MANAGING THE TEACHING-LEARNING ENVIRONMENT DURING TURBULENT TIME

Edited By

MMDR Deegahawature, PhD

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Staff Development Center

Wayamba University of Sri Lanka

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Forward

It is my honor to write this foreword to the latest publication of the Staff Development Center (SDC) of the Wayamba University of Sri Lanka (WUSL), edited by Prof. M.M.D.R. Deegahawature and Dr. E.A.C.P. Karunarathne under the theme, "Managing the Teaching-Learning Environment During Turbulent Time". Exploring the opportunities to serve the community and academia effectively, the SDC of the WUSL consistently looks for non-traditional practices. As such a practice, the SDC has done a series of publications covering various aspects of higher education and has significantly contributed to the development of academia. While filling the knowledge gaps particularly on current issues in academia, the SDC's publications make a platform to share best practices with colleagues. Certainly, this book marks another significant milestone in the SDC's journey toward strengthening academia.

Managing the teaching-learning environment is always challenging; thus, educational institutions and teachers consistently bring novelty into it. The unexpected changes in the environment since 2020 have turned it into a different dimension creating an environment that the world never experienced before. While the turbulent environment created by the pandemic posed unique challenges around the globe, the economic downturn in the country made further challenges to educational institutions. During this turbulent time, educational institutions and educators introduced and tested diverse steps to manage the teaching-learning environment, thereby, improve the effectiveness of the teaching-learning process. These steps largely helped them to face the challenges of a turbulent environment and mitigate the adverse effects and this new environment taught lessons and provided a significant experience for all stakeholders.

This edited book has made a platform for sharing those lessons and experiences with the rest of the world through sixteen interesting chapters organized under three sections. Considering the key features of the present turbulent environment, the first section focuses on best practices that facilitate the teaching-learning process. To overcome emerging limitations, process transformation to the digital platform has been considered as one of the favorite options by many educational institutes and educators. Taking into account this imperative aspect, the second section focuses on novel approaches to empower learners. At the outset, it appears that conducting

practical-based modules is a question since those mainly target the development of students' skills. However, the educators innovated new methods to answer this question effectively, and the third section is devoted to discussing them.

Not only as the Vice-Chancellor, but also as a person who held the position of Director, SDC for a couple of terms, 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. Also, I congratulate the editors and the authors of the chapters and wish all of them good luck in their future endeavors to serve academia.

Senior Prof. Udith K. Jayasinghe
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15th December 2022

Preface

The turbulent environment since 2020 has forced many sectors, including the higher education sector, to rethink and redesign their key processes. The environmental uncertainty was intensified by a series of unforeseen issues, including the pandemic, economic crisis, and political instability posing unexpected and unique challenges to the higher education sector. Although the environment has adversely affected the teachers, students, and other key elements in higher education in different ways, it was compelled to continue the education process. Apart from the socio-economic and technical issues, there were pedagogical issues that undermined the effectiveness of the teaching-learning process during this turbulent environment. The new environment demands educators and higher education institutions to come up with innovative resilient methods, practices, and strategies to face challenges and mitigate the adverse effect. Though being responsive was an exigency, it became troublesome due to the unfamiliar situation. However, being responsive to the environment and its demand for change, the higher education sector has tested and implemented different countermeasures to continue the core process of education despite the enormous constraints. Those countermeasures covered diverse aspects of education, including teaching-learning strategies, environment, assessments, etc. Among them, the higher education institutes and individual teachers adopted several strategies to manage the teaching-learning environment with the aim of meeting the objectives of education. Also, addressing the unique issues of diverse subject disciplines, institutions and teachers adopted different methods to manage the teaching-learning environment thus, several methods become discipline-specific.

In the recent past, higher education institutions across the globe managed the teaching-learning environment by adopting novel approaches to promote learner achievements by mitigating the adverse effect of the turbulent environment. Digitalization becomes a popular strategy during the transformation to the new environment as it facilitates remote learning. To share those best practices, this edited book is devoted to discussing the tools, techniques, methods, strategies, etc., that help manage the teaching-learning environment during this turbulent time. Focusing on this scenario, this edited book presents sixteen chapters under three sections covering novel teaching-

learning methods in a turbulent time, empowering learners during digital transformation, and conducting practical modules during a turbulent time.

The teaching-learning process underwent drastic changes due to the challenges posed during the turbulent time. Numerous methods were tested and adopted by the institutes and educators to ensure the continuation of education. The first section has devoted to sharing the experience of facilitating the teaching-learning process in a turbulent time through five chapters. Introducing the turbulent environment, its effect on the higher education sector, and the transition from onsite to online mode of teaching, the first chapter elaborates on the transition from traditional teaching-learning to distance education while discussing several important concerns such as learners' motivation, engagement, assessment, learning technologies, and promoting achievements. It is essential to examine the relevance of the teaching-learning methods to the uncertain environment. Covering this need, the second chapter proposes three pedagogical approaches to be considered in creating such strategies. Presenting several appropriate methods to enhance learners' engagement and confidence, the chapter discusses the relevance of self-directed learning to a turbulent environment. The third chapter insists on the importance of readjustment to environmental changes. The education sector has adjusted itself to the dynamic environment. Further, the chapter has done a SWOT analysis and provides insight into managing the education environment in the present crisis. Considering the learners' achievement, the fourth chapter elaborates on how the present systems can be modified to fit the present environment while bringing novel methods to facilitate the teaching-learning environment. The fifth chapter focuses on a case of engineering and technology education and proposes three novel approaches that help ensure the effectiveness of education in professional courses during the pandemic. Also, the chapter identifies the prerequisites to adopt those approaches discussing the effect of the same on learners' achievement and engagement.

Digitalization and access to the internet have made a tremendous impact on humans, and it has turned out to be a paramount important contributor to continuing education during this turbulent time. However, although there were numerous benefits of education supported by digitalization, there were certain constraints. One such limitation was empowering the learners. The second section has been devoted to discussing the role of digital transformation in empowering learners. Elaborating on three major types of online tools, the sixth chapter proposes several tools to facilitate and enhance learners' empowerment. The higher education sector has identified mentoring as an essential development tool. The recent turbulent environment demands educational institutes to continue mentoring via distance mode. Elaborating on the role of mentoring

in higher education, the seventh chapter discusses how mentoring can effectively be used for online learners. The educational institutes and educators had to find innovative ways of blending traditional and novel teaching approaches to ensure learners' achievement in an online setting. Highlighting the teacher-centred approaches adopted in the early part of the pandemic, the eighth chapter discusses the appropriate blended techniques for online classrooms referring to the technology degree program.

Moreover, recent changes in the teaching-learning environment made it mandatory to switch to the virtual environment with the use of digital tools. The ninth chapter insists on the importance of the teacher's role during this transformation. Also, it presents several standard digital tools and ways to motivate learners for higher achievement. The turbulent environment created numerous unforeseen challenges for educators. Proposing resilient pedagogy as an effective way to respond to these challenges, the tenth chapter elaborates on how it can be used to face challenges and meet educational goals.

Empowering learners in higher education happens not only through lectures and seminars but also through practical experience. The online and digital tools used during the turbulent time helped deliver lectures and seminars effectively. Despite the relative difficulty of using such online and digital tools for practicals, educational institutes and educators introduced alternative tools to conduct practical modules effectively. The third section has been devoted to sharing the experience of conducting practical-oriented modules. From the skill development perspective, medical education is one of the best examples where the learners are expected to undergo essential practical components. During this turbulent time, educators introduced alternative teaching-learning methods to facilitate practical modules. Based on the case of teaching Anatomy, the eleventh chapter explains how technology has been integrated into teaching Anatomy during the pandemic. Insisting on the importance of hands-on experience through practicals, the twelfth chapter shares the experience of managing practical classes and blended learning in the discipline of food science during the trying time. The thirteenth chapter also attempts to share the experience of facilitating medical education. While summarizing novel approaches to medical education in different parts of the world, the chapter shares the experience gained during the pre-clinical, para-clinical, and clinical phases at the Faculty of Medicine, Wayamba University of Sri Lanka. The fourteenth chapter asserts the necessity of promoting the humanities among medical undergraduates. Also, it explains the challenges and methods of promoting medical humanities among undergraduates. Bringing several examples from other countries about barriers to online education, the fifteenth chapter elaborates on online medical education in Sri Lanka. Also, the chapter discusses the integration of online methods into medical education. As the

education system of the county undergoes a unique condition due to numerous challenges, it is required to revise the existing system and think of a new one. The sixteenth chapter introduces a six-step path-way to be followed in establishing such a new system to be par with the world.

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Acknowledgment

The editors gratefully acknowledge the encouragement and guidance provided by the Vice-Chancellor of the Wayamba University of Sri Lanka, Senior Professor Udith K. Jayasinghe, throughout this publication process. Also, it is our duty to extend our appreciation for his insightful forward, which adds immense value to this book. As a senior consultant and expert in academia and staff development, also who was keen on this publication, he deserves special thanks for his distinct service to uplift the standards in staff development in academia.

Also, we reserve a special thanks to all the resource persons of the Staff Development Center (SDC) and senior academics for their encouragement and 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. VVK Senevirathne 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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15th December 2022

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Section 01

Facilitating Teaching-Learning Process in a Turbulent Environment

CHAPTER 1

Facilitating Teaching-Learning Process in a Turbulent Environment: Novel Approaches

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Introduction

Sri Lanka, the island nation, has been facing a turbulent socio-economic environment for around three years since the Easter Sunday attack in April 2019. Less than a year later, the country was again hit with the COVID pandemic after discovering the first COVID-infected individual in January 2020. Owing to the fast-spreading global pandemic, travel restrictions were imposed, and the daily livelihood of the people was impacted adversely with self-isolation, large-scale social distancing and quarantining. However, the COVID-19 pandemic soon converted from a health crisis to a social and economic crisis in Sri Lanka, causing multiple adverse social and economic effects on the country. The economy, crippled by the Easter Sunday attack followed by the pandemic, created detrimental economic impacts.

The education sector is one of the most devastated areas due to the continuous turmoil in the country, where some of the undergraduates in the university system had very little opportunity to participate in physical classes and enjoy university life. Most of the students continued and completed their university education through online learning and teaching modes, which is very new to both the students and the lecturers. Online education has created a gap where there is significantly less student interaction during the lectures and where students rarely actively participate. Unlike face-to-face

lectures, there is very less opportunity for the lecturers to interact with the students. Thus, this book chapter elaborates on the latest technologies and modes used to conduct lectures, conduct assessments and also methods to interact with students with the intention of spurring student achievements despite the turbulent socio-economic environment.

Impact of the Country's Turbulent Environment on the Higher Education Sector in Sri Lanka

With the pandemic and the current economic crisis, the education sector was severely affected, similar to all other sectors in the country. From kindergarten to university, the students, teachers, lecturers, and non-academic staff attached to the education system have been affected in unprecedented ways. Since the breakout of the pandemic and now with the prevailing economic crisis, educational institutions, including the University system, are struggling to run academic activities owing to multiple reasons such as frequent power cuts, shortages of supplies including stationery and necessary chemicals for laboratories etc. Moreover, owing to the rising inflation, students have been unable to pay for boarding places, facing difficulties in providing their daily needs, including food and transportation. Students from low-income communities, poverty-stricken urban areas, fishing communities, plantation communities and the students from the war-affected North and East are among the highly affected groups due to the burden of this crisis. Thus, it is reported that the financial issues have even resulted in a reduction of students enrolling on some four-year special degrees in state universities. Moreover, it is reported that Sri Lanka has temporarily shut down at least three universities due to the prevailing fuel crisis and a collapsing economy, mainly due to the inability of university students and lecturers to attend classes. The University of Peradeniya, the largest state-run University, the University of Rajarata and the University of Visual and Performing Arts were closed temporarily due to these issues.

Therefore, distance learning or online learning has been the main mode of teaching-learning practice during these difficult times. Distance learning is defined as a "type of education which is developed using technology that allows students to attend classes in remote locations [1]and also can be defined as a type of education which joins lecturers and students from different locations".

The Transition of Face-to-Face Teaching Learning Approach to Distance Education

Since the inception of higher education in Sri Lanka, almost all Universities have been highly dependent on face-to-face learning or presence learning which consists of the participation of both the students and teachers in the same physical classroom. This face-to-face learning

teaching method involves the presence of a lecturer depositing knowledge in a demarcated classroom using the same old traditional methods. However, this method is not accessible owing to the challenges ranging from the COVID pandemic to the economic crisis. Hence, teaching and learning and also examinations of the higher educational institutions are held through online platforms.

Conducting Pre Recorded Lectures as a Mode of Distance Education

Under distance learning, conducting lectures can be done in two ways 1) doing pre-recorded lectures and 2) conducting online lectures. Conducting pre-recorded lectures can be considered as a part of providing flexible education environments that address the diverse needs in higher education in multiple ways, such as place, pace and time[2]. This method facilitates students to have flexibility in viewing it, where to view the lecture and provides various ways in which they can view the lecture (such as phones, computers, audio or through television). Further, this supports the students to replay lectures at any time in the semester and alter the speed of delivery to match their learning preferences. This method is not regularly used in the Sri Lankan University system, where the lecturers create pre-recorded lectures for the students. However, this method is popular in other parts of the world, including Universities in Australia, such as Western Sydney University. Pre-recorded lectures can be created using apps such as Panopto which facilitates lecturers to edit lecture recordings, insert quizzes and videos etc. However, creating these types of pre-recorded lectures can be more time-consuming than presenting live lectures in Universities. In the Sri Lankan context, lecturers usually record the online lectures that are conducted and upload them to Learning Management Systems (LMS). However, this method of creating pre-recorded lectures using new apps such as Panopto can be a novel method for local Universities.

Conducting Online Lectures as a Mode of Distance Education

Online lectures are the most common mode of distance education. The synchronous online lecturers or live lecturers are conducted mostly through apps such as Zoom, Google meet or Cisco Webex, where students attend at a scheduled time. Under this approach, the lecturers announce that a particular lecture will be conducted through an email or through a WhatsApp message, and the study materials will be uploaded to an online platform such as the LMS or will be emailed to the students, and the lectures will be conducted using the apps mentioned above. Apps such as Zoom has tools which support the lecturers to interact with the students, including screen annotation, chat tools, pooling, breakout rooms where students can divide into groups and engage in group work activities and verbal and non-verbal feedback buttons. These Zoom-run lectures can be accessed via

laptops, tablets, desktops, and smartphones, providing students with the flexibility to attend the lectures in a convenient method. When conducting online lectures through these apps, it is important to encourage active student involvement by creating enriching and enjoyable lectures as students learn more and would like to participate when they engage in an active learning process rather than being a passive audience.

Increasing Motivation and Engagement of University Students during Online Lecturers Using Novel Digital Programs and Tools

The lecturers can use multiple digital tools in order to increase student motivation and engagement when conducting online lecture sessions. Gamification is considered as one such technique which can be used to involve students and motivate them. This term refers to using game design elements and principles in non-game contexts such as education. One such popular game-based student response system is "Kahoot". This interactive quiz platform uses many gamification techniques to engage student participation and enhance learning. This app facilitates creating live quizzes, which can be done in single mode or team mode and can be answered within a given time. Another app which can be used to increase student engagement is "Mentimeter" which can be used to engage with students using word clouds, live polls, multiple-choice questions and quizzes and more. Further, the app can be used to track understanding and learning by asking questions and downloading results. Mentimeter can be integrated with Zoom and Microsoft Teams and can be presented to students directly.

Additionally, another interactive app is "Slido" which can be used to maximize the learning experience of the students and increase student interaction with the lecturer. Using this app, students can engage in quizzes, live polls, and interactive Q&As. These apps are useful as they can be used to make live polls or quizzes to check if the students are keeping up with the lecture and help the lecturer to identify points that need clarification. Further, students can ask questions from the lecturers anonymously from their phones if they are feared to ask questions in front of the class. And also, lecturers can obtain student feedback by preparing surveys using these apps. Hence, these novel technological apps can be used in distance learning and teaching to increase student interaction and involvement with the lecture.

Conducting Online Examinations under Distance Learning

Student assessments are of two types as formative and summative. The formative assessments occur within an online course or lesson and are used to determine how students are learning. These are mostly ongoing and consistent and provide critical feedback to the learners. Summative refers to the final examinations which measure whether the student has learned after

finishing the course. Novel approaches are used to conduct both types of formative and summative assessments these days with distance learning. One method of conducting formative assessments is through having online quizzes. Although quizzes are a traditional assessment tool, they can be paired with technology becoming an excellent way to engage student learning. These online quizzes can be created using the previously mentioned apps such as Kahoot or more advanced methods such as "iSpring Suite", an online quiz-making tool that can prepare 14 question types. Moreover, final examinations/summative assessments are conducted with the support of online apps such as Zoom and WhatsApp.

The Eight Remote Learning Technologies Introduced by the McKinsey Research for Higher Education Students

McKinsey Research, one of the leading research firms in the world, has presented eight learning technologies which can be used by Universities for teaching and learning. Under this, the first technological tool is group work or virtual collaboration and knowledge sharing. The importance of virtual collaboration is rising day by day with technological advancement. The main reason for such development is the ability to disperse knowledge across physical borders. University students and lecturers can use virtual collaboration tools such as "Slack", a popular and well-crafted platform offering instant messaging and file transfer to interact virtually during these online sessions. Further, there are apps such as "Webex" which can be used to hold personalized video meeting rooms where hosts can join meetings. These tools will enhance the collaboration among the lecturers and students in learning environments.

The second learning technological tool introduced is connectivity and community building. In distance education, many students fail to develop connections and community; therefore, social media enables them to build a community. It can be considered as one of the most widely used platforms for interactions as almost all students will be actively engaging in social media. Hence it helps to create discussion platforms and virtual study groups to have connectivity and helps in community building.

The third learning technological tool is Augmented Reality/ Virtual Reality (VR). VR is another highly adopted technology by education systems around the globe. It enables students to experience destinations around the world without leaving their classroom. It simply provides access to interactive content (images and videos) that allows to explore 360^0 views of a scene. Thus, contrasting to traditional teaching techniques, it gives the opportunity to learn with experience. It further encourages more peer interactions since studies show that students are eager to share their unique experiences with others. Since students visit out of the classroom virtually and get a unique experience, creativity is improved among students via

learning through VR. It ultimately provides a memorable experience; hence the learnings will likely be reflected in future lessons.

The fourth learning tool is machine learning-powered teaching assistants. Machine learning has been one of the hot topics in the tech industry recently on how it could influence the human race in the near future. The world believes that Machine learning provides better opportunities for improvement and growth. It is successfully used for higher education purposes as well. Various apps and Chatbots have been developed to answer questions and create different tests. It assists in providing services to many students altogether. Further, numerous tests can be developed without much difficulty. Thus, these assistants likely improve quality and productivity in higher education.

The fifth learning tool is Artificial Intelligence (AI) adaptive course delivery. AI is evolving at a rapid pace. This explosive growth benefits many fields, including education. Thus, many Universities and schools adopt AI for various functions. A review on plagiarism is one of the most commonly used AI-based functions in education. Further, it helps in better course deliveries for learners with disabilities. Voice assistants like Google Assistant, Alexa etc., could be used to help interact with different learning materials. Furthermore, tech companies are in high competition, hence continuously adding new features for AI-based education. Hence this will further improve the advantages of AI adoption in course delivery.

The sixth tool is Student Progress Monitoring. Progress monitoring is a process of evaluating advancement towards a performance target. It enables tracking students and ensuring their progress is at the expected level. Technology enables to create various risk alert levels to trigger any deviations of expected progress levels of students. Hence corrective measures could be taken to keep students on the correct path.

The seventh is classroom interactions which were also discussed earlier. Classroom interactions simply mean the interaction between teacher and students and among themselves. Some students may eagerly participate in class activities and interact heavily, whereas some may not utter a word. Further studies have shown that classroom interactions nurture critical thinking. Thus, it is vital to facilitate willingness to raise questions and offer feedback will likely enhance the intellectual development of students. Hence, under online teaching methods, software platforms can be used to allow students to ask questions, make comments, respond to polls (these apps were discussed in previous sections) and attend breakout discussions. These apps are downloadable and accessible from phones, computers and other devises, can be used when teaching all subject areas.

The eighth is classroom exercises. Classroom exercises help to energize teaching sessions. It helps to create more interactive sessions while enabling the chance to network with each other. Furthermore, studies show that the scores were increased by $>5\%$ whenever classroom exercises and interactive sessions are conducted, and the failure rate is higher when non-

interactive sessions are conducted. These include gamified learning (discussed in a previous section), where students can learn with fun.

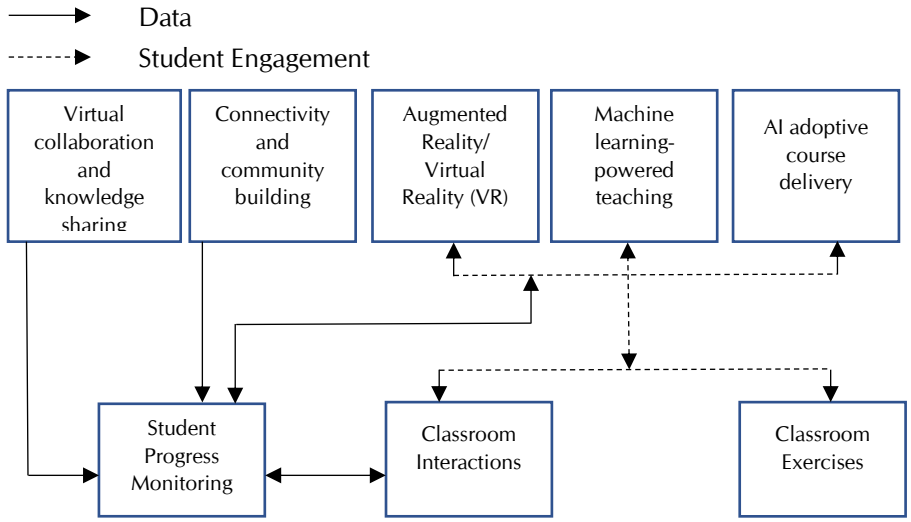

Figure 1: Eight learning Technologies that are Enabling Change
Source: McKinsey Research

Challenges in Implementing Novel Technologies for Teaching and Learning

There is a myriad of challenges in implementing novel technologies in teaching and learning. One of the major issues is the lack of awareness regarding these new types of apps and other platforms that facilitates remote learning. And also, using some of these latest technological instruments, including artificial intelligence, VR and Augmented reality, are expensive for most universities to afford. In the Sri Lankan context, universities do not use most of these latest technological tools due to unaffordability. Another aspect is that some of the lecturers and instructors believe that these learning techniques have no impact. They mostly believe using student interaction tools and conducting such activities are ineffective. And also, there is a thought that these technological tools will not work. Above all, in the Sri Lankan context, online and remote teaching has multiple challenges ranging from power cuts, unaffordability of students to purchase proper devices, the rising cost of data and internet services due to increased taxes and even some areas do not have proper data signals and therefore low speeds in the internet.

And also, there are digital literacy gaps among the lecturers and instructors. Highly tech-savvy lecturers would prefer to use interaction and engagement-focused modes of lecturing, while others who are less familiar with these latest technological aspects would prefer display and delivery-focused methods and technologies. Hence, some attitudinal change is

required basically among the lecturers and students to believe that these techniques would be productive and that they will make a change in teaching and learning. So that, they will be encouraged to implement these techniques in the teaching process.

Promoting Learner Achievements through Novel Teaching and Learning Approaches despite Difficulties

Promoting learners' achievements is one of the ultimate goals of the higher education system and lecturers. And in order to achieve that objective, it is vital that they study the latest methods, tools and strategies that are used globally in order to deliver the best to their student community. It is important that they adopt these new tools and techniques without following the traditional display and delivery-focused technologies to make a more productive and interactive session so that they can mitigate the adverse effects of the environment and promote learners' achievements.

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1 Larkin, H.E. (2010). "But they won't come to lectures ..." The impact of audio recorded lectures on student experience and attendance. *Australasian Journal of Educational Technology*. *26*(2), 238–249. https://doi.org/10.14742/ajet.1093

2 Brasca, C. Krishnan, C., & Owen, K. (2022, June 15). How technology is shaping learning in higher education. McKinesy & Company. https://www.mckinsey.com/industries/education/our-insights/how technology-is-shaping-learning-in-higher-education

3 Patel, H. (2021,March 28). The seven greatest challenges the education technology faces today. WPG Consulting. https://www.wpgconsult.com/the-7-greatest-challenges-facing-education-technology-today/

CHAPTER 2

Creating a Strong Relevance in Teaching and Learning Modalities of Higher Education for a Turbulent Environment

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Introduction

The survival of the human species has become more challenging today since humanity faces a broader range of global economic, social, cultural, and ecological changes. The pandemics like COVID-19 have created unprecedented challenges in every aspect of life, giving a great example. As a result, the current environment has changed in a complex and even turbulent manner, creating disputable claims in different sectors. Consequently, the higher education system has dramatically changed by identifying its best approaches and solutions to tackle these uncertain situations.

In the olden days, it was firmly believed that no pedagogical approach could replace teacher-taught direct interaction, which was considered the peak position of formal education. In the year 2020, it was revealed that due to the COVID-19 pandemic, universities and higher education institutions had been closed by over 92% worldwide, and this has initially limited the teaching and learning process[1]. But in the aftermath of these uncertain crisis situations, online education has crossed the border to shift from traditional methods to modern teaching and learning approaches from physical to virtual classrooms. In earlier days, distance education and student-centred learning were popularly accepted as a part of non-formal education. Interestingly, it seems that it would gradually replace the formal education system.

When novel methods and practices first emerge, one expectation is to deliver more efficient and effective teaching and learning methods than conventional methods. It cannot be denied that teaching and learning modalities require more effort by the higher education system itself to encourage improvements in the use of modern learning methodologies than just face-to-face instruction. This has highly affected the low and middle-income countries since they need more effort to handle the sudden shifting scenario of educational planning, management, and organization during this type of turbulent environment as they are running out of financial stability. But noticeably, no one can afford the negligence towards the novel approaches in the higher education system. Despite this, the fullest effort and commitment have to be positioned to recognize the reliable academic tools, high-quality digital academic experience, and promote technology-enabled learning for students.

Strategic use of teaching and learning tools with new concepts can help teachers and students during uncertain times by providing structure and space for effective learning and enabling them to think critically. Concerning all these facts and opinions, this chapter addresses effective ways of producing novel teaching-learning practices that could be followed in the higher education system to achieve success in these uncertain environments.

Pedagogical Approaches in Turbulent Times

Planning new pedagogical strategies is an active strive to improve the quality and relevance of teaching and learning in higher education, mainly focusing on developing student-centred learning environments. The current turbulent environment has proven that cooperative or collaborative learning strategies in higher education can improve student performance rather than individualistic ways of building student performance and progression.

Online instruction can be given in three pedagogical approaches[2], as the immediate future is uncertain with new outbreaks, economic turbulence, and lockdowns.

