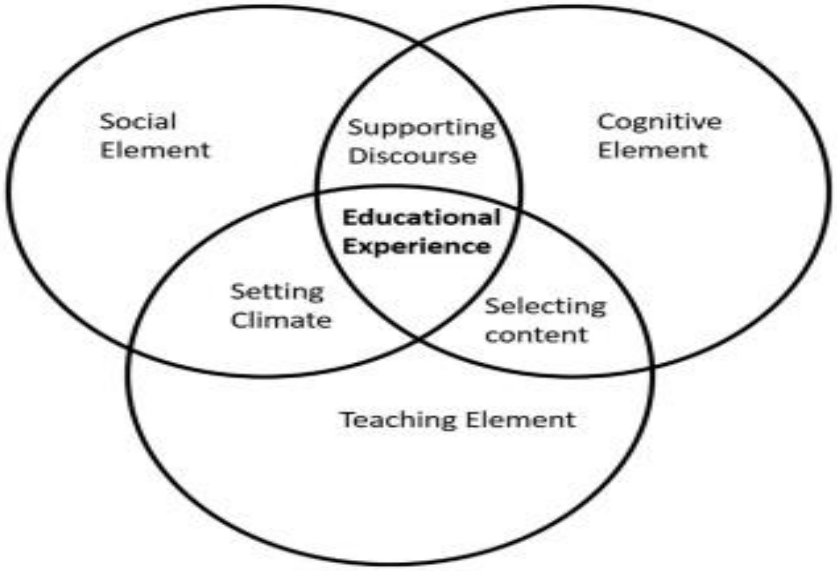


**Figure 2: The Community of Inquiry Model[9]**

## Andragogy in Blended Online and Onsite Teaching and Learning in HE

After the COVID-19 Pandemic broke out and the simultaneous closure of HE institutes, the entire student body and teacher community prepared themselves for the worst that was yet to have come; however, the transition from onsite teaching and learning mode to online mode took a brief period of a tumultuous period. It quickly gained the steams, and thus, it bridges the gaps of the technical know-how of teachers and learners on embracing the unexpected change in HE. State universities supported the teachers in HE institute do teaching efficiently and effectively. Despite all the technical challenges of online-based andragogy, state universities have admitted new students by online orientation program with no student harassment. The contingency plan co-opted prevents students from being held abeyance until the COVID-19 is wholly gone, which was little quixotic thought in a global pandemic.

Faculty of Technology, Faculty of Medicine, and Faculty of Engineering need their students to gain finer details of the disciplines which are not transferable by rote instructions of teaching that typically happened in the cognitive domain of Bloom's taxonomy. Thus, HEs must utilize a blended andragogic leapfrogging pedagogy to overcome lapses by addressing Bloom's taxonomy's psychomotor and affective domains of teaching and learning activities. However, the outcomes of blended andragogy for online teaching and transferring unique experiential teaching and learning in the said disciplines remain unclear. Thus HE institutes need to successfully transform themselves to a blended andragogic leapfrogging pedagogy transforming both physical model of operations and online mode of teaching by selecting the modules to be taught and the mode of assessments to facilitate the operations of HE organizations. Such a blended model of both physical and online education seems to be the only choice and the promise to recapture the all good under one umbrella[1].

Concerning all these challenges, this chapter has tried to shed light on some aspects of effective teaching practices that could be practised in HE regarding the transferability of skills in Science and Technology to achieve success during the uncertain times of the COVID 19 pandemic. Much more research and scholarly work need to be done in HE to maximize the opportunities in higher education for students in the COVID pandemic.

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# CHAPTER 02

## The Impact of "E-Learning" on Physical Education during COVID-19 Pandemic: Is Blended Learning the Way Forward?

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Over the last decade, there has been an ongoing debate on utilising online platforms for teaching-learning processes. The graft below was from an article published in 2017 in Inside Higher Ed[1].

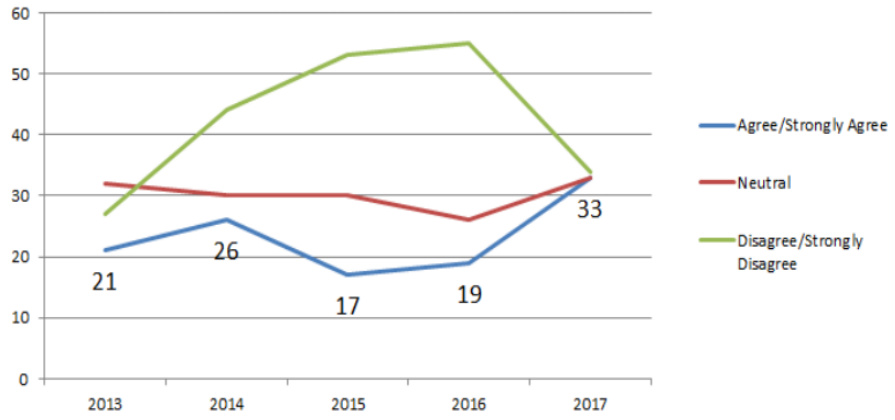


**Figure 1: Professors are Slowly Gaining Confidence in the Effectiveness of Online Learning as More of Them Reach Online**
**Source: Survey of Faculty Attitudes on Technology Reveals[1]**

The study[1] done a few years before the emergence of COVID-19 illustrates the positive percentage change in the gain in the confidence in online teaching over the years among professors recruited in the study.

In 2020, with the instantaneous global emergency of the COVID-19 pandemic, the World Health Organization (WHO)[6] strongly endorsed against public gatherings and recommended social distancing as the initial method of disease control. Thus, abruptly the collective community

activities came to a halt. In order to make escape plans, people tend to do most of their work and social movements in cyberspace. Accordingly, the education or teaching-learning processes, as well as the examinations, followed the same online path. This directly shifted the balance towards e-education from the traditional physical method.

Compared with the well-established physical education system, this newly attuned education scheme has distinctive advantages and disadvantages. With the continuous improvements in advantages and rectifying the disadvantages, the applicability of online education can endure even after the pandemic. Experts in the education field believe that the future teaching process will be a hybrid version[2] of physical and online methods. This chapter discusses the advantages and disadvantages of generally accepted online platforms.

**Figure 2: Balanced Education Modalities[2]**

## Key Benefits of Online Education

Convenience is the key to gaining this reputation for online education[3]. If someone has easy access to the internet, then that individual is just a fingertip away from the education platform. With the development of competition among internet service providers, technological advancement in super speed connections, nationwide network coverages, relatively low-priced data charges, and affordable internet packages have all contributed immensely in this regard.

At the present time, the online classes are just a click-a-link away, thus cumbersome installation of software is avoided. The technological advancement in the software industry, as well as the hardware of devices, also play a pivotal role behind the success of this newel teaching-learning modality.

Flexibility is the other significant contributor to handiness[3]. As an example, if one is unable to attend an online class on-time, that particular

person can still log the class later provided the session is saved in online platforms such as Learning Management System. Therefore, fitting to own schedule is very imperative. Suppleness is highlighted particularly when the class is done over different time zones across the globe. This exposes the student to a whole new domain of opportunities in global education.

Moreover, certain theory subjects can be covered entirely or partially by using e-teaching methods. It's the same case when it comes to their examinations. The best part of it is that students will receive an e-certificate at the successful completion of the course. Hence student satisfaction is at a higher level with a minimal physical excursion.

Furthermore, students and teachers are completely free from spending loads of time and money on overseas or local travel tickets. Besides, both parties can save the expenditure on clothing, making-up, and books due to liberally available e-books. So saved time and money can be invested in other important matters.

Apart from these, the educational institutes could also save lots of currency spent on physical space and multimedia. Therefore, the online platform is rapidly gaining popularity on the basis of cost-effectiveness for all involved parties.

Even though there is minimal physical interaction in e-learning, software developers are working their way to overcome the obstacles. They had made video conferencing as easy as never before and fortified it with multiple interactive options such as share screen icons, chat rooms, communicating emojis, etc. These symbolic communications and private chat rooms have gained popularity, especially among otherwise shy students. In order to make students more engaged in the activity, larger groups can be sub-grouped into break out rooms for group assignments under the supervision of the teacher. Hence these tools foster accountability in order to maintain active student participation. These interventions are of emerging success in gaining students' attention and interest in interaction. Off video and muted audio are not "bad" at all, especially if the student is in an embarrassing situation.

The natural advantage of online teaching is that it breaks the front raw- back raw division among students by bringing them to a same e-line circling around the teacher. The teacher has the advantage of using many virtual teaching modalities online, such as video-assisted teaching, downloadable digital whiteboard writing, online quizzes, etc. The biggest benefit of e-learning is hardly any risk of spreading communicable illnesses. Therefore, even if the teacher or student is ill, they can continue participating in the activity without rescheduling class timetables.

## The Leading Drawbacks of Online Education

Humankind is a very sociable community from the known ancient history. They always need affection, attraction, interaction, and a sense of

being in the community. Thus, it is not an easy task to keep them away from each other.

Neither everyone enjoys learning in isolation4 nor working independently. Some will certainly need to work in a physical environment with peer support. Thus, some students find it very difficult to transform to a new e-learning environment from the comfortable physical campus community which they are already accustomed to. This kind of student finds it challenging to focus on online teaching. In addition, they feel helpless and less reachable to their teachers. Therefore, they get distracted easily, especially into other irrelevant websites, online entertainment, social media and gaming servers, etc. Those who lack self-discipline will commit the same mistake. Moreover, they tend to switch off video and mute mics while attending the class online and engage in other physical activity disengaging from the actual matter in hand.

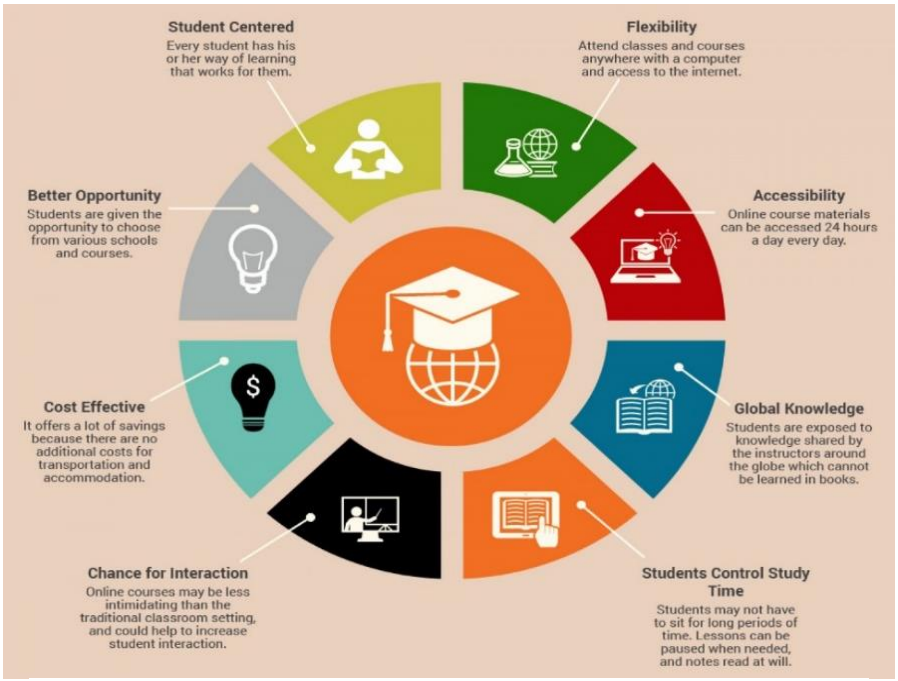


**Figure 3: Benefits of Online-Education[3]**

Lack of physical interaction in virtual space may even distract otherwise good students in the physical classroom4. Some students might feel like losing attention from their teachers and not receiving enough expected guidance. Hence, they might also lose their sense of responsibility, social skills, and effective communication skills in the long run. Even though online attendance is marked, their attentiveness to the subject can go down drastically. All in all, from this point of view, e-learning has failed to match the effectiveness of traditional physical courses.

Certain advanced subjects such as medicine, engineering, veterinary sciences and agriculture, etc. which engage in plenty of practical and hands-on skills cannot be completely covered only by online teaching.

On the other hand, teachers also face multiple key challenges. Primarily they lose their well-practiced time tested physical teaching activity, and they face the challenge of swapping over to the online method with extra effort and a variable learning curve. If they do not convert teaching methods efficaciously with available online resources, the student could lose interest in the subject. In order to achieve this, the teacher has to attend mandatory training on e-teaching, including the latest versatile software, learning management systems, audio and video capturing and real-time online quizzes, etc.

Consequently, training teachers and upgrading technical facilities, and establishing information and computer technology departments are major challenges faced by the education institutes. So the smooth functioning of the online teaching system can be expected only after all these grounds works have been completed.

The prevalent shortcoming of online education is the technical issues. Of which most highlighted matters are connection problems and audio-visual disputes.

But there are instances where certain students especially those from low economic backgrounds might find it difficult to afford these high-tech devices or even to pay their data bills. And unfortunately, there are no established systems to support these needy students in order to have free access to the relevant online session.

The inevitable drawback of this newel learning method is excessive time spent in front of the screen[4]. This invariably leads to visual or sight-related, physical problems such as headache, posture-related issues like back pain, and psychological concerns such as stress. If someone finds it difficult to cope with these matters, then there is a risk of their future education being hampered.


**Figure 4: Disadvantages of Online Learning[4]**

Younger students or children and people with attention deficit disorder would be at a greater disadvantage if online teaching takes over the traditional methods.

## Conclusion

For higher education, online learning has many exciting advantages for the student, teacher as well as institute, which deems far ahead of its' addressable weaknesses. By the way, as technical capabilities reached new altitudes and many major problems of online courses were solved, the advantages of online courses have begun to cover their disadvantages.

On the other hand, well-established physical education also progresses in its strengths and takes necessary actions to improve on its weaknesses.

In conclusion, if there is a marriage between online and physical education methods, all parties are at safe and healthy grounds when considering the overall effective educational outcome. Therefore, in recommendation, the future of edification should be the blend of both physical and online education methods.

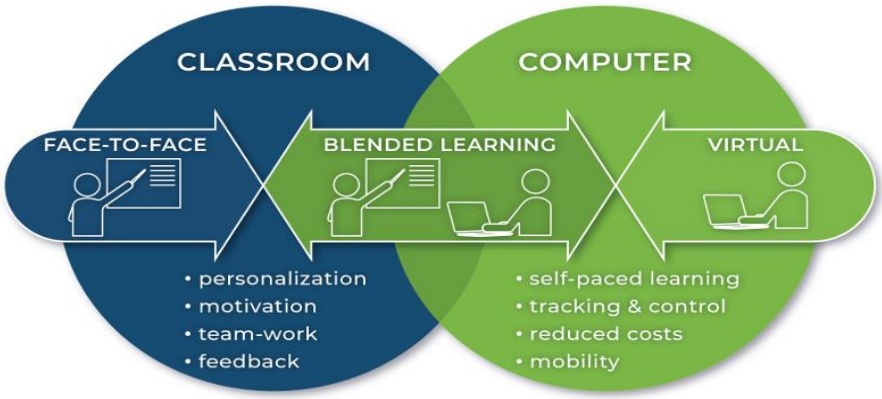


**Figure 5: Blended Learning**[5]

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# CHAPTER 03

# Teaching and Learning Practices in Higher Education Underwent during the Covid-19 Pandemic: Adaptations and Perspectives

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## Introduction

Education is the key factor of economic and socio-cultural development in the present world. Teaching and learning have taken much attraction with the drastic development of education. Face-to-face teaching, distance learning, and online teaching are popular teaching and learning techniques used worldwide. Online teaching is a newborn technique relative to on-class teaching, which developed with information technology. Even though online education started in the 1990s[1], online teaching is not much popular in Sri Lanka until 2020.