(1) Synchronous
(2) Asynchronous
(3) Blended

Synchronous Pedagogical Approach

The synchronous pedagogical approach in online lectures is designed to give lectures on the course by using video conferencing software during the designated class hours. Students are asked to participate in the lectures at a particular time and can ask questions vocally, via live text chat, or using an appropriate online tool. This is a firm class, and both student and lecturer need to have a weekly time commitment that cannot be

rescheduled. Some examples of synchronous learning include live webinars, virtual classrooms and video conferencing.

Asynchronous Pedagogical Approach

In this pedagogical approach, students can access the materials such as prerecorded video lessons or game-based learning tasks to be completed by themselves as the most commonly applied forms of digital and online learning. One of the promising advantages of this approach is students can access the content at their most convenient time. Asynchronous learning is beneficial for learners due to its ability to pause and review virtual materials until they are fully confident with key concepts. This is the optimal way to learn and identify the key concepts for many learners.

Blended Pedagogical Approach

The blended online learning-teaching strategy is the most practical method under the mentioned pedagogical approaches. This basically combines the advantages of synchronous and asynchronous strategies. The blended pedagogical approach is more advantageous as this strategy leads to an increase in the student's involvement in their own learning process without quietly sitting during a video conferencing class room. The cognitive load theory is the basis of this approach which is vital for teachers to understand how learners process knowledge.

The ''flipped classroom'' is an active blended learning strategy where traditional lectures and homework are replaced by pre-classed activities such as prerecorded short lecture videos. Further, students have been asked to read the relevant reference materials to engage in active learning, such as workshops and group discussions in the class.

Teaching in Uncertain Environments: Tools for Getting the Things Right

The growth of online teaching in higher education has increased significantly in the last few years due to the COVID-19 pandemic and problems raised due to the economic crisis. The utilization of online platforms and related tools is essential to increase student interaction and motivation. The following tools were introduced as effective in helping students to make them more engaged and confident in their academic capabilities.

Effective Instructional Tools

In most instances, the lecture slide show, along with its recording, is uploaded by the lecturer to the Learning Management System (LMS) for student reference. There has been criticism of this type of uploading because it can be considered as an ineffective instructional tool as it exhibits nothing

related to student engagement, class discussion, and personal examples. Nearpod is an excellent platform to avoid these critiques. It contains a wide variety of features to embed within a slideshow and enables students to engage in the material, similar to how they expect to interact in a classroom. Through Nearpod, links can be created to external websites, articles, and videos in the slide deck to emphasize the examples of the lecture content. Nearpod can be further used to grade participant knowledge by doing the activities such as taking a poll, answering a quiz, writing answers for sudden questions or matching keywords.

Audio-Visual Aids

Audio-visual aids are essential to encourage the teaching-learning process, and they keep the way of learning easier and more interesting. Flipgrid is an example of an online video tool that is quick to learn. This can be used only up to a certain extent because the lecturer sets the time limit for recording. Flipgrid is more user-friendly by having the capability of simply downloading the app through a laptop and then offering a fairly simple channel of recording.

Web-Based Graphic Design and Infographic Makers

Students can enhance their basic skills in web-based graphic designing while completing assignments in a visual format using tools like Piktochart. Piktochart is known as a web-based graphic design tool and infographic maker. It has the ability to create infographics and presentation skills. These tools have assisted the students in learning by conveying their ideas through numerous modalities.

Educational Blogs

Educational blogs are prepared for educational purposes, and they may offer huge instructional potential as an online resource. It is a well-known knowledge spreading and awareness tool. Edublogs is one example of achieving and assisting teaching and learning procedures by providing facilities to question themselves and others. This will clear the road for students to engage in activities related to higher-order thinking. Further, students will get the opportunity to engage in a community learning process.

Game-Based Learning

It has been strongly proven that students learn best when they are practising active learning. Game-based learning is a dynamic learning tool that can be used to improve student engagement, attitude, and performance. Kahoot is an excellent example of a game-based learning platform that allows users to make quizzes. Finally, once the students answered the

questions, summarized results of students' scores in real-time will be provided. The game-based learning tools should be realistic, competitive, and aligned with the learning outcomes to correctly apply the concepts developed in the class.

The Basic Tools

The current era with many uncertainties has highly utilized google docs and Zoom, considered basic tools, but their power for teaching and learning can never be overlooked.

There are a significant number of tools certainly available to educators that can help to keep students actively engaged. The most important fact, which is parallelly going through these tools, is that any tool that is chosen for student teaching should align with the overall objectives of the course or module design. It is strongly recommended that these tools should be added when they are necessary to achieve where course design and structure should always come first.

Self-Directed Learning (SDL): A Longstanding Tool for Uncertain Times

As the teacher is not physically present during remote teaching, recent turbulent environments have made the students enter uncharted territory in their higher education, where they have to take more responsibility and afford more challenges for their learning than usual. This has created an environment for students to become more self-directed in their learning in many aspects.

SDL has received enormous interest in educational research, and its intervention in higher education is phenomenal. SDL describes a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes[3].

SDL is exhibiting a good learning strategy in higher education, being a good predictor of academic performance, by creating skillful learners with problem-solving, innovative, and super-motivated individuals that go beyond classroom practice.

The self-directedness in students is tested often after the introduction of remote teaching and learning as the new norm in many countries. SDL is one of the skills that can help students to improve their academic progress and development during uncertain environments.

Conceptual Framework of Self-Directed Learning

There are five major steps of SDL (Figure 1) that can be considered the basics for self-directed learning[4].

- **Establish learning goals:** Identify the students themselves, what they want to perceive, how they expect to get the most out of their learning, and the way of utilizing their learning.
- **Locate and access resources:** Assess learning resources (Keyword searches, databases, identifying relevant resources, wider resources from other platforms such as Google Scholar, Web of Science and other educational websites).
- **Adopt and execute learning activities:** Inspire the students to plan specific self-directed learning activities which can be effectively used for themselves.
- **Monitor and evaluate learning performance:** Ask students to consider their current knowledge and apply them to understand whether learning goals have been achieved or not.
- **Reassess learning strategies:** Encourage students to reassess their timetable and different learning activities which are broken down, and the resources they used to identify whether time allocation and resource utilization are considerable for allocated tasks.

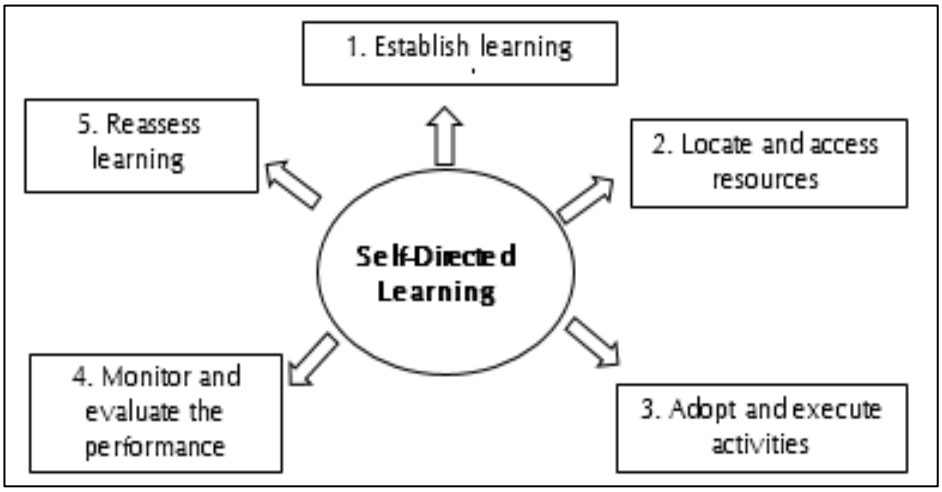

Figure 1: Conceptual Framework of Self-Directed Learning

Importance of SDL in Learners

SDL always allows learners to become successful and efficient problem solvers by enabling them to find the most appropriate final solution. Self-Directed learners exhibit long-term memory retention related to the things that they have studied, and they can use this comprehensive knowledge in various scenarios of learning and incidences related to problem-solving.

Self-directed learners adapt to new developments quicker, and this assists them in going with new plans according to new developments. More

importantly, during turbulent environments, self-directed learners will quickly understand their weaknesses in remote learning and convert them into strengths upon understanding that remote learning is their new norm. They consider every change during this type of uncertain situation as a challenge and make every strength to continue their studies.

Role of Higher Educational Institutions in SDL

Teachers who believe in SDL allow their students to take responsibility for managing and self-direct their learning while being facilitators of the learning environment. They assist the students in finding their learning passion and give the students freedom to initiate their learning passion on their own.

Environments with lots of unstable conditions like global pandemics and economic crises have given challenges to students in coping with remote learning environments. The responsibility of higher education institutions is to provide them with some necessary technological gadgets and stable remote teaching and learning systems.

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1 UNESCO. (2020). COVID-19 Impact on Education. UNESCO.https://en.unesco.org/covid19/educationresponse.

2 Lapitan Jr, L.D., Tiangco, C.E., Sumalinog, D.A.G., Sabarillo, N.S., & Diaz, J.M. (2021). An effective blended online teaching and learning strategy during the COVID-19 pandemic. *Education for Chemical Engineers*, 35, 116-131. https://doi.org/10.1016/j.ece.2021.01.012

3 Knowles, M.S. (1975). *Self-directed learning: A guide for learners and teachers*.

4 Blumberg, P. (2000). Evaluating the evidence that problem-based learners are self-directed learners: A review of the literature.

CHAPTER 3

From Socrates to Satellites - Conquering the Virtual Platform

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Hit by an Avalanche

Every facet of the Sri Lankan community flowed smoothly at its own monotonous pace as it has always been over the decades. Even education in all avenues was carrying on with minimal novelty and the repetitive use of hackneyed teaching modalities. All seemed well until suddenly the avalanche of the 'COVID-19 pandemic' hit. The ever unsuspecting, un-predicting education system of Sri Lanka, totally overwhelmed in surprise, came to an abrupt standstill.

In all facades of education in Sri Lanka, which is still referred to as a developing country, had heavily relied upon direct contact modes of delivery by teachers where traditional teacher-centered pedagogy dominated. Yet, the COVID-19 pandemic prohibited the public from stepping out of their dwellings, let alone attending academic activities or engaging in basic routines such as marketing. Constant curfew was imposed, and working from home became the norm.

On the 20th of March, 2020, all educational institutions, including 15 state universities and approximately 40 state and non-state tertiary education establishments, closed following government orders. All educational institutions were forced to embrace the virtual platform.

Alarmingly, Sri Lanka did not have any established, time-tested online delivery systems. Only a minority of education institutions had at least a moderate preparedness for catering to remote learning. Such was the predicament of all national educational conduits.

With the advent of mass vaccination campaigns, COVID-19 gradually dissolved into tolerable limits. Life in Sri Lanka was still returning to normalcy when suddenly in 2022, the second avalanche hit the Pearl of the Indian Ocean. Sri Lanka collapsed into the deepest dungeons of economic instability. The consequent severe fuel crisis forced the governing bodies to resort to the work from home policies to minimize energy consumption. Even to date, the volatile atmosphere persists amidst hope for a steadfast nation.

Remote Learning - A Bare Necessity

Bearing the lessons learned from the recent past firmly in mind, it is high time to implement a national policy for remote learning. The seemingly unpredictable prospects of the future mandate this need.

The virtual platform has to be strengthened to a great extent so that it could be utilized as a panacea when the need arises, be it pandemics, economic jeopardy, or even natural calamities like floods, hurricanes, or earthquakes, which force direct contact modalities of teaching and learning to dissipate.

"The art of life is a constant readjustment to our surroundings",
these wise words of the renowned Japanese scholar and art critic Kakuzo Okakaura hold true even today.

Though embracing a change of approach to teaching for a country that has depended for generations on solely physical means of education is inevitably cumbersome, Sri Lanka is in the process of successfully combating the challenge head-on.

A New Beginning

E-learning expands the horizons of learning, enabling the learner to assimilate knowledge from anywhere, at any time, wherever he or she is.

Technology provides a range of new potentialities as well as limitations. Distance, scale, and personalized teaching and learning are among the biggest challenges for e-learning. However, online education has a multitude of benefits as well as pitfalls (Table 1).

Laying a Solid Cornerstone

A solid remote teaching-learning platform is indeed a vital requirement of the current era to enjoy the lucrative benefits of online learning. The learners should be catered to the basic requirements facilitating the accessibility and affordability of online resources.

Recent evidence suggests that the area of residence, family income, knowledge in the field of information and communication technology, and previous exposure to e-learning significantly influence remote learning among undergraduates of Sri Lanka[1].

Measures should be taken to distribute electronic devices, and WIFI facilities equally to the entire country and to strive for a future where our technology is on par with the world.

Adherence to a systematic approach is vital for a smooth-flowing e-learning system to be born. Every aspect of the remote learning delivery chain should be analyzed, and steps to mitigate pitfalls at every subset should be entertained well in advance.

Mandatorily the teaching staff should be trained to make them well-versed in the software tools to be utilized. This will enable the teachers to give their students adequate training on novel software applications. The time spent on this training process is inevitably going to be an investment to convert remote learning into a success.

Table 1: The SWOT Analysis of Online Learning during Crises
SWOT – Strengths, Weaknesses, Opportunities, and Challenges

Strengths	Weaknesses
1. Time flexibility 2. Location flexibility 3. Catering to a wide audience 4. Wide availability of courses and content 5. Immediate feedback	1. Technical difficulties 2. Learner's capability and confidence level 3. Time management 4. Distractions, frustration, anxiety, and confusion 5. Lack of personal/physical attention
Opportunities	**Challenges**
1. Scope for innovation and digital development 2. Designing flexible programs 3. Strengthen skills: problem-solving, critical thinking, and adaptability 4. Users can be of any age 5. An innovative pedagogical approach (Radical transformation in all aspects of education)	1. Unequal distribution of ICT infrastructure 2. Quality of education 3. Digital illiteracy 4. Digital divide 5. Technology cost and obsolescence

Creating Linkage

An efficient mode of communication between teachers and students is also essential. Currently, creating groups on applications such as Telegram, WhatsApp, Viber, and emails can be considered effective modes of conveying messages to large groups regarding academic activities/online teaching links, troubleshooting, and answering common queries.

Establishing a powerful Learning Management System (LMS) for the students is also vital when trying to bridge the involved parties. It has to be converted into a useful interface where communication between teachers and students thrives. All the details ranging from lists of online tools/ software

required login procedures to Frequently Asked Questions (FAQs) could be integrated into the LMS. It could be well organized to include academic timetables, assignments, content delivered by the teachers, softcopies of reading material, or useful web links. The LMS should be updated regularly to the latest software versions to abate accessibility and malfunction issues.

Furthermore, the LMS being versatile provides important data on useful student learning variables for researchers, teachers, and policymakers to retrospectively analyze important correlations such as the degree of student utilization of LMS to the grades acquired by the students.

Heeding the Diversity

Age, gender, genetic factors, intelligence, and individual learning facilities are internal factors affecting the learning outcome of a student. Several external factors, such as the mode and method of instruction of the teacher, qualification of the teacher, peer influence on the students, and teacher-student ratio in a learning session, also play a role[2].

Learners adopt varied learning styles. Hence amalgamating all three modalities- visual, auditory, and kinesthetic at delivery would enhance retention. Kinesthetic inputs can be provided during onsite contact sessions of curricula comprising blended learning.

The teachers need to consider the requirements and preferences of the audience. The lesson plans should be prepared to meet the learning objectives of all learners.

Since the latest research reveals a gradual decline in attention after the first 6-7 minutes, regular short intervals are encouraged during remote learning sessions. Kind advice could be provided regarding limiting environmental and device-related distractions as much as possible.

Models for the Development of Instructional Content

The instructional material should inevitably be of superior quality to make e-learning a success. Evidence suggests that the ADDIE model and the Dick and Carey models are the most widely used for developing effective online delivery materials. The five-step approach of the ADDIE model consists of:

- Analyzing the instructional goals, and characteristics of the target audience, such as the existing knowledge/ skills and the available resources
- Designing course material that aligns with the objectives, methods, and goals
- Developing learning resources, validating/ revising drafts, and carrying out a pilot test.
- Implementing the course, learning activities, and engaging participants

- Evaluating the quality of the learning resources and the extent to which the instructional goals have been accomplished

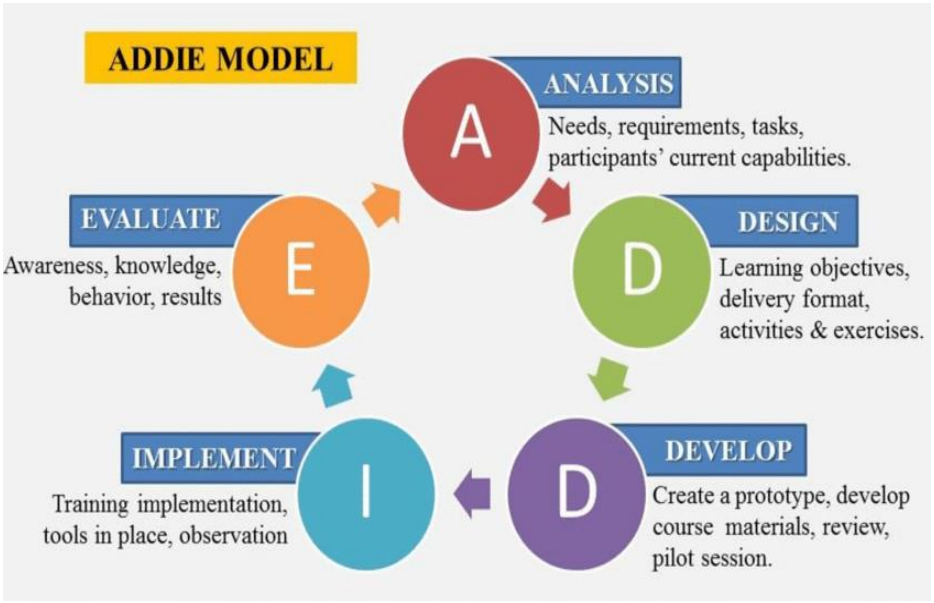

Figure 1: The Addie Model
Source: http://eclipse.mu.ac.in/mod/forum/discuss.php?d=1783

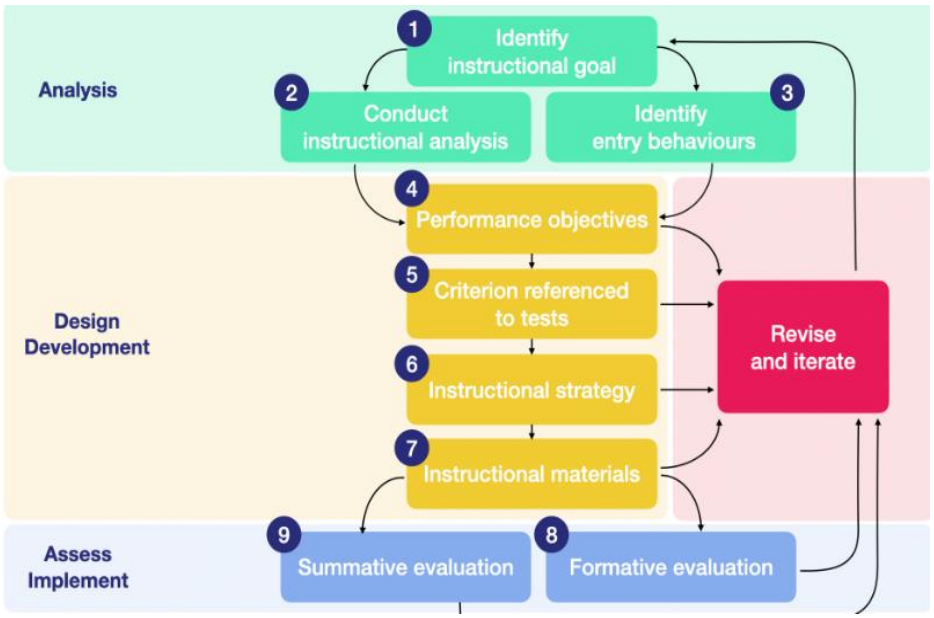

Figure 2: The Dick and Carey Model
Source: https://www.celestevolpi.com/design-models-section/dick-and-carrey-model

The Dick and Carey model refers to an instructional systems design approach with nine steps used for developing curricula oriented towards a defined instructional goal. The relevant components considered are the learning audience, the instructor, study materials, instructional activities, the delivery system, and the teaching-learning environment.

I Do and I Understand-Confucius

Dale's work in 1969 revealed that rote unidirectional pedagogical delivery systems fail to register information long-term for students. He proposed the Cone of Learning (Figure 3). Active learning approaches help students to retain 70-90% of what has been learned even after two weeks have lapsed. On the contrary, in passive modalities such as lecturing, passive reading, viewing posters, demonstrations, etc., the students retained only up to a lesser extent (10-30%).

Hence traditional lecture delivery methods should be replaced with innovative, more student-centered techniques which enable active remote learning. Active approaches such as online group activities, role-play, debates, quizzes, questioning, rewards, discussions, paired/group work, self-, peer-, co-learning, observations, switching activities, and audio/visuals would undoubtedly arouse student enthusiasm versus the traditional monotonous methods. Students can be encouraged to formulate a question on their own, which seems like a novel approach with higher yields.

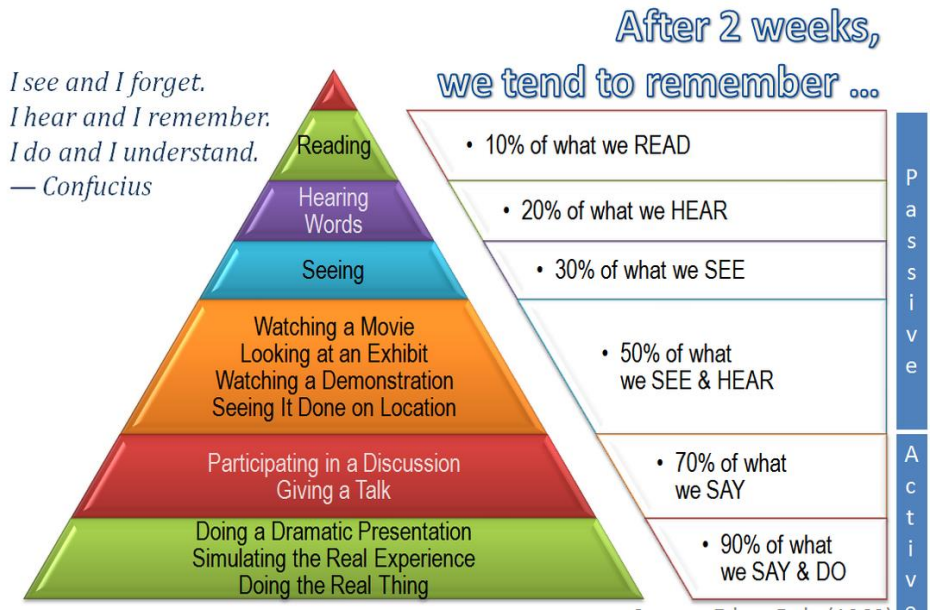

Figure 3: The Cone of Learning

Source: https://www.researchgate.net/figure/283011989_fig1_Figure-2-Edgar-Dale-Audio-Visual-Methods-in-Teaching-3rd-Edition-Holt-Rinehart-and

Shifting the Paradigm from 'Instructional' To 'Constructional'

Education occurs as a process within the minds of the students and is in itself a discovery. As in any production process, adherence to appropriate techniques is required to achieve a quality, final product, even in teaching and learning. Efforts should be made to adhere to high-yield principles of pedagogy during virtual sessions.

Constructivism denotes an assortment of educational practices that are student-centered, meaning-based, process-orientated, interactive, and catering to the personal interests and requirements of the students. Piaget (1977) has also reiterated the importance of constructivism in education.

Dewey (1916) and Piaget stated the importance of the students holding the responsibility for learning. Several effective pedagogical approaches can be utilized in remote learning:

1. Constructivist approach
2. Collaborative approach
3. Enquiry-based approach
4. Integrative approach
5. Reflective approach

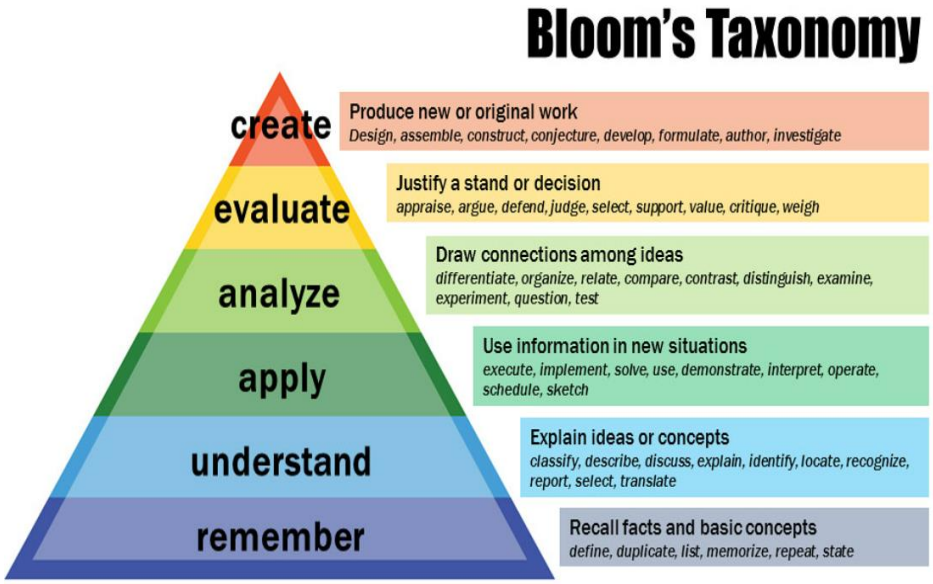

Figure 4: Bloom's Taxonomy

Source: https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/

Constructivist Approach

This denotes that learning involves an active process where knowledge is understood, assimilated, and constructed contrary to being a passive receiver of whatever is taught.

Collaborative Approach

This is based on a practice where students learn by actively interacting with each other, adopting asymmetrical roles, and sharing knowledge.

Enquiry Based Approach

This is a form of learning where questioning, problem, or case-based learning plays a pivotal role. This enhances higher-order thinking skills described in Bloom's Taxonomy, a classification system defining and distinguishing different levels of human cognition.

Integrative Approach

This is a theory where bridging between disciplines occurs, and a combined learning experience is delivered to the student. This enhances the level of understanding and deepens the assimilation and retention of knowledge.

Reflective Approach

In the reflective approach, the teachers revisit their methods of teaching and modes of delivery, aiming at improvements and alignment with student requirements.

Setting the Bar Higher

Instigating evidence-based effective methods such as goal-directed learning, collaborative, case-based, and project-based learning, constant motivation of students, and providing regular targeted feedback help students of the virtual platform thrive.

A multitude of teaching techniques can be adopted to convert remote learning from passivity to an active process emanating interaction, interest, and nurturing critical thinking.

Online presentations are considered an effective mode of conveying ideas. Since 65% of the population is considered to be visual learners, creative and thought-provoking slide presentations could enhance the retention of facts. The tools that could be utilized are Microsoft PowerPoint, Google slides, and Slide Share.

The virtual whiteboard is an ideal alternative for those who miss the conventional blackboard. This could be utilized for interactive teaching with flow charts, images, mind mapping, etc.

Live-streaming of the lectures can also be carried out in an attempt to instigate a 'personal touch, though virtually. Constant feedback could be sought from the students, and the teaching methodology could be altered to cater to the requirements of the students. Delivery must occur in bite-sized portions to ascertain the unwavering attention of the pupils.

Zoom, Microsoft Teams, and Google classroom are the examples for some online platforms with an array of attributes for conducting virtual classrooms.

Much interactive software is available to arouse interest in the student and interrupt the monotony. Kahoot, Mentimeter, and padlet are the examples for such software. These applications provide an enjoyable learning experience while simultaneously enhancing student-centered learning.

Video conferencing tools could be useful for game-based teaching. Questions could be conveyed via the chat option.

Group discussions and debates provide opportunities to mitigate the sense of isolation in remote learning. These promote interaction and virtual socializing among the students.

Self-studying can be encouraged by assigning topics for students to engage in on their own. Evidence suggests that top scorers perform a significant amount of self-studying, which augments the integration and retention of knowledge concurrently promoting the exploration and discovery of appropriate study methods.

The 'Flipped classroom' concept is a very effective online teaching modality where the students review study material and attend well-equipped with knowledge for the lesson. Pre-recorded videos, reading material, and web links for resources can be provided in advance. 'Flipped classroom' can be implemented via group discussions, polls, quizzes, mind mapping, word clouds, infographics, problem-solving activities, debates, etc.

Embracing Innovation

Innovative and tailor-made teaching and learning methodologies can be adapted to cater to the diverse student population. Constant experimenting could be executed on various remote delivery approaches. Utilizing several methods in unison enhances the efficacy of disseminating knowledge concomitantly, ensuring the rapt attention of the students.

Recently, an innovative teaching method consisting of Self-study, Test, Question, and Discussion (STQD) (Figure 5) was practiced in a Native Medicine University in China with impressive results[4]. It comprised self-learning, peer-learning, co-learning, active learning, inductive teaching, and formative assessment to enhance student-centered teaching in pharmacy education.

The final assessment at the end of the four-year course revealed students' average scores in an STQD class to be higher than the students' average scores in a traditional class. Also, most students indicated that the STQD approach had improved their learning and communication abilities while facilitating retention.

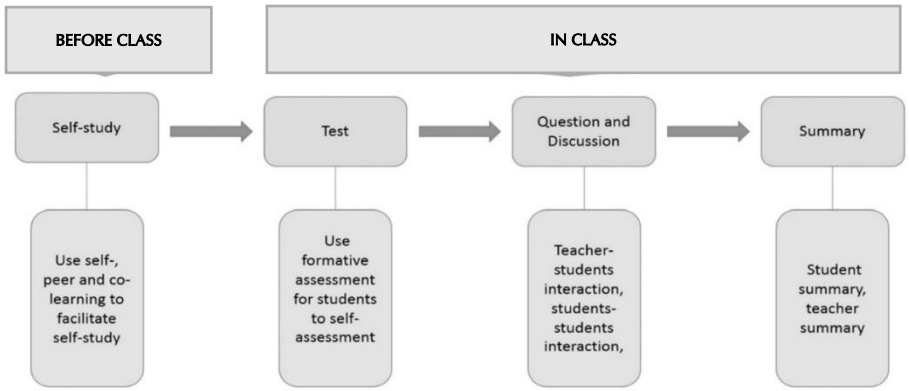

Figure 5: Schematic Illustration of the Novel Student-Centered Teaching Method (STQD)[3]

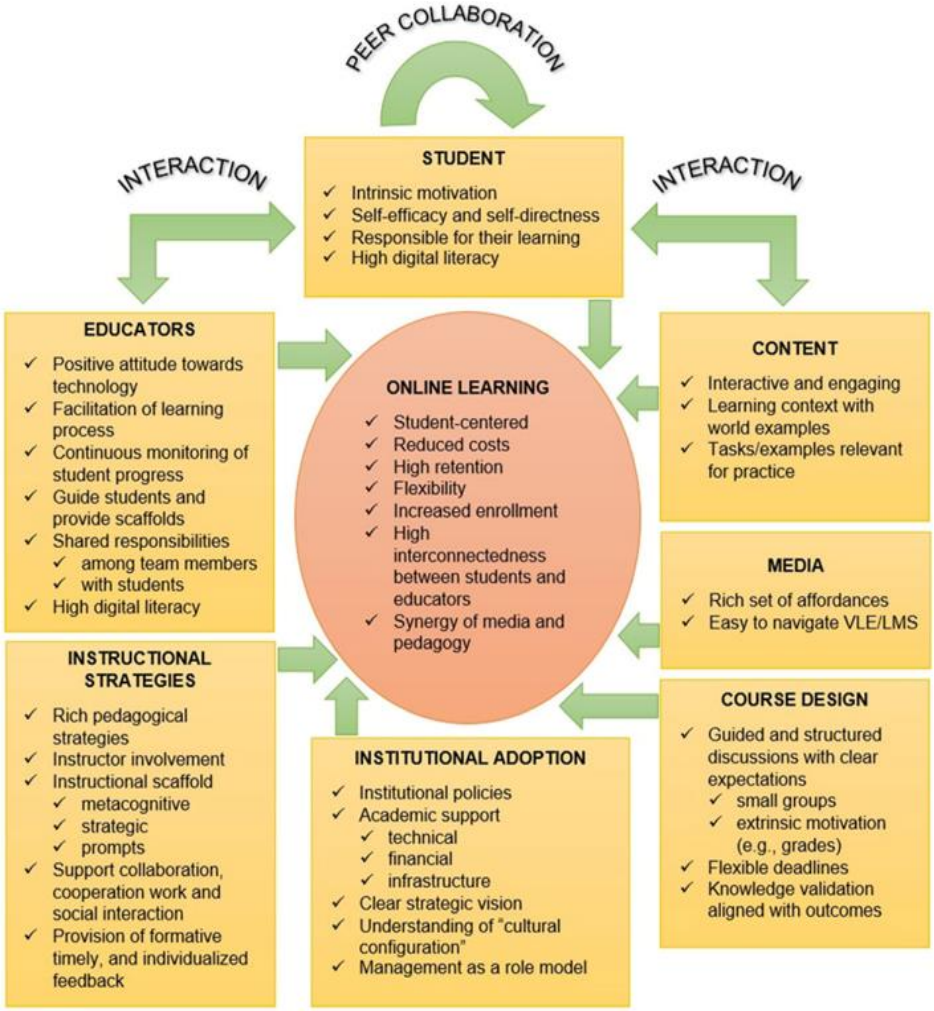

Figure 6: A Conceptual Diagram of Online Learning Settings[4]

Way Forward

Remote learning, with all its lucrative returns, can be termed a bare necessity in the current era. It is indeed a treasure trove and an asset of modern technology. The online teaching portal has paved the way for seemingly impossible new avenues, expanding the horizons of education. Though still a developing nation, all possible measures should be implemented in Sri Lanka to convert the virtual platform to a steadfast, effective, and established pinnacle where education of all facets could be entertained, facilitating students to reach remarkable heights.

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1 Subashini, N., Udayanga, L., De Silva, L.H.N., Edirisinghe, J.C., & Nafla, M.N. (2022). Undergraduate perceptions on transitioning into E-learning for continuation of higher education during the COVID pandemic in a developing country: a cross-sectional study from Sri Lanka. *BMC Medical Education*, *22*(1), 1–12. https://doi.org/10.1186/s12909-022-03586-2

2 Singh, P.S. (2016). Management Factors Affecting Academic Performance of Students Priya Singh Professor, Faculty of Management Studies, Gurukul Kangri Uni- Research Scholar (JRF), Faculty of Management Studies, Gurukul Research Scholar, Faculty of Management Studies, *Indian Journal of Research*, *5*(4), 176–178.

3 Meng, X., Yang, L., Sun, H., Du, X., Yang, B., & Guo, H. (2019). Using a novel student-centered teaching method to improve pharmacy student learning. *American Journal of Pharmaceutical Education*, *83*(2). https://doi.org/10.5688/ajpe6505

4 Castro, M.D.B., & Tumibay, G.M. (2021). A literature review: efficacy of online learning courses for higher education institution using meta-analysis. *Education and Information Technologies*, *26*(2), 1367–1385.

CHAPTER 4

Managing Teaching-Learning Environment to Spur Students' Achievements

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Introduction

Education, especially higher education, plays a critical role as it overlaps with the societal interests and development goals of a country. The evolution of higher education on par with the socioeconomic dynamics of a country is crucial in establishing a skillful labor force and hence in the development of the country. Innovative strategies in higher education could facilitate the emerging requirements expected in the labor force for a sustainable development. The Asian Development Bank has pointed out the aspects of Higher Education that need further development with respect to Sri Lanka[1].

Statistical Evidence on the Evolution of Higher Education

According to the Sri Lanka University Statistics 2020, issued by the University Grant Commission Sri Lanka, the number of new admissions for general education has declined gradually over three decades which is evident by the fact that it was 387,314 in 1990 and 319,405 in 2020, while that of University education has been increasing from 7,152 in 2019 to 41,669 in 2020[2]. However, the percentage of students eligible for University Education from General Certificate Examination Advanced Level (GCE A/L) was 45.2% in 1990 with the percentage of admissions from the eligible group was 20.74%, while that of 2020 was 62.42% and 22.98%,

respectively. In 1990, the number of universities was nine, with 32 faculties and 229 departments, which by 2020, increased to 15 universities, 109 faculties, and 675 departments. The increase of expenditure by the government on university education as a percentage was 1.16% in 1990 and 2.49% in 2019, and it was reduced to 2.08% in 2020. Statistics referred to the universities and higher education institutions established under the Universities Act show the evolution of higher education in Sri Lanka throughout the decades and bares testimony to the fact that higher education in a country should evolve with respect to numbers and quality with novel approaches to cater to the needs of students. Maintaining a good teaching and learning environment is one of the most important facts with respect to these aspects.

Challenges Faced by a Fresh Candidate

Transition from Secondary Education to Tertiary Education

The education system in Sri Lanka is arranged in such a way that primary and secondary education is more or less teacher-centred learning, and tertiary or higher education is more student-centred learning. During the initial phase of higher education, students show poor adaptation skills to this transition from teacher-centred learning to student-centred learning, making it difficult for them to have a smooth beginning. Transitioning from mother tongue to a second language, which is mostly English, further adds to this effect. Freedom and relative independence from family and lack of contact with the family further contributes to these issues. Being the top performers in secondary education, students find it challenging to keep their motivation for learning which results from the performance not amounting to their expected performance during the initial transition phase, which leads to a lack of interest in academic activities as a whole. The fact that during secondary education, most students have the goal of entering a certain university or a faculty but not a certain profession, gives them a sense of accomplishment of their goal by entering a university that ultimately hinders their perseverance for active engagement in learning.

Adverse Outcomes of Global and National Crises on Higher Education

The whole education system, including primary, secondary, and tertiary, were adversely affected by the turbulent environment experienced globally with the SARS-CoV-2 outbreak. Changes mark a crucial turning point in the education system of Sri Lanka, where the availability, accessibility and literacy of devices started to play a crucial role as the continuation of education was ensured through distance learning that required devices and internet facilities.

Being a developing country, Sri Lanka has reported an overall computer literacy of 32.3% in 2020, while the availability of a desktop or a

laptop computer in a household varied between 22%-23% between 2017 to 2020, as depicted by the data of the Department of Census and Statistics, Sri Lanka. This invariably led to a point where access to learning as well as the quality of teaching was affected by the socioeconomic status of mainly the learner and, to some extent, by the teacher, respectively. The economic crisis in Sri Lanka, with a major impact on public transport, further aggravated the circumstances of the post-pandemic period and almost collapsed the education system that was regaining its pace following SARS-CoV-2 pandemic period. The mental stress and the psychological impacts of the crises affect both the teacher and learner in their performance.

Thus, maintaining a quality teaching and learning environment through novel approaches was warranted in order to maintain a student-friendly environment that helps the students to spur their achievements.

Teaching and Learning Environment

With the novel trends in education, the teaching and Learning environment could not be simplified to a particular venue such as a lecture hall, a faculty or a University in particular or else to a platform such as real or virtual as in zoom; which is currently the most popular online platform. It implies a complex impression gradually developed within the mind of the student as a result of his or her interactions with their teachers, peers, and surrounding. The ability of those interactions to ensure the growth they expect not only as a professional but also as a person is also a component of the teaching and learning environment.

Modifications to the Existing System as a Novel Approach

In order to ensure their trust in their learning environment, addressing the issues of the transition period is crucial. A student who trusts his environment will be more oriented towards his goals, and this invariably will raise the standards of the teaching environment as well. The interventions to make a student more comfortable and goal specific during the initial days of their higher education will raise their enthusiasm and positively contribute to the teaching and learning environment by ensuring students' perseverance to spur their achievements.

In this regard, having a friendly and collaborative student-teacher interaction is most important during the initial phase of higher education. This could be achieved by appointing a teacher as a mentor for every student. This approach could be strengthened by maintaining a favorable student-teacher ratio. However, according to Sri Lanka University Grants Commission statistics 2020, even though the number of university teachers, including temporary and probationary lecturers, has increased in number from 2,040 in 1990 to 7,258 in 2020, student to teacher ratio has also increased from 13.9% in 1990 to 18.8% in 2020. This has to be addressed

by maintaining a favourable student-to-teacher ratio in order to cater to the needs of the students.

Further strengthening of the mentoring program could be ensured through the evaluation of the program at regular intervals concerning student feedback. Following the appointment, students should be allowed to request a change in their mentor, provided justifiable reasons are pointed out for the change. Near-peer support through temporary lecturers could be of immense importance with the possibility of students being more open to temporary staff than permanent academic staff considering the comfortability of disclosing their drawbacks that according to them, might affect their developing career. Online platforms such as "MentorMe" or even social media platforms such as "WhatsApp" and "Viber" could be made used to create student groups where students who face similar adversities share their drawbacks as well as the adaptations that they adopted to overcome the hardships.

Orienting the students about their careers through a career guidance program at university enrollment will help them set goals for their higher education period. This help the students to identify the areas of importance that are relevant to their future career interests and help them be more active in achieving their goals and be more goal specific. In a period of turbulence, maintaining the interest of the students in their carrier at the very beginning is the most crucial fact to ensure student enthusiasm which invariably will improve the quality of the teaching and learning environment.

Students should also be educated about the importance of research for their carrier at enrollment, and they should be given an idea about research, from choosing a topic to methods of publication. So that those who are enthusiastic about research could engage in research activities from the beginning of their higher education. These procedures will indirectly assist in uplifting the standards of the university.

Improving English language proficiency and computer literacy are of immense benefit in order to maintain smooth and continuous teaching and learning platform during an era of crisis.

Novel Approaches in Managing Teaching and Learning Environment

The "United Nations Global Compact Model in Higher Education" is a flexible model that could be used as guidance in organizational changes to corporate sustainability. This is a vicious cycle of committing to, assessing, defining, implementing, measuring, and communicating institutional sustainability.

The Role of the Teacher in the Teaching and Learning Environment

The development of learner attributes is a significant factor that should be considered in an effective teaching and learning environment.

This helps the learners to be creative professionals working in a collaborative culture.

Understanding is a construction built up in a learners' mind, and in order to develop a learner`s mind, the existing mentality has to be challenged and extended. This could be done gradually by initially assessing and establishing their level of understanding and then to challenge it methodically in a stepwise manner. This is the area of challenge an individual could achieve with the help of another skilled person. This method describes as scaffold learning, the "zone of proximal development" that will help the learner adapt and inculcate changes concerning the professional they will become one day[3].

Current circumstances nationally as well as globally warrant the need to direct the students towards more student-centered learning, provided they are guided with a set of objectives and assessed at regular intervals to ascertain their progress. The sources of reference are instructed, and students are given a set of objectives to be achieved within a given time frame. This method of active learning where the learners are not the mere passive recipients of teaching but the actively engaged party in learning, is an important practice with respect to medical education as medical professionals should be lifelong learners to update themselves of the novel approaches that come into the practice for the management of various clinical conditions.

After modification of the role of a teacher to be more or less of a "guide", the strategy of teaching must be revisited. The usual methods would be individual-designed learning activities, group work and activities that involve the whole-class. In all these aspects, the key element would be the quality of engagement of the learner. In the current situation where most of the institutions adopt a virtual platform to ensure continuity of education, the method most affected would be group work and the development of skills such as interpersonal skills, teamwork and leadership skills will be severely affected. This could be addressed to a certain extent by the schedule of group activities in virtual platforms such as breakout rooms in zoom. The students are given a task such as critical evaluation of a segment of a research article and each student is asked to make a comment on the article while the teacher could visit the breakout rooms and observe the participation of the students. But virtual group activities lack the benefit of the development of adaptations in addressing a gathering, and more importantly, the opportunity to cope with performance anxiety is greatly hindered by this method. Another aspect impaired by virtual platforms is the collaborative problem-solving competency as collaborative problem solving requires teamwork where individuals productively work towards shared goals. This could partially be overcome by working in collaboration with other departments to organize a scheduled number of days for group work per semester or module and to conduct them in consecutive days giving the opportunity for

students to conclude in person activity of different departments during a single visit in person. In planning group activities, teachers should be able to understand the distinction between cooperation and collaboration as these are two different entities. During virtual activity where the whole class is involved, the attention and concentration of the students could be improved by active participation of the students to the session through questioning and through quizzes conducted by platforms such as "kahoot". The concept of smart classrooms could be adopted to increase the efficiency of the teaching platform be it real or virtual.

The students should also be explained about the importance of continuing their education despite the hardships and should be encouraged to propose their own methods and way outs for more customary student-teacher interactions. Social media platforms can play a significant role in this where the students could create a group including the teacher as a member and to post their questions for quick and easy reference of the teacher. Thus, modifications in the interactions between the teacher and learner depending on the circumstances plays a vital role in maintaining the teaching and learning environment.

Another important aspect in the strategy of teaching is to connect the learning to the real world where students realize the importance as well as the instances of applications of their knowledge. Encouraging students for reflective learning adds to the benefits of student-centered learning by creating opportunities for students to understand their progression. Furthermore, in designing the curricular, it is important for teachers to design it in such a way to ensure the cognitive, creative, and psychomotor development of the learner in such a way to support and apply learning attributes across curricular and co-curricular activities. A rich selection of co-curricular activities will ensure the opportunities to develop the interpersonal as well as intrapersonal skills of the learner. Ultimately, the teacher should play a supportive role so that it helps the students to learn how to learn.

The Role of Reflective Learning

The students should be made to understand that they too are active participants of the teaching and learning activities and their active participation in modifying teaching and learning environment must be encouraged and appreciated. With the turbulence in the society at present, the students should be encouraged to engage in self learning and reading, with reading techniques such as SQ3R technique; skimming, scanning, active reading, detailed reading, and structure-proposition-evaluation while introducing novel learning methods and providing the opportunity to customize the methods according to their needs[4]. The effectiveness of the methods adopted by the learner must be evaluated and the learner is given

the opportunity for reflective learning. The learner should understand themselves as learners in order to evaluate their own progress and should understand the nature of the knowledge they are gaining. They are given the opportunity to employ a range of strategies to overcome the challenges they face as a learner and an opportunity is created for them to share their individual experiences as learners. They should be given the idea that learner attributes are not mutually exclusive but are interconnected to each other[5]. The learner is guided to realize that their mistakes are not failures rather an opportunity to learn. With developing reflective learning skills, the learner will care about the learning of others and will understand that learning is social and collective endeavor. Students should be encouraged to be effective learners, who understand that learning is active that involves questioning, identification of barriers, identification of strategies to overcome barriers, evaluation, and change of their strategy when it does not work out. Learners should be given the opportunity to realize that passive learning is less effective compared to active learning and that understanding cannot be transmitted from a text or a person to the memory.

Interdisciplinary Understanding

This is another important aspect that has to be addressed through novel approaches of learning. Interdisciplinary understanding could be improved through a combined assessment method rather than questioning from the individual disciplines separately and emphasizes the importance of a holistic approach for appreciation of knowledge that provides new perspectives. The learner should be encouraged to realize that the applications of their knowledge would rather be in an integrated format than a separate individual format. For this to occur disciplinary understanding needs to be thorough and rigorous. Superficial coverage of the curricular could lead to confusion of the learner leading to lack of enthusiasm. In order to make the interdisciplinary understanding a success, the teachers of individual disciplines should work in collaboration. Curriculum coordinators play an important role in identifying effective and meaningful links that enhances interdisciplinary collaboration. Access to the course materials of other disciplines should be given to the teachers through a learning management system to help them get an idea about the existing knowledge as well as the methods that could be adopted to build up from the previously existing knowledge of the students.

Modifications to the Curriculum

A curriculum committee could revisit the curriculum at intervals to identify the aspects that need to be revisited to cater to the needs of current

trends in population. For an example in medical education, update of knowledge in a medical student about the diseases that are emerging at a particular point of time will invariably be an effective source of information and communication to the patients they come into contact with and through them to the society as a whole. This will automatically create a professional who meets the needs warranted by the society at the time of their graduation. This will further help them to identify timely research interests and to arrive at evidence-based conclusions.

For a course such as Bachelor of Medicine Bachelor of Surgery (MBBS) which runs ideally for five years and occasionally longer due to various social circumstances, the students should be given an alternative exit point to drop out if they wish to, offering them a reasonable degree for what they have learnt so far. One such example is the offering of a degree on human biology by the Faculty of Medicine, University of Peradeniya for the dropouts completing up to the end of the fourth academic year and unwilling to complete the final year professorial appointments. This would be of immense importance in a period of political and social unrest where the students might wish to leave their medical carrier due to the obligations towards their family. This will invariably improve the quality of medical graduates passed out from the faculties by giving an alternative opportunity for the students who continue to be in medical education for the sake of obtaining a degree due to the reluctance to leave university without a higher education degree but at the same time are not happy to cope up with the lifestyle and responsibilities of a medical professional as well.

A conceptual approach to various disciplines should be further encouraged. The combination of second order and substantive concepts will define the uniqueness of a discipline. The use of threshold concepts as a doorway for understanding a topic in a new way should be encouraged. Providing opportunities to identify and understand the key concepts of a subject help the learners to achieve a certain developmental stage of learning. Key concepts are crucial to link, review and put knowledge into context.

The curriculum should also be modified in such a way to give opportunities for the students to collaborate with international universities for them to gain a diverse array of experiences. This experience enhances the horizons of the students.

Conclusion

Finally, modifications of current approaches followed by the implementation of novel methods will support a teaching and learning environment that will spur the students' achievements in a turbulent environment.

1 Asian Development Bank. (2016). *Innovative Strategies In Higher Education For Accelerated Human Resource Development In South Asia Sri Lanka*.

2 *11Sri Lanka University Statistics 2020*. (2020). University Grant Commission – Sri Lanka, https://www.ugc.ac.lk

3 Cambridge, T. (n.d.). *3. Approaches to teaching and learning*. 40–47.

4 Munna, A.S., & Kalam M.A. (2021). Teaching and learning process to enhance teaching effectiveness: a literature review. *International Journal of Humanities and Innovation (IJHI)*, *4*(1), 1-4. http://dx.doi.org/10.33750/ijhi.v4i1.102

5 Meng, X., Yang, L., Sun, H., Du, X., Yang, B., & Guo, H. (2019). Using a novel student-centered teaching method to improve pharmacy student learning. *American Journal of Pharmaceutical Education*, *83*(2). https://doi.org/10.5688/ajpe6505

CHAPTER 5

Maintaining Effective Engineering and Technology Education Amidst Crisis: Three Novel Approaches

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Engineering and Technology Education in Sri Lanka

The Sri Lankan state university system comprises seventeen state universities, of which six universities are engaged in engineering education. In addition to faculties of engineering established in the country, newly established faculties of technology also aim to produce technology professionals to work in engineering-related fields within the country and overseas. Being professional courses, engineering and technology degree programs focus on producing industry-ready personnel with not only adequate theoretical knowledge but also practical knowledge as well. Therefore, these programs have been designed to engage students in a broad spectrum of activities reflecting professionalism by the end of their degree program.

However, carrying out such programs requires intense use of resources such as laboratory facilities, enhanced lecture rooms, qualified lecturers, and collaboration with the industries. All these resources have been centralized physically at the universities allowing students to access them when they are at the university. However, in challenging times when it becomes infeasible for students to attend university physically, they may experience difficulties engaging in teaching and learning activities effectively. In order to minimize these adverse effects while ensuring the programs deliver intended outcomes, conventional teaching and learning techniques should be updated.

Teaching-learning Techniques for Engineering and Technology Education in Sri Lanka

Numerous teaching-learning techniques are in use globally when it comes to engineering and technology education. However, not every technique is feasible to be adopted by Sri Lankan universities when the availability of resources is concerned. Adaptability gets narrower when the current situation in the country is considered, where teaching-learning activities have been severely affected by the pandemic as well as the economic downturn of the country. Under these circumstances, promising teaching-learning techniques for engineering and technology education in Sri Lanka are discussed below[1].

Project-based Learning

Project-based learning is one of the student-centred learning techniques that the pedagogical objectives are achieved by making students engage in exploring solutions to real-world problems[2]. In this approach, it is believed that the students gain deeper knowledge in subject areas through active engagement in trying to solve a real-world problem. For project-based learning, students should be directed towards problems which touch a broad spectrum of subject areas. The problems suitable to be used for this technique often are complex and require knowledge and understanding of more than one subject area. For better outcomes, students should be guided by an instructor with sufficient expertise in the field of work.

Project-based learning touches multiple levels of Bloom's taxonomy, where the latter part of an engineering or technology degree program reaches higher levels. Graduates of engineering and technology degree programs are expected to effectively apply their knowledge to solve problems once they get into the industry. Project-based learning improves the necessary skills such as analytical thinking, lifelong learning, critical thinking and even communication and team working, depending on the nature of the project. Engaging in finding solutions to real-world problems can drive the student intrinsically as the student directly experiences the difference they can make. In contrast to conventional teacher-led instruction, where the students passively listen to the instructor, project-based learning is more active as they get to apply their knowledge and see the results by themselves.

This technique is highly applicable for engineering and technology degree programs in Sri Lanka with the use of minimal resources. Students often can be assigned to a designated supervisor and directed towards finding solutions for existing real-world problems. This technique usually is student-centred; hence the student is the key player in the teaching-learning process. Guidance can be given to the students via online mode, which eliminates the necessity of face-to-face contact sessions. Such flexibility

allows this technique to be used even when the student and teacher are in remote locations away from the university.

Simulation-based Learning

Simulation-based learning is a teaching-learning technique where the real world is replicated in an interactive way with guidance. This is called an immersive technique where the learners can immerse themselves in the learning environment. Simulation-based learning enables students to gain experience with no responsibility to the real world. Even though choices made by students during the simulation-based learning process can be grave mistakes, they still do not have any bearing over the real world, thus giving freedom for students to explore the scenario more.