In early 2020, an unexpected pandemic called COVID 19 pandemic was erupted in China and spread throughout the world in a very short time period[2]. Sri Lanka faced this outbreak in March 2020, and the government shut down all the transportation through the island and announced a lockdown period[3]. The whole education was stopped for a few days, and the government and other respective institutes tried to find alternative methods to continue the education process. Nearly 1.6 billion learners from 190 countries were affected by the COVID 19 pandemic[4].

Online teaching and distance learning have got much interest during this pandemic[5] (Qazi et al., 2021). The entire education system, including kindergarten, started to conduct teaching and learning practices via online platforms[6]. According to Cheng et al.[7] China has moved to online education since the mid of February 2020. Based on the Hayashi and coworkers study, 90.3% of universities in Japan have facilitated distance learning as of 1 June 2020[8]. Most higher educational institutes have facilitated online learning systems since May 2020 in Sri Lanka.

Due to COVID-19 and lockdown, we were compelled to deliver education through e-learning. This chapter presents a quick overview of the

available online teaching and learning tools utilised in the online mode and teaching and learning practices in the higher education (HE) system. Further, discuss the adaptations and perspectives of the online mode.

## Available Teaching and Learning Techniques

### Distance Learning

Distance learning is another popular technique widely used in this pandemic situation. According to Jain et al., distance learning is "a process to create and provide access to learning when the source of information and the learners are separated by time and distance, or both"[9]. Simply distance education can be defined as a learning process where the learner is physically apart from the teacher[10]. Saykili has discussed distance learning under three generations. In the first-generation, distance learning has been practised using print technology. Postal service was taken as the communication medium. Broadcast technology was used in the second generation. Television and radio were used as communication mediums. The third generation was more sophisticated, and two-way communication was possible. Audio/video conferencing synchronous and asynchronous computer-mediated communication are some examples for the third generation. According to the Amani, "correspondence conducted through regular mail, internet conducted either synchronously or asynchronously, telecourse-broadcast where content is delivered via radio or television, CD-ROM where the student interacts with computer content stored on a CD-ROM, Pocket-PC/Mobile Learning where that student accesses course content stored on a mobile device or through a wireless server" are the distance learning methods[11]. Table 1 shows the other types of distance learning[12].

Qazi et al. conducted research on the adaption of distance learning during COVID 19 pandemic[5]. The sample of the study consisted of 150 participants, and open-ended questions were used. PLS Smart Version 3 was used to test the model. The results have shown that both students' awareness and readiness are critical factors in adapting to distance learning mode.

Armstrong and his coworkers had executed extensive research on distance learning at Georgia State University [13] The main objective of this study is to identify academic challenges and the unforeseen benefits of distance learning. 792 students as both graduates and undergraduates participated in this study, and the research team found that distance learning has positively influenced student motivation throughout the pandemic.

### Online Learning

Nowadays, online learning has become one of the promising words due to the coronavirus outbreak. Any instruction delivered electronically via

the internet platform, and multimedia is called online learning[14]. E-learning, web-based learning, Internet-based learning, and computer-assisted instruction are similar terms of online learning. Swerdloff has reported that online learning "emulates instruction delivered in person, by a teacher, as a means of offering more instructional contact without the confines of place, time, and expense"[15]. And also, Swerdloff has highlighted that anyone can learn "anywhere, anytime, on any device" through online learning. Virtual and augmented reality devices, email, video conferencing via social networking sites, voice-over-internet protocol, and mobile applications are sophisticated tools used in online learning and teaching[16].

**Table 1: Types of Distance Learning[11]**

| Types of Distance Education | Examples |
|---|---|
| **Correspondence model** | Print |
| **Audio-based models** | Broadcast: IRI |
| | Narrowcast: IAI (via audiotape or CDs) |
| | Two-way radio |
| | Audio conferencing and telephone |
| | Broadcast radio |
| **Televisual models** | Broadcast television (educational and instructional) |
| | Videoconferencing |
| | Video |
| **Computer-based multimedia models** | Interactive video (disc and tape) |
| | CD-ROMs |
| | Digital videodiscs (DVDs/VCDs) |
| | Interactive multimedia |
| **Web-based models** | Computer-mediated communication |
| | Internet-based access to World Wide Web resources |
| | Online courses (e-learning) |
| | Online conferences (webcasts and webinars) |
| | Virtual classes/schools (cyber schools) and universities |
| **Mobile models** | Hand-held devices |
| | Portable media players (podcasting) |
| | Cell phones and smartphones |
| | Tablets |
| | E-readers |

Tomasz and Bachnik had reported that both professors and students need to master or create new skills, capabilities, and venues to execute online teaching and learning[1]. Webex, Microsoft Teams, Zoom, Padlet, and Blackboard Collaborate are some platforms used in online education[15].

Tencent classrooms/meetings, Rain Classroom, Xuexitong and Blackboard are popular live broadcasting teaching platforms used in the HE sector in China[2]. Rafique et al. had stated the merits of online education as convenience, flexibility, teamwork, time-saving, and fewer physical boundaries for collaboration. Even though there are many benefits in online education, especially during this pandemic situation, some scholars have highlighted drawbacks such as connection difficulties due to low signal and low internet speed, lack of nonverbal communication such as facial expression and voice tone, and poor writing skills or language barriers[17]. And also, they reported that preparation for on-class is less time consuming than preparing for online classes[1]. Chiang and colleagues have conducted a comparison study on physical education and online education with dental students[18]. They have found that dental students tend to have online classes more than physical classes. But they preferred to have physical classroom examinations over online examinations due to convenience and fairness.

Bdair has researched to find out nursing students' and lecturers' perceptions on online learning during this pandemic[19]. Data was collected using telephone semi-structured interviews. Analysis results had shown that both parties were averagely satisfied with online teaching and learning. Further, results show that student-centred learning, academic achievement, and flexible learning environments benefit online learning, and academic integrity, inadequacy, family burden, and learning environment are challenges of online education.

Muflih and his coworkers had undergone research to determine medical students' attitudes on online learning[20]. The Snowball sampling technique was used to find the participants, and the sample consisted of 1,210 Jordanian medical college students. The results emphasised that students' attitudes toward online learning were moderate level, and sex, major, living area, college level, and previous experience are correlated with their attitudes.

Another study has conducted by Hussein and coworkers to find undergraduates' attitudes towards online learning during the pandemic situation using 45 students selected from the convenience sampling technique in the United Arab Emirates[21]. The results have shown that "cost and time effectiveness, safety, convenience and improved participation" are positive aspects of online education and "distraction, reduced focus, heavy workload, problems with technology and the internet, and insufficient support from instructors and colleagues" are as negative aspects of online teaching.

## Effective Teaching Tools

This section will be discussed the effective online teaching techniques in teaching sessions, practical sessions, and assessments. The following table is elaborated on the sophisticated techniques in different teaching activities.

**Table 2: Teaching and Learning Activities before and during the Pandemic[22]**

| Activities | Before Covid-19 | During Covid-19 pandemic & under MCO |
|---|---|---|
| **Teaching & Learning** | Face-to-face lectures. | Pre-recorded videos + online discussion. |
| | Hands-on practicals, demonstration , and submission of practical reports. | Viewing of videos recordings of practicals and those available from websites.<br>Students were required to answer questions after viewing the videos. |
| | Logbook record of clinical postings and observations. | Discontinued. |
| **Assessments** | Written assignments. | Assignments submitted online. |
| | Oral presentations. | Video presentations. |
| | Written examination. | Multiple-choice-questions (MCQs) and tests administered via online platforms, such as Google Form or SPeCTRUM. |
| **Research Project** | Experimental and clinical research work that required data collection in the hospital. | Experimental and clinical research work that required data collection in the hospital.<br>Special permission was obtained for students to access hospital facilities and collect data.<br>The amount of data needed was reduced. |
| **Final Exam** | Closed book. | Open book.<br>Most questions required students to apply higher-order thinking skills (HOTS). |
| **Oral Examination** | The physical presence of an external examiner during the oral examination was required. | Student makes a short video recording of their presentation and question and answers session conducted online via MS Team. |
| **Student engagement** | Face-to-face interactions and discussions. | Online meeting, Kahoot! and Google form MCQs. |
| **Communication** | Verbal, WhatsApp, and email. | WhatsApp and email. |
| **VLE/cloud storage** | SPeCTRUM and Google Drive. | SPeCTRUM and Google Drive. |
| **Attendance record** | Signature on the attendance sheet. | Google form |

In order to limit the Covid-19 outbreak, the stay-at-home strategy kept university students away from their campuses. The quick transition from face-to-face or hybrid learning to entirely online learning and teaching was unexpected. It essentially reflected adverse circumstances in whole university education, particularly in the natural science fields. As a result, the adaption for creative and effective online teaching is the only solution to overcome the situation, as shown in above Table 2[21].

## Teaching Sessions (Lectures)

Teachers and students in the HE system are increasingly turning to online teaching and learning activities worldwide. The achievement of online teaching, as we all know, is strongly dependent on a variety of technological factors, including the high-speed internet connection and the use of teaching platforms. Zoom, Microsoft Teams, and many other software are used for online teaching worldwide. Witing rooms, breakout rooms, and many other sophisticated facilities in these live broadcast platforms provide much easiness for online education. Some of their own live broadcasting platforms, instructional and learning management systems, and some other platforms have grown significantly in China. Tencent classrooms/meetings (Tencent Holdings Ltd., Shenzhen, China), similar to Zoom, are used as a live broadcasting education platform. Rain Classroom and Xuexitong are used as a teaching platform, and now it is upgraded for live broadcasting teaching purposes.

## Practical Sessions

During the pandemic, implementation of practical sessions at a lower level than theoretical teaching sessions in the HE system. In practical sessions, live broadcasting and recorded video broadcasting are the most popular methods. Zoom like live broadcasting platforms and other online teaching management platforms are used for live practical sessions. The moodle-based learning management platforms, institutional websites, Youtube, etc., are used as recorded video uploading platforms.

According to Cheng et al.[2], aside from the theoretical sessions, microstructural inspection under a microscope in a practical laboratory is an important aspect of HE related fields such as biology, chemistry, and material sciences-related fields. In these fields, virtual microscopy has brought extensive applications in practical classes. Most medical colleges in China use virtual microscopy platforms for various applications.

## Online Assessment

In China, some of their own platforms use for online assessments, such as Rain Classroom, which is used as a teaching platform, and Blackboard, which is like a moodle-based learning management platform that is used for uploading their teaching materials, including lecture notes,

presentations, videos, exercises and many other materials, and use as a realtime exam platform for quizzes, MCQs, Short answer questions, crosswords, fill in the blanks, etc.

## Teachers' Responsibilities and Experiences in HE

At the start of online teaching, many teachers faced many technical difficulties adapting to the situation. According to several scholars, teachers are unable to complete their intended learning outcomes during this pandemic because of these negative attitudes and some real difficulties in practical-based modules. However, with time, teachers were also aware of the relevance of this high-impact online teaching experience, and they changed to gather online-based teaching experiences. Teachers should be aware of the importance of this high-impact online teaching experience over time, and they should be gathered online-based teaching knowledge and experiences.

According to their analysis, the diversity of teaching methods should be enhanced in this situation to enhance the quality of HE.

## Suggestions for HE Online Teaching

Except for innovative online teaching and learning methods, other factors should have been focused on. According to different surveys done by several groups, the leading suggestions to improve online-based HE concentrated on four aspects. Those are online teaching resources, online teaching strategies, motivation to move toward online teaching, and improving the online teaching environment. According to Cheng et al.[2], 37 % of sample demands of sharing online teaching resources is a major concern. Online teaching strategies are the second focus, which is around 29 %. 20 % of the sample has a negative attitude or less motivation to move for online teaching is the third focus. The fourth fact is based on improving the online teaching environment, which is around 10 % of the sample[2]. Therefore, focusing on the above factors redesigning course contents, and adopting basic knowledge optimisation methods should be highly focused.

## Summary

COVID-19 pandemic has badly impacted the day-to-day activities of people around the world. The higher education system is one of the strongly affected sectors, and most of the universities and other institutes were closed for several months. Because of this critical situation, many educational institutes have focused on distance and online teaching techniques to continue academic sessions. This chapter discussed the effective teaching techniques that can be used during the COVID-19 pandemic. Distance learning was discussed with the focus on sophisticated teaching techniques in print technology, broadcast technology, and synchronous and asynchronous computer-mediated communication. Under the online

teaching techniques, teaching sessions, practical sessions, and assessments were discussed. Microsoft Teams, Webex, Zoom, Blackboard Collaborate, and Padlet are some popular platforms that were highlighted in this chapter. Finally, teachers' responsibilities and suggestions for HE online teaching were discussed.

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# Section 02

## Best Practices to Enhance Teaching-Learning Process in a Pandemic

# CHAPTER 04

# An Analysis of Best Practices Adopted to Enhance the Effectiveness of the Teaching-Learning Process in Higher Educational Institutes during COVID-19 Pandemic

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## Introduction

The corona pandemic significantly impacts the teaching and learning process in higher educational institutions, affecting the traditional face-to-face interaction between lecturers and students. In addition, universities around the world were subjected to various safety precautions in order to prevent the spread of the virus and ensure the continuation of the educational process. As a result, higher educational institutions are obligated to conduct all academic-related activities online.

Nowadays, as an alternative to traditional learning, internet-based learning has become an essential requirement for maintaining the activities of higher educational institutes during the corona pandemic. With this sudden shift to online teaching, students' perceptions of how they are taught have been altered, and they may differ from those found in studies prior to the pandemic.

Studies have shown that student-centred e-learning is more flexible and that students' interaction will be improved using asynchronous and synchronous tools such as e-mail, forums, chats, and video conferences. Additionally, online technologies make it easier to distribute learning materials to a large audience. Students can also have control over the content of the teaching materials, and time spent on learning and teaching can be successfully determined based on learner needs and learning outcomes. Even though a few challenges are associated with online teaching, better communication between students and lecturers can be expected.

However, issues such as student motivation, isolation, and the lack of availability of teachers at all times when students are learning can be identified as barriers to online teaching and learning. Effective teaching and learning strategies tailored to the needs of students can solve the problems.

Therefore, lecturers and students require experience in a virtual environment to carry out best practices. Furthermore, poor internet signal strength, connectivity with high-end devices are major issues faced by students along with a lack of interaction with lecturers. Lecturers are attempting to strike a balance between online and traditional courses, which may have an impact on students' health as a result of them spending so much time in front of a screen.