Common examples of simulation-based learning are pilot training using flight simulators (computerized) and training doctors using mannequins (physical). The use of these simulation tools allows the students to immerse themselves in the learning experience without jeopardizing the safety of other people, even when a bad decision is made. The same technique can be applied to engineering and technology education using computerized or physical simulated environments. This technique can be used to teach a number of courses which often require the use of resource-intensive physical sessions. Some courses where simulation-based learning can be adopted would be engineering design courses, automobile technology courses, communication technology courses, structural engineering courses, and workshop technology courses. In simulated environments, students can apply their knowledge to perform a given task. When combined with proper instructions, they can see the effects of each action on the given task in real-time. This lifts one of the main dilemmas faced by engineering and technology students: the confusion about where and how to apply their knowledge.

The use of computerized simulation environments for engineering and technology education seems to be more promising given the recent developments in the country where students are unable to attend university physically. Furthermore, minimal risk to resources when a simulated environment is used also makes this technique more suitable for Sri Lanka, given the limited funding for the higher education sector.

Virtual Learning Environment

A virtual learning environment is a web-based learning environment where the students are directed towards resources, activities, and interactions within the course. The learning environment can be created to be self-paced or to be completed within a specific time period. A course-specific virtual learning environment enables the course administrators to create course elements like learning materials, assessments, quizzes, and

interactive learning sessions. With the advancements of technology, tools like virtual laboratories, virtual reality, and augmented reality can be embedded into the virtual learning environment to enhance the learner experience and make teaching more effective.

Virtual learning environments provide a platform to continue students' education regardless of their physical location. Elements in the virtual learning environments can be designed to attract students towards the course and engage them in course activities more actively. Most of the courses offered in undergraduate engineering programs can be hosted in these virtual learning environments with instructions provided by the course instructors. Features available to use in these virtual learning environments allow students to grab even more complex course contents when effectively used. When interactive tools like virtual laboratories are incorporated into the learning environment, student engagement can be boosted while giving them opportunities to experience what they learn in a simulated environment.

Almost all Sri Lankan universities have widely adopted Learning Management Systems (LMS), essentially virtual learning environments. With all the infrastructure already in place, it should be feasible to augment the teaching-learning experience with slight modifications, such as the addition of modern tools like virtual laboratories and virtual reality. These internet-based education systems can be accessed by students anywhere in the country, eliminating the need for them to be physically present at the university. These systems are easily scalable thus class sizes can be increased with less to none additional resource requirements. In addition, these environments lay the groundwork for establishing massive open online courses that cater to a much larger user base. Students can continue their education with minimal resources; an internet connection and a device to access the internet.

Applicability in Challenging Times

The education sector should be resilient to the changes in the external environment. Sri Lanka experienced the adverse impacts of not having a resilient education system during the COVID-19 era. The education sector in the country remains severely paralyzed even though the immediate danger of the pandemic has already been mitigated. The higher education sector in the country is among one of the most affected due to the unprecedented escalations of the pandemic situation, where most of the universities are still not fully functional. The situation has become worse with the economic downturn of the country. This dysfunctionality stemmed from the high dependence on traditional classroom-based teaching-learning methods and the lack of innovative teaching-learning techniques. This approach has proven to be very resource intensive and unsustainable in the face of the COVID-19 pandemic and the economic crisis.

As soon as the pandemic hit, many developed countries in the world almost instantly changed their approach to teaching and learning while developing countries struggled. The success of such drastic changes depends on the availability of necessary infrastructure and resources and the resource intensity of the approach. For example, even though Sri Lankan universities could adopt online education relatively faster, simulation-based learning has not yet been sufficiently implemented. The main cause is the resource intensiveness of the two approaches; simulation-based learning being the more resource-intensive approach.

With the economic crisis and COVID-19, conducting classes physically has become a challenge. However, professional degree programs must ensure that the graduates bear the necessary qualities and competencies by the time they graduate. This means that the quality of engineering and technology education should not be compromised. The novel techniques discussed in this chapter can be easily adapted to be utilized in a distance learning setting where the students and teachers do not need to be in the same room. Simulation-based learning and virtual learning environments can be hosted on internet-based platforms allowing the students to access the courses regardless of their physical whereabouts. Project-based learning also can be moved online with the aid of new technological tools such as video and audio conferencing. This flexibility largely reduces the susceptibility of the higher education sector to external environmental factors.

Furthermore, virtual learning environments provide the ability for higher educational institutions to scale up educational activities with minimum resource utilization. For example, student enrolment can be conveniently managed and scaled up whenever needed when the teaching-learning activities are conducted online rather than physically at a university. The reason for this is to scale up physical classes a large amount of funds and resources are required to develop the necessary infrastructure. Combined with the virtual reality teaching technique, the students can still effectively engage in learning activities by immersing themselves in the same learning environment as they would physically at a university. The learning experience may be even better as the virtual environment can be augmented as needed. Modifications to the learning environment are also faster when compared to traditional place-based teaching and learning as making changes physically is time-consuming. In contrast, modifying a virtual learning environment can be done more conveniently.

When fully adopted, virtual learning environments and simulation-based learning can be more resilient to changes in the external environment. For example, at present, Sri Lanka's economic crisis has paralyzed public transportation. If the universities functioned under normal conditions following a traditional place-based approach during these times, it would impact student attendance. However, going online in virtual learning

environments minimize this issue making teaching-learning more resilient to the changes in the external environment.

What Needs to be Developed to Fully Adopt these Techniques?

Despite having largely adopted online education in the past couple of years, the higher education sector in Sri Lanka still needs modifications to allow it to be more resilient to the external environment while maintaining quality.

Adequate infrastructure is essential for the success of the teaching-learning techniques discussed in this chapter. Even though basic requirements have been met by most of the universities, they are still not sufficient to fully adopt these novel techniques. There are times even the already existing infrastructure has proven to be insufficient to sustain the present level of teaching and learning activities. These infrastructure facilities include high-performance servers to host courses and teaching learning activities, reliable internet facilities and power supply to keep the learning environment functional, advanced programming to incorporate new tools into the learning environment. Full functionality can only be expected when these infrastructure facilities are available. However, even during a time of economic downturn, this is not infeasible given the sustainability of the education system in the long run with the minimum fund and resource utilization.

In addition to the infrastructure facilities to support the learning environment, courses and assessment methods need to be redesigned in a suitable way to be adopted to the novel techniques. Courses should be redesigned to retain student engagement and meet the intended learning outcomes even when the mode of delivery is changed. Traditional assessment methods may not be best suited to evaluate the students when novel techniques are adopted for teaching and learning. Academics should explore potential assessment methods that can still reflect students' competence and knowledge in a specific course.

Above all, the attitudes of students, teachers and society should change to embrace these new techniques. Students should be responsible when engaging in learning activities. Teachers should be willing to make a commitment to developing the learning environment even if it means going out of the comfort zone that everyone is used to. The attitude of society towards new educational techniques also plays a crucial role in the success of the education system as a whole.

Effect on Enhancing Students' Achievements

The effectiveness of remote education has become a major concern as almost all the state universities shifted towards online teaching following the developments of the pandemic situation in Sri Lanka. It has been

questioned whether the students are able to perform in this new learning mode as they would if teaching and learning were carried out physically. Therefore, it is necessary to adopt teaching and learning techniques that ensure student performance is not compromised depending on the mode of delivery.

The project-based learning approach is a promising teaching-learning technique where the student is compelled to apply the knowledge to solve real-world problems. As a problem usually touches multiple subject areas in the engineering and technology field, a student engaging in a project has the opportunity to sharpen several technical skills such as engineering design, programming, use of state-of-the-art software and equipment as well as soft skills such as communication, analytical skills, and team working. Students with these skills are more likely to be successful even from the early stages of their careers. Furthermore, engagement in a project has proven to broaden a student's employability after graduation as industries are looking for talented individuals with a proven track record, even when recruiting fresh engineering or technology graduates. In a study by Gomez Del Rio and Rodriguez to assess the impact of project-based learning to enhance engineering design skills through a laboratory session, it was found that the project-based learning technique had a clear impact on the students gaining knowledge and design skills[3].

Simulation-based learning approaches also can be fine-tuned to develop the skills of students the same way project-based learning does. With the interactive and immersive learning environment, students get the opportunity to work with state-of-the-art technologies, including simulation software, which comes in handy when they work in the industry. Furthermore, students can be motivated for lifelong learning as course units can be made to be more interesting, allowing students to explore new boundaries. Such exposure would stem a sustainable research culture where student achievements are definite. Students trained to perform in these emerging educational environments will face no hardships even when they engage in higher studies in developed countries that have already adopted these techniques in their engineering and technology degree programs. A study conducted by Ruiz-Ramos et al. where the students in both graduate and undergraduate levels were tasked with using a commercial simulation software to design and analyse a biorefinery system it revealed that the students were very satisfied with the work. It was also noted that the undergraduate students gained more theoretical understanding of key concepts[4].

Maintaining Student Engagement

Online education is speculated to be less effective due to minimal student engagement. When students were interviewed, this conjecture

seemed to be true. Unlike a traditional classroom, students can easily get distracted when attending online lectures, which minimizes their engagement in learning sessions. The current economic situation makes things worse as students tend to engage in other activities, such as helping their families, despite having classes. When a student is not engaged in learning more actively, it is more likely for that student to miss essential learning points made out in course units. Hence it is imperative to maintain student engagement as much as possible. Otherwise, it becomes pointless no matter how good a novel learning method is.

One of the most effective ways to keep students engaged in learning is by making the space to immerse themselves in learning activities. Conventional teacher-led, one-way online lectures completely keep the student aside. Simulation-based learning can be one of the most effective techniques to keep students engaged in learning. As a simulation-based learning environment gives students space to actively engage in learning activities in an interesting way, they will be more likely to engage with the lecture and the teacher. When a simulation-based activity was used to design and analyze a hydraulic power system it was observed that almost all of the students actively engaged in the learning activity. They were very curious to explore many extra features and technologies available in the simulation software and even came up with more brilliant solutions at times. Furthermore, it was later revealed that the students continue to use such software and simulation environments in learning activities well after the said activity promoting lifelong learning.

The main reason for students being passive in learning is that they are not aware of how particular subjects or learning points make sense in their life. This can be alleviated by letting the students see the outcome of learning and letting them experience what they could become after engaging in relevant course units. Project-based learning is a proven technique to spur enthusiasm in students. When they are engaged in solving a real-world problem, they experience how their subject knowledge is applied in the world outside the learning environment. When they see something is being developed from scratch just because of their active involvement, students are intrinsically motivated towards self-learning. It gives them a sense of importance and purpose. Project-based learning can be implemented for students at any level in their program. When fresh intake students who did not have any subject-specific technical knowledge were tasked with a technical project, it was observed that they tended to learn by themselves and progress in their projects with determination. The situation remains the same for the students at senior levels as well. The outcomes of this approach may hold financial values or intellectual values, which further motivate students towards active engagement. Though this approach is very effective in terms of student engagement, the instructor should be aware that there can be instances where students lose interest and drop out from the course.

Hence the instructor should be careful enough to motivate the students time-to-time, clarify cloudy situations, and find help for students whenever they are in need.

Conclusion

In conclusion, novel approaches should be explored and adopted to effectively manage the teaching and learning of engineering and technology degree programs, especially during tough times such as economic recessions and pandemic situations. Implementing novel approaches is not as easy as maintaining them. It requires great effort, funding, time, resources, and, more importantly, positive attitudes of teachers, students, and administrators. Once implemented, the approaches can be very effective against common problems that arise not only during crisis situations but also during conventional place-based education. Novel approaches discussed in this chapter can be used as instruments to provide quality education and to produce well-qualified personnel from professional courses such as engineering and technology degree programs.

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1 García-Peñalvo, F., & Colomo-Palacios, R. (2015). Innovative teaching methods in Engineering. *International Journal of Engineering Education*, 689-693.

2 Guo, P., Saab, N., Post, L., & Admiraal, W. (2020). A review of project-based learning in higher education: Student outcomes and measures. *International Journal of Educational Research*, *10*(2020). https://doi.org/10.1016/j.ijer.2020.101586

3 Rio, T.G.D., & Rodriguez, J. (2022). Design and assessment of a project-based learning in a laboratory for integrating knowledge and improving engineering design skills. *Education for Chemical Engineers*, 17-28. https://doi.org/10.1016/j.ece.2022.04.002

4 Ruiz-Ramos, E., Romero-Garcia, J.M., Espinola, F., Romero, I., Hernandez, V., & Castro, E. (2017). Learning and researching based on local experience and simulation software for graduate and undergraduate courses in chemical and environmental engineering. *Education for Chemical Engineers*. http://dx.doi.org/doi:10.1016/j.ece.2017.05.001

Section 02

Empowering the Learner through Digital Transformation in a Turbulent Environment

CHAPTER 6

Digital Transformation in Education: Online Resources to Empower the Learner

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Introduction

Inclusive and quality education can be considered as one of the key determinants of sustainable development that can help lift people out of poverty and reduce inequality. The global outbreak of the COVID-19 pandemic has created a major crisis in education, potentially, the greatest ever of its kind, creating a global state of emergency. This has disrupted the lives of many students, teachers and parents all over the world. Many countries and governments, however, have taken progressive and creative measures to continue teaching and learning under the new normal scenario. Some international organizations such as the International Telecommunication Union (ITU), UNICEF and UNESCO have brought this issue to the forefront of their agendas while attempting to enhance the quality of connectivity, technology and access to new and advanced online resources. As a result of this situation and also as a countermeasure, the paradigm shift to online education was spearheaded.

Online learning, also known as e-learning, can simply be defined as the use of electronic media to deliver education[1]. More broadly, it is "the self-paced or real-time delivery of training and education over the internet to an end-user device[2]. However, different types of technology-oriented, delivery system-oriented and communication-oriented definitions of online learning could be found in the relevant literature.

Online Learning Tools

Many tools are used in online and distance learning, such as applications, programs and technologies. These resources improve the effectiveness and interactivity of the delivery of the teacher. On the other end, the degree of success of the student's access to the delivery and experience is enhanced. Three major types of online learning tools are;

1. Online Classrooms
2. Assistive technology
3. Applications

Online Classrooms

The rapid advancement of technology and the recent global pandemic have compelled teachers and students to reach and utilize technology for teaching and learning more than ever before. Pulled by demand, numerous tools supplement the ability to share knowledge.

A conventional teacher would require a student to visit the library and refer to an encyclopedia or some other books. However, the modern student is not significantly dependent upon the teacher and has the ability to get involved in self-studying to a greater extent. Basically, three types of online classrooms have evolved.

1. Blended Classrooms
2. Flipped Classrooms
3. Virtual Classrooms

In a blended classroom, both face-to-face interaction and online teaching are involved. Many international universities utilise this mechanism to facilitate the learning of, especially, their international students to mitigate the adverse impacts of the closure of borders due to the pandemic. Once the borders are re-opened, these universities continue their degree programmes physically. In the case of a flipped classroom, the students are responsible for online learning through self-studying before the physical class. Thereafter, the projects, laboratory tests and activities will be conducted in the physical classroom. Virtual classrooms are fully offered online, where the teacher and the student never interact face-to-face.

Assistive Technology

Assistive Technology is any technology-driven solution that makes learning, working or living with differently-abled people easy and hassle-free. Elderly people and people with non-communicable diseases, gradual functional decline or mental health conditions such as autism and dementia also benefit from assistive technology. There are plenty of assistive technology solutions that enhance the learning process of such people.

Notepad is a type of receptive technology in which users can record colour-coded information to facilitate students with learning disabilities. Talking dictionaries which are not as expensive as computers or tablets, enable students to verify definitions and spellings. Listening to classic books and trending topics are made easy with popular audiobooks. This application is prominent among people with visual impairments.

Another form of the most widely used assistive technology is text-to-speech (TTS) software. They assist children with reading difficulties. Radio broadcast technology is used in FM systems where the teacher and the student can maintain a consistent sound level regardless of distance or background noise by using a transmitter microphone and receivers. Students with mobility issues, such as paralysis or problems with fine motor skills, can control a computer or any other smart device with a particular device in his or her mouth referred to as a sip-and-puff system. Moreover, proofreading software has been designed primarily for people with dyslexia, yet it can help people with learning disabilities make writing easier.

Students, parents, and teachers now have apparently unlimited tools at their disposal with the rapid advances in assistive technology, which enable academic and personal growth of students with special requirements.

Applications

Computer programs designed to carry out a specific task are known as application software. For the sake of the advancement of technology, teaching was continued hassle-free even under severe situations such as lockdowns. Zoom, Google Meet, Nearpod, VIPEr, Lulu, StudyBlue, Kahoot, Schoology, Quizizz, Evernote, Animoto, TeacherKit, SeeSaw, Socrative, and Slido are some of the most prominent applications utilized for teaching and learning.

Zoom

'Zoom' is an intuitive, secure and scalable choice for educational institutions such as universities, colleges and schools, large enterprises, small businesses and individuals. It is a fully pledged solution for collaboration and distance learning, allowing frictionless video and audio communication. The software developers kept adding features that offer an exhilarating experience for the end user. These striking user-friendly attributes have penetrated the market at a rate of 2 900% by 2022 compared to 2019. Statistically, there were 300 million users of Zoom worldwide by the mid of 2022 when compared with 10 million users in 2019[3]. Some salient features of Zoom include;

1. High-quality HD video and audio can be streamed.
2. Cross-platform messaging via browser client, desktop client and mobile client.

3. Instant messaging.
4. End-to-end encryption and a higher degree of security as it can be signed in only via a Google account, a Facebook account or SSO with a Zoom account.
5. Built-in scheduling of meetings and the ability to send invitations via the application.
6. Pairing with calendar apps such as Outlook or Google Calendar.
7. The ability to record the meetings on a local computer
8. Meeting reminders on a mobile app.
9. Safe driving mode, which enables successful meeting participation while in transit.
10. Aesthetics such as light and dark sidebars and virtual backgrounds which enhance the experience.
11. The ability to remotely control the participants.
12. The ability to record and save the meeting, the chat and the whiteboard.
13. File sharing to a group or directly to a single user.
14. Other features such as polling, hand raising, annotation and co-annotation, screen sharing, multi sharing and breakout rooms.

Different versions of plans are available in Zoom to meet the customized requirements of its users. Basically, there are two types of plans: Personal and Business plans. Personal plans of Zoom are available as a Basic license, a Pro license, and a Business license. The following differences can be identified among these three types of personal plans.

Table 1: Personal Plans of Zoom

Criteria	Basic	Pro	Business
Price	Free	$149.90/user/year	$199.90/user/year
No. of Participants	100	100	300
No. of Hosts	1	1-9	10-99
Time limit per session	40 Minutes	30 Hours	30 Hours
Cloud Storage	No	5 GB	5 GB
Whiteboards	3	3	Unlimited

Source: https://zoom.us/pricing

Business plans of Zoom are available as a Basic license, a Pro license, a Business license and an Enterprise license with following features.

In addition to the aforementioned features, the Basic version of zoom has the following limitations compared to other plans.

1. Meetings cannot be recorded when accessed via a mobile device.
2. Live streaming to Facebook and YouTube is not available.
3. Have less control over managing end-users.

The crisis-driven economic and social transformation made zoom prominent among academicians and students. The convenience of accessing course materials and resources aroused the interest of students in learning. Further, students found it thrilling as it was a fresh learning experience. For some students, it was more comfortable than taking physical classes as they were offered more freedom and less guided behaviour. The motivation of students to ask questions and get clarification has improved significantly.

However, based on the quality of the connectivity and the sophistication of the device being used to attend Zoom classes, some students might have a bad experience with this application. Yet, this might not be the solution for some students who really enjoy the experience of a physical class. Even though some recent studies argue that students perceive Zoom to exert some adverse impacts on their learning experience and motivation to learn[4], it remains the best application in terms of convenience and affordability among university students[5].

Table 2: Business Plans of Zoom

Criteria	Basic	Pro	Business	Enterprise
Price	Free	$149.90/user/ year	$199.90/user/ year	Customized
Participants	100	100	300	1000
No. of Hosts	1	1-9	10-99	50+
Time limit per session	40 Minutes	30 Hours	30 Hours	30 Hours
Cloud Storage	No	5 GB	5 GB	Depends
Whiteboards	3	3	Unlimited	Unlimited
Managed Domains	X	X	√	√
Company Branding	X	X	√	√
Zoom Phone	X	X	X	√
Zoom Room	X	X	X	√
Conference Room Connector	X	X	X	√

Source: https://zoom.us/pricing

Google Meet

This is another video conferencing solution similar to Zoom developed by replacing Google Hangouts, Google Chat and Google Duo. This is the second most prominent virtual meeting platform in the world[6]. This application limits the maximum participant capacity per session to 250, even in a paid version. The free version of Google Meet limits hosting time to one hour, whereas in paid versions, the maximum time limit is up to 24

hours. The breakout room facility and recording facility are available only on paid plans. Built-in whiteboard as of Zoom is not available but is available with Google Jamboard. In Google Meet, separate Chrome extensions are required for meeting filters and meeting transcripts, whereas in Zoom those are built-in facilities. Hence, the popularity and market penetration of this application is lower than that of Zoom.

There are other similar video conferencing tools, such as Microsoft Teams and Skype, which have been remarkable market growth since the Global pandemic in 2019. However, these are not much popular when compared to Zoom and Google Meet.

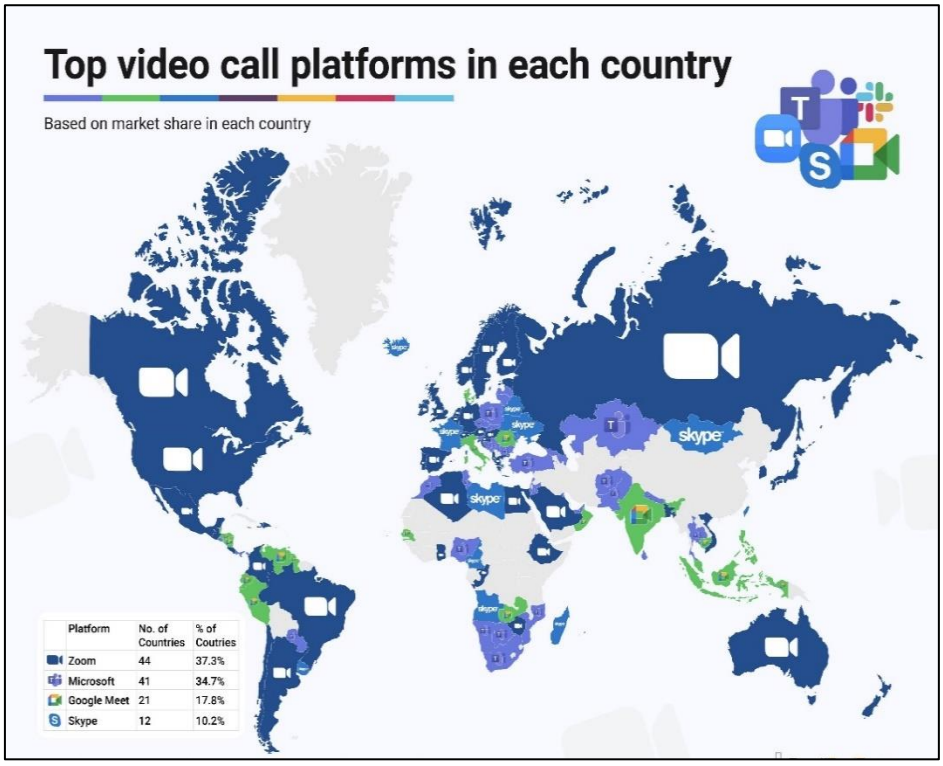

Figure 1: Top Video Call Platforms based on Market Share of each Country

Source: https://www.digitalinformationworld.com/2021/04/top-video-call-platform-by-market-share.html

Nearpod

This is another, yet very interactive solution specially designated for virtual teaching. Probably, the best resource out of the available resources for distance learning as far as formative assessments are concerned. It enables the teacher to create interactive presentations, which may also include collaborative boards, quizzes, videos, polls, open-ended questions, matching pairs, drawing activities and many more. Self-assessment of

students is also available by way of a traffic light system. Students with visual impairment are facilitated in this application. Nearpod can also be used as an alternative to other presentation tools such as Powerpoint or Google Slides. Teachers who use Nearpod have access to a library of pre-made resources by reliable subject experts, thereby reducing the workload of teachers.

Other Resources

There is a platform called 'VIPEr' which is a specially designated pedagogical electronic resource for the collaborative development of learning materials and their dissemination to the wider community of inorganic chemistry. It also acts as a repository and leading disseminator of the best practices of the field.

There is another resource called 'Lulu' which is a platform for self-publishing of books which enables users to publish their books, print-on demand and distribute.

'StudyBlue' is another innovative resource for online studying specially developed to enable school and college students to have their own deck of electronic flashcards developed by experts relating to the subjects or courses they take. In the repository, there are over 500 million flashcards. These flashcards can be used as short notes and referred to at any time from any location.

Another powerful tool which can be utilized in making notes is 'Evernote'. This application is useful for teachers and students in creating notes by way of text, audio, drawings, photographs and saved web content. Those who do not represent the education sector, such as entrepreneurs and executives can capture and arrange their ideas, involve in task management and archiving.

'Kahoot' is a game-based education platform which entails user-generated multiple choice questions. A teacher can use this platform to make learning more interesting and fun. Group activities can also be arranged with the use of this application.

Another similar gaming platform is 'Quizizz' which can be used in class, group assignments, pre-test review, formative assessments and pop quizzes.

In addition to teaching and learning solutions, there are Learning Management Systems (LMS) which provide tools to manage classrooms on cloud-based platforms. Schoology is such a web content management system which facilitates virtual learning. Google Classroom is a similar, blended learning platform specially designed for educational institutions. The pandemic-driven global Learning Management System (LMS) is experiencing the highest-ever annual growth rate of 19.1% compared with an average annual growth rate of 5%[7] prior to the pandemic.

Due to these unprecedented and influential innovations, the digital learning industry has grown exceptionally by 900% since 2 000, and it is recorded as the fastest-growing industry in the education sector[7]. Further, it is astounding that E-learning has increased student retention rates by 25% to 60%[7]. All in all, these affirmative tendencies will positively and significantly impact achieving sustainable development goals by 2030.