As a result, the shift to exclusively e-learning may significantly impact the educational process and students' perceptions of the online environment's role in teaching and learning. Alternative methods for effectively delivering content and achieving learning outcomes have been tested by lecturers and higher educational institutions. To share the best practices used in the teaching-learning process during the pandemic, this article investigates the tools, techniques, and strategies that can be used to improve the teaching-learning process' effectiveness. First, the article explains the challenges faced by the lecturers and students during online education and opportunities to enhance the teaching and learning process. Then, the article describes the existing practices adopted in the teaching-learning process during the pandemic. Next, it briefly discusses the results of the literature review and finally, it presents the conclusion of the study.

## Challenges

When utilizing or referring to online educational tools and platforms, both lecturers and students confront regular problems. The most commonly recognized problems with e-learning Include financial problems in purchasing data packages and devices, poor signal strength, and learning methodology. Students in low-income families cannot afford to buy new learning devices, and online education makes the students stay more in front of a digital screen or with computers.

The learning process of most of the bright students in the batches is not getting affected even under the minimum guidance of their lectures, while the students who show poor performances in their academic activities in the face-to-face physical environment are more struggling in their learning process. On the other hand, some brightest students with poor financial stabilities cannot afford the cost associated with the virtual environment to purchase devices. With minimum interaction with the lecturers, students struggle and use more hours to understand most of the learning concepts, leading to poor academic performance in end-semester examinations and mid-semester examinations.[1]

Student evaluations are completed online, resulting in a great deal of trial and error, ambiguity, and confusion among lecturers and students. The method used to conduct online exams differs depending on the convenience and skill of the lecturers, as well as the compatibility of the learners. Appropriate measures to check plagiarism are yet to be implemented in many higher educational institutions, mainly due to the high student

population and unavailability of proper plagiarism software. Due to the COVID-19 epidemic and nationwide lockdown, several academic examinations, university-level tests, and entrance exams have been postponed across the country. Because of the ongoing crisis, the education system at institutions across the country has been badly disrupted, and most exams have eventually been done online[2].

Apart from being enjoyable for students, time spent at universities improves social skills and awareness. While students are away from their regular university schedules, they have economic, social, and psychological consequences. Many students have now enrolled in online programs and spend more time on virtual platforms, making them vulnerable to online exploitation. Increased and unstructured time spent on online learning has exposed students to potentially harmful and violent content as well as a greater risk of cyberbullying.

The bulk of students in online learning comes from rural areas, where their parents are largely illiterate farmers. When the students are at home, they assist their parents with agricultural tasks such as agriculture, livestock care, and domestic duties. Because they had to labor on the fields, some students have even skipped examinations and lectures that are scheduled outside of usual working hours.

Some students have stated that while being at home, they have to care for and attend to their sick family members with accomplishing them to hospitals frequently and it makes it hard to stay in touch and follow the courses. Financially struggling parents are in the position to allow the children to repeat in the current academic year and consider that their children can follow the course and pass the exams once the higher education institutes are reopened. With the lack of internet signal coverage, most students do not have access to their mobile phones at home. So, some of them have to wander here and there in finding places of enough signal strength. Family situations were converted to worsen with the loss of jobs with the pandemic led most of the families to too little or no income. Providing a continuous online facility to their children becomes an extra burden for most families.

Most students are willing to switch on the camera during teaching sessions to experience face-to-face communication. However, students in low-income families like to switch off the camera to save internet data. This makes the lecturers confused about which tools to use to be fair for all in their teaching sessions. It has been seen that some students request pre-recorded videos even if it reduces the interaction between the students and the lecturers. Therefore, it is more challenging to adopt a platform that satisfies the demand of all students

## Opportunities for Teaching and Learning

Even if it is more challenging to implement online education with obstacles faced by students and lecturers in higher educational institutes,

opportunities and changes have been given to establishing an e-learning system. The bond between the lecturers and parents has been more developed than in the conventional environment. Definitely online education being at home requires financial assistance from the parents while additional assistance should be given to the students with disabilities. Online platforms such as zoom, Microsoft teams, etc. have been tested for online teaching, and nowadays, service providers offer bundle packages at low cost and the government has offered a data-free zoom platform for online education. Even after the higher educational institutes are reopened, these online platforms can provide more materials to the students.

It is necessary for lecturers to put forward their maximum effort to introduce innovative strategies to overcome the challenges of virtual communications. Lecturers are cooperating with each other to design and introduce new teaching techniques. As instructors, parents, and students share similar experiences, there are potential chances to collaborate, innovate new solutions, and learn from others while exploring new methods[3]. Many educational institutions are introducing new teaching tools and solutions to the students and lecturers in order to enhance the teaching and learning process in a more dynamic and engaging setting. Nowadays, lecturers and students are testing novel ways for effective education in contrast to traditional classroom settings.

## Best Practices for Teaching and Learning

Most of the higher educational institutes got closed due to lockdown and other measures to prevent the spread of the COVID-19. Therefore, the way the lecturers deliver the education to the students is completely changed by shifting to various online platforms adopting different strategies, tools, and methods to enhance the effectiveness of the teaching-learning process.

## Strategies of Online Teaching & Learning

### *Understanding of the Technology*

Everyone is new to online education. As a result, familiarity with technology is required, and in the event of a problem during a lecture, basic knowledge is required to troubleshoot the system while informing the students that the lecturer is working on it. Lecturers are now receiving additional training from ICT centres in higher education institutions. Students should also be aware of where they can get technical assistance if they are having difficulties with the technologies.

### *Preparation for the Unexpected Events*

It's possible that these online technologies will eventually fail. Zoom may fail to connect due to a bandwidth limitation. It's possible that students' assignments aren't being uploaded correctly or that links aren't working. As a result, a backup plan is required for sessions that rely on technology.

Students should be informed about the steps they must take if they are unable to join a Zoom session or submit an assignment due to technical difficulties. For example, if the official submission links are down, students can be instructed to use emails or WhatsApp.

### *Maintenance of a Strong Presence*

Maintaining a strong presence of the lecturer during online sessions is critical in attempting to replicate the physical classroom experience. If possible, the lecturer and all students can turn on the camera. Additionally, the sessions become more interactive by involving students in discussions and responding to questions raised by students.

### *Establishment of Clear Expectations for the Course*

Students are also unfamiliar with online platforms. As a result, it is necessary to inform students about how they will be evaluated at the start of the course. Sometimes, attendance is used as a criterion for grading in online classes.

Thus, continuous monitoring of content resources and applications is vital. It's critical to regularly double-check all links, resources, modules, and activities. Disengagement can occur when online content moves or changes. Students who are having difficulty navigating course links or managing material spread across multiple web pages can seek assistance from lecturers.

## Tools for Online Teaching & Learning

### *Online Communication Tools*

Even though it is more difficult, maintaining communication with each student in a virtual classroom is critical for successful teaching and learning. Popular communication networks can help students overcome the challenges of larger groups by enabling video conferencing, instant messaging, audio calls, and virtual rooms.

To increase the effectiveness of the communication tools, before the online class, the students must be informed of the lesson's agenda. The expected level of politeness from students during online classes should be explained at the start of each session, and except for the person speaking, all microphones are muted, and students can make a gesture to alert the lecturer without interrupting others. It is necessary to control the rate at which the lecture is delivered. If the presentation slides or recorded lectures are not going to be shared, the students must be given time to take notes and review them.

### *Social Media Channels*

Lectures and students can stay connected via social media platforms such as Facebook, WhatsApp, and other similar platforms, and students can maintain communication among themselves by engaging with one another.

### *Document Management Tools*

Lectures must keep track of a variety of documents on a regular basis. When lecturers are teaching remotely, central locations such as Google drive, dropbox, and similar services are required to store, organize, and manage all of these documents. It is easier for the lecturer to retrieve files and share them quickly by organizing them in relevant subfolders and adjusting the permission settings.

### *Online Video Creating and Sharing Tools*

If the lecturer is unable to conduct the lecture due to an unavoidable reason, or if the same lecture is repeated in different classes, pre-recorded lessons can be used and uploaded prior to the lesson to save time. Furthermore, the students would be encouraged to learn independently with prerecorded lessons, allowing them to understand the materials independently.

## Methods for Online Teaching & Learning

### *Experiments with Graphical Presentations*

Presentations can be used to communicate ideas effectively. Many presentation designing platforms are freely available; Microsoft PowerPoint, Google Slides, Slide Share. The audience's interest in the topic can be piqued using creative slides. Complete reliance on the slide, on the other hand, will not be effective. As a result, the wording and slides should be well balanced. Students can learn independently and improve their presentation skills by using presentations. If necessary, lecturers can include a few interesting stories to make the session more exciting and appealing.

### *Usage of Virtual Whiteboard*

Spoken words can be backed up by written work to convey an idea effectively to students. Students may miss essential points if the lectures become solely vocal. As a result, an online blackboard can be used. There is a variety of software that can be used to display images, text, flow charts, and other information on these boards. Thoughts can always be conveyed more effectively through writing than through spoken words. If the lectures are only spoken, there is a chance that students will miss a lot of important information.

## Discussion

The pandemic affected students and lecturers at higher education institutions all around the world. Therefore, it has become a crucial requirement to provide the student with an effective learning environment being at home. The conventional delivery methods with face-to-face communication cannot be applied for online teaching. Even though different

methods have been introduced for online learning, most technologically illiterate lecturers need further training on handling online software to enhance the teaching process. Evaluation and feedbacks are a prominent part of the learning process. However, it has been difficult for lecturers with the class size and lack of student participation.

Many educational institutions have developed a variety of online infrastructure that has been made available freely for the study throughout this pandemic. The cost and accessibility of these online infrastructures for all learners from different economic backgrounds remain a concern. Students with special needs who have learning challenges, such as hearing loss, vision loss, or mobility issues, require specialized instruction with assistance and supervision. Many caregivers and parents at home are unable to provide such demands, impeding this group of learners' learning. As a result, there is a need to devote time and money to exploring and researching the best solutions for these children's specific educational requirements. Because all students' assignments and exams are completed from home, it is difficult for instructors to determine the validity of the work and the real learning that is taking place. Furthermore, many parents influence and assist their children's learning, and the quantity and degree of support vary significantly.

## Conclusion

The impact of the COVID-19 pandemic on teaching and learning in higher educational institutes and the best practices adopted in the teaching-learning process during the pandemic are discussed in this article. It can be seen when the higher educational institutes are reopened to resume the conventional teaching process, online tools also should be incorporated alongside with face to face to communication to improve the teaching and learning process. The government's intervention is a necessary requirement to make online platforms more affordable and accessible. Another important finding is that tools should be available for evaluation and quick feedback. Financially unstable families have identified the cost and accessibility of online devices as an issue. So government should invest more in improving and developing professional development and effective teaching and learning processes. Making online teaching more creative, inventive, and engaging through user-friendly technologies will help and prepare the educational system for future pandemics as well.

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# CHAPTER 05

# Introducing a New Tribrid Model (3R) for Effective Teaching-Learning Process during Pandemic Situation to Sri Lankan Higher Education System

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## Introduction

COVID-19 is the disease caused by a new coronavirus called SARS-CoV-2. WHO first learned of this new virus on 31st December 2019, following a report of a cluster of cases of 'viral pneumonia' in Wuhan, People's Republic of China[1]. Sri Lanka at present is witnessing a raging third wave of the pandemic, with an exponential rise in cases. Widespread contamination of elevated mortality rates has become a terrible headache worldwide. Doctors, scientists, honorable religious leaders, and even politicians are also experimenting with different alternatives to overcome this issue. This is a stage that many educators have attempted to implement new things, models, strategies, methods, etc., when it comes to learning during this pandemic. As a result, the online learning mode has already replaced the physical learning mode by now.

## Effect of Covid-19 Pandemic on Higher Education Sector in Sri Lanka

During this pandemic period, the most significant turning point of the education system was the introduction and replacement of our own traditional physical classroom-based learning system with the distance learning method or virtual platform or, as everybody knows, "online teaching" for the educational system in Sri Lanka. Anyhow, though this concept is novel to our country, it has been well accepted and has already become universal in most developed countries in the world.

Online education was not given much priority for higher education in Sri Lanka before the appearance of Covid-19. But, with the closure of universities due to the Covid-19 pandemic, the government of Sri Lanka promoted the online mode of education as an ideal alternative solution to

continue higher education activities[2]. Thus, online education has become an essential component of Sri Lanka's higher education sector. Comparison of previously utilized and currently utilizing ways of the distance mode concept in higher education[3] are shown in Figures 1 & 2.

According to the findings, more than 1/5th of students in the higher education system before Covid-19 never used online methods for their studies. Also, another 30% of them utilized a low proportion of online access (see Figure 1). The findings show that more than 50% of undergraduates were less sound in online format during the pre-Covid-19 period compared to now. But after the encounter of covid-19, this pattern has changed dramatically. Compared to 22% and 30% of students who disliked this mode as "very low" and "low level" preference of accessing online, now has declined to 2% and 5% respectively (see Figure 2). Also, the "high level" and "very high level" usage percentages have shifted to 42% and 29% respectively from 4% and 14%, which is more than 70% out of total undergraduates who previously had 18%. Therefore, this chapter discusses a new tribrid model to address this trend in a more practical way to move the Sri Lankan higher education system into a new innovative era.

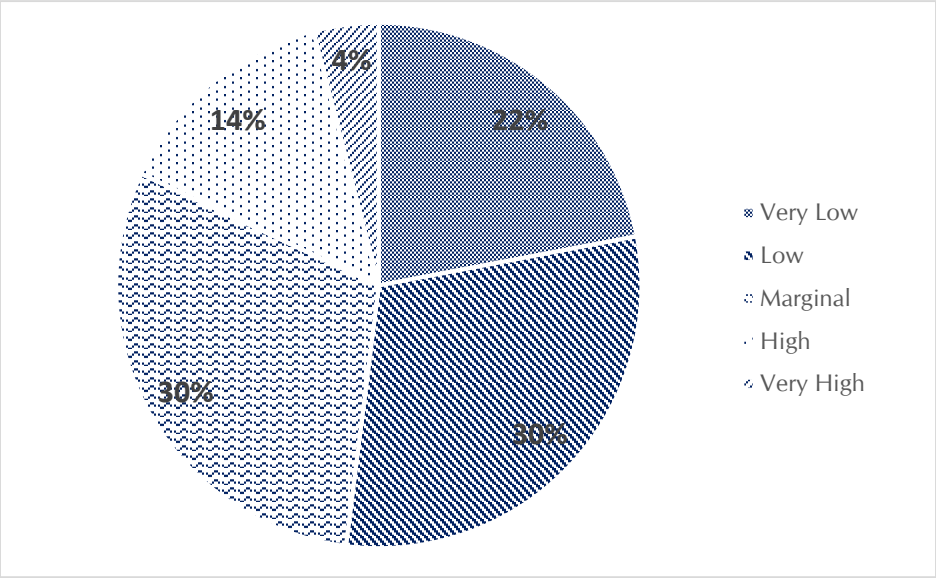


**Figure 1: Contribution to Online Education before 2019 in Higher Educational Sector in Sri Lanka**

## Tribrid Model - "3R"

At the moment, the online mode of education is well established in Sri Lanka and progressing well with ups and downs. To make this concept more reliable, effective, and efficient, the tribrid model is introduced and discussed here. As a method in brief, "Tri" introduces a method comprising three disparate individual components. Once these are combined and

organized well, the outcome will become more sustainable in the future than in the present.

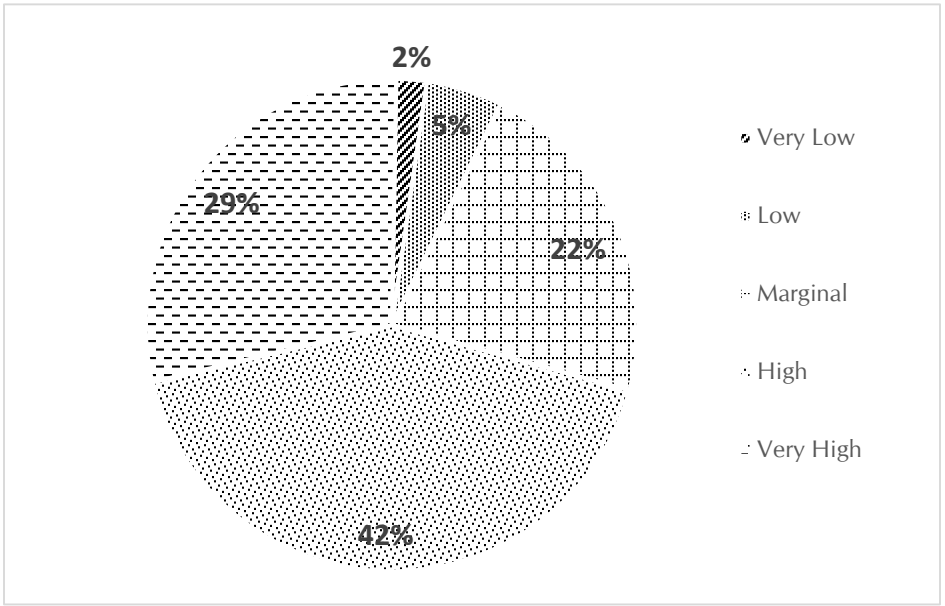


**Figure 2: Contribution to Online Education after 2019 in Higher Educational Sector in Sri Lanka**

The first concept of this model is the role of a teacher. In this chapter, different effective teaching methods to be followed by an effective teacher during this time have been discussed. Secondly, learners' responsibility is to adapt to this and respond to the teachers' role. The third aspect focuses on the compatibility of the required infrastructure and assessment stage. If all three components are not taken into consideration, concluding the suitability of the suggested 3R method would be useless. Because all the 3Rs are interdependent entities (Figure 3). Therefore, "TEACHERS ROLE" in teaching, "LEARNERS ROLE" in learning, and environmental background for online with "CONTINUOUS RATING" will launch in this tribrid model as "3Rs" for online system for higher education stream in Sri Lanka.

## Teachers' Role in Teaching: The First "R"

Keeping the students more live during their online learning sessions is the most challenging part of teaching. Due to this pandemic, teachers have no other option other than this online method to give the curriculum without any failure to learners'[3]. Students are keen to make quick decisions in their lives because they are still young, energetic, and more immature due to their gained experiences. Most of them have just passed the age of 18, and the majority of the university students are between the age range of 20 - 30 by considering the overall population of both undergraduates and postgraduates. Because of this above mentioned

fact, they cannot tolerate more advanced ways like matured ones in the society. To address this issue teachers, university lecturers or instructors need to pay more attention to innovatively transferring their knowledge and experiences using the technology. So how can teachers achieve this goal in a promising way? Learners can learn in different ways, and we call those things as "Learners' Learning Styles". Howard Gardner's introduced eight distinct bits of intelligence are visual-spatial, naturalistic, interpersonal, intrapersonal, logical-mathematical, linguistic, musical, and bodily-kinesthetic, according to an "educators guide to teaching styles and learning styles" published by the University of San Diego[4] (Figure 4). Thus, it is important to discuss how to implement these into the online educational system.

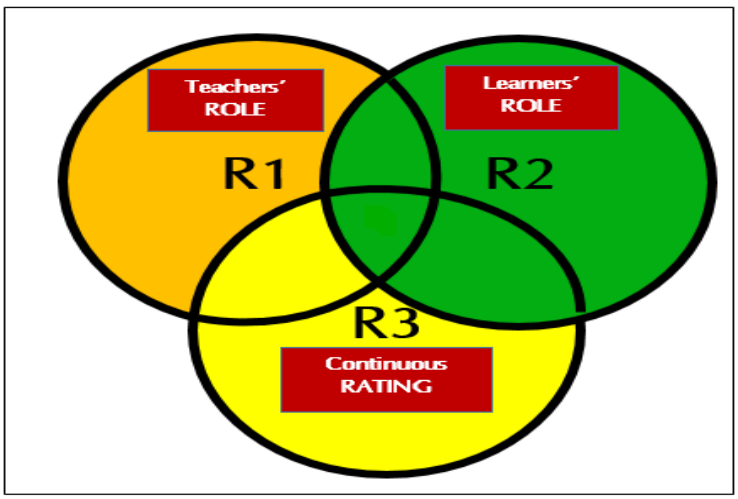


**Figure 3: 3R - Proposed Tribrid Model for Higher Educational Sector in Sri Lanka**

No matter the type of channel used, teachers need to adapt their practices and be creative to keep students engaged as every household has become a university premise - more often than not - without an environment that supports learning. Teachers can use either radio, TV, mobile, or any other advanced online platforms like skype, messenger, Viber, WhatsApp, Google groups, Google links, emails, or even more advanced ways like Microsoft teams, Zoom, Google transfer, etc. These platforms provide many spaces to make an online session more interactive[5].

As a result, mentioned methods will create a new face to build up more flexibility and more interactive sessions with teachers or lecturers and with students. Then automatically, the eight distinct bits of intelligence will become more live in each and every second for learners. Thus, "First R" on this trybrid can be suggested in this manner. So what else are remaining?

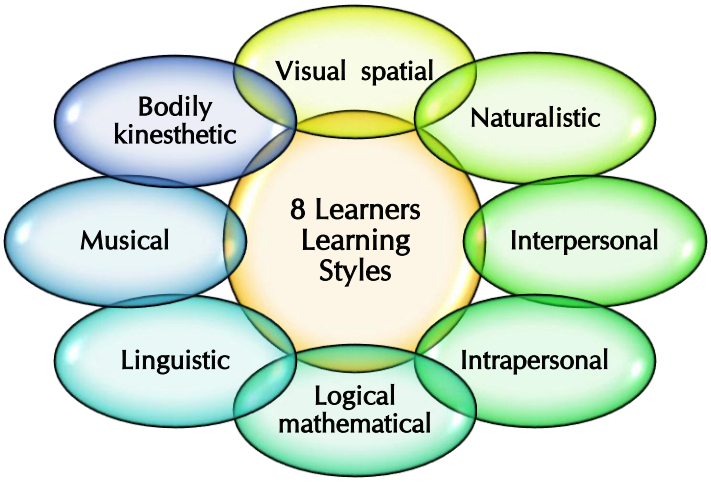


**Figure 4: Eight Learners Learning Styles**

## Learners' Role of Learning: "The Second R"

What about learning materials or reference documents? They play a very critical role. To make learners satisfied is highly crucial. Learners have a considerable role to play in this context. Therefore, the teachers' role is to make learners' roles easier, flexible, and more enthusiastic. Then the learners will do the rest. That concept is most practicable during this pandemic time. Otherwise, the majority of learners will give up within a short time period. The level range of intelligence creates more questions to make this a success. Unlike students learning at university, the home or room environment is totally different. Sometimes it might create more alone, stressful conditions for students than they had experienced earlier.

Due to this scenario, lecturers or higher education systems should have enough capacity and more advanced strategies to address this in an ideal way. More advanced and student-friendly accessing methods are suggested to check whether they gather enough knowledge from the conducted online sessions. Exercises, assignments, quizzes, puzzles, games, reference materials, links, audio and video recordings of each online session, lectures with more videos and other interactive entertaining activities related to each lesson might provide superior resolution to this proposed method[3].

From that way, this proposed tribrid system will get activated and be more workable with great enthusiasm to learners also. By providing everything, the learner's satisfactory level and confidence level can be boosted very rapidly. Then learner also has a belief to continue their role to make the success achievable in a more advanced manner. Ultimately the role of learner will become easier than earlier. That's how the "second R" plays in this challenging context of the pandemic period. To fulfill this "Second R", interaction with "First R" will be more vital.

## Standards of Continuous Ratings: "The Third "R"

After doing all these hard works from "R1" and "R2", what kind of level of expectancy will higher education institutes or universities are looking for from learners and their overall higher educational performance? It can be achieved in different ways. Successful online strategies, methods, and everything discussed so far will facilitate learners to engage with lecturers and academic staff perfectly, promote those interactions in more feasible and practicable ways, encourage more cooperation among learners, resolve conflicts with each other, encourage and become more interested in active online learning, implement institutional strategies in more effective ways, etc.

To make this more successful in future years than in previous and current, what kind of good practices will universities or higher institutes focus on or follow? That's the next very critical factor called "R3". Continuous feedback from the following students will tell a lot about ongoing strategies. It will perfectly guide to improve more in the future than today. Other than that, monitoring the students' process and progress, different time management strategies, learning environment, and methods on updating current knowledge are very special[4].

By making and fulfilling everything right, this radical shift saw a surge in the use of various digital platforms and applications, digital learning management systems, collaboration platforms for live-video communications, massive open online courses (MOOCs), and tools for creating learning content at this stage[6].

Anyhow, a sudden conversion of the physical learning system is not much practicable. It may cause to receive higher failure rate due to various reasons. Therefore, each and every point has to be addressed very carefully and find out the significant gaps. How to manage this properly? What are the possible difficulties or failures that might be expected in this system? These have to be rethought daily, rated, and link them appropriately.

Online teaching will create more problems than never expected. For example, financial problems, language problems, less technical potential of students to handle, computer literacy levels and availability of computer facilities, poor internet coverage, availability of sufficient internet access, other equipment's and devise problems and purchasing power of all these things fluctuate from student to student, families to families, village/city area factor, financial status[3,] etc. To find out these potential groups is one of the premium responsibilities of the higher position staff during this task. If it's possible to identify and rate those gaps and potential groups and provide a kind of technical assistance, guidance, and finally, a potential scholarship scheme can be developed to address these essential gaps. These basic practices will provide huge credits and evidence when this online process or this radical shift will surge in one day that will no longer be today.

## Conclusion

Due to this Covid-19 pandemic, the total lifestyle of people in Sri Lanka and the entire world changed. Some of the streams it affected very badly and accounted positively for others. Also, health, education, culture, tourism, industry, economy, and many other areas collapsed. So, this chapter mainly focuses on positively addressing the higher education system in Sri Lanka more accurately, effectively, fruitfully, meaningfully, and enthusiastically. Everything will be addressed in a newly introduced tribrid model called "3Rs", delivered and extendedly discussed in this chapter.

Teachers ROLE in teaching, "R1", Learners ROLE in learning, "R2" and Standards of Continuous RATING, "R3" are the three tri models discussed so far in this chapter. To make online teaching-learning a success in the higher education system in Sri Lanka, each R1, R2 and R3 have different key roles to play. Also, all three responsibilities need to correlate with each other to make this task more successful. Further, it says that keeping or isolating only one factor or two is insufficient to make and convert the higher education system into their expected standard level during this pandemic.

Therefore, this is a new introducing tribrid model consisting of three parts as "R1", "R2" and "R3" and called as "3Rs" will play a gigantic role in modern and future higher education system in Sri Lanka if it is used appropriately.

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# CHAPTER 06

# The Virtual Flipped Classroom (VFC) for an Effective Teaching and Learning Process during the Pandemic

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## Impact of COVID-19 on Higher Education

The current global pandemic has already shown us the incredible power of an invisible tiny virus to make visible and significant impacts on every aspect of human life. It is obvious that the pandemic has severely impacted the education system. Continuous school and university closures due to COVID-19 have caused significant disruptions to education across the world. The actual effect of the pandemic on the mental health and social well-being of students and teachers at all levels of education is yet to be realized. However, from the present situation, it is obvious that the pandemic has changed the world forever, and we cannot return to the world as it was before. According to United Nations International Children's Emergency Fund (UNICEF) data, as a result of school closures, more than 1 billion children are at risk of falling behind in education.[1] Not only primary education but it also has a significant impact on the higher education system.[2] Due to the continuous lockdowns and travel restrictions, university students and lecturers have been confined to home for more than one year. Therefore, it tremendously impacted the normal pattern of university education. With the advancement of information technology, online education has already become a major phenomenon worldwide. However, converting a traditional classroom to an online platform or the new normal of education is very challenging to communities with limited access to high-speed internet, smart devices, and poor technological infrastructure. Despite these challenges, educators have to ensure that the delivery of the content is done effectively and the intended learning outcomes are met.

Following the outbreak of COVID-19, the Sri-Lankan government ordered all educational institutions, including higher education institutions, to temporarily close from March 2020. This includes higher education institutions, 15 state universities, and about 40 other state and non-state

tertiary education institutions in Sri Lanka. Being a developing country, access to higher education is already limited in Sri Lanka. Therefore, it is obvious that the unexpected disruptions to Sri Lankan higher education significantly affect or delay the mechanism of creating the skilled workforce required for the development of the country. In order to mitigate adverse effects due to continuous university closure, education was transformed completely into a distance learning approach. Currently, Sri Lankan universities utilize a Moodle-based Learning Management System for online teaching[3]. However, there are numerous challenges to address when it comes to online teaching. Considering the above facts, the purpose of this article is to bring readers' attention to a novel internet-based pedagogical strategy, the Virtual Flipped Class (VFC) model, which can be applied to improve the effectiveness of the education delivery process during these unprecedented times.

## Incorporate Blended Teaching and Learning Strategies

Blended learning can be defined as a teaching methodology that integrates technology or digital media with traditional classroom activities. Even though the blended learning technique has been around for a while, it is becoming prominent in the new normal education[4]. Blended classrooms include face-to-face instruction techniques such as lectures and small group discussions together with computer-assisted or online learning techniques. The online component is often facilitated by Learning Management System (LMS). LMS is a software application or web-based technology used to plan, implement, and assess a specific learning process. Blackboard, Canvas, Schoology, and Google classroom are examples of LMSs that are often used in schools across the world.

Even though conventional blended learning involves a combination of in-person and online teaching, there are numerous ways to approach blended learning with the advancement of modern information technology. Considering the global pandemic situation due to social distancing rules, it is not easy to conduct face-to-face sessions. However, this blended teaching model can be still used during the pandemic with virtual instructional sessions. The face-to-face instructional sessions can be replaced with live sessions. Teachers can connect with students for online meetings using web-based applications such as Zoom, Microsoft teams, or Google meets. Live sessions can be recorded and uploaded into LMS to watch in case they are unable to attend the live sessions or if they need additional help. In addition to that, teachers can have virtual office hours to provide additional assistance to students and give them feedback on their assignments. Blended learning provides students with a unique opportunity to work at their own pace while having teachers on hand to guide the areas they need help. Therefore, students are more attracted to this blended teaching model than in traditional classrooms.