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1 Koohang, A., & Harman, K. (2005). Open source: A metaphor for E-learning. *Informing Science*, *8*, 75–86. https://doi.org/10.28945/488

2 Lee, T., & Lee, J. (2006) Quality assurance of web based e-Learning for statistical education. In Compstat 2006: Proceedings in Computational Statistics; Rizzi, A., Vichi, M., Eds.; Physica-Verlag HD: Heidelberg, Germany, 2006; pp. 429–438. https://doi.org/10.1007/978-3-7908-1709-6_34

3 Woodward, M. (2022, July 25). Zoom User Statistics: How Many People Use Zoom In 2022? https://www.matthewwoodward.co.uk/work/zoom-user-statistics/

4 Serhan, D. (2020). Transitioning from face-to-face to remote learning: Students' attitudes and perceptions of using Zoom during COVID-19 pandemic. *The International Journal of Technology in Education and Science (IJTES)*, *4*(4), 335-342. https://doi.org/10.46328/ijtes.v4i4.148

5 Minhas, S., Hussain, T., Ghani, A., Sajid, K., & Pakistan, L. (2021). Exploring Students Online Learning: A Study of Zoom Application. *Gazi University Journal of Science*, *34*(2), 171–178

6 Novak, J., & Bottorff, C. (2022, July 30). Google Meet Vs. Zoom. Forbes: https://www.forbes.com/advisor/business/software/google-meet-vs-zoom/

7 Forbes, Wire, B., Kpmg, LinkedIn, Ibm, Belitsoft, Bersin, J., Hall, B., Elearningbrothers, Shift, Weekly, C., Mag, T.R.G., Statista, Markets, R. &, MarketResearch.com, Technavio, BI, F., Francis, T. &, E-Estonia, … Jise. (2022, September 23). *100 essential E-learning statistics for 2022 - e-student*. E. https://e-student.org/e-learning-statistics/

CHAPTER 7

Distance Mentoring in Higher Education

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The Transformation of Teaching Learning Process

The last two years starting from 2020, could be the most challenging and transformational period for all nations. The Covid-19 pandemic began to strike all over the world with a rapid spreading. Though the new coronavirus was discovered in Wuhan, China, in 2019, due to its enormous potential for infectivity, high mortality, and incubation period, the outbreak disrupted the world's economy. The director general of the World Health Organization (WHO), Tedros Adhanom Ghebreyesus, made his point that the virus would coincide with us for quite a while[1]. Social distance and isolation were the main preventive measures. As a result, human mobility and social gatherings were restricted or minimized due to newly imposed rules by the government and with self-controlled behaviour to not to meet up as previously practised. Countries and/or cities were locked down entirely to control the spreading of the virus.

The collateral damage from the Covid-19 pandemic has impacted individuals and society at large as a cultural and social crisis, apart from the exceptional impact on health. The higher education sector around the world was severely impacted and started taking immediate remedial measures to resume the teaching and learning process. Research aligned with finding alternatives to streamline higher education in an online platform. The sudden transformation of 'emergency online education' created an uncomfortable environment for the students as well as for the staff[2]. Students needed assistance and infrastructure to follow up on online modules, and at

the same time, staff had to face many challenges to cope with new technologies and delivery modes. University administration together with academic staff had to reinvent how to carry out campus operations. This issue arose mostly from the degree programs intended to offer as physical conduct. Universities had to consider all communities that depend on its environment and national and international students struggling with economic crisis[2].

Some of the Higher Education Institutes (HEIs) have been foreseeing the inconvenience of offering courses on physical platforms for a large community and issues in travelling overseas to follow their programs by foreign students, and the 'online education' models have been in practice for the last decade. Those HEIs were reaping their advantage by increasing their student interactions. However, the pandemic has opened avenues for other HEIs to deliver their courses online. As an alternative to physical student mobility, 60% of HEIs said that Covid-19 had enhanced their virtual mobility and/or online learning[2]. Indirectly, it encouraged the internationalization of some HEIs which were not visible previously in global presence. The below graph shows how Covid-19 has affected teaching and learning in higher education (Figure 1).

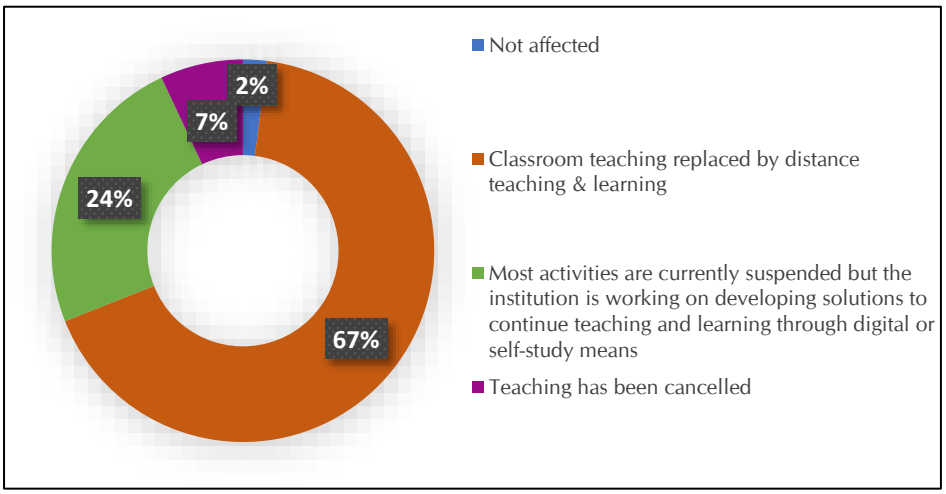

Figure 1. How Has Covid-19 Affected Teaching and Learning?

Note: The Figure 1 was taken from the report "The impact of covid-19 on higher education around the world" published by the International Association of Universities.

The transformation from the physical environment to online or virtual platforms enabled students to continue their higher education and secured their future well-being. Or else, learning losses could translate into fewer opportunities in higher education, less participation in the labour market and ultimately lower future earnings[3].

The Role of Mentoring in Higher Education

The term "mentoring" has been used to describe a variety of procedures that entail the growth of strong interpersonal bonds and effective communication, including coaching, counselling, advising, and teaching[4]. In other words, "mentoring is a protected relationship in which learning and experimentation can transpire; potential skills can be developed, and in which results can be measured in terms of competencies gained" [5]. Mentoring is an interpersonal relationship where one party provides guidance, direction, modeling of behaviors or approaches, information, or encouragement to others. The person who provides mentoring is known as the 'mentor' who has a high level of communication skills, is an expert in an interesting area, and has more experience to share with others. The party who receives guidance in the mentoring process is known as the 'mentee' who is typically new to the field and possesses less expertism. The mentee is also less familiar with an area of knowledge and seeks to be introduced into a greater community. Traditionally, mentoring is associated with in-person interactions with close professional relationships[4].

Benefits of Mentoring

As evidenced in many studies, the students engaging in their higher education benefitted from mentoring in various ways[6].

1. Mentoring fosters positive learning experiences for new students, boosting their potential
2. Students develop their global presence within their higher study timeframe
3. Aid students in becoming quickly accustomed to the facility and its surroundings
4. Encourage learners to pursue their goals

At the same time, mentors and the HEIs also get benefitted.

1. Improve the relationships and communication with students and the faculty.
2. Helps to manage the cultural diversity of the institution.

When considering the higher educational setup, it is always challenging with time-bound targets. In addition to academic work, students must engage in extracurricular activities to balance their mental and physical well-being. Students must be able to foresee future opportunities and credible targets throughout their learning process. The mentor is responsible for sharing the experience and directing the mentee on the correct path. Diluting bonds with the mentor might affect the disorientation of hopes of the mentee when he/she faces difficulties in performance. Close monitoring and mentoring always keep the mentee intact with the course. Face-to-face physical interaction in mentoring was believed to be the most promising

platform until the pandemic. Even though there is evidence of distance mentoring before the pandemic, it was not a hot topic. With the transformation of the teaching-learning process under distance learning platforms, distance mentoring also came in to play a significant role.

Distance Mentoring

As previously mentioned, distance mentoring is not a novel concept. This strategy was taken into consideration with the introduction of e-learning technology prior to the Covid-19 pandemic. Virtual mentoring, e-mentoring, and cyber mentoring are a few of the synonyms used for distance mentoring. Distance mentoring doesn't require physical presence and interactions. The advancement of technologies has provided different platforms that can be used for mentoring. Asynchronous mentoring enables students and mentors to speak on the phone and through other relatively affordable online tools, including websites, e-mails, discussion forums, blog entries, and chat rooms. Mentees can connect with the mentor at anytime from anywhere without any geographical barrier, and possible to build a 'virtual' mentoring relationship. Mentors can easily provide guidance, advice, and support by sitting on a chair and using the computer[7]. Distance mentoring is also possible in a synchronous fashion. This can be achieved using tools like webinars, audio and video through the internet protocol via Skype, Zoom, MS Teams, and Live chat. When applying synchronous mentoring, mentor and mentee meet live on an online platform. Therefore, mentoring is possible from anywhere in the world; however, it must happen simultaneously.

Distance Mentoring for Online Students

Mentoring students following online courses is an effective strategy that creates a favourable environment for their learning process. As discussed in previous topics, a higher proportion of students who are currently engaged in online learning were not intended to do so. They were originally joined for physically interactive courses, which were supposed to conduct at university premises. Those students might expect to interact physically with the community and gain experience and expertism. If there is not any platform to guide students throughout their learning process, it might adversely affect their individual performances. Mentoring generally covers the aspects of time management, instructional and academic skills, career opportunities, general campus resources, health, and well-being[8]. Therefore, distance mentoring plays a vital role in higher education.

Best Practices Support in Distance Mentoring

There are vital concerns when practising distance mentoring. All communication, interaction, feedback, and engagement with the

mentor/mentee rely on technology. Mentoring is a progressive relationship. This relationship starts and strengthens only by giving feedback to your mentee about how she/he handled a situation. Followings are the best practices a mentor must follow in a distance mentoring process[8].

- You should open your ears and willing to listen, and be patient with the back-and-forth communication as needed.
- You should be familiar with the shortcomings of various online modalities and be able to adjust accordingly.
- Make sure you understand the situation clearly.
- Always paraphrase what you heard from the mentee and clarify your perception by asking questions.
- Make sure you state your feedback and the message clearly and specifically.
- Speak out or state the problem from your viewpoint and confirm that mentee also identifies it.
- Propose tactics and strategies which bear positive answers for the problem which can be applied by the mentee.
- Focus on behaviors and actions that your mentee can follow now and, in the future, which will not rely on outside factors or conditions.
- Make sure that your mentee understands what you are proposing and that she/he feels confident in taking the proposed action. If there is no confidence, check out why not. You may have an incomplete idea about the situation, or the proposed strategy might not align with the mentee's personal style.

In each interactive session with the mentee, the mentor builds a rapport in a good or bad way. Therefore, it is important to use wise words as much as possible. Taking the time and taking full advantage of writing or speaking helps avoid mistrust. If the mentoring process happens in a synchronous meeting platform, care must be taken to choose correct eye contact and facial expressions[8]. After the mentoring process, it is a must to have a follow-up questionnaire to clarify whether the mentee had received the promising solution for the problem answered.

Tools for Distance Mentoring at HEIs

As described earlier, distance mentoring is possible either in asynchronous or synchronous media. Apart from what is generally available, HEIs practice different models to mentor students engaging in higher education. It is a customizable and area-specific approach. The HEIs maintain online platforms to engage with students to provide answers and advice whenever required. Examples include specific websites that automatically adapt to various situations, social networks with thematic communities, and training and motivating webinars.

Training and Motivational Webinars

Almost all HEIs who already engage in the distance teaching and learning process has initiated training programs via online platforms i.e., Zoom, MS Teams, Google Meet etc. There are many tools which could use to interact with students throughout the program. For example, 'Mentimeter' interactive presentation software could be used to get answers for different pre-set questions, make word clouds, and take polls. 'Kahoot' is another such example where you can make interesting games to get students' answers. All these options are most suitable when mentoring a large audience. Conducting webinars with subject experts and people who have already won their personal goals is another approach practised by HEIs. Thereby, the institute is trying to open the eyes of the students by showing the career paths available after their graduation and live examples of people who are already there.

Thematic Communities in Social Networks

This is a common practice in most HEIs. One such mode is a database maintained by the institute to collect information on alumni students and subject experts who are involved with the HEIs. A bridge is created between these people and students who are currently engaged in their academic programs. Such platforms can facilitate students by enabling mentoring in the form of answering uprise problems by experts and providing continuous guidance and advice to students. Social networks help to create the media of interaction. Creating Facebook groups, WhatsApp groups, and Writing Blogs are such examples.

Automized Websites

Some HEIs keep a separate website just for online mentoring. Every request for mentoring is treated as a distinct case. It offers a step-by-step approach to problem-solving, numerous iterations to explain the issue, a variety of communication channels, and multiple answers[9]. There is no "one proper answer", so this is merely a potential option. Coupling a chatbot and mobile app for distance mentoring is an extension of this approach. The University of Zurich looked into whether using a chatbot as a mentor for personal development could cause changes in the user's character and behaviour[10]. In that investigation, a mobile app performed the mentoring function for ten weeks. They posed questions about health and life values and provided development advice. The results revealed that an automated conversational agent's coaching intervention significantly increased user motivation. As a result, the study demonstrated that machine mentoring could substantially ease the process of distance mentoring.

Possible Applications of Distance Mentoring at University

Throughout this chapter, it supports evidence for the importance of distance mentoring in HEIs. However, the HEIs must conduct deep analysis to identify the possible places and situations where this could be practised. It can be planned in an organized manner by considering different stages passing by the students in their higher education career[11]. Mainly there are three levels such as pre-entry level, undergraduate level, and post-entry level.

Pre-Entry Level

To ensure a better career path, it is important to streamline students before entering the HEIs. Distance mentoring can be practised by allowing potential students to have a great idea of the courses offered by the HEIs and the benefits they will receive after graduation. Since the possibility of following courses online from various destinations, above mention tools can be used to initiate pre-entry level mentoring. After having a broad idea and being equipped with relevant skill sets according to the mentoring gained at the pre-entry level, the students are well equipped to follow the course in full strength. Then they have a clear idea of goals and objective that needs to be achieved during their higher education journey.

Undergraduate Level

Distance mentoring can be done at the university level. Since most of the contact sessions or all of them are restricted to online platforms, it is very difficult to observe each student in close contact. Peer mentoring is almost impossible since students join sessions individually from their home place. Distance mentoring allows the mentor to identify the potential of the mentee and the problems they encountered. There is a great possibility to align the mentee on the correct path and follow up the progress through the distance mentoring process. If any student is seeking expertism where she/he is not good at, it is possible to allocate a few mentors from different disciplines to mould their future in particular fields.

Post-Entry Level

Distance mentoring is a promising method at the post-entry level in higher education. It can bridge subject expertise from different professions, share knowledge, and get advice from professionals already in the industry. The HEIs can keep track of students and their performance in the industry after graduation. If any student is struggling with identifying career opportunities or getting recruited by a company, distance mentoring could be helpful in identifying their strengths and weakness. Possible solutions can be proposed by the mentor who comes from the same industry as an expert.

Therefore, distance mentoring is a reliable approach in the present higher education system.

Summary

Distance mentoring has become a hot topic with the strike of the Covid-19 pandemic. Though it was not a new approach, its application and usage frequency increased with the improvements in the online teaching-learning process in higher education. Distance mentoring does not demand physical meetups and time and place independence. Mentoring can be conducted via asynchronous and/or synchronous platforms. There are best practices to follow by the mentor in the effective distance mentoring process. Both mentor and mentee must understand the shortcomings arising from online modalities and bear it patiently throughout mentoring. There are different tools applied by HEIs for distance mentoring purposes. The level of knowledge of technology also plays a vital role in experiencing a smooth mentoring process. The HEIs must identify the different stages to apply distance mentoring for the students who are following higher education in an online platform.

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1 Jinjin, M. (2020). Research on the impact of covid19 on global economy. *IOP Conf. Series: Earth and environmental science* (p. 546). Incheon: IOP Publishing. https://doi.org/10.1088/1755-1315/546/3/032043

2 Marinoni, G., Land, H.V., & Jensen, T. (2020). *The impact of covid-19 on higher education around the world.* Miollis: International Association of Universities.

3 Donnelly, R., Patrinos, H.A., & Gresham, J. (2021). The impact of covid-19 on education – recommendations and opportunities for Ukraine. *Opinion*.

4 Klasen, K., & Clutterbuck, D. (2002). *Implementing mentoring schemes: a practical guide to successful programmes.* Oxford: Elsevier Butterworth-Heinemann.

5 Collins, C. (2009). A method for encouraging the development of good mentor protégé relationships. *Teaching of Psychology*, *16*, 80-128.

6 Macías, A.V., de Miguel, C.R., Jiménez, E.G., & Rodríguez, S.R. (2004). Innovación en la orientación universitaria: La mentoría como respuesta. *Contextos educativos*, *6*, 87-112. https://doi.org/10.18172/con.530

7 Single, P.B., & Muller, C.B. (1999). Electronic mentoring: Issues to advance research and practice. *International Mentoring Association Annual Meeting* (pp. 234-250). Atlanta: GA.

8 Ko, S., & Zhadko, O. (2022). *Best practices for mentoring in online programs.* New York: Taylor and Francis Group. https://doi.org/10.4324/ 9780429434754

9 Belolutskaya, A.K., & Shcherbakova, T.V. (2022). Opportunities and tools for distance mentoring at university: "MCU - your mentor" platform. *European proceedings of educational sciences* (pp. 3, 1-310). Chiang: European Publisher. https://doi.org/10.15405/epes.22043.2

10 Stieger, M., Nißen, M., Rüegger, D., Kowatsch, T., Flückiger, C., & Allemand, M. (2018). A smartphone- and conversational agent-based coaching intervention for intentional personality change: study protocol of a randomized, wait-list controlled trial. *BMC Psychology*, *48*, 1-15. https://doi.org/10.1186/s40359-018-0257-9

11 Watson, S. (2006). Virtual mentoring in higher education: teacher education. *International Journal of Teaching and Learning in Higher Education*, *18*, 168-179.

CHAPTER 8

Blending Traditional and Novel Teaching Approaches to Spur Students' Achievements in an Online Learning Environment

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Introduction

Higher education or post-secondary education is an optional formal learning stage after secondary education. The oldest history of higher education extends to 3000 BCs, per an extant Egyptian papyrus. Since that point in known history, higher education has been subjected to many changes to suit the era's requirements. The Sri Lankan higher education system has undergone many changes since the establishment of free education in 1943. As graduates of a country can be identified as the cream of the nation, many countries, including Sri Lanka, focus on nourishing undergraduates with the best resources. Though many countries have to cope with grade inflation encouraged by the universities, Sri Lankan state universities have maintained the quality of their degree programs throughout history. But, with the evolution of technology, some traditional teaching methods have been replaced, highlighting the importance of blending traditional techniques with modern technology. For example, almost all the academic activities related to degree programs were conducted on-site in the Sri Lankan university system. But the Corona pandemic has severely affected worldwide education and the drastic changes in today's lifestyle. There was a sudden requirement to switch from on-site education to remote/online education to facilitate students, which caused considerable turbulence in the education system. Though there was a requirement to upgrade teaching techniques followed in the knowledge-transferring process, a drastic change

from on-site to online education was a challenge faced by lecturers. Therefore, it is necessary to analyse and follow a suitable mixture of teaching techniques as a novel approach to spur student achievement.

Traditional and Novel Techniques for Improving Students' Engagement

Generally, in a typical classroom, various teaching/learning techniques are employed for a fruitful delivery of knowledge to the students. These approaches can be categorized into two main divisions: teacher-centred and student centred. Though the earliest methods of teaching mainly involved teacher-centred education, current studies have proven that student-centred teaching will enhance students' analytical and critical thinking. A mixture of student-centred and teacher-centred techniques is the recommendation of the experts for an effective knowledge transfer.

At the beginning of the modern higher education systems, A considerable portion of the teaching-learning process consisted of teacher-centred approaches. Direct instruction was the primary technique used at the universities and in the secondary phase of education. Lectures and teacher-led demonstrations were the heart of this approach. In this form of teaching, formal authority, expert, and personal model are the roles played by the teacher. Classrooms are controlled with rules and expectations, and teachers have formal authority due to their knowledge; therefore, everything is done according to the sole wish of the teacher. As an expert in the classroom, teachers consider students to be empty vessels; thus, the student's preference does not have a say. The personal model is another direct instruction, where learning is done by observing and following the teacher[1]. Direct instruction is a highly teacher-centred approach; the assessment and tests are conducted to measure the learning process.

Kinesthetic learning can be identified as an approach one step ahead of direct instruction. In kinesthetic learning, the learning process is not based on lectures and teacher-led demonstrations but on hands-on experience. This approach can be teacher and student-centred, based on the priority given to students' choices and interest[2]. Compared with the direct instruction approach, this is a reasonably good step forward in engaging students in active learning. A significant drawback of this approach is the lack of time and resources to teach everything. Therefore, often, it is blended with another method to give optimum results.

Both of the above approaches can be made with minimum technological resources. The flipped classroom was introduced for a more flexible learning process when moving towards a more technological teacher-centred approach. In this particular setup, students can listen to pre-recorded lectures and complete the assignments at any preferred time. A significant advantage of this concept is that students are allowed to work at their own pace, and they can listen to lectures at any desired time at any

frequency. Though this is also a teacher-centred teaching/learning process, it offers many advantages over direct instruction approaches. But it is required to have the proper equipment and fair enough internet connectivity for the student and the teacher to engage in the process.

With the evolution of education systems, more and more universities are moving towards student-centred approaches to the teaching/learning process, as they are proven to be more effective than the existing methods. In this article, more focus will be given to Inquiry-based learning, Expeditionary learning, Game-based learning and Personalized learning.

In inquiry-based learning, as the name implies, students access knowledge by inquiring. The sole purpose of the teacher in this form of teaching/learning process is to guide their students throughout the learning process by being a facilitator, personal model or delegator. As a facilitator, the teacher may provide guidance and instructions. In the case of the delegator, the teacher plays a passive role while students are carrying out their learning process in accordance. Just like in the direct instruction approach, the role of a personal model will be to provide an example for students to follow, but in a more student-oriented environment. This approach can be identified as a high-technology approach, as this process can utilize technology for learning. Though the use of this approach in the teaching/learning process is questionable in some subject areas, most of the time, it increases the effectiveness of the process.

Expeditionary learning can be identified as an advanced step of inquiry-based learning. In this case, the student is learning while engaging in project-based activities. There, they will address real-life problems while the student learns all the areas to solve them. In this approach, the student is given more authority for learning, and the learned matter will directly link to the practical applications. Therefore, this approach improves students' active learning, as most students fall behind in the traditional teacher-centred system. Finally, the link between real-world application and theory drives students' interest in a specific subject area, which is well maintained in expeditionary learning[3]. The main drawback of this approach is that the students only cover what is required for their project.

Another interactive student-centred approach is game-based learning. Unlike in expeditionary learning, the student will work in simulation-based problem-solving. By using students' desire to earn badges, make progress and surpass others in gaming, the learning environment also can be converted into such an environment. With the concept of achieving something tangibly, their interest in the subject matter and desire to learn more will be the driving force to guide them towards practical learning. The main drawback of this approach is that students and teachers must own the required software and hardware components for the teaching and learning process. Also, the teachers must put in more effort to create a suitable gaming environment based on the subject content. Finally, though teachers play a

significant role in deciding what to include in the gaming environment, students are the most deciding factor, as they can work at their own pace.

Lecturers must cope with many students at different learning levels in a university classroom. However, the student's interest plays a significant role in learning. Although lecturers are delivered to all the students in the same way, their performance will be different from each other. Most courses provide the common knowledge required for completing the degree, but students are always interested in learning more. In this case, personalized learning comes into play. This approach can be used in the other way, where students falling behind are also addressed by making changes to the lesson plans. Finally, the students' lagging can be identified through regular assessments.

Use of Various Techniques in the Technology Degree Programme

The Bachelor of Engineering Technology Honours degree programme at the Wayamba University of Sri Lanka will be used for comparison in this article due to my familiarity with this degree programme. When looking through the curriculum of the Engineering Technology degree programme at the Wayamba University of Sri Lanka, the applicability of different teaching approaches for an effective teaching process can be detected throughout.

At the beginning of the degree programme, undergraduates are oriented to university life using a systematic orientation programme. More focus is given to improving the students' language and soft skills, allowing them to grow. Direct instruction, as well as expeditionary learning, is followed during this period. After completing the orientation programme, students are directed to start their undergraduate life from an academic point of view. At the beginning of the lecture series, most of the teaching process is done with direct instruction, where students will grab the fundamental knowledge of their respective fields and attitude growth. Though direct instruction is highly teacher-oriented, it is the most suitable for beginners as they are still learning the fundamentals.

Along with the conventional lecture series, courses requiring more hands-on experience conduct practical demonstrations for students, where a demonstrator/lecturer will take the lead. This approach is proven suitable for beginners as they are yet to familiarize themselves with the university's procedures. Along with these conventional teaching/learning practices, students are assigned to a mentor to support them passively. The students work in a group to provide solutions to real-life problems. The students are to identify the problem alone, but the mentor/supervisor will guide them. While working on the project, the students explore the knowledge by themselves, which is an inquiry-based approach. This approach is much similar to expeditionary learning. Still, the supervisor's role as a

facilitator/delegator to guide these fresh undergraduates to the optimum path make it a more teacher-centred approach.

After completing the first few semesters, they will select a path of specialization and engage in the actual work. With this transition, the teaching/learning processes are becoming more student-centred. Practical sessions are started with a direct instruction session and then gradually transform into a more student-centred environment, where the task is given, and the students are to discover the things to be done to achieve the target by themselves. Lecturers will play a passive role but will be there to support them when required. There will be more and more projects inside the courses, biasing towards expeditionary learning. In the final year, undergraduates fully engage in individual research projects to solve real-world problems. There they will have to apply what they have learned, and also, they will have to study some brand-new areas to find solutions. At this point, expeditionary comes into full action. While following the degree programme, the lecturers allow students to participate in industry-based projects. Students interested in the relevant field can always join them to grab the chance for personalized learning.

The flipped classroom concept was not popular among the faculty lecturers until the drastic change caused by the Corona pandemic. With that, remote education had to be promoted to continue the learning and teaching process without interruption. With that, flipped classrooms were suddenly the solution for most students who do not have access to an uninterrupted power supply. Though it is a highly teacher-centred approach, many students found that more effective, as they can download the videos at any convenient time, saving money and time.

While looking through the degree programme, implementation of almost all the teaching approaches discussed in the previous section could be identified, except for game-based learning. Evaluation of the students is done through traditional examinations and continuous assessments for most teacher-centred approaches. At the same time, viva, presentation and report are the main components in assessing the student for student-centred learning.

Blending of Techniques to Suit the Online Classroom

Student performance growth could be observed to evaluate the overall effectiveness of the approaches in teaching and learning. As a mixture of techniques was used in the classroom, it was possible to maintain the students' interest at an adequate level. But this was before the attack done by the Corona pandemic on the higher education system. There were drastic changes in day-to-day lifestyles, which directly affected the higher education system of Sri Lanka. Almost all the universities were conducting their lectures on-site, and the pandemic forced them to adapt to remote

education almost in no time. All the techniques followed to maintain students' interest were not helpful anymore. As the time for adoption was very little, lectures had no option but to conduct classes online, narrowing down to a teacher-centred approach. With the connection issues, some students suffered, and the lecturers had no choice but to upload lecture videos, which is a flipped classroom approach. Though some students have found it advantageous at the beginning, the lack of interaction has deteriorated students' performance over time. The effect of remote education could be observed in students' results in the physical examinations. There, students' performance was lower than expected in most courses. Another main problem encountered by the lecturers while teaching is that the student's lack of response in the online learning platform makes it more like one-way communication.