## Flipped Classroom Model

The flipped-classroom model is one of the significant forms of blended learning, or it resides within the bigger umbrella of blended learning (Figure 1). The flipped classroom concept was introduced in 2007 by two high school teachers, Jonathan Bergman and Aaron Sams when they began recording their classroom lectures so that students could access them at home.[5] Flipped-classroom aims to enhance students' engagement by having students watch instructional videos or complete readings at home and focus on live problem solving, assignments, or application problems during class time. The comparison of the Bloom's taxonomy related to traditional and flipped learning (Figure 2), clearly shows the differences in student engagement in the learning process.[6] In the flipped classroom, students are more involved in lower levels of cognitive work, remembering and understanding new materials outside of the classroom and focusing on the higher types of cognitive work (applying, analyzing, evaluating, and creating) in class, where they have the encouragement of their peers and teacher. According to the International Society for Teaching in Education (ISTE), there are four components required for a flipped classroom: relationship building, personalized learning, passion-based learning, and project-based learning. Generally, in a traditional classroom, students listen to the teacher and take notes, and spend their time as passive learners. However, in a flipped classroom, students have more control over their learning, and it promotes student-centred learning and collaboration. On the other hand, flipped classroom makes course content easily accessible. Once disadvantage is compared to a conventional classroom, a flipped classroom requires more preparation time and more work for the teacher. However, in recent years, flipped class model of learning has attracted more followers. Therefore, teachers at different educational levels and contexts have tried it. Especially in the context of university education, the applications and experiences described are considerably numerous. Previous studies have shown that the application of the flipped-classroom model has provided a successful learning experience in higher education.[7]

## Virtual Flipped Classroom Approach (VFC)

With the complete transformation to the online learning due to the pandemic, flipped classrooms have to be adjusted into a completely virtual world. The virtual flipped classroom is a novel pedagogical approach, which is a combination of two concepts, the flipped classroom, and the virtual classroom. A research study carried out at Sultan Qaboos University, Oman, in 2018, introduced the concept of the virtual flipped classroom.[8] This is the first attempt to integrate the two concepts, the flipped classroom, and the virtual classroom, into a novel pedagogical strategy. The objective of this research study was to investigate student engagement in a computer

programming course in a virtual flipped classroom. Further, this study revealed that the students learning achievement increased significantly after applying the VFC. Interestingly, this concept was introduced in 2018, right before the covid-19 pandemic. By the time they conducted the research, they may not even think about its significance to the world today. Considering the challenges faced due to the pandemic, the concept of the virtual flipped classroom is perfectly applicable to continue education effectively without disruptions.

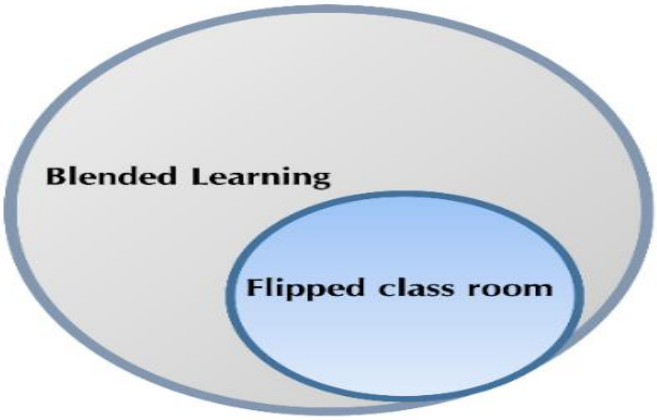


**Figure 1: Flipped Class Room Model Resides within the Bigger Umbrella of Blended Learning**

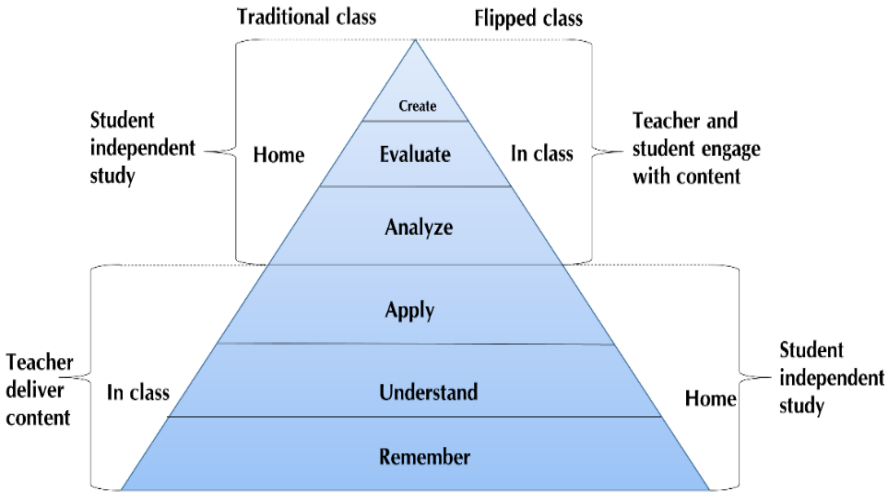


**Figure 2: Bloom's Taxonomy in a Flipped Classroom**

According to Bishop and Verleger,[9] a traditional flipped classroom can be described as an interactive collaborating group-based learning activity in the classroom and direct technology-based instructions for individual uses outside the classroom (Table 1). However, with the help of

advanced information technology, a virtual flipped classroom can be set up to go beyond the traditional flipped classroom (Figure 3). Compared to the traditional flipped classroom setting, the virtual flipped classroom provides opportunities for students to engage in live discussions and instruction in even smaller groups. In addition to that, students also have the opportunity to review learning materials prior to the beginning of class. It enhances their confidence in new study materials and increases students' engagement in live discussions. Especially, this is ideal for introverted students since they can use the chat feature to express or share their ideas. It also allows teachers to interact with students in even deeper, more authentic ways despite the distance. Therefore, the virtual flipped classroom model can be introduced as an effective strategy to engage in effective teaching and learning during the pandemic.

**Table 1: Tasks in a Flipped Classroom**

| Inside class room | Outside class room |
|---|---|
| Questions and answers | Video lectures |
| Group-based/Open-ended problem solving | Close-ended Quizzes/ problem solving |

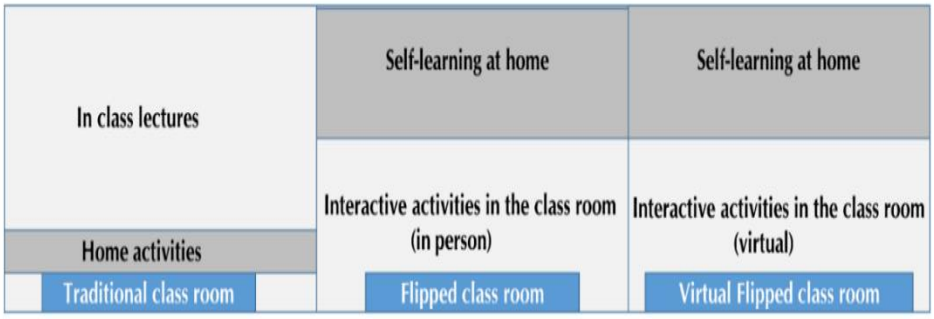


**Figure 3: Traditional Class Room, Flipped Class Room and Virtual Flipped Class Room Models**

## Challenges Faced in a Virtual Flipped Classroom

Educational experts have recognized that the dynamics of the flipped classroom model provide the most effective solutions to the transformation of in-person to online teaching. However, there are some challenges and limitations to address when we completely move into a virtual flipped classroom. For example, in order to have a successful virtual flipped classroom, both students and teachers should have open access to computers and high-speed internet connections from their homes. Actually, this is quite a big challenge for developing countries to continue their education on virtual platforms. However, the Sri Lankan government

together with responsible parties, has taken appropriate actions to overcome this issue. The University Grant Commission and Telecommunications Regulatory Commission of Sri Lanka (TRCSL) reached an agreement with all internet providers of Sri Lanka to provide free internet access to university web servers through the Lanka Education and Research Network (LEARN).[3] Being a developing country, the decision made by the responsible parties should be appreciated since it can be considered as the most practical solution to continue education during the pandemic. Therefore, implementing the virtual flipped class concept in Sri Lankan universities is not a big challenge.

Previous studies have shown that the implementation of the flipped classroom model both before and during the pandemic has proven to be successful.[10] Someone can argue that students have to spend more time in front of a computer screen in a virtual flipped classroom and experience less human interaction. However, considering the current pandemic situation, students and teachers are already confined to their homes for more than one year. Therefore, considering the current situation, rather than completely disrupting it, it is wise to continue education using this kind of virtual platform. Indeed, many educational institutions across the world have already introduced this new methodology, the virtual flipped classroom concept, to their education systems.

## Summary

We have lived with the pandemic for almost two years, which changed every aspect of our lives. Most importantly, it severely affected the education sector all over the world. Therefore, educators have to rethink novel remote teaching and learning strategies to overcome the adverse effects caused by the virus on our education systems. The flipped classroom concept, which came into play 15 years ago, was identified as an effective classroom-based teaching method. However, considering the prevailing pandemic situation, the flipped classroom has to exist in the virtual platform. It is obvious that advanced communication technologies support the virtual-flipped classroom. This new concept of flipped-classroom is identified as a convenient strategy to actively interact with students in the virtual platform. However, there are some limitations in implementing this novel concept, especially in developing countries such as Sri Lanka. However, with the involvement of the Sri Lankan government and the responsible parties, there is a possibility to introduce these kinds of novel teaching strategies in Sri Lanka. Considering the above facts, the main focus of the article is to bring readers' attention to this novel internet-based pedagogical strategy, Virtual Flipped Class (VFC) model. The advantages, as well as limitations of this novel teaching strategy, are succinctly discussed in the article. The pandemic is reshaping the education system worldwide. Therefore, despite challenges, it is worth introducing novel teaching concepts such as the virtual flipped classroom model to the education system of Sri Lanka.

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# Section 03

# Challenges with Conducting Practical Modules in a Pandemic

# CHAPTER 07

# Teaching to Undergraduate Medical Students during the Covid-19 Pandemic: A Case of Pathology Discipline

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## Introduction

The pathology curricula have evolved over the time from the single department led didactic teaching to a problem-based integrated teaching nowadays. Pathology is considered as a key component in the para-clinical phase of the medical science degree program. Various modalities of teaching have been employed, including large group teaching, small group discussions, tutorials, practical classes and museum classes traditionally. The curriculum has been designed to define a basic knowledge on the pathogenesis of the disease, and related laboratory needed for a first-day intern, i.e. a minimum level of training, relating broadly to all aspects of Pathology, at Medical Faculty"[1]. Pathology learning is divided traditionally into the following three categories:

1. Profound knowledge of basic pathology: which covers cell biology and pathological process. e.g.: Cellular adaptation, inflammation, healing, and neoplasia
2. Knowledge on applied pathology relating to systems of the body: systemic pathology
3. General competencies

These core concepts are taught using traditional classrooms, in-person tutorials, microscopic practical sessions, and museum classes. These are time tested methods. The teachers and students are both in their element. The facial expressions and responses from the students are used to take as good ques as to the level of interest and attention paid by the students. The attendance is marked at each session, and they are used as eligibility criteria for exams. The practical and museum classes are considered as mandatory sessions.

## Challenges of the Covid-19 Pandemic

Then the covid-19 pandemic happened, changing the world as we knew it. The countries were shaken by the force and the global nature of the impact. The social distancing and curfew ensured to prevent the disease from the spread. The universities closed down, forcing and limiting the students to their homes. Remote learning was the only available option for continuing education, and it became the new norm. This situation threw the medical pathology education landscape into disarray.

Students were already familiar with the Learning Management System (LMS) in the online platform. However, complete online teaching to introduce new concepts in pathology has not been attempted. So, a new challenge was created for teachers. There was the need to balance online hours, introducing new knowledge while maintaining student motivation. Converting undergraduate pathology education to an online format involved transforming all the aspects of teaching and learning.

## Strategies to Face / Overcome Challenges

### Three Focal Strategies

During the Covid-19 pandemic, the students had to evacuate the hostels, and in-person teaching and learning activities were abandoned island-wide. The academics were faced with the dilemma of withholding the teaching altogether or continuing as online teaching.

An innovative plan was needed to achieve this difficult task of delivering pathology subjects to the students during the Covid-19 pandemic. Three aspects of the teaching methods were planned as below.

1. The large group teaching was continued via Zoom using PowerPoint based presentations. These were recorded and the recorded materials were uploaded to the LMS for future reference.
2. The format of the small group discussions changed. It was started by using "Case Analysis" to encourage students to refer and learn around a case. The cases were presented via a web-based platform. Each scenario comprised brief clinical history, relevant imaging, monographs, and microscopy virtual slides. Each case unfolds sequentially, and the students work through each case by answering questions as they move through the case. The students attempted these on an individual basis, and these were discussed within small groups at zoom breakout rooms. The students were very interactive and inquisitive at these sessions. Many of these cases and discussions covered the pathogenesis of the diseases comprehensively. There, particular attention was given to microscopic and macroscopic features covering the deficits of the practical classes. Many similar teaching methods used worldwide were referred to during the planning and preparing sessions[2,3].

3. The third format is a virtual museum class. There, the students in small groups were taken on virtual tours examining fixed gross specimens (eg, hearts or brains) or tours of pathology laboratories. The students are again shown the autopsy finding of various diseases affecting the body organs. Specimen transportation and specimen handling were focused mainly in the pathology laboratory class.

## Supportive Strategies

Students were encouraged to use the Zoom chat box to ask questions and raise their hands during the session. This was introduced and encouraged to overcome the backward nature of most of the students. With time, more students became very interactive, triaging questions among themselves. This was a very positive and encouraging development.

At the end of each module, students again got together in small groups and prepared flashcards/memorang to remember key points in each lesson. Flashcards prepared by the students were compiled into a single document and uploaded into the LMS for future reference. Few multiple-choice questions were discussed parallel to these sessions to keep the students' interest alive. With time, both the teachers and students became familiar with the system, and the initial communication (interaction) barriers dissolved.

Another important aspect of our online teaching plan was the use of Google classroom as a virtual platform.

## Student Experience/ Feedback/ Acceptance

Several sessions of formative assessments were initially given to encourage additional reading. The other purpose was to monitor the process of learning. This was also a useful means of providing rough feedback to the student[4]. The summative assessment is used to decide if a student has acquired a level of competency to move to the next level of learning[5]. It was decided that an online platform is not suitable for an end-semester assessment. Particularly because many students have unstable internet connections in Sri Lanka[6].

## Assessment Strategies

Several continuous assessments were successfully conducted online with the support of a "safe exam browser" and LMS. The students were given multiple-choice questions. This was superior to the traditional method of assessment which is real cumbersome. The online version is auto marked, and there is instant feedback to the students. And the analysis of the students' performance in each question and the behaviour of each question is very detailed and helpful.

The below graphs (Figure 1 and Figure 2) illustrate experience during the online continuous assessments Test.

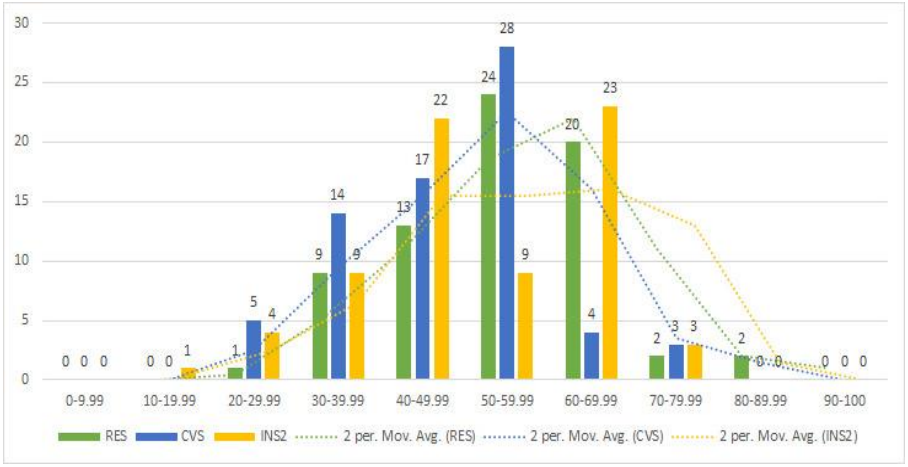


**Figure 1: Students' Performance for each Module on Online Continuous Assessment Test**

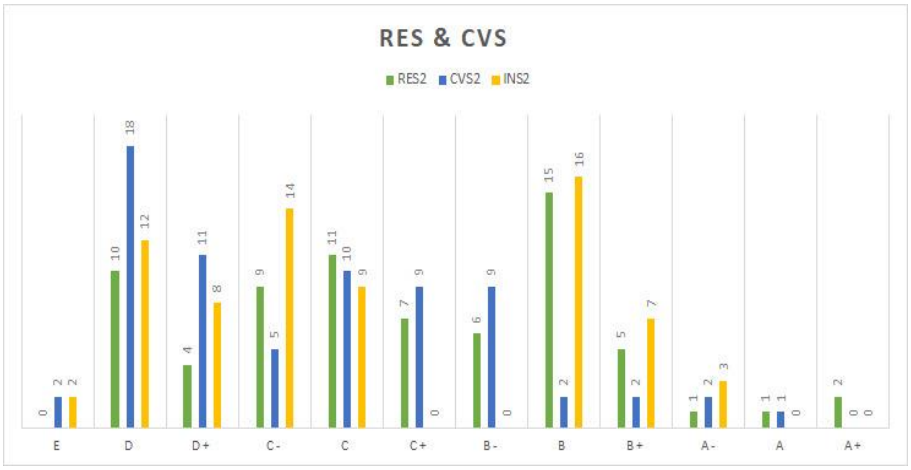


**Figure 2: Students' Grades for each Module on Online Continuous Assessment Test**

These graphs show the question-by-question analysis which was instantly retrieved from the system. Figure 2 shows the marks distribution in three separate modules where the systemic application of pathology is taught.

## Lessons Learnt

The use of these online teaching proved to be an effective method to maintain uninterrupted teaching of Pathology to medical students during a pandemic when conventional face-to-face teaching was not possible. There was very positive feedback from the students asking to continue these practices in the future as well, when in-person activities are possible. This experience indicated the use of online available educational portals, even in

the future, with an integration to the conventional teaching methods for the specific subject disciplines to medical undergraduates.

Continuous assessments can be conducted in this online platform, which is more efficient and time-saving. Some well-developed resources are required to continue with the online platform for this discipline. A well-equipped specimen museum is one of the main requirements. The established faculties usually collect these over the years and decades. Due to the pandemic, a virtual specimen museum which is very interactive and is a far better substitute to a conventional museum, was created. Looking back, the traditional method seems outdated and obsolete. Because of the problem-based learning environment, the students were compelled to read and seek knowledge from different credible sources.

As mentioned previously, using the Google classroom, teachers were able to encourage the students to peer review. The tutorial answers were shuffled among the students, giving them the opportunity to assess another student's answer critically. The responses were anonymized. The students learned to appreciate the common mistakes in presenting the answer and agreed that this strategy improved their confidence in handling structured essay questions.

## Summary

The Covid-19 pandemic taught us many things. It totally changed our perceptions about life and everything else. The changes that ensued forced new strategies and demanded that people change accordingly. It broadened our horizons. It was determined to continue using these modalities in teaching throughout my future career. In order to do that, there should be a dramatic improvement in the technical and web supports available in the university. Some of our virtual teaching materials can be commercialized.

Online assessment has been restricted to closed-answer type questions, such as Multiple Choice Questions and Single Best Answer. Text recognition software can be used to change the format of online exams[7]. At the moment, online assessment is used to assess theoretical knowledge. Though, newer technologies will enable the assessment of clinical skills on virtual simulated patients online[8,9]

It is such a positive trend to note that medical education in a developing country like ours has risen to the challenge and managed to cover intended learning outcomes without losing precious hours in student life.

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# CHAPTER 08

# 'Virtual Ward Round' as an Emergency Remote Teaching during Covid 19 Pandemic Lockdown in Place of Hospital-based Medical Undergraduate Training

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## A Virus Disrupted Global University Education

A small living particle called a 'virus', not visible under light microscope, has gripped the entire human population of all the continents with mortal threats since the first quarter of the year 2020. This highly contagious culprit named 'Covid 19', christened by the ultimate global body dealing with health - World Health Organization (WHO)[1], disrupted a range of livelihoods, occupations, and activities. Education suffered greatly. Both school and university education came to a standstill in their in-person activities. The information technology developed over the last few decades emerged as the rescue, compared to the last pandemic in 1918, and online teaching and learning could provide for the alternative platform successfully. As the pandemic continued aggressively, university assessments also embarked on to the online world as a further extension to the internet-based university education.

## Effect of Covid 19 on Medical Undergraduate Curriculum

Any medical undergraduate curriculum would not be complete if they do not incorporate sufficient hours of training based in hospitals. The parallel curricula in all Sri Lankan medical schools entertain at least 3000 hours of hospital-based clinical training out of approximately 8000 hours of five-year medical undergraduate courses. This requirement has even been strengthened by the country's law in Sri Lanka through a gazette notification[2]. This requirement parallels the standards published by the World Federation of Medical Education (WFME) based at the University of Copenhagen, which states that hospital-based clinical training should comprise at least one-third of total course hours[3].

The pandemic itself and the resultant lockdowns of the country have threatened the credible medical training and its legitimate requirements. In comparison to the successful transit of many other teaching-learning activities into the online format, hospital-based training faced a major obstacle. The undergraduates did not have access to hospital wards, and regular and orderly training got disorganized. At this juncture, the responses by global medical education were patchy and incomplete.

**Figure 1: Teaching had been Held in the Open Air during the Spanish Flu Pandemic of 1918 at the University of Montana**
**Source: Best Colleges, Red Ventures Company**

Did all university teaching get converted into web-based activities? The answer is disturbing. A significant number of undergraduate courses or their components fell behind, as there were no immediate online alternatives. This included much practical work, industrial training, and hospital-based clinical training. The latter undergraduate clinical training faced a significant challenge while the rest of the medical teaching could survive under alternative platforms.

## How did COVID-19 Affect the Clinical Training?

With the emergence of a highly contagious viral pandemic, there was the concern of students transmitting the virus unknowingly to patients and other staff, or contracting the disease by themselves, which necessitated keeping students away from the hospitals. The long time taken for the development of vaccines against the Covid 19 virus, and the emergence of novel virulent strains delayed allowing students to ward. The other factors that disturbed clinical training were the lack of COVID-19 testing, diminished value of education, the cancellation of surgical procedures and routine admissions, and shortage of adequate personal protective equipment (PPE)[4].

This threat of pandemic concomitantly presented unique challenges and opportunities to the institutions conducting clinical training. The students, faculty, and staff were encouraged to attempt innovative and hitherto unthought-of teaching and learning measures that have not been seen 'on this scale in the lifetimes of anyone currently involved'[5]. This mode of teaching is best differentiated as Emergency Remote Teaching (ERT) from routine online teaching, which had its roots much before the Covid 19 challenges. It is important to avoid equating ERT with online learning as well. The universities had to carefully plan and design their own web-based clinicals in conformity with ERT. The SWOT analysis of such a programme should make the institution prepared for future needs to implement ERT.

## What Successful Global Measures are Reported in the Literature?

The spread of the pandemic from the east to the west of the globe saw the development of novel technologies to cater to the emerging needs in the online world. Totally new platforms appeared, and existing ones vastly improved. The Moodle, Zoom, Teams, and similar web-based tools elevated to essential software. Universities in developed and developing worlds engaged in their best efforts to survive the pandemic. The result was uninterrupted yet slowed down academic programmes in universities.

Some of the Trusts of the National Health Service of United Kingdom (NHS UK) had pioneered organizing innovative online clinical training methods.

Greater Glasgow and Clyde NHS Trust have produced a series of simulated ward rounds as videos for online clinical and shared them generously on the worldwide web[6]. Their programme commenced in March 2020 had involved patient actors, thus avoiding the issues of confidentiality and shared of sensitive patient data. The mode of delivery has been recorded video.

Northwest University Healthcare NHS Trust in London has adopted a totally different mode for rescue teaching[7]. Smartphones have been used with improvised technology run by a small ward round team that has maintained the patient care and teaching while an office-based remote team including students observed. This has reduced the number of staff to be physically present in the wards reducing the rate of transmission of COVID-19 and cutting down the need for Personal Protective Equipment (PPE) requirement, and improving both patient and staff safety. This innovation has offered real-time clinical teaching, and the students had the opportunity of observing the proceedings similar to their physical presence in the wards.

The Imperial College of London NHS Trust has adopted yet another ingenious mode of trainee experience. Their virtual ward round involved the teacher wearing a Microsoft's HoloLens glasses, which streamed real-time video to the students' computers (see Figure 2). Students have been facilitated to hear the conversation between the doctor and the patient, and relevant medical records and reports were made available while maintaining

the patient's confidentiality[8]. This has allowed for continuous and unbroken teaching-learning activities.

**Figure 2: A Physician at St Mary's Hospital of Imperial College NHS Trust Attends Ward Round Wearing a HoloLens Headset Used to Examine Patients**
**Source: Thomas Angus of Imperial College London**

A review of articles presenting online medical education by a team from Birmingham Medical School reported the usefulness of streaming live surgeries and interactive immersive online case scenarios providing commendable alternatives to in-person clinical training[9]. In the long run, the total experience during the pandemic warrants extensive review to identify the most appropriate and credible online clinical training methods for future utility.

Virtual reality medical simulation by Oxford Medical Simulations has been in use since 2016, which provided an alternate platform to mend the gap during lockdowns[10] (see Figure 3). This has been developed by the partnership with many leading global universities and is beyond the affordability of many institutions. While this mode of delivery is all-time useful, it has proven a highly relevant tool during this critical time requiring rescue in the form of ERT.

During the last 18 months, medical education has marked reasonable success, as the world over final medical examination has been held almost on time to graduate their students.

## "Interactive Virtual Ward Round" in Wayamba University Medical School

The new Faculty of Medicine at the Wayamba University of Sri Lanka saw the entry of its inaugural intake of students to their pre-professorial clinical training during the peak of the pandemic. Their hospital-based training faced frequent disturbances as the country went into several lockdowns. Students had to transit between the university and their homes.

The continuity of their clinical training during lockdown periods was attempted with a series of 'Studying Clinical Cases' via Moodle by clinical teachers, including the author. This series comprised clinical scenarios relevant to an undergraduate course while maintaining patients' confidentiality. The students engaged enthusiastically in such activities as the sole opportunity for clinical training materials.

Another sequence of regular online clinical activities delivered was interactive case-based discussions titled 'Virtual Ward Round' managed using the Zoom platform in which small groups of students interacted in the remote forum to discuss aspects of patients' presentations and management. Both above modes of online training were welcomed by students with healthy feedback from them. They allowed clinicians to share important clinical materials regularly.

Taking similar precedence, the students themselves developed a mobile phone application (App) 'Waya Clinicals', to share important and academically useful clinical cases. The app appeared promising in ensuring the maintenance of confidentiality of patients. Further improvements might see a promising platform for clinical training both during disturbed times as well as unaffected periods.


Figure 3: Oxford Medical Simulations: A Virtual Reality Application

## Future of Virtual Ward Rounds

The Covid pandemic taught the educationists a lesson of their lifetime. It forced to think beyond traditions. In order to continue education and to maintain the credibility of assessments, many existing tools were used with an innovative approach. The hospital-based actual patient encounters are never reproducible in any other platform. But to maintain an alternative delivery in an emergency setting, the different approaches discussed above are proven rescue methods.

The virtual modes need further improvements and wider availability to medical schools for the benefit of students, as the human society needs medical students graduating regularly to fill the ever-increasing demands amidst the growing care needs of Covid 19 patients. The experience gathered and the development of further tools will prove useful for many years to come and at different global and local catastrophes.

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# CHAPTER 09

# Interactive Online Teaching of Electronics Subjects with Simulation Software Tools

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## Background of Interactive Online Teaching

With the development of the internet, most of the services have been moved to online platforms due to their vast accessibility. Also, the service can be provided more effectively and efficiently with the help of software solutions attached to online platforms. In the education sector, some portions of the teaching-learning activities were gradually transferred into online delivery with the gradual development of the teaching-learning online tools. The most popular online teaching method was teaching in hybrid mode, where part of the teaching-learning activity is covered by physical participation, whereas the remaining part of the teaching-learning activities was delivered online. However, with the COVID outbreak at the beginning of 2020, most education services were moved fully online as the physical meeting of the teacher and learner is restricted due to the imposed health restrictions. Therefore, both teacher and learner have to adapt to the online delivery for the continuation of the teaching and learning activities. With these adaptations, online delivery was gradually improved and still improving with the enthusiastic and continuous effort of the educators.

Varies methods are being used for online education. To deliver the lectures one to one video or voice calls, group video calls, broadcasts, and webinars can be utilized. Although these methods are vastly being used, they failed to provide the interaction provided by the conventional physical teaching methods. As these virtual platforms have a lack of ability and a small number of options for the interaction between the learner and the educator, monitoring the active participation of each learner is more difficult[1]. Also, this interaction is affected by other factors such as stability of the internet connection, type of user devices, and motivation toward learning activities of the learner as well as the educators. Various interactive platforms are currently being introduced to overcome the lack of interaction

in online teaching. Padlet, Nearpod, and Menti can be given as interactive platforms that can be used to improve the interaction in an online classroom. These platforms are providing vast options to enhance the interaction by performing and conducting several activities with the students.

## Background of Use of Simulation Software

Computer-based simulation software allows the user to model a real-world application or process in a software tool to observe and monitor an operation in a simulated platform. With observation and monitoring, the user can obtain the data, and visual outputs without actually performing the same operation. Simulation software is widely used in Engineering and Technology sector for several purposes. To obtain a general idea of the working operation of a design, to obtain design parameters of a design, to perform an operation that could not perform in a real-world environment, and to perform an operation that could not perform due to the lack of physical instruments can be mentioned as of few major reasons of using a software simulation tools. These simulation softwares are developed to model a real phenomenon as per the set of theories and mathematical formulas.

Simulation software has been used in teaching-learning activities in the last few decades. With the advent of information technologies, the usage of simulation software's in the education sector was abruptly increased, and major increments can be observed in the higher education sector. The students in Engineering and Technology have used simulation tools in practical classes, design classes, and some theoretical classes. The advantages and disadvantages of simulation-based teaching in a physical or online class can be expressed as follows[2,3,4].