To overcome this issue, many lecturers use new technology besides online lectures, like virtual rooms, online dashboards, social media networks, etc. From these methods, initially, teacher-centred approaches could be mixed with student-centred approaches for more effectiveness. Still, a significant component of learning, the expeditionary learning done through project works, is severely affected. Delivery of practical exposure to the students is done by conducting on-site practical sessions, but most universities still follow remote education. Though flipped classrooms relieve students with internet connectivity issues and allow them to work at their own pace after downloading the recorded videos, the student's performance is not satisfactory compared with the traditional on-site classroom. That is because most students tend to store downloaded lecture videos to watch late, but when the exam is at hand, they do not have enough time to watch them all, thus covering it up by grabbing some things from here and there.

Therefore, there is a requirement for a teaching/learning process which will spur students' achievement, despite the environment. When focusing on the expeditionary learning process by engaging in projects, most students tend to hinder at specific milestones, as they have to learn everything from scratch to acquire the required knowledge for progress. Generally, most of these things are covered at the early stages of undergraduate life. However, as the early stages of the Corona pandemic resulted in a highly teacher-centred teaching process, students' interest in the subject and understanding of the applications were immensely affected. Therefore, the main focus of the academic staff must be on improving the delivery approaches of lectures conducted online. That way, when the foundation of the student is strong, it will be easier to build up the remaining.

When starting from the beginning, formal authority must be a primary factor to ensure active participation. As all are aware, most students join the lecture virtually and then engage in various other works, not listening to the lecturer. Therefore, maintaining authority throughout the lecture is very important. It can be done by advising, warning and punishing

them within the limits of academic morality. If the teacher cannot keep the students' interest throughout the lecture, maintaining the authority will not be enough for the active engagement of the students. Therefore, the main focus must be on using appropriate teaching/learning techniques[4].

When focusing on maintaining students' interest and engagement throughout the lecture, it is essential to identify the main reasons behind student distraction. An issue faced by most students is that they can not link the practical applicability of the theories they are learning. One common misconception among the students is that modules learned at the undergraduate level are useless, and they will have to learn everything from scratch when they are released to the industry. Due to this mindset, most of them passively engage in learning to pass the module. Though all the lecturers provide a course outline at the beginning of their lecture series, students are not capable of linking what they learned with applications without any visual aid. Introducing a kind of map at the beginning of the lecture series and completing milestones visually after each lecture would be an excellent approach to address this. The type of application of this particular technique will be different from module to module. Generally, the lecturer will introduce a complete application, dissected into several components based on the module's topics. At the beginning of each topic, the lecturer can visually show the section which will be covered. After finishing the relevant topic, the lecture can guide the students to complete the relevant component of the large application. Mixed with a visual interpretation, the approach will grab the students' interest, as they can connect what they learn with the given application, which is more like completing levels in a game to get the whole picture. For this purpose, the lecturer will have to invest more time while preparing lecture materials, but after setting up for the first time, it will come in handy for all the other years[5].

Another major issue with this online education is the lack of internet stability and power cuts affecting the learning process on students' end. For this, the flipped classroom is already in operation, but as discussed above, the problem is when they are not watching these uploaded videos in the given time frame. To ensure they are going through them, a lecturer can introduce a simple set of questions to be answered after completing the lecture. Students who have the issues mentioned above can be allowed to submit answers within an acceptable time frame. However, as this set of questions checks their engagement in the lecture, they must not be evaluated, and the chance to correct their answers must be given. This approach is followed in online courses and can be directly applied in lectures. Connecting with the previous system, the LMS can be arranged to show a kind of map with milestones, where learning each topic is updated after facing the set of questions.

Another significant issue is lecturers have to cope with students of different interest levels. For example, some students may gain prior

knowledge due to their interests, while most are to be fed from the foundations. In this case, the lecturers have no option but to follow the flow to facilitate the majority of the student. When the students already familiar with the subject have no challenge in learning, they tend to drift away from the learning process, blunting their performance. The learning process is a real tragedy, as these students are the real gems. Personalized learning can be used as an excellent approach to overcome this problem. Students had the chance to actively work with lectures in an on-site environment, but with the transition to remote education, these chances were slimmer. Therefore, introducing separate advanced path steps for these students to follow in the same course unit would be a solution. Most students will follow the lectures as usual and do the things assigned to them in class. But those interested in the area can learn more by being them with pre-prepared lecture material and recorded videos, which is more like a flipped classroom. Though the usual lectures will not be helpful to heighten their knowledge and interest, the provided material and activities will keep their interest. As a result, they will learn more in an active state. Though their achievements in this advanced course section cannot be evaluated for the final grade, they can be rewarded with recommendations after testing them separately.

The article's main focus was on the ability to blend traditional and novel approaches in teaching to enhance students' achievements. When analysing the two strategies individually, it can be observed that both types acquire unique features, useful for a fruitful teaching and learning environment. Applicability of teaching techniques may vary, depending on the level of students, as fresher students may need additional guidance. The on-site classroom before the pandemic situation utilized many of these blended techniques. With the sudden need to transit to an online teaching-learning environment, a more teacher-centred approach was followed due to a lack of time to adjust. It is required to revisit existing teaching methods to suit both instances. As per the results of many studies conducted in this area, the existing techniques used during on-site teaching were fruitful, but blended with more student-centred techniques would contribute more to enhancing students' achievements. The procedures mentioned above may require more time and energy from the lecturers before implementation[6]. Still, after adequately preparing the field, the harvest will ensure that the hard work pays off.

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1 Grasha, F. (2010). The Matter as of Expert, Style: Formal and Authority, Delegator Teacher Personal Model, Facilitator, *Teacher*, *42*(4), 142–149.

2 2U, Inc. (2022). *Teaching Methods*. Retrieved July 20, 2022, from Teach.com: https://teach.com/what/teachers-know/

3 Guo, P., Saab, N., Post, L.S., & Admiraal, W. (2020). A review of project-based learning in higher education: Student outcomes and measures. *International Journal of Educational Research*, *102*(April), 101586. https://doi.org/10.1016/j.ijer.2020.101586

4 Zhou, M. (2011). Learning Styles and Teaching Styles in College English Teaching. *International Education Studies, 4(1)*, 73-77. https://doi.org/ 10.5539/ies.v4n1p73

5 Schmidt, S. (2020). Distracted learning: Big problem and golden opportunity. *Journal of Food Science Education*, *19*(4), 278-291. https://doi.org/10.1111/1541-4329.12206

6 Romanelli, F., Bird, E., & Ryan, M. (2009). Learning Styles: A Review of Theory, Application, and Best Practices. *American Journal of Pharmaceutical Education*, *73*(1), 9. https://doi.org/10.5688/aj730109

CHAPTER 9

Role of the Teacher in Managing Teaching-Learning Environment using Digital Tools in Virtual Classes

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Impact of Knowledge

Human society has developed over thousands of years on the earth, and three main ages have been identified by scholars as results of their studies which are popularly named as pre-agricultural age, agricultural age, and industrial age. But contemporarily, the world is experiencing a major shock of a shift from the industrial age to the information age (also known as the post-industrial age, digital age, and globalization age). All progressions in human civilization from one age to another age have happened due to a major revolution (such as agricultural revolution and industrial revolution) .They all have taken a few decades or centuries to complete the progression. However, the progress from the industrial age to the information age is highly confusing compared to the previous two progressions, due to the difficulty of identifying a clear cut between the two ages as almost every industry has absorbed the emerging information technologies into their industrial operations. Concurrently, this progress seems to be highly rapid progress compared to the earlier two progressions in terms of the time taken.

Some scholars prefer to call this new age as the "knowledge age" because they believe that all the changes in the way of living during the last progression from the industrial age to the information age are motivated by the knowledge generation and dissemination in such a way it reaches the majority of the world population[1].

However, it is obvious that the creation and dissemination of knowledge have highly impacted all of the above progressions of human civilization more or less, while all future progressions will certainly depend on knowledge. Education is the direct and main service industry that focuses on the creation and dissemination of knowledge all over the world. Therefore, the education sector is also affected by the knowledge created within the own service industry, and its progression is highly impacted by the new knowledge generated. Most of the major processes in the education industry such as teaching, learning, evaluation, and research, have reached new dimensions due to the integration of emerging information technologies to implement service operations in the education industry.

Onsite to Online Transformation

University teachers are the main facilitators in tertiary education who absorb the existing knowledge, generate and disseminate new knowledge, mainly among university academics and students but not limited to. School teachers cannot be forgotten in this case as they are basically trained to facilitate the dissemination of existing knowledge among children all over the world during their primary and secondary education who will eventually be the future inputs of tertiary education. A variety of teaching-learning environments have evolved throughout the human history to facilitate both teachers and students in all primary, secondary, and tertiary education. In the recent past, it was observed that the world is maintaining teaching-learning environments within formal physical setups such as schools, colleges, and universities. But the nature of these traditional teaching-learning environments has been questioned by new generations in the information age, resulting a transformation of education service operations while absorbing the shock of the shift from the industrial age to the information age.

As a result, the impact of new technologies was experienced in the most common traditional teaching-learning environment; the physical classrooms. Computers, projectors, microphones, digital screens, and other technical devices were being used together with many different software applications to enrich the teaching-learning environment in traditional classrooms. Moreover, educational service institutes implemented different information systems, such as Learning Management Systems, to manage education service operations efficiently. Many other teaching-learning environments emerged, such as websites and web-based systems implemented by educational institutes, and also social media platforms like YouTube, with the development of digital technologies. It is observed that "Gen Z" students (born after 1997) prefer the emerging virtual teaching-learning environments over traditional classrooms, while the majority of teachers represent the generations of "Millennials" (born during 1981-1996),

"Gen X" (born during 1965-1980), or "Boomers II" (born during 1955-1964) who prefer traditional classrooms over virtual classrooms.

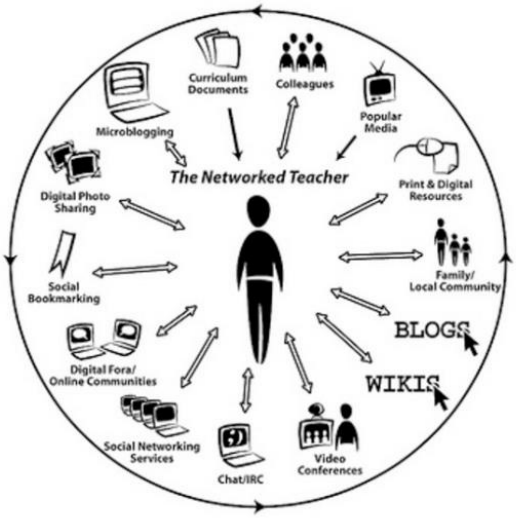
The world experienced a new challenge with the "Covid-19" pandemic, which has spread all over the globe since December 2019 and is yet growing in different variants and keep creating new waves. The three common instructions to the public to avoid contacting with the virus were wearing face masks continuously, washing hands frequently, and maintaining social distancing. Meanwhile, most governments were compelled by the rapid spread of the virus and fatal results to implement the complete or partial country lockdowns which existed over months. This situation created a total disruption in providing educational services that were mainly based on traditional teaching-learning environments. In contrast, virtual teaching-learning environments experienced an immediate, unexpected global demand. This resulted in an obligation to implement educational processes such as teaching, learning, evaluation, and research, which were more or less performed in traditional physical classrooms existing in physical institutional premises, to be implemented in virtual teaching-learning environments. In short, turbulent situations compelled the education service providers such as universities, colleges and schools to transform their teaching-learning environments from onsite to online.

Importance of Updating the Role of Teacher

Any industry is supposed to be updated and upgraded according to the rising demands of the end customers, and the education service industry is no exception. The unforeseen challenge of "Covid-19" pandemic lead to immediate discussions among education administrators, academics, educationists, and other stakeholders of the educational institutes on transforming educational processes to a virtual mode. These discussions highlighted the importance of providing a discontinued educational service to students amidst the turbulent situation, acquiring appropriate virtual platforms which adequately satisfy the service capacity requirements of the institutes, and the role of teachers when managing the virtual teaching-learning environments. When the education service industry advances the operations integrating the emerging digital technologies and when the education institutes adapt to the situation while upgrading the services provided and facilitating with adequate digital resources, it is unavoidable that the teachers must update their technical knowledge and skills relevant to pedagogy to successfully deliver their service to students via online platforms by facilitating and guiding students.

A student mainly encounters learning, researching, and relevant industrial training during tertiary education. Therefore, a university teacher must be ready to facilitate all these three basic processes with pedagogical, research, evaluation, and supervision skills which are updated adequately to

be performed via online platforms. Novel approaches have to be studied, trained, and implemented by university academics when these educational processes are conducted virtually. These approaches include hundreds of different methods, tools, techniques and strategies from which academics need to carefully select the most appropriate approaches based on their applicability and successful usage or implementation when performing educational processes in the relevant disciplines. The most important thing is not the quantity but the quality; the number of approaches selected may be just a handful, but academics must ensure that they use the selected approaches adequately, appropriately, and successfully



. Figure 1: The Networked Teacher Using Technology and Gadgets

Commonly Used Tools in Online Education by Academics

University academics mostly use the below tools in providing education via virtual platforms for providing different educational processes. Different skills are needed to use each tool, while unique techniques are to be followed by academics in various educational processes being performed using these digital tools.

MS Office Package

Word, Excel, and PPT applications are used for developing lesson plans, creating learning materials and teaching aids for lecturing. Word is used for providing in-detail feedback for student reports for both supervision and evaluation purposes. Word and Excel applications are used to develop assignments, papers, marking schemes, and mark sheets relevant to evaluations.

Google Products

Google products include substitutes for most MS Office applications, such as Google Docs[4] for Word, Google Sheets for Excel, and Google Slides for PPT. They can be used for the same purposes as mentioned previously. Moreover, Google applications can be used as live documents and do not need to be shared multiple times when being updated. Other than the substitutes for MS Office applications, there are a few more widely used Google Products by academics. For instance, Google Drive can be used for the effective sharing of teaching resources with students. Google Classroom is a free platform that can be used along with other tools as a blended learning platform. A google classroom can be created for one course module, and the students can be enrolled by the teacher. This facilitates the sharing of learning materials and also distributing, collecting and grading of student assignments. Gmail can be effectively used for google classroom communications, and Gmail groups allow one to communicate successfully with a group of students. Google input tools and Gboard are other products specially designed as virtual keyboards. They can be used by academics to develop learning content using their respective native languages. Google Chrome is used as a search engine to search the existing knowledge and even teaching materials. YouTube is a video-sharing platform where academics can find ample teaching materials as learning resources to be used during lectures in order to save time and also to maintain the students' attention throughout the lesson delivery without letting them get bored.

Google Forms is another tool that can be used for both evaluation and data collection purposes when conducting research. Google Scholar is a free platform where academics and students can have their own profiles to share research publications while enjoying access to millions of research publications which can be simply searched within a few seconds based on preferred keywords. Google Meet is a real-time video communication platform that can be used to conduct lectures, research, or project meetings while sharing screens and files with the students being logged into the meeting. It is not a secret that university academics are living busy life while performing educational activities that are totally different from each other. Time management can be done effectively with the help of Google Calander to schedule all the planned activities such as lectures, research meetings, and online evaluation sessions. Google Alerts is another tool that sends notification messages to Gmail, which can be used with Google Scholar; not to miss the important research publications being added to the literature. Google products are not limited to the above-mentioned tools, and most of them can be used by academics to effectively manage their teaching-learning environment with the intention of promoting student achievements.

ZOOM

This is the most famous application since the covid-19 pandemic outbreak in every industry to facilitate real-time video conferencing, education service industry is not an exception[5]. Currently, ZOOM is widely used to conduct all the live sessions in academia when it comes to lecture delivery, research and project supervision and even for evaluations. Using features such as ZOOM whiteboard, screen sharing, and the ability to connect drawing touchpads and integrate them into ZOOM are critical skills to be improved by academics when considering lecture delivery. Academics have to be familiar with switching among ZOOM dialogue boxes that detail student participation information and chat box that helps to communicate with students while sharing the screens, and properly muting and unmuting audio/video options in order to be smart in virtual classroom management. Collaborative learning can be used as an effective learning method when conducting lectures for a considerably large number of students via ZOOM. The breakout room feature can be effectively used to promote student achievements during online sessions by putting a manageable number of students in simultaneous sub-sessions within the main session. The same technique can be used for implementing cooperative learning while small groups of students are in the breakout rooms; the lecturer will visit each room to guide the students in their tasks.

Moreover, the ZOOM reactions such as the raise hand option can be frequently used to receive quick feedback from the students ensuring their achievements during the live sessions. Moreover, ZOOM sessions can be video recorded and shared to motivate the achievements of the students who encounter technical difficulties in joining the live sessions.

Learning Management Systems

Learning Management Systems (LMS) is one of the most widely used types of management information systems by higher education institutes. Academics need to study the available LMS in the organization thoroughly and use the available features during the academic processes to promote student achievements[6].

The most commonly used features are the sharing options for files, folders, pages and URLs to share learning materials. The assignment submission option is also widely used as it makes the life of academics easy to collect submissions with less chaos. But there are many other options that academics can use during the lecture delivery to manage the teaching-learning environment to keep the continuous attention of the student.

Forums can be created on LMS pages to promote intellectual discussions among students on a given problem or a topic. Quizzes can be conducted to evaluate the student's achievements which include a variety of question items such as multiple choice, true and false, matching, short

answers, essay, numerical, select missing words, etc. These quizzes can be set to provide automatic feedback to students after attempting the quiz. Multiple attempts can be allowed when answering to quizzes (without restricting students to a single attempt) with the objective of motivating the students' achievements by letting them to learn things via the feedback given. Students can do their self-studies and improve themselves based on the feedback given at the end of each attempt of quiz.

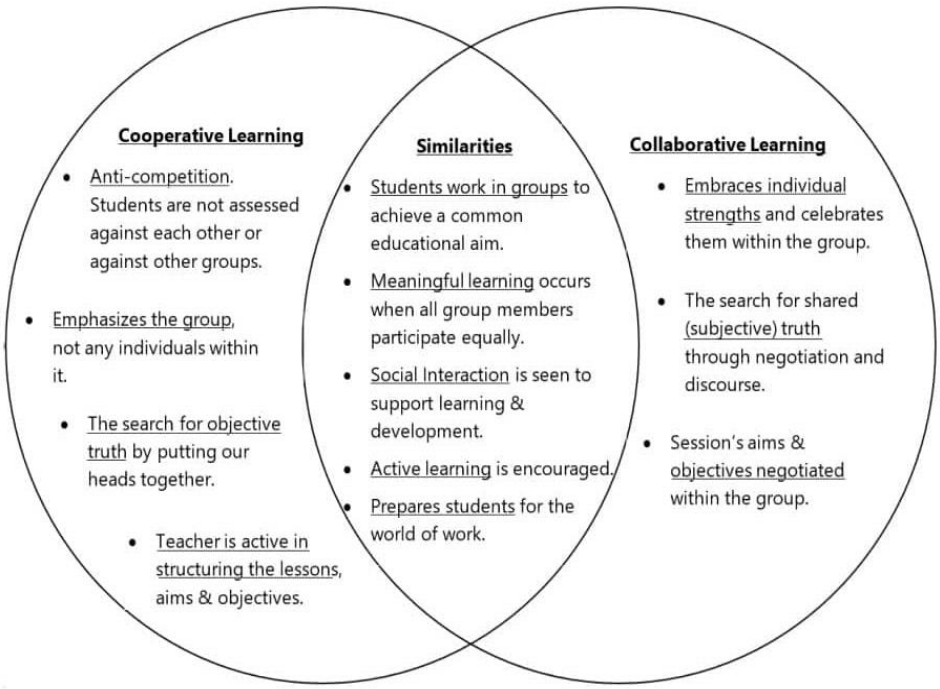


Figure 2: Cooperative vs Collaborative Learning

Conclusion

It is obvious that the knowledge generation and dissemination have been key factors which lead human civilization into main progressions. Teachers play an important and inevitable role when considering these two factors. Contemporary, we are experiencing a huge impact of digitalization on the padegogy. Virtual classrooms have become more popular among students who represents new generations. Therefore, teachers must have skills to manage teaching-learning environments in virtual classes. This article discusses the importance of the role teacher's role in a virtual classroom while focusing on common digital tools that are being used in virtual classrooms. It has become a compulsory skill for teachers to be able to motivate student achievements using various digital tools in virtual classrooms.

1. Nancy, W., Parimala, A., & Livingston, L.M.M. (2020). Advanced Teaching Pedagogy As Innovative Approach In Modern Education System. *Procedia Computer Science, 172, 382-388*. https://doi.org/10.1016/ j.procs.2020.05.059
2. Naziya, H.N.H. (2020). Online Teaching-Learning During Covid-19 Pandemic: Students' Perspective, *The Online Journal of Distance Education and e-Learning*
3. Rabie, M. (2013). Saving Capitalism and Democracy. Palgrave Macmillan US. https://doi.org/10.1057/9781137321312
4. Edwards, J.T., & Baker, C. (2010). A Case Study: Google Collaboration Applications as Online Course Teaching Tools. *MERLOT Journal of Online Learning and Teaching*, *6(4), 828-838*
5. Minhas, S., Hussain, T., Ghani, A., & Sajid, K. (2021). Exploring Students Online Learning: A Study of Zoom Application, *Gazi University Journal of Science*, *171-178*
6. Kalimullina, O., Tarman, B., & Stepanova, I. (2021). Education in the Context of Digitalization and Culture: Evolution of the Teacher's Role, Pre-pandemic Overview. *Journal of Ethnic and Cultural Studies*, *8*(1), 226-238. https://doi.org/10.29333/ejecs/347

CHAPTER 10

Resilient Pedagogy: A Development Opportunity for Educators

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What is Resilience?

Resilience is the process and the outcome of successfully adapting to challenging experiences. It describes the physical, mental, emotional, behavioral flexibility and ability to adjust to internal and external demands.

Resilience is an important concept in facing challenges. Those who lack resilience can be affected and may develop unhealthy coping mechanisms. Contrary to the above fact, resilient individuals tap into their strengths and accomplish their goals.

Resilient Pedagogy

Resilient Pedagogy is an approach of teaching with resilience in course design, institution and students during difficult times and changing circumstances.

Since 2020, when the COVID-19 pandemic erupted, there has been a definite disruption of the education system, including higher education, throughout the world. Until that, in most higher educational institutes, the courses were designed exclusively for face-to-face delivery. In fact, there was an institutional prejudice against online education, hence not turning up the online teaching method earlier. Even though before COVD 19 pandemic, the use of the term "Resilient Pedagogy" was minimal, after this turbulence, most academics designed their teaching with the resilient principle in their mind.

The resilient Pedagogy teaching approach is something like preparing practically for a day out. It permits adaptable and flexible course design with whatever modalities using as teaching methods. The core structure used in this method is based on the fundamental elements of resilience. The experience expected from Resilient Pedagogy is to continue the teaching activities even amid the turbulent and disruptive situations we face.

Application of Resilient Pedagogy is not only focused on crisis situations but also will benefit students as well as teachers in the long run, irrespective of the circumstances. Student-centred mindset is the final product when engaging in this teaching method. Designing a dynamic study course by the teachers will help them to use their time and effort fruitfully as resistance to disruption. To accomplish the above task, the teachers also must be resilient themselves.

Components of Resilient Pedagogy

Three fundamental components in Resilient Pedagogy are Flexibility, Extensibility and Redundancy.

Extensibility

The course content has clearly defined the purpose and the goals of learning, but basic course content could be extended according to the new capabilities as per the requirement of introducing the latest tools. Also, it could change the format in the preview of synchronous to asynchronous modalities we have to use.

Flexibility

The design of the course should address the individual needs of the learners focusing on the changing learning environment. This should focus on every possible student's needs even before knowing the particular forum of students. The learner-centered approach is fundamental in this, but the teacher's objectives and assessments should also consider flexing in response to these needs.

Redundancy

As Resilient Pedagogy focuses on a situation of disruption, obviously, it should have contingency plans in place. The possible interruptions and vulnerabilities should be analyzed when designing the course content. As an example, how the students can adapt to the synchronous virtual meetings be given the opportunity to involve in learning activities if their internet access is interrupted? Hence, when designing the course content, the teachers should focus on alternative ways of fulfilling goals amidst these

disruptions eliminating the point of failure. This fact indeed is crucial when academics plan to teach in a crisis or an emergency.

Motivation and Engagement

Even though these two words are used interchangeably, the meaning of the two is different. Motivation is about the internal drive towards an accomplishment. Engagement is the evidence which gives the motivation to move towards the goal. Studies have revealed that student engagement is vital for fulfilling educational goals[1].

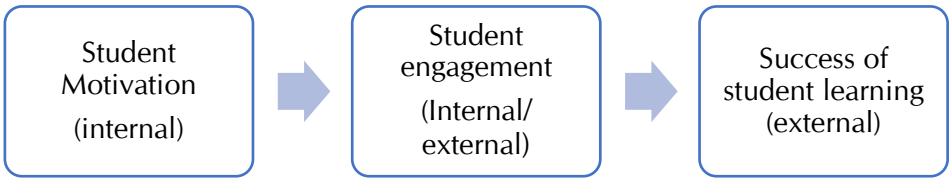

Figure 1: Relationship between Motivation, Engagement and Student Success

Engagement can be subdivided into three components.

1. Behavioural engagement – The genuine participation in the learning environment
   Eg. Interactions during the lectures, Submitting assignments and tutorials on time
2. Cognitive engagement – The amount of effort the students are willing to spend working on a given task and how long they remain.
3. Emotional engagement – The factors affecting engagement like happiness, support, attitudes towards the teacher, and peers.

Self Determination Theory

This is a macro theory for the study of human motivation and personality. According to this theory, fulfillment of basic human psychological needs is necessary for optimal functionality of humans[2]. The three basic needs are autonomy, competence and relatedness. Research evidence shows that fulfilling these needs will result in desired academic outcomes. Furthermore, the fulfillment of these needs is mainly governed by environmental inputs. Hence highly structured learning environments facilitate students to build up a sense of control, leading to competence.

Therefore, if a teacher addresses student's perception of competence, relatedness and autonomy when he/she is designing the course, that course is resilient to disruptions. Figure 2 describes how the student need fulfillment results in resilient course design in Resilient Pedagogy.