Advantages

- Simulations allow students to perform otherwise impossible activities or procedural tasks due to the unavailability of the instruments or due to a high risk of performing the relevant task.
- Simulation permit happening of errors than actual tasks and this will allow the learners to learn from the error. Consequently, this will improve the troubleshooting capability of the student.
- Simulation allows students to improve/modify their design much more frequently and much more efficiently than the actual performance of the task. Ultimately, the cost and time taken to implement the final physical design will be reduced.
- Simulation permits the students to understand the operation of the devices and instruments.
- Simulation-based teaching and learning will improve the active participation of the students. They can obtain a greater idea about the phenomenon is being learned by self-learning with the help of simulations.

- Simulation-based teaching and learning expand the students' critical thinking, near hands-on experience, effective and efficient decision making, the ability of following procedures and effective communication skills.
- Simulation-based teaching and learning provide much flexibility in changing times and locations of performing, and also it improves the repeatability of the task.
- Simulation-based teaching and learning improve the flexibility of customizing the teaching method and simulating tasks as appropriate to the learner's level of expertise in the field.

Disadvantages

- The simulation does not exactly model/perform real situations/tasks as it uses several approximations during the modelling.
- Simulation software has its limitation, and this will result in the use of few simulation software to perform the task. Also, this will generate different results for the simulated task or operation
- Simulation software can be costly and also require constant updates and maintenance.
- The students should be familiar with the simulation software. The accuracy of the results obtained from simulation depends upon the level of expertise the student has in the simulator. To accomplish accurate results, the students should be trained on the simulator.

The interaction between the teacher and the learner can be improved by utilizing simulators in teaching-learning activities. However, this can be accomplished in certain filed of education and as well as in a few of the subject areas. In the fields of Engineering or Technology, Simulation-based teaching can be used in several subject areas compared to the other fields of study. This chapter presents the motivation, procedures, and conclusive remarks on the use of simulation-based teaching in electronics subjects. In this regard, we have chosen the Digital Electronics subject that is delivered to second-year students of the department of Electrotechnology, Wayamba University of Sri Lanka.

## Motivation

In the discipline of engineering technology, scientific and mathematical knowledge are being applied for the innovation, designing, and maintenance of devices and systems. Therefore, most of the engineering technology classes are planned and designed by including many activities to develop the aforementioned required skills by the engineering technologist. The successful achievement of the outcomes of the teaching activities is highly dependent upon the self-learning and self-working ability of these students.

In an outcome-based education system, the Intended Learning Outcomes (ILOs) play a vital role in ensuring that the program outcomes are successfully achieved. The most important responsibility of the teacher should be an effective use of the teaching, learning, and assessment methods that directly support to achieve the aims and ILOs of the subject[5]. Accordingly, the educator should plan all the teaching and learning activities such as lectures, assignments, quizzes, lab sessions to be perfectly aligned with the ILOs. In simulation-based teaching activities, in order to achieve the relevant ILOs, the verbs from low cognitive level to high cognitive level can be incorporated. From the low cognitive level verbs such as memorizing, and identifying to apply to the problems can be actively applied in simulation-based teaching and learning. Moreover, high cognitive level engagement verbs such as describe, explain, apply and theorize will be more effectively applied in simulation-based teaching and learning process. Taking into account the students learn well when they take responsibility for their learning and also, the students are driven by assessment[6], some of the simulation activities are used as an assessment method.

## Methodology

In the Digital Electronics online class, some of the activities are covered by using simulation. The covered ILO, activity, and the respective assessment method are given in Table 1.

Table 1: Activities Covered by Simulation

| ILO | Activity | Assessment method |
|---|---|---|
| Employ Karnaugh Map to reduce Boolean expressions and logic circuits to their simplest forms | 01: Design a Binary to alphabet display in a seven-segment and implement your design on the Proteus simulation environment and Tinker Cad Simulation. | Design model submission, Viva session |
| Design and implement combinational logic circuits to provide a solution for a given problem. | | |
| Design and implement synchronous and asynchronous sequential circuits. | 02: Design a Digital Clock by using flip-flops/counters/decoders and implement your design on the Proteus simulation environment and Tinker Cad Simulation. | Design model submission, Viva session |

Before allocating students with the activities mentioned in Table 1, students were motivated by mentioning the following points in their online lectures. In this regard, we clearly elaborate on these points by emphasizing abilities that can be achieved by the student at the end of this process. On

the successful completion of the simulation-based classes, the students should be able to,

- Design and implement synchronous and asynchronous digital circuits for a given application.
- Develop their self-learning and problem-solving skills.
- Apply learned theories to solve real-world problems.
- Identify the hard section of the subject for them, and consequently, they can be well prepared for the relevant section with the help of the lecturer.
- Obtain a prior idea about the nature of the problems that will be given in exams.
- Gain the ability to ask questions from teachers and peers.

Also, students were given prior experience with the software tools used (Proteus and Tinker Cad). In this regard, simulation was frequently used to explain the theories during the lecture by setting an example by the lecturer. From this step, students have realized the importance of using this software throughout the subject. Moreover, upon request, the lecturer helped the students install the required software on their devices.

After successful completion of the aforementioned process, the activities in Table 01 were given to the students. For the completion of each task required amount of time was allocated. During the activity, the lecturer continuously helped the students to resolve the aroused problems. However, the lecturer observed that the request for help was at the minimum level as the students were able to resolve the issue themself with the help of internet resources and their peers. A few submitted designs are depicted in Figure 1 and Figure 2, respectively.

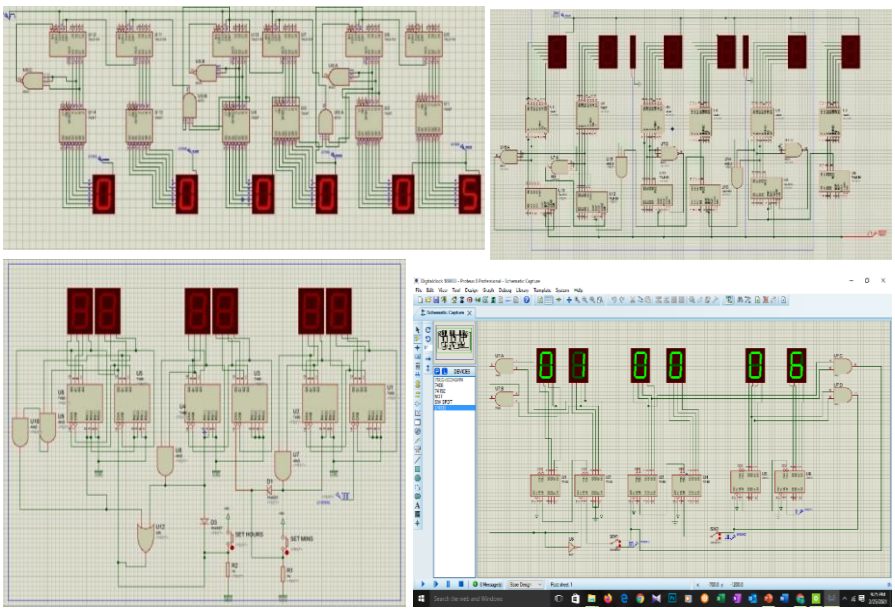

Figure 1: Designs of Activity 01

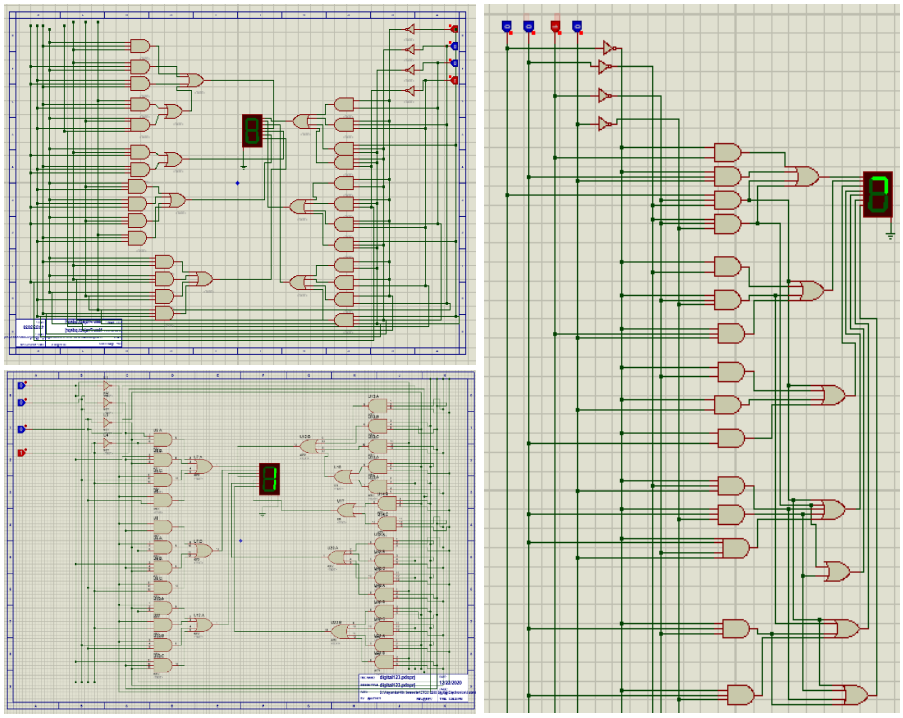

**Figure 2: Designs of Activity 02**

## The Problem Faced and Solutions

The problem faced during the simulation-based online classes and the respective solution were given are in Table 2.

**Table 2: Problem Faced and Given Solution during the Activities**

| Problem faced | Solution given |
|---|---|
| Students did not have proper training in used software | Small simulation sessions were conducted during the lectures. Also, simulation training was given to the students during the design classes. Students were provided with online resources to develop the simulation experience. |
| Students did not have easy access to the software. | The software was provided to the students by the lecturer on demand. Online software was used as alternative software (Tinker Cad). |
| Some of the students did not have the devices such as a personal computer (PC) or a laptop to conduct the simulations | Alternative online software was used. It can be run on a smartphone as well. Every student had at least a smartphone with them. |
| Some of the students had connectivity problems due to connection issues. | All the theory lectures and as well as design classes were recorded, and videos were uploaded to the learning management system (LMS). |

## Conclusion

Due to the current global situation, education delivery has moved entirely online or partially online. Keeping continuous interaction between teacher and learner becomes an uneasy task during the online session via virtual platforms. New methods are proposed to increase interaction between the teacher and the student in online teaching and learning. This chapter presents simulation-based classes for electronics subjects in engineering technology. Lectures, designs, and assessments can be conducted as simulation-based classes/ activities using appropriate online/ offline software tools. Also, practical classes can be delivered after proper planning of teaching-learning components.

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# Section 04

## Effective Modes of Alternative Assessments in a Pandemic

# CHAPTER 10

## Online Assessment of Students in Higher Education System during Pandemic

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The emergence of the global pandemic stage of the COVID-19 has significantly influenced humankind by forcing changes in the lifestyle with social distancing. With the healthcare, economy, and other established systems, education has also been severely affected globally, with no discrepancy between developed and developing countries. Therefore, United Nations Education, Scientific, and Cultural Organization (UNESCO) have recognised that the pandemic has affected the education system seriously, threatening the educational rights of the 90% of students worldwide[1].

With the series of lockdowns and the medical instructions for the social distancing, the higher education system was forced to make changes in the teaching-learning process to safeguard the students' education and health. Traditionally, higher educational teaching is characterised by face to face teaching; lectures, tutorials, practicals, seminars, group works, and field visits. These teaching-learning activities have been identified as high-risk activities due to the contagious nature of the COVID-19 virus. Therefore, the distant teaching-learning methods mainly delivered online are the alternatives with safer approaches to teaching-learning activities during the pandemic.

However, the change in teaching-learning activities needs to be implemented rapidly without prior opportunity to assess the capability of conducting the education via the online platforms. Therefore, many challenges are inevitable during this transitional phase.

Yet, there is a uniform understanding that this forceful situation is temporary, and the education system can revert to the traditional teaching-learning procedures with the control of the global COVID-19 pandemic. Therefore, the term "Emergency Remote Teaching (ERT)" was introduced to differentiate this situation from the established online education system[2].

Even though many educational institutions were increasingly adopting the advantages of online teaching-learning activities over the past decade, the sudden limitation of human interactions requires a rapid transition from traditional in-person teaching and learning to online teaching and learning. This challenges the effective delivery of knowledge, information, and skills to the students and maintains the standards of the teaching-learning process.

As the pandemic has confined all in their residencies, the reduced physical interaction between the teacher and the students has affected many aspects of the teaching-learning process. Among them, assessing the extent to which the students have successfully received and gathered the knowledge and information delivered by the academics is a challenge. When the in-person lectures had been transformed into the online form, several concerns were arisen in finding the appropriate online assessment methods to ensure the achievement of expected outcomes of the teaching-learning process during the pandemic.

## Traditional Method of Assessment

Assessment plays a vital role in every academic curriculum. According to the Cambridge Dictionary, assessment is defined as "the act of judging or deciding the amount, value, quality or importance of something, or the judgment or decision that is made"[3].

In higher institutions, assessment aims to support learning, execute accountability and provide certification, progress, and transfer.[4] Effective planning for any evaluation requires competence in course content, identifying the target group, aligning the assessment with intended learning outcomes, deciding the appropriate areas to test, and using various suitable assessment methods[5].

Assessments are broadly categorised as formative and summative assessments. Formative assessments are done as an ongoing process during the teaching and learning process, while summative assessments are usually conducted at the end of a course to conclude the students' competence of the course content.

Formative assessments are usually conducted informal way to prevent grading and judgment. However, they can be formal too. These assessments provide feedback to students about their progress, the extent of knowledge and skills they have achieved, and the areas which require improvement. They also inform the teachers about the degree to which the student has understood and earned the expected goals and outcomes. They also offer a clear understanding of the areas that more attention during the teaching-learning process. In contrast, summative assessments are conducted in a formal way; usually, the students are graded according to their achievements at the end of the course.

There are various methods to assess the students like written assessments consisting of multiple-choice, true-false, extended matching,

short answer questions, structured essay questions or essay questions. The methods like problem-based questions, case scenarios, performance tasks, skill assessments, viva, objective specific practical examinations and objective specific clinical examinations are also practised.

## Online Assessment: Challenges and Overcoming Challenges

With the transition from traditional teaching to online teaching, academicians faced the challenge of assessing the student appropriately. During the pandemic, many educational institutions changed their policies regarding the online assessment techniques while few institutions held the assessments hoping the situation getting better. However, this shifting of assessment via online platform was not smooth since many different challenges were encountered while implementing these online assessment techniques.

Many teachers use work given to be done (such as homework, practicals, and tutorials to assess the student performance, while some teachers use quizzers, group projects, online presentations and talks, and oral tests via the online platform. However, most students are found to be fond of the traditional assessment methods than these online assessment methods.[6] Further, individual and institutional unpreparedness is an additional challenge in the effective conduct of online assessments[7].

The main challenges faced during the online assessments are academic dishonesty, infrastructural issues (such as lack of internet, and computer facilities), and the lack of technical knowledge on using the internet and different types of computer applications[7]. Academic dishonesty may lead to frustrations and demoralisation of the students. Difficulties in assessing the learning outcomes are also experienced, particularly in the learning outcomes addressing the affective and psychomotor domains[8].