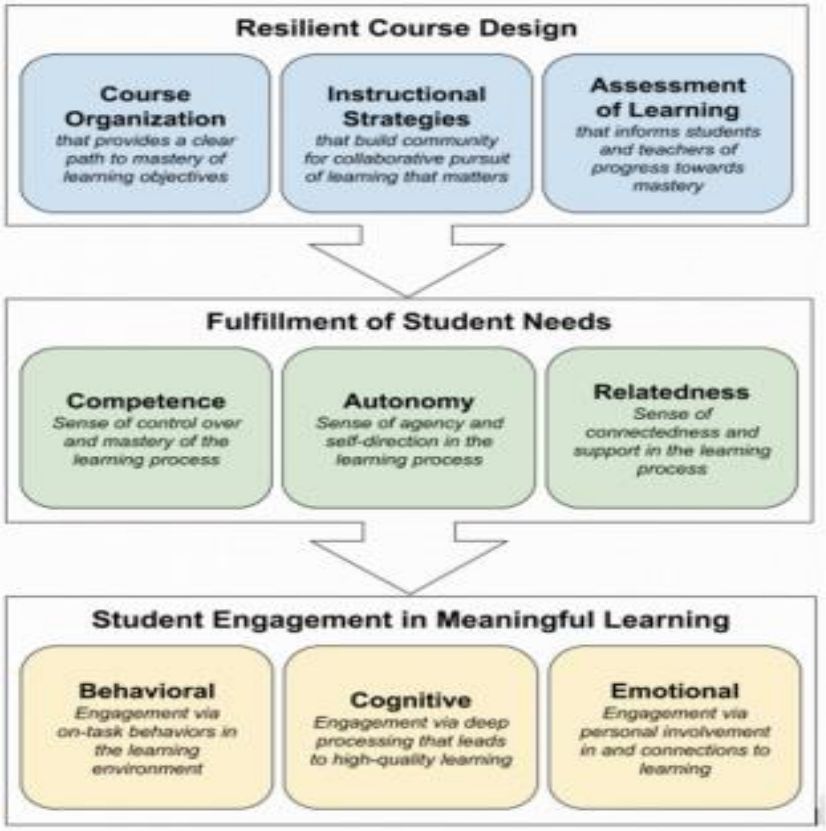

Figure 2: How the Student Needs Fulfillment Result in Resilient Course Design in Resilient Pedagogy

Source: *https://doi.org/10.26079/a516-fb24*

Innovative Pedagogies in the Times of Turbulence

With the disruptions and turbulent situation faced globally, many novel technologies are being used for teaching and learning purposes. Using new technologies which were developed today in Pedagogy will result in immense benefits to educators. It makes distant learning easier. Feedback can be obtained faster than earlier, and it makes a platform to enhance collaborative action among a large group of students in higher education. Technologies like podcasting and websites help students to follow the discussions even if they could not participate. The interactive whiteboard is a method which can be used to make teaching easier by offering students visual aids. The information can be delivered to students with mobile devices in a lightning-fast manner. Distance learning and online teaching is an area which is growing day by day. The lectures and learning activities are no more confined to the four walls of lecture halls. Technology made the Pedagogy much smarter and faster.

Innovative Educational Technologies in Action

E-Learning

With the eruption of the COVID-19 pandemic, most educational platforms, including higher education, were converted into distant learning methods due to constraints in gathering physically. E-learning is the education delivered via electronically.

In e-learning, the educational stuff is delivered to the students using various devices; Computers, laptops, tablets or smartphones. This interactive learning method allows students to participate actively with their teacher irrespectively wherever they are. Although e-learning is helpful in enhancing the knowledge of the students, multimodal practical learning experiences could be experienced through podcasts, videos and animations.

Even though e-learning has been there for a long time, it can still be considered as a novel technique because online and blended learning courses with innovative ideas are produced day by day. The outstanding characteristic feature of the e-learning platform is the variety. The students can be addressed synchronously through the live stream as well as group meetings can be conducted by zoom, Microsoft teams or google meet. On the other hand, when students face internet issues or other interruptions, asynchronous methods like recordings are available with a large spectrum of media and digital functions to convey the study materials to students. Learning Management System (LMS) is one of the online learning platforms that helps teachers to keep track of their students.

There are free, open-source web applications that connect and support the research workflow. This platform acts as a forum to discuss matters among researchers. Eg. OSF. Researches use OSF to document, collaborate, archive, share and register research projects, materials and data. In higher educational institutes, these sorts of web applications are an immense help in disruptive situations.

Video-Assisted Learning

This is a growing strategic teaching approach in modern teaching practice, which is used as a learning aid. Access to educational videos is simple; hence teachers are prone to use these readily available videos as a resource in their teaching. Most educational institutions report that their teachers incorporate videos in their classrooms.

Even though there is a debate on screen time, this method is used in socio-emotional learning, cognitive ability and inclusivity. Students widely accept this novel method of teaching because it aids in giving them desired educational message as well as fun. It improves the student's outcome as well as reduces the teacher's workload.

Blockchain Technology

This is a novel technique of education which gives immense benefits to education with regard to data storage. It is a type of Distributed Ledger Technology (DLT).

DLT is a protocol which enables the secure functioning of a decentralized digital database. When the new data is added, automatically it adds another block to the system; hence the storage is limitless. Coincidently, the data is encrypted and distributed across multiple devices in the system.

Blockchain technology is utilized in the verification of e-portfolios and Massive Open Online Courses (MOOCs).

Artificial Intelligence (AI)

Artificial intelligence refers to the simulation of human intelligence processes by machines, especially computer systems. Both students and teachers are getting benefits from this. Artificial intelligence can be used to automate basic activities in education Eg grading. Hence, with artificial intelligence, automated grading of the Multiple Choice Questions (MCQs) and fill-in-the-blanks questions is now possible.

Artificial Intelligence teaching systems act as a tool for teachers and students to learn independently in some universities. It provides enough learning resources and learning tools to students. Teaching evaluation can also be conducted with Artificial Intelligence, enabling teachers to understand the weaknesses, adjust the teaching strategies and upgrade the teaching quality.

Learning Analytics

Learning Analytics is a novel Pedagogical technique in which there is a collection and analysis of data about learners and their background to understand and improve the learning outcomes.

When teachers are aware of the insights of their students, it will help to improve the knowledge and skills delivered to the students. The teachers can see what type of information (i.e infographics, videos, text) most of the students are referring to, and then teachers can use that information when they are preparing future lesson plans. Furthermore, teachers are able to find out the group of students who have challenges in their academic activities. Thereby teachers are capable of taking necessary actions to rectify those issues and optimize student's full potential.

Gamification

Gamification in education means that educators apply elements of game designs to educational settings to make learning more engaging.

Students can learn while they are engaging in exciting game activities. Studies have shown that game-based learning imposes a positive impact on student's motivation, engagement and problem-solving skills[3].

Learning Management Systems and virtual environments are the platforms for implementing gamification in education. In higher education also, teachers face the problem of keeping students' attention and engagement with the course. The role of gamification comes under this.

The expected courses can be designed with the incorporation of game activities.

Augmented Reality (AR) and Virtual Reality (VR)

Augmented Reality and Virtual Reality are reality technologies meant to enhance or replace a real-life environment with a simulated one. Augmented Reality (AR) helps to augment one's surroundings by adding digital elements to a live view by using the camera on a smartphone. Virtual Reality (VR) is a technique which replaces a real-life environment with a simulated one.

With these methods, teaching and learning have become much more interactive and interesting among youngsters. As AR provide an enhanced view of a real image, this can be used to explain complex concepts which are difficult to elaborate in plain images or description alone. Especially in Medical Education, VR can be used in an effective way. The students can experience real-world surgeries and medical examinations via VR in a low-risk environment. This is an immense trophy in the modern world with the turbulences that the students face daily and a very effective way of learning method.

Social Media in Learning

From younger age to older age, almost all individuals are using social media nowadays. It has become a fad irrespective of the differences among individuals. Many educational institutes have utilized social media as a communication tool in allowing students to interact with others easily. Teachers, as well as students, can share study materials, comment or discuss with others in a group via this communication tool. In addition to the Whats app, YouTube and Viber, the TedEd is one of novel examples of this Social Media. Social media allows free access and variety of free services. This organization facilitates sharing of lessons and posts them on Youtube, where many can easily access, search and share the educational videos with colleagues.

Hence Social Media plays a leading role in staying and sharing the educational stuff, which helps to build a culture of collaboration and thereby improve the learning experience.

Conclusion

With emerging diseases and other social, economic problems arise within society, the teachers and students of every field, including higher education, face turbulences and disruptions day by day. The main challenge for all of them is how to continue and accomplish their education in the midst of these adverse situations. The Resilient Pedagogy is the path to overcoming the said challenges. It provides a technical, evidence-based approach on how to work on, design and implement the teaching and learning stuffs effectively and acceptably so that the teachers and students can get the maximum benefit from it.

With the innovation of novel technologies, the designed course materials according to the Resilient Pedagogic concepts can be implemented with the usage of these novel technologies successfully. The audience in higher education is youngsters, which is helpful in implementing these novel techniques. Hence, Resilient Pedagogy and widespread digitalization in education can mitigate learning loss due to the challenges in higher education. "The road ahead will be bumpy, but the tools for success are in place".

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1 Fredricks, J.A., Blumenfeld, P.C., & Paris, A.H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of educational research, 74*(1), 59–109. https://doi.org/10.3102/00346543074001059

2 Deci, E.L., & Ryan, R.M. (2000). The "what" and "why" of goal pursuits: Human needs and the selfdetermination of behavior. *Psychological Inquiry, 11*(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01

3 Scepanovic, S. & Zaric, N. (2015). Gamification in higher education learning-state of the art, challenges and opportunities [Paper Presentation]. *The Sixth International Conference on e-Learning*, Belgrade, Serbia.

Section 03

Conducting Practical Oriented Modules in a Turbulent Environment

CHAPTER 11

Novel Teaching Approaches of Conducting Practical Oriented Modules during the Covid-19 Pandemic: A Case of Anatomy

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The Science of "Cutting"

Human anatomy is a science that dates back over two thousand years. It is the study of the structural makeup of the human body. The term "Anatomy" has been derived from the Greek language and means the science of cutting. Traditionally, dissecting or cutting cadavers was the most important aspect of human anatomy study.

Like the majority of scientific fields, anatomy also has its subspecialties. Microscopic anatomy and gross anatomy are its two main subfields. The study of macroscopic, clearly visible human bodily structures is known as gross anatomy. In the study of gross anatomy, cadaver dissection is crucial. The two subfields of microscopic anatomy are histology and cytology. While cytology is the study of cells, histology is the study of tissues.

A solid understanding of anatomy is required for practising medicine as a professional. Therefore, developing effective teaching modalities in anatomy for safe clinical practice is critical.

Traditional Methods of Teaching Anatomy

Aside from the cadaver dissection, teachers in Anatomy have traditionally used blackboard or whiteboard as their primary teaching tool. Also, PowerPoint presentations are now used for the delivery of lectures[1].

- The blackboard or whiteboard - The blackboard is one of the oldest tools used in teaching Anatomy, which has been currently replaced with the use of the whiteboard. Although it is one of the most traditional methods, it is still recognized as one of the most effective methods in teaching Anatomy. It is very useful in describing complex concepts and diagrams in a simplified manner.
- PowerPoint presentations - PowerPoint presentations are more attractive to the listeners than whiteboard illustrations. Descriptive diagrams, animations and videos are supportive tools that can be used to simplify complex concepts in Anatomy.
- Dissections – Cadaver dissections are carried out in almost all medical faculties as the main teaching method worldwide. It enables the creation of a three-dimensional mind map of the various anatomical regions of the body[1].

The Covid-19 Pandemic

In December 2019, the City of Wuhan, China, saw the first cases of the new coronavirus. The epidemic began to spread over the globe in early 2020, and it ruled the entire planet in a brief amount of time. The covid-19 pandemic caused severe health problems and unexpectedly upset many nations' economies and communities. Many restrictions were imposed to avoid gathering people in order to prevent the spread of the virus. Education systems throughout the world were also affected adversely due to this[2].

The Impact of the Novel Coronavirus Pandemic on Higher Education Systems Worldwide

According to UNESCO, one million five hundred forty-two thousand students—or 89.4% of all enrolled students were affected by the closure of 185 countries' schools and higher education institutions by the first day of April 2020. According to a survey by the International Association of Universities (IAU), the education of almost all higher education institutes around the world was affected due to the pandemic. According to that study, around two-thirds of higher education institutes worldwide have reported that onsite education was replaced by online education, and around one-quarter of institutions have reported that most of the educational activities were suspended[3].

The Impact of the Novel Coronavirus Pandemic on Anatomy Education Worldwide

Although online classes can effectively deliver theory lectures, learning Anatomy exclusively through online mode is a bit challenging. The gold standard of anatomy education is the cadaveric dissection, "The Body

of Knowledge,". Due to the Covid-19 pandemic, students lost access to their routine cadaveric dissections. They also lost the histology practical sessions and also, access to prosected specimens and bones[4].

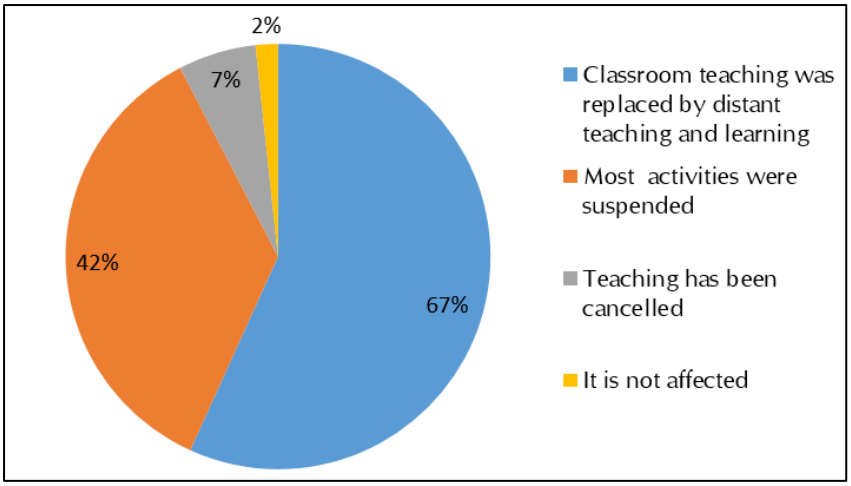

Figure 1: How has Covid-19 Affected Teaching and Learning? [3]

Integration of Innovative Technology to Continue Anatomy Education during the Pandemic

Replicating the experience of practical exposure in digital mode was a significant challenge for anatomy teachers. Demonstrating cadaveric dissections, histology practical sessions with microscopic slides, osteology and prosected specimens in online mode was perceived impossible. Anatomy teachers all over the world tried to overcome this challenge and began to use advanced technology during the pandemic to make the teaching-learning process more engaging.

Web-based Learning

During the pandemic, teachers started to deliver lectures online via platforms like zoom. Zoom whiteboard replaced the traditional whiteboard. PowerPoint presentations were still sharable with the students via zoom. Google Classroom is another effective method of delivering online lectures.

Educational Programs Based on Computer

Many programmes can be created using the computer by combining videos and voice recordings. Cadaveric dissections can be recorded into a video clip, and voice recordings can be added. They can be shared with the students via Learning Management systems or any other online methods like WhatsApp groups. Elsevier's complete 3D Anatomy educational program is one example used to teach functional Anatomy during the pandemic[5].

Anatomy Studio

In Anatomy Studio, 3D reconstruction of the structures of the human body is done. This allows virtual dissection by the student. Students can also visualize different cross-sections of the body[6].

Virtual Dissection

In the virtual dissection table, a virtual cadaver is constructed three-dimensionally. Students can perform dissections virtually. Unlike traditional dissections, students can delete and redo the dissections in this method. This helped students a lot during the pandemic when they lost access to real cadavers. Most virtual dissectors also had image libraries with histology of the related areas. This also allowed students to learn microscopic anatomy when they lost access to the microscope and slides[7].

Three Dimensional Stereoscopy

Three-dimensional Stereoscopic instructional videos can be prepared online. These are easily accessible to students as most students have smartphones. These are helpful in creating three-dimensional images of anatomical structures in students' minds. This is very beneficial in improving students' knowledge of anatomical relationships[8].

Flipped Classrooms

A new educational model named flipped classroom has been created with cloud technology. Cloud technology has also been previously used as an online study material. In this technique, students attend the class before the lecture and make contributions to the discussion during the lecture. In the classroom, students can participate in group projects and analytical activities. The flipped classroom has proven improved learning outcomes[9].

Social Media

Social media platforms like Facebook, Whatsapp, Twitter and Instagram were already available even before the pandemic. But, they weren't widely used for educational purposes. During the pandemic, these played an important role in peer learning as well as in communication with teachers. Social media platforms helped to improve the learning abilities of students as well as their communication skills. They also acted as a supportive network during the pandemic[10].

Limitations of Online Teaching

Online teaching played an important role during the pandemic as it was the only mode to continue education. It had some added benefits also. But it had its own limitations, especially when considering the study of Anatomy[11].

- The traditional cadaveric dissection allows students to touch and cut real human bodies, which will also help them to improve their surgical skills. They will develop some ability to use surgical instruments like scalpels and scissors. But this will not happen with virtual dissections even though they will give knowledge of anatomical structures. Also, during traditional cadaver dissections, students will identify many anatomical variations in natural human bodies. This will not happen with the artificial pre-prepared virtual cadavers. But virtual cadavers can be very helpful in identifying the complex anatomical structures students find it difficult to dissect.
- All of these newer modalities have prohibitively high acquisition and maintenance costs. So, most of the students will have difficulty in affording them.
- Because most faculties around the world are unfamiliar with these newer tools in teaching, pedagogical training for faculties is required globally.
- Most online tools are very costly. Also, they require strong internet connections. Students who cannot afford them and students living in areas with poor internet connections will have difficulty in accessing them. This is one of the major limitations of online teaching, especially in developing countries[11].

Which is Better? Traditional Teaching or Online Teaching?

According to several studies done all over the world after the covid-19 pandemic, most students have accepted online teaching and expressed a desire to continue using online resources in the future. Online teaching has been reported to save time and improve students' performance. Only a few studies have reported that remote learning negatively impacted teaching effectiveness and students' interaction with peers and educators. Although online education carried many benefits, it was widely agreed that digital visual resources were insufficient to fully replace the traditional dissection of cadavers. Most of the students have stated that they are less confident in sections completed without the dissection of cadavers. They have emphasized the importance of traditional cadaveric dissections, prosected specimens and histology slides[12].

Every Dark Cloud has a Silver Lining

Although the Novel coronavirus pandemic adversely affected the education system all around the globe, it encouraged educationists to explore newer methodologies of teaching. This will change the future of many disciplines, including "Anatomy".

In the end, it was understood that traditional cadaveric dissections still play the most crucial role in the study of Anatomy, but it can be

supplemented with novel teaching and learning methods found during the pandemic era. Therefore the future of Anatomy education will be a blended method combining both traditional and novel methods benefitting medical students worldwide[13].

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1 Benly, P. (2014). Teaching methodologies on anatomy-a review. *Journal of Pharmaceutical Sciences and Research*, *6*(6), 242.

2 Aristovnik, A., Keržič, D., Ravšelj, D., Tomaževič, N., & Umek, L. (2020). Impacts of the COVID-19 pandemic on the life of higher education students: A global perspective. *Sustainability*, *12*(20), 8438. https://doi.org/10.3390/su12208438

3 Marinoni, G., Van't Land, H., & Jensen, T. (2020). The impact of Covid-19 on higher education around the world. IAU global survey report, 23.

4 Singal, A., Bansal, A., & Chaudhary, P. (2020). Cadaverless anatomy: Darkness in the times of pandemic Covid-19. *Morphologie*, *104*(346), 147-150. https://doi.org/10.1016/j.morpho.2020.05.003

5 Owolabi, J., & Bekele, A. (2021). Implementation of innovative educational technologies in the teaching of anatomy and basic medical sciences during the COVID-19 pandemic in a developing country: the COVID-19 silver lining?. *Advances in medical education and practice*, *12*, 619. https://doi.org/10.2147/AMEP.S295239

6 Zorzal, E.R., Sousa, M., Mendes, D., dos Anjos, R.K., Medeiros, D., Paulo, S. F., & Lopes, D.S. (2019). Anatomy studio: a tool for a virtual dissection through augmented 3D reconstruction. *Computers & Graphics*, *85*, 74-84. https://doi.org/10.1016/j.cag.2019.09.006

7 Martín, J.G., Mora, C.D., & Henche, S.A. (2018). Possibilities for the use of Anatomage (the anatomical real body-size table) for teaching and learning anatomy with the students. *Biomed J Sci Tech Res*, *4*(4), 94. https://doi.org/10.26717/BJSTR.2018.04.0001094

8 Bernard, F., Richard, P., Kahn, A., & Fournier, H.D. (2020). Does 3D stereoscopy support anatomical education?. *Surgical and Radiologic Anatomy*, *42*(7), 843-852. https://doi.org/10.1007/s00276-020-02465-z

9 Hew, K.F., & Lo, C.K. (2018). Flipped classroom improves student learning in health professions education: a meta-analysis. *BMC medical education*, *18*(1), 1-12. https://doi.org/10.1186/s12909-018-1144-z

10 Hennessy, C.M., Kirkpatrick, E., Smith, C.F., & Border, S. (2016). Social media and anatomy education: Using Twitter to enhance the student learning experience in anatomy. *Anatomical Sciences Education*, *9*(6), 505-515. https://doi.org/10.1002/ase.1610

11 Patra, A., Asghar, A., Chaudhary, P., & Ravi, K.S. (2022). Integration of innovative educational technologies in anatomy teaching: new normal in anatomy education. *Surgical and Radiologic Anatomy*, *44*(1), 25-32. https://doi.org/10.1007/s00276-021-02868-6

12 Papa, V., Varotto, E., Galli, M., Vaccarezza, M., & Galassi, F.M. (2022). One year of anatomy teaching and learning in the outbreak: Has the Covid-19 pandemic marked the end of a century-old practice? A systematic review. *Anatomical Sciences Education*, *15*(2), 261-280. https://doi.org/10.1002/ase.2162

13 Naidoo, N., Satyapal, K.S., & Lazarus, L. (2021). Could COVID-19 Trigger a Rebirth in Anatomy Education? A Glimpse of Anatomists' Responses to Pandemics of the Past and Present. *SN Comprehensive Clinical Medicine*, *3*(3), 784-789. https://doi.org/10.1007/s42399-021-00813-7

CHAPTER 12

Cultivate Love for Learning Food Science during Trying Times

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Introduction

Sri Lanka, as a country, is undergoing dramatic changes in terms of the socioeconomic well-being of its citizens. The education of 1.6 billion students in over 150 countries has been affected by the COVID-19 pandemic. The higher education system in Sri Lanka too, was affected by this, but as the nation learned to adapt and rise above the challenges of distant education, it was presented with a new hurdle which is the current economic situation of the country.

To be a successful graduate in food science and technology, the student must not only have a comprehensive grasp of the theoretical concepts but must also have a very good understanding of their practical applications with hands-on experiences as well as a good understanding of how the food industry operates. The current situation in the country affects both the learners and educators equally. However, regardless of the challenges, higher education institutes have to help their students achieve the graduate profile through novel teaching and learning methods to ensure that the future of the country's workforce is fully prepared to take on the task of restoring the economy back to its normal state.

Distance Learning

Distance learning or distance education became a popular choice with the onset of COVID-19 as an alternative to conventional in-person

classroom learning experiences. In simple terms, distance learning means that the teacher is not present at the same time or place as the student, and the students can learn remotely from their homes. This helped to overcome the drawbacks of conventional lectures, such as bans on public gatherings, travel bans between districts, and the unavailability of transportation due to the fuel crisis.

However, conducting lectures online meant that the student-teacher interaction was reduced, and there was much less supervision of the students which led to a loss in motivation among students. In the worst cases, it was seen that the students had a lack of self-confidence to face assessments. Therefore, it is very important to relook at the way higher education institutes approach online education in order to find ways to make distance education more engaging and inspiring for students.

Conventional Learning Vs Distance Learning

In order to overcome the drawbacks of distance learning, let's first take a look at some differences between conventional and distance learning.

Location

For conventional learning, the student has to attend the lectures physically, and in situations where the courses of interest are taught at a university that is far from the hometown of the student, he/she will have to move to the city where the university is located. In our university system, the students are provided hostel facilities, and this became a challenge due to COVID as students have to use common sanitary facilities. However, the students do not need to be present at the university for distance education, and they can attend the lectures as long as they have a stable internet connection

Discipline and Self-Motivation

In traditional classrooms, the students are given a timetable to follow, where they have to attend the classes in person at the specified time, and attendance is recorded as a form of motivation to get the students to participate in the lectures.

However, due to the power interruptions which are happening island-wide, the practice of marking attendance was dropped and all lecture recordings were made available online. The students need to be self-motivated enough to attend the online lectures, and in cases in which they cannot, they have to be disciplined enough to focus on completing course content by watching the lecture recordings later and completing the guided activities done in class.

Social Interaction

Social interaction is a key benefit in a conventional classroom setup as it allows students to engage in group activities and discussions, but in an online setting, this is limited. However, there are new methods to create a more interactive environment in a virtual setting which will be discussed later in this chapter.

Different Forms of Distance Learning for Food Science

Online Lectures as a Form of Synchronous Distance Learning

In these types of methods, both the student and teacher engage in teaching-learning activities online at the same time. Such online courses are the most common and most popular these days with Zoom, Microsoft Teams, Skype and Google Meet being popular platforms to host such video conference calls. Zoom is widely used by Sri Lankan universities and has a range of functions such as screen share, annotations, whiteboard and breakout rooms. This is perfect for teaching theoretical aspects of food science subjects, and with video-optimized options in screen sharing, the teacher can switch in and out between multiple applications such as PowerPoint and video players to make better use of multimedia resources from websites such as YouTube etc. For example, following a presentation discussion on drying equipment, the teacher can easily switch to a video, and show how such a drying equipment works. Also, the teacher can ask revision questions from the audience. Whiteboard is a very useful tool for a lecturer who can invest in hardware extensions to make the best use of the annotation functions in order to replace the chalk and board-style explanations.

However, in online lectures, there should be a considerable proportion of student activities and interactions to keep the students motivated and reduce boredom. Breakout rooms are one feature that a teacher can use within zoom itself to create smaller groups to facilitate peer discussions. This is an effective tool that substitute the in-person discussions that the teachers let the students have during product development brainstorming sessions or to discuss research papers and prepare for group-wise presentations. There are new interactive tools made by third-party companies to make a lesson far more interesting than a conventional one. For example:

- Kahoot
- Mentimeter
- Padlet
- Nearpod
- Edpuzzle
- Google form (Quiz format)

Such quiz-making and brainstorming tools can be used as a great way to help students memorize or recall certain facts and points, and can be used at the end of the lesson or at the beginning of a new lesson.

These can be used for tutorial discussions while the lesson is progressing. The quiz format of Google forms is a very simple but effective tool to create tutorials with minimum effort and also it can be used to create workbooks that the students can use to do interactive online classroom activities, fill in lesson notes etc., in order to break the monotony in online lectures.

Asynchronous Distance Learning

For distance education, the lecturer does not necessarily have to be present at the same time as the student. Learning management system (LMS) based tasks for self-studying can be assigned for students to gather information on their own. The most popular forms of asynchronous distance learning are Massive Open Online Courses (MOOCs) such as;

- EdX
- Coursera
- Udemy
- Udacity

These platforms offer courses with video-recorded lectures and course materials that the students can follow at a self-paced speed. There are free courses as well as paid courses that offer virtual certificates after completing the course.

Using the LMS, this can be easily implemented in the Sri Lankan University system. However, the initial effort to record the lectures, and create the required graphics (animations and images/ figures) would be high. But the advantage of this is that once implemented, these materials can be used year after year with minimum modifications and most importantly, in the following years, the academics will have more free time at hand to engage in other activities to increase the productivity of the university system as a whole.