A proper addressing the related issues are necessary for conducting an effective online assessment. Although the extent of academic dishonesty during online assessments is not thoroughly evaluated, it remains as one of the severe issues in online examinations. Most examiners attempt to prevent academic dishonesty by using different questions for each student or randomisations of the questions. But this is possible only within a small group of students. Also, some assessment methods, such as online oral presentations, help prevent academic dishonesty. Signing the academic integrity statement by students before an examination is evidential in reducing academic dishonesty[9].

Lack of well-established infrastructural facilities is a common problem throughout the world, though the problem's extent is much more significant in the developing world[10]. Development of the infrastructural facilities needs to be fulfilled with the involvement of different stakeholders, including the policymakers. Using multiple assessment methods makes the learning outcomes achievable while minimising academic dishonesty.

According to the proctoring status, online assessments can be broadly classified into two categories; remotely proctored exams (time-constrained) and open-ended assessments[7]. Remotely proctored exams are time-bound exams that are remotely observed by the examiners via the online platforms using the webcams and microphones. However, the lack of well-established infrastructure facilities and technical issues while conducting the exams are disadvantages, and hence alternative plans should be identified when designing the examination. Additionally, students are not willing to be under continuous monitoring through a camera since that would be additional stress during the examination[11].

Open-end assessments can be conducted based on the nature of the course, and the questions assess the achievement of the Intended Learning Outcomes. These can be the best alternatives for the remotely proctored examinations since the conduct is relatively easy. There are many methods in these kinds of assessments, such as series of quizzers, open-book, take-home assessments, professional presentations or demonstrations, annotated bibliography, fact sheets, and e-portfolio.

A Series of quizzers gives valuable information regarding the understanding of subject matter by the students, and it also provides immediate feedback for the students. Also, randomisations of the questions minimise the cheating by the students.

Open-book and take-home assignments are more conventional and can be used when remote proctoring methods are not conductible. However, the examiners should ensure that the answers for the assessments cannot be found directly from any source. Post-assignment oral presentations or interviews can reduce the academic dishonesty by students.

Professional presentations or demonstrations can be conducted via online conference systems such as the Zoom platform, and these provide a better reflection on understanding of the student about the subject matters.

An annotated bibliography summarises core ideas in academic documents (such as articles, and thesis) and relates those to students' ideas and thesis. These allow students to assess their higher-order abilities to evaluate sources, compare multiple perspectives, and provide rationales for their choices.

The fact sheet is a piece of work that provides information clearly and concisely. Preparing a fact sheet on a given field can be assigned to students as an assessment method. E-Portfolios reflect the students' work during the course, and it is also helping further to evaluate the teaching and learning during the course.

## Planning Online Assessment

Many guidelines have been developed to provide guidance for academicians throughout the world. Different challenges are encountered in different courses. However, these guidelines will provide invaluable

information on planning an online assessment. There are significant areas that need to be assessed and addressed before, during, and after conducting the online assessments.

Prior to designing any kind of online assessment, the examiners need to evaluate prerequisites for implementing the online assessment. Those include readiness of the institutional levels and the individual level[12]. Readiness of the institutional level comprises the policies, by-laws, resources, and other infrastructural facilities such as well-established internet facilities with uninterrupted power supply. At the individual level, the capability of handling the essential applications, having adequate computer literacy, and having adequate resources to smoothly conduct the exam should be assessed among the students as well as examiners[8].

Examiners should also ensure whether the assessment activities are aligned with the Intended Learning Outcomes provided for the students. This is a fundamental requirement for all the assessments in the higher education system. Though the cognitive domain is fairly assessed by the online assessment, assessing the affective and psychomotor domains is difficult using online assessment methods. Therefore, careful planning and usage of appropriate assessment methods are necessary to ensure the assessment of the learning objectives that reflect the affective and psychomotor domains.

The situation at the student level should also be evaluated prior to designing the online assessment. Information and Communication Technology (ICT) facilities, students' socio-economic status, language proficiency, and ICT knowledge will affect the final results of the evaluation. Therefore, every action should be taken to reduce variability among the student to ensure an equal chance for the performance in the online assessment.

A balance between the formative and summative assessment should be kept when planning the online assessment for a course. Since students will be disoriented at the initial stages of the online assessment, regular formative assessment is always encouraged in order to achieve a better outcome[13]. Online assessments are better in achieving the purpose of formative assessment since they produce immediate feedback to the students and many attempts are possible providing the opportunity for the improvement[14].

Online assessment should design in a way to stimulate students towards education, which is an expectation of every assessment. Therefore, an innovative method in the online assessment such as group projects, and group presentations should be used to encourage the students to engage in further studies.

The assessment format should ensure assessing all the domains in education. Using more than one format of assessment is encouraged to assess one particular domain. The date of the assessment should be scheduled carefully considering the course timetable and other relevant factors. The assessment time should be scheduled to avoid the busy hours of

internet consumption, particularly when planning remote proctoring examinations.

Clear instructions regarding the assessment type, schedule of the assessment, weightage, assessment criteria for passing, and the instructions for the assessment should be given beforehand. In some assessment methods, specific instructions such as when the assessment opens, duration, type of questions, and number of attempts should also be provided to the students[15] [16]. Contact details of the examiner or any other responsible person should be provided to the students for contact whenever an issue is aroused[17].

Timely feedback makes assessment effective. Therefore, informative feedback should be provided to students in order to allow them to identify their weak areas and correct those. Some assessment methods, such as multiple-choice questions, allow students to get immediate feedback as soon as they complete the assessment.

Examiners should also ensure the validity and the quality of the assessment by following the standard guidelines to keep the confidentiality, scrutinising the assessment, and putting their maximum effort to prevent academic dishonesty[8].

Considering all the aspects, it is evident that proper arrangement and conducting an online assessment in the higher education system is demanding work. However, with the signs that the COVID-19 pandemic will time to time affect the lifestyle of humans, the implementation of these online assessment methods to the higher education system looks inevitable. New assessment methods will be identified and introduced to the system with the gathering experience in this field. Therefore, constant evaluation and updating the knowledge are essential in order to develop an effective online assessment system.

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# CHAPTER 11

## Assessing during the Global Pandemic: Use of Alternative Assessments in Higher Education

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The number of COVID-19 cases rises each day around the world. People have adopted different mechanisms to proceed with their work when this pandemic obstructs face-to-face communication and meetings. Subsequently, universities and other higher education institutions are also closed down to minimise face-to-face contact, whereas the majority of the universities are now conducting teaching through virtual media. As these distant learning methods are a novel experience for teachers and undergraduates equally, the university teachers are faced with a similar problem in assessing the learners safeguarding academic validity, reliability, and fairness. Moreover, whether the undergraduates respect academic honesty and whether they secure academic integrity is another issue visible in the field of higher education at present. Hence, teachers have to be creative enough to find assessment methods and mechanisms to suit the learner population, and knowledge and to promote life-long learning of the undergraduates.

### Why do We Need Assessments?

Assessments are any method or criteria that support teachers in understanding the current knowledge level of the students. Different personnel in the field of education employ different techniques and strategies to assess the learners. For instance, some use formative assessments with the belief that they are more effective than summative assessments[1].

Yet, the difference between assessment and testing should be clearly understood before implementing them in the classroom. Testing is often considered a formal and standardised method where information on what the learners can do is measured[2]. Here, the students do not have an

opportunity to engage in the administering process as the scoring is pre-designed. Furthermore, testing gives one opportunity to learners with a precise period with a definite structure. Testing is mostly a one-dimensional method of assessing learners. On the other hand, there is a plethora of ways to collect information on learners' knowledge and the learners have the opportunity to be peer reviewers and be a part of the administering procedure.

Hence, it is evident that assessment has become an integral part of the teaching-learning process. To maintain the standards of the teaching procedure and to understand the current level of knowledge of the learners, assessments need to be carried out.

## Alternative Assessments vs. Traditional Assessments

Alternative assessments are an assessment strategy that evolved due to educators' awareness of the testing and curriculum design. Traditional assessments are identified as testing methods and are condemned for their very nature of traditionality. Many scholars mention that traditional assessments are unintended and inauthentic. Furthermore, traditional assessments are a one-time process that is based on speed and the ability to memorise and recall lower-order cognitive skills. Hence is, learners' knowledge is showcased in a programmed manner. The scores of these standard tests cannot be used to map the progress of the student. Similarly, the teachers are unable to understand the difficult areas for the learners. Moreover, appropriate feedback cannot be provided for the learners to develop and grow[3].

However, alternative assessments assess the higher-order thinking skills of the learners as students are allowed to reveal what they learned. These assessments focus on the development and the performance of the student. If the learners are not successful at one time with one particular variety of tasks, then they are provided with another opportunity at a different time to showcase their knowledge and ability. This is because the alternative assessments contain different types of assessments to show their skills. For instance, one learner may perform well in essay writing while another can be proficient in presentations. When there is this variety, it promotes fairness and all the learners have equal opportunity to perform well. Moreover, teachers also have time to measure the strengths and weaknesses of the students in a variety of areas and situations. In addition, teachers have the opportunity to combine multiple intelligences in assessing the learners when using alternative assessments in the class.

## What are Alternative Assessments?

When the assessment process is concerned, teachers should be careful to create and implement the right kind of assessments for the particular learner group. The assessment should have variety, should be

valid and reliable and life-long learning should be promoted through this assessment[4].

As scholars have mentioned, in order to increase the efficiency of the assessment, teachers need to consider several points.

1. The assessment should be aligned with what was taught in the class
2. The students should be informed of the marking criteria and rubrics before they start the task
3. Students should be provided with standards and models on how to engage with the assessment before engaging with the task
4. Provide an opportunity for the students to assess themselves
5. Students' performance should be analysed using the standards previously provided to the students

As scholars have pointed out that there are shortcomings in the traditional assessments. As a result, alternative assessments are proposed to be an ideal method for assessing learners. Therefore, alternative assessments emerged as a method to compensate the teacher-centredness and obtain a real-time measurement of the learners' engagement in the classroom.

Alternative assessment strategies include assigning learners to exhibits, demonstrations, and hands-on experience on experiments, projects, and portfolios.

Some common alternative assessment techniques are as follows.

1. Portfolios
2. Projects
3. The fishbowl
4. Crib Sheet
5. Report writing

Let’s focus on each one in detail.

## Portfolios:

A portfolio is a document that displays student engagement, his/her efforts, development, achievements, and work that provides evidence for his/her proficiency in the particular area/s of skill. Most importantly, a portfolio contains self-reflection on their engagement with the task. This promotes and provides the opportunity for the learners to think about their successes or failures during the engagement process. Creating a portfolio makes learners more responsible for the process as they reflect on their practices and beliefs.

The benefits of creating a portfolio are,

1. It provides an in-depth view of students' present level of knowledge and what they are able to do
2. It provides an alternative to standardised test methods

3. This provides the opportunity to receive evidence on students' progress
4. If the portfolio is created on an online platform, learners have the opportunity to be exposed to online tools and equipment

### Projects:

Projects can be based on any aspect that the learners discussed in the class or they can be a project for self-exploration. Any type of method that displays what students know about a specific topic is considered as a project. Further, it can be assigned to be created individually or as a group. Hence, collaboration and cooperation among the learners can also be promoted. They can promote authenticity, real-life concepts as well as prior experience of the learners. Problem-based learning requires learners to use their problem-solving skills to respond to a given situation. For instance, they can be presented with a problem and asked to suggest solutions. Learners can be asked to present the findings in various forms, such as PowerPoint presentations, dialogues, and written reports.

### The Fishbowl:

This is an activity similar to a debate and is possible to be done in a virtual classroom. A few students are selected to be in the "hot seat," where they respond to questions, concerns, and ideas, about the given topic. Other students in the class ask questions and present arguments against the topic. This is an activity that supports improving active listening, group discussion, presentation, critical thinking, and professional manner of presenting arguments.

### Crib Sheet:

This is a form of an open-book assessment. The students are allowed to bring a small sheet of paper called a 'crib sheet' where they have created a summary of all important information. Here, the learners have to be critical thinkers as they need to determine what information is important or unimportant for them.

### Report Writing:

Reports allow the students to present what they have comprehended regarding a certain topic or a concept. The learners need to identify the purpose of the report, follow a structure, and present the information concisely to make it understandable for any reader.

Moreover, conducting interviews and making concept maps can also be used as alternative assessments which improve learners' critical thinking ability and active listening skills.

## Benefits of Alternative Assessments for Teachers and Undergraduates

Alternative assessments, also called performance assessments, contain a variety of advantages[5]. For instance,

1. Alternative assessments are focused on complex learning where learners are invited to move beyond the present level.
2. These assessments engage learners in higher-order thinking and critical problem-solving skills
3. They stimulate a wide array of active responses from the learners.
4. Alternative Assessments include challenging tasks that require numerous steps,
5. They entail significant amounts of students' time and effort
6. They simulate real-life contexts
7. Learners have a chance to practice the real-life activities
8. Learners have the opportunity to work collaboratively
9. Alternative assessments assist educators (teachers) to have a better understanding of student learning

## Barriers to Implementing Alternative Assessments during the Pandemic

The most crucial barrier to implement alternative assessments is the existing digital divide. This is a common issue in the world, and especially in Si Lanka, unequal access to online education is a widespread problem. Most often, the learners and teachers do not have the necessary equipment to access online education or they lack the necessary knowledge and exposure to the use of these online resources. The lack of access to information is hindering the pre-existing gap in the digital divide. Furthermore, the teachers and learners who live in rural areas do not have access to the Internet as there are issues about connection and accessibility[6].

Moreover, the teachers' lack of knowledge and skill in ICT also has hindered the implementation of alternative assessments. It should be accepted that all the teachers do not have adequate competence, same knowledge, and attitudes to benefit from the opportunities offered by the Internet.

Moreover, the hesitation of some institutions for innovations and innovative activities may obstruct the implementation of alternative assessments in their teaching-learning process. Even though the teachers attempt in facilitating a successful learning process, this has delayed the alternative assessments implementation process.

Furthermore, the concern on the protection of the learners when accessing the Internet has hindered the implementation of alternative assessments. The parents' concern about limiting internet usage for their children has aggravated this issue.

## How to Minimize the Barriers of Implementation

As it is evident, there are hindrances and barriers to the implementation of alternative assessments, it should be noted that we must take steps to minimize them in order to facilitate homeschooling during the period of this pandemic. Here are some suggestions to minimize the aforementioned barriers for implementing alternative assessments.

1. Guidelines or policies should be provided to address the issues pertaining to online teaching and the implementation of alternative assessments
2. Repetition of some assessments and classes to facilitate the students who missed them
3. to create evaluating methods that facilitate the access of a majority of the students
4. introduction of formative tools which facilitate teachers to understand learners' level of knowledge
5. to train students and teachers to use ICT related tools and equipment in an effective manner
6. awareness on how to protect themselves as Internet users, particularly in light of the current circumstances in which children and adolescents spend more time online.

It is evident that assessing and testing the learners are two different concepts. The teachers should promote assessing the learners using formative assessment tools as they support developing the learners' higher-order thinking skills. Even though there are barriers to implementing the alternative assessments, as teachers, we should be creative and innovative enough to minimize such barriers to facilitate a smooth and effective online education in higher education.

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