Certain modules of such courses can be recommended to students as a form of supplementary materials. However, since this is self-paced and there is no motivation for the students from the side of the lecturer, a mix of both synchronous and asynchronous modes can be followed.

Hybrid Distance Learning

Here, the lecturer can assign tasks based on the LMS or MOOCs as a form of pre-preparation for the next online lecture. Such activities can be assigned to gather information from local food businesses and passed-out graduates already working in the industry to make up for the field visits that

the students are missing under the current context. This has to be followed up with a live discussion where the student gets to present what he/she found to the class. This not only sets a timeline for the students to work, but it challenges them to gather more information and create an interesting story.

With regards to field visits, webinars conducted by companies are a great way to create a link between the students and the food industry while evaluating the knowledge of the students by means of a proforma. Onsite webinars can be organized by companies to show different processes to the students, thus ensuring that the student has a clear understanding of the inner workings of a company.

This method would be highly effective for single-credit courses that are easy to follow. However, the live discussion session is crucial in order to keep track of the progress of the students and to do that, other tools such as Kahoot and Mentimeter can be used.

Managing Practical Classes in Distant Learning

The most challenging aspect of conducting a practical-oriented course such as food science online was figuring out an effective delivery method for practical classes, which is essential to achieving the graduate profile. These practical classes are of two types;

- Laboratory based – Food chemistry/ Food Analysis/ Food Quality
- Kitchen based – Food processing/ Product development

Passive methods, such as showing videos, tend to get boring. There have been many novel approaches that have been tried and tested globally for similar disciplines, such as chemistry, which are applicable to this subject stream.

Virtual Chemical Laboratory (VCL)

Virtual laboratories can be defined as "computer-simulated learning environments that range from 2D visualizations of experiments to 3D simulations that can replicate real laboratory environments[1]". Figure 1 is an example of a VCL simulator interface[2]. Compared to traditional hands-on laboratories, the following benefits can be offered by virtual laboratories:

- Cost is lower
- Offers greater accessibility
- Non-disposal of toxic chemicals helps the environment
- Less time-consuming as there is no need to arrange the practical in advance
- Flexibility
- Self-paced
- Ease of assessment

There are much more sophisticated versions that include virtual reality hardware as well. But in the Sri Lankan context, computer-based and mobile-based VCLs will be beneficial, and they need to be programmed to suit the practical classes for food science. Studies have shown that these VCLs show better cognitive learning outcomes than traditional passive media.

Figure 1: Virtual Chemistry Laboratory

Redesigning Kitchen-Based Practical Sessions

D'Youville College in Buffalo, New York, had redesigned their practical sessions in the dietetic program courses in a way that students are able to conduct them using standard kitchen equipment and ingredients[2]. They have distributed lab supply kits to the students and set up scheduled ingredient pick-ups throughout the semester. A similar approach can be taken for certain food science courses, such as new product development and food processing-based courses: confectionary and beverage technology, dairy products technology, fish, meat and egg products technology, etc. This can be blended with a video conference classroom so that all the students can conduct the practical in real time under the supervision of the tutors. However, an increased cost will be involved as these sessions are usually conducted in groups to manage the existing resources.

Importance of Getting Feedback in Distance Education

Student feedback is very important in all forms of education, whether conventional or distance education. But, in order to make sure that the students don't feel isolated at their homes, we have to make sure that there is a two-way communication channel between the student and the lecturer, and this can be used to get feedback from the students as to whether they have understood the content or not.

The following tools can be used in this context to get student feedback:

- Chat box in zoom
- Padlet
- Google form
- LMS (Moodle)
- Informal methods (WhatsApp group discussions)

Chat box in zoom is a basic facility that allows the lecturer to get feedback while doing the lesson. However, certain students may feel shy to ask questions and the Q&A function of zoom will allow students to ask questions anonymously.

By creating a poll at the end of the lesson, the lecturer can get real-time data as to whether the lecture was interesting to the students or not. Even conventional tools such as email and google forms can be used. To collect feedback on lessons, courses, and even teachers, which can be used to modify the teaching methods as well as the course content.

Conclusion

In conclusion, it can be deduced that blended/ hybrid modes of learning are most suitable during these challenging times. Although there are difficulties, there are ways that higher education institutes can use modern technology to make learning a more pleasurable experience for the students and develop their creativity as well as skills.

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1 Border, K. (2021). Implementing a Higher Education Food Science Laboratory Course during the Covid-19 Pandemic. *Food Science and Nutrition*, *7*(1), 1-5. https://doi.org/10.24966/FSN-1076/100089

2 Aziz, E., Esche, S., & Chassapis, C. (2009). Review of the state of the art in virtual learning environments based on Multi-player Computer Games. Computers in Education Journal, *20*(1), 22-35.

CHAPTER 13

Responding to the Changes in Medical Education: Experience of Faculty of Medicine, Wayamba University of Sri Lanka

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Introduction

Education plays a huge role in a country's successful outcome in every sector. Out of all the education in a country, medical education is key to a good and effective health service. Medical education has been developing since the pre-independent era in Sri Lanka up to now. It has passed so many milestones along the way and still keeps growing. The predominant thinking pattern nowadays is that there should be active learning to enhance the student's skills required for that time so they can adapt to the needs of society. It is a challenging situation for students and teachers equally since this requires perceptual changes in the teaching-learning process of all involved parties[1].

The world is constantly changing, especially the western world and systems our academic systems are based on is always dynamic. So, according to these requirements, medical education goes through more significant updates. As a result, changes to the learning objectives, assessment and teaching methods and development of novel practical skills will need changes.

Students tend to be reluctant to these changes at the beginning since this would mean they have to be responsible for their education and put a great effort from their side. They may be less cooperative, and this might reduce the quality of their training process[2].

The outbreak of the COVID pandemic in 2019 underscored the need for education systems worldwide to adapt to rapidly changing situations. Even before the COVID, the relevance of teaching methods and content in academics was becoming increasingly crucial[3].

This article will discuss the already established novel approaches and possible future methods of applications in three main phases of medical education: pre-clinical, para-clinical and clinical phases, based on the experienced practices in the Faculty of Medicine, Wayamba University of Sri Lanka. And at the end, the discussion was made by taking a brief look into some new approaches taken by other medical education institutes worldwide.

The pre-clinical education is done during mostly the first two years of medical education. The main subjects taught during these years are anatomy, biochemistry and physiology. The para-clinical phase comprises subjects like pathology, community medicine, parasitology, microbiology etc. the para-clinical phase is usually conducted during the third and fourth years of the medical education curriculum, during which the morning clinical activities are also conducted. The clinical phase spans from the third year to the fifth year. Third and fourth-year students are engaged in clinical activities only in the mornings. In the fifth year, students engage in clinical activities during the whole day without attending lectures.

Approaches in the Pre-Clinical Phase

Many novel approaches are already being adopted during this phase, and few methods can be adapted in a future setting. For example, during the COVID pandemic, many procedures were implemented to continue the education in the pre-clinical phase by the faculty administration and the academic staff. One of the most profound problems in the COVID pandemic was the difficulty of getting students together because of the physical contact causing the spread of the disease. For that, most of the pre-clinical lectures were done on the online platform with the participation of the students via applications like zoom. Participation was promoted by making them compulsory even though it was not mandatory in the physical setting.

The advantages of this technique were that we could overcome the main obstacle we faced in the COVID era “Physical contact”. And for the students with good internet facilities this was not much of a problem but the main drawback was the unavailability of good and speed internet facilities for most of the students. A significant proportion of students were from rural areas and faced difficulty joining due to inferior connectivity. Another disadvantage of the method was keeping the students' full attention throughout the class session since they were not physically present. However, when considering the difficulty with continuing education during this pandemic, online platforms greatly facilitate keeping up with the

planned academic activities. The same technique was applied for the tutorials, although it encountered the same issues discussed under lectures.

The main issue was the practical sessions where students needed to understand the principles of the lesson by studying them in physical presence. So, these were done in later sessions in a controlled environment.

But for this also there are methods that can be used in a more novel way. For example, the practical sessions can be uploaded to the learning management system (LMS) for students to view and learn before doing the practical sessions. For this purpose, recorded videos can be used to explain the principles behind these academic activities. Also, these can be used to broaden their minds and give them a chance to clarify any doubts before the practical session.

Other novel approaches include uploading quizzes and assessment materials to LMS and encouraging students to participate in these activities. This can be done in a manner in which students are getting interested in these activities rather than forcing them to do these. For example, choosing a winner from a quiz and assessment and establishing a system to recognize them on a more public platform.

Even though this is the pre-clinical phase, the involvement of the clinician can be used as an innovative way of teaching some areas of these three main subjects. The areas where there are clinical applications can be taught by a team comprising academic staff from a particular department and relevant clinicians with the students. For example, anatomy lecturers can involve surface marking, and surface anatomy can be taught with the help of surgeons by whom this theory is practically used for various procedures.

In the same way, the biochemistry department can get the involvement of clinical hematologists and chemical pathologists where it is relevant. The involvement of the clinicians in these teaching is beneficial to understand the practical usage of the knowledge they are acquiring in the very early stage of their teaching in the medical curriculum.

Approaches in the Para-Clinical Phase

The methods used in the pre-clinical phase were similarly used in the para-clinical phase, especially the lectures, tutorials and practical sessions. The same advantages and disadvantages were encountered. Some of them were poor internet connectivity and losing students' concentration to online activities. In addition to the novel activities done during the preclinical phase, assessments were conducted online during the para-clinical phase for the first time. This online assessment allowed the faculty to conduct exams as scheduled without getting delayed. It was done with the contribution of academic and non-academic staff, especially the team from the information technology section.

The online assessment is a method which expands the teaching-learning experience by both teachers and students since both groups are physically away. If regular assessments were not done this way, the students would not understand the applicability of the lectures and tutorials done online. The assessment was only tried with multiple choice questions which were well received by the students. The assessment method can be expanded in future to include essay questions and other types of questions based on images and video clips to cover most of the components in a physically done examination.

In addition to already established methods for lectures, tutorials and practical sessions, there are other ways that can be done to improve the teaching-learning experience for both teachers and students. Although already discussed online teaching methods mainly came into play because of the COVID pandemic, these new methods can be implemented to improve the outcome of teaching in the para-clinical phase in any setting.

The suggested new approach to teaching in the para-clinical phase is based on the fact that the teaching in this phase is not well connected when it comes to academic activities such as lectures and practical sessions with the clinical activities done by the students in the morning sessions.

For example, pathology is the main subject taught in the para-clinical phase, which deals with investigations of diseases by various sub-specialties such as histopathology, hematology, chemical pathology and microbiology. Even though the students encounter a number of patients during their morning clinical sessions in whom these investigations are practically being used, the correlation between these investigations and the things they are going to learn in the evening lectures are not well connected. The reason is the involvement of two academic groups in teaching. The novel approach suggested is more coordination of para-clinical academic staff and the clinicians involved in the morning teaching sessions. A method can be developed by using patients as learning experiences to discuss their medical problems and pathological investigation by both groups to the students simultaneously so that students will understand the practical applicability in a day-to-day setting. The same principle of involvement of both groups can be used for assessment purposes too. And also, to ensure that principles and basics of para-clinical pathology teaching are being delivered to the students.

Another example is that changes can be implemented in the community medicine stream, which is another important subject in the para-clinical setting. The basics of clinical studies, research and statistics are being taught during this period. After an initial phase of lectures, these principles can be put into the clinical setting with the help of the clinicians. There are multiple opportunities for research and clinical studies in hospital wards where the students are mainly engaged in clinical activities, but the involvement of the clinicians in the studies by students is scarce, probably due to time constraints. This problem can be overcome by involvement of

the academic members from the Department of Community Medicine in these studies in practical settings where students, clinicians and academic members of community medicine sit together.

Pharmacology is another main area studied by students in the para-clinical phase. But most of the content is being taught in the theoretical form. The development of drugs is a complicated process which is already being done locally also. So, the promotion of the involvement of the students in a practical setting would benefit them to understand these principles much better. Another example where pharmacology can be taught in a novel approach is where the students, clinicians and academic staff from the Pharmacology Department can discuss the prescriptions and adverse outcomes from incorrect prescriptions in clinical settings. It would be much more beneficial for students to learn these facts in a more clinical environment than in a classroom. Additionally, the clinician can give their input to these teachings since they have much more practical knowledge in these areas. Also, it can be used as a platform to clarify any doubts by students since expert opinion is available to them from both parties (The clinicians and academic staff) simultaneously.

A subject like microbiology which is again mostly taught in a para-clinical setting, can be practically done in a clinical setting rather than a classroom. For example, the culture of various organisms is being done at university to teach students, whereas the same procedures are done at the hospital for practical and clinical reasons. The involvement of the department of microbiology with the hospital microbiology team would enhance the content grasped by the students more. Especially with regards to the practical problems arising in a clinical setting, errors and fallbacks in techniques used in microbiology can be easily understood in a much more practical setting.

Approaches in the Clinical Phase

The clinical phase comprises the time students participate in 3–4-year morning clinical training in hospitals and the full 5th year dedicated to clinical teaching at ward settings. There are already established innovative teaching methods with regard to this phase.

For example, the introduction of a pre-professorial semester just before students start the final year is now being conducted. This phase aims to have a smooth transition of students from the para-clinical phase to the final year. This semester enables students to understand the clinical applications of the theoretical knowledge they achieved during the first 4 years from anatomy to pathology.

Contribution to this semester comes from all the departments pre-clinical, para-clinical and clinical departments. Rather than single topics or areas, this semester will discuss focusing on patients and clinical diagnoses.

So, the discussion is being done by all the relevant parties involved in that patient /clinical diagnosis.

Patients' clinical diagnosis and management are discussed with highlighting the investigative side of para-clinical departments, while pre-clinical departments will deal with the basis for all these presentations.

In this way, students get a chance to clarify their doubts in the presence of academics in all the departments. Also, it will highlight the importance of all the academic teaching done from the very early stages of the medical curriculum.

Another approach taken by clinical departments for teaching in this phase is changing the way of assessing students' competence in clinical practice. Traditionally this assessment was done at the very end of clinical appointments, that's in the final year. This practice was changed because when it's used in a much earlier stage, it can be used to improve learning by students. Because the feedback students and teachers get after earlier assessment can be used as a tool in subsequent teaching. So accordingly, the new assessment methods are used at an earlier stage from year 3 clinical appointments.

This assessment is composed of viva-based assessment and submission of a portfolio by each student at the end of each clinical appointment. Truly speaking the viva is also based on the submitted portfolio of the students. The portfolio should represent all the learning the student acquired during that particular clinical training period or appointment.

The new approaches in teaching in the clinical phase can be implemented in ward settings with the help of medical and para-medical staff. For example, most of the procedures in the ward are done by nursing officers, but hardly any teaching is facilitated to the students by nurses. This can be officially recognized and get the involvement of para -medical staff like nurses in teaching practices. This teaching method can be much more successful than the teaching done by a person in the ward who is actually not handling this type of work routinely.

Same principle can be used for some other new learning practices, for example getting to know the administrative side of a clinical ward and legal aspects during working in a ward. These things can be taught by people who are actually involved in these responsibilities in day-to-day practice such as ward sisters, ward clerks, medico-legal officers etc.

Another practice that can be implemented to improve the learning conditions by students at clinical settings would be the correct guidance on achieving the goals and objectives expected from them in that particular appointment. This is practically important because even though the students are given the specific objectives for that particular appointment, they are not guided enough how to achieve them in an effective way. One of the most striking problems during the completion of these objectives is students tend to complete these by getting just the signatures without actually observing

or doing it. This can be overcome by correct guidance on how to achieve them. For example, a meeting with the whole group of students can be arranged with the university academic staff and clinician responsible for that particular appointment. So at the beginning all will have an understanding of the things expected during that appointment. Students can raise their concerns and problems. Even clinicians can comment on the practical feasibility of completing those objectives by the students within a given time.

Thereby making these objectives appear more achievable and making students get self-motivated to do the clinical appointment with much more enthusiasm.

In Sri Lanka all medical students face a common examination based on multiple choice questions at the end of the final year. So, it becomes difficult for some of the new faculties to keep up with the pace with what the older medical faculties with experienced lectures are doing. Therefore, it would be a good platform to students in the clinical phase if more activities are planned with collaborations with the other medical faculties of the country. This might involve the academic staff, students and all other relevant parties. The events or teaching sessions can be arranged in the form of case-based discussions, quizzes etc. This will allow the students to get an idea about what their colleagues from other faculties are doing so they can prepare themselves for the common test they have to face at the end.

Novel Approaches in Medical Education in other Countries

In one study, mannequin and computer-based simulators were tested on medical students for patient management, physical procedures and their competency in these areas. They are usually not known to be effective in teaching clinical medicine. But this study showed that retention of contents was significantly improved in students where web-based medical learning modality was used compared to the traditional lecture format[4].

Another study done in United Kingdom medical schools showed that basic life sciences (traditionally taught during the pre-clinical phase) are significantly changed in amount and their approach to content. For example, dissection is being replaced by prosected specimens (pre-dissected specimens displayed for the students to examine and study) and using advanced models and computer images. And focus on patients is being maintained in theoretical learning by the use of problem-based learning.

Some institutions use electronic curriculum programmes (such as "blackboard'' or 'student central") to coordinate their courses. This method allows quick and effective access to information. This method allowed all the students and teachers to examine their contribution to the curriculum.[5]

The same study noted that most medical faculties do not identify the conventional division of clinical and non-clinical phases. They plan their academic activities bearing in mind the desired outcomes.[6]

Another study explored the gaining popularity of the method of self-regulated learning. In this study, the students created questions for other students to perform. This activity made the students happy and engaged in learning teaching activities and provided a good understanding of the subject matter to a deeper level. With this method, they could be creative; hence it improved their ability to face questions in subsequent exams.[7]

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1 McWilliam, E. (2017). Today's children, tomorrow's creatives: Living, learning and earning in the conceptual age. In: S. Choo, D. Sawch, A. Villanueva, & R. Vinz, (Eds.) *Educating for the 21st Century*. Singapore: Springer. (pp. 7-23). https://doi.org/10.1007/978-981-10-1673-8_1

2 Naamati-Schneider, L., & Meirovich, A. (2021). Students Guided Learning for Medical Students - Novel Teaching for the 21st Century. In M. S. Firstenberg, & S. P. Stawicki (Eds.), *Medical Education for the 21st Century*. https://doi.org/10.5772/intechopen.98823

3 Alt, D., & Naamati-Schneider L. (2021, Feb 17). Health management students' self-regulation and digital concept mapping in online learning environments. *BMC Med Educ.*, *21*(1), 110. https://doi.org/10.1186/s12909-021-02542-w

4 Subramanian, A., Timberlake, M., Mittakanti, H., Lara, M., & Brandt, M.L. (2012, Mar-Apr). Novel educational approach for medical students: improved retention rates using interactive medical software compared with traditional lecture-based format. *J Surg Educ*. *69*(2), 253-6. https://doi.org/10.1016/j.jsurg.2011.12.007

5 David, T., Patel, N., Burdett, K., & Rangachari, P. (1999). *Problem based learning in medicine*. London: Royal Society of Medicine

6 Harden, R.M., Crosby, J.R., Davis, M.H., & Friedman, M. (1999). Outcome-based education 5—from competency to meta-competency: a model for the specification of learning outcomes. AMEE Guide 14. Med Teach 1999, *21*. 546-52. https://doi.org/10.1080/01421599978951

7 Lakhtakia, R., Otaki, F., Alsuwaidi, L., & Zary, N. (2022). Assessment as Learning in Medical Education: Feasibility and Perceived Impact of Student-Generated Formative Assessments, *JMIR Medical Education*, *8*(3). https://doi.org/10.2196/35820

CHAPTER 14

Novel Approaches of Promoting the Humanities among Medical Undergraduates: Challenge and Necessity

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Impact of Turbulent Teaching Learning Environment on Medical Education

The COVID-19 pandemic together with the ongoing challenging situation in the country has unquestionably disrupted the deep-rooted structure of medical education. As a result of this prolonged crisis, medical undergraduates face serious consequences which have adversely affected their academic performances as well as psychological wellbeing. With this new reality, medical undergraduates have to face multiple challenges they have never dealt with. Coping up with these challenges requires lots of life skills and empowerment, which is very much lacking among current undergraduates.

With these conditions, there is an urgent need to adjust the structure of medical education to empower medical undergraduates to face the turbulent educational environment and to achieve their maximum potentials. This could only be implemented by creating a healthy educational environment through motivation, facilitation to make them adapt to the new reality.

The Value of the Humanities

The humanities are a field of study that deals with human society from a critical perspective[1]. The essence of humanities is to promote critical

thinking and creativity. It provides insights into one's religious, philosophical, and aesthetic appreciation and thereby enhances personal and spiritual well-being.

The humanities help to generate tolerance and understanding among people. Humanities also facilitate making decisions in complex situations. Humanistic knowledge offers the ideal foundation to explore human experience and to appreciate differences between each other. It always deals with inspiration, organization, and action, which are essential to create a culture of innovation.

Why Do We Need to Study the Humanities?

We are living in a rapidly changing world, and we continue to face new challenges and opportunities. Studying humanities helps us to understand who we are and how to organize ourselves to achieve our own goals. Especially the soft skills that you gain from studying humanities will really become important in developing your carrier in any field. It will also equip us with a unique set of skills that we can apply throughout our lifetime.

Skills You can Gain from Studying Humanities

- Critical thinking
- Creative thinking
- Effective communication
- Emotional intelligence
- Team building
- Networking
- Cultural understanding
- Problem-solving

Humanities in Medicine

Medical Humanities study "what is meant by being human in the context of health and healthcare". It provides a comprehensive approach, to tackle needs in medical education in terms of professional development and patient care. Medical humanities help to better understand patient conditions, human suffering and patient perspectives and experiences. It also provides insight into professionalism and accountability.

The field of Medical Humanities comprehends a wide range of disciplines, including social sciences, medical ethics, and psychology. Most importantly, Medical Humanities facilitate the application of creative works to recognize the human experience in health and illness[2].These disciplines address the essential thematic areas of personal development, humaneness, health & behavior, effective communication, professionalism, and medical ethics.

The Role of Humanities in Medical Education

The humanities have shown to play a significant role in medical education. It has been found that humanities nurture the humane qualities of medical professionals, such as compassionate care, professionalism, and medical ethics. In addition, humanities develop the skill of careful interpretation of the patient, extending empathy towards the patient, developing of a better doctor-patient relationship and ultimately making a more humane health care professional.

It has been revealed that humanities primarily play an instrumental role in medical education. Literature may expose students to problematic life situations. Imaginative experience of these problems would facilitate them in solving similar problems in clinical situations. Humanities will also facilitate students to acquire useful life skills such as communication skills from drama, and analytical skills from philosophy.

Art, music, literature and drama are considered as 'expressions of human creativity'. They always reflect human happiness and sadness. A deep understanding of these will remind the purpose of their own art. It will also enable them to fully engage in their duty of serving mankind.

The ultimate objective of medical education is to make competent physicians with compassion. The integrated approach of transmitting knowledge and skills with the inculcation of medical values is required to achieve this objective.

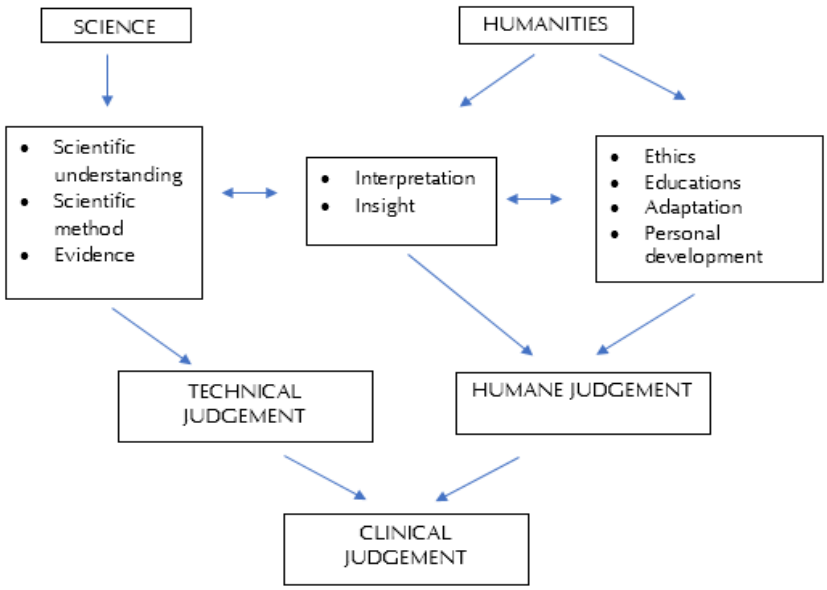

Figure 1: Attributes of a Medical Graduate[3]

Training medical undergraduates to be concerned with the patients rather than their symptoms or the disease is important. All disciplines

included in medical humanities play a role in inculcating those humane qualities among undergraduates, which are essential for the quality medical education of doctors. Furthermore, by integrating humanities throughout medical education, both the trainees and trainers can empower to be better observers and interpreters.

Necessity of Promoting Humanities among Medical Undergraduates

Contemporary medical practices have much more deviated from the basic need for such practices. The current practice has shifted into stereotypical fact-finding, application of knowledge and achieving targets, instead of understanding and relieving the pain of fellow human beings. If the current practice continues, there is a danger of losing humanity in the practice of medicine by future doctors. Therefore, it is essential to nurture the essential humanitarian instincts of medical undergraduates to reverse this trend.

The current practice of Evidenced Based- Medicine (EBM) integrates the best evidence with clinical expertise and patient values[4]. The practice of EBM requires analytical skills to a greater extent to interpret qualitative data. The practice of medicine also demands problem-solving to a greater extent, and medical undergraduates may require their talents and skills to find the best solution in each context.

Humanities also facilitate the improvement of observational skills, analytical reasoning, self-reflection, and empathy of medical undergraduates. The understanding of medical ethics and professionalism helps medical undergraduates to develop better doctor-patient relationships.

Medical undergraduates are always under stressful life conditions due to their high workload, the tension of the clinical environment, frequent assessments and evaluations and many other responsibilities. Exposure to the humanities helps medical undergraduates to develop their problem-solving skills as well as their coping skills. It will also help students to adjust their future practice of medicine according to their cultural and social contexts. This is very much essential in the present era of minimum social interactions as humanities prepare future doctors to face the moral challenges which are not addressed in their conventional medical curriculum.

Challenges in Promoting Humanities among Undergraduates within the Turbulent Teaching Learning Environment

Today, the undergraduate medical curriculum is overwhelmed by many streams, and the teaching within the curriculum time has become really challenging. Most medical undergraduates face massive pressure to grasp the core knowledge and skills of medical education. The current

turbulent teaching-learning environment has compelled medical education programs to move from conventional in-person teaching and learning to remote teaching and learning. This has limited the social interactions between students further aggravating their tension.

Furthermore, medical education faces a unique set of challenges in remote teaching and learning. There is not much evidence of how remote teaching and learning in medicine may affect the academic and clinical performance of medical undergraduates.

Medical undergraduates spend a significant amount of their time in memorizing and processing information, and they have limited time for other activities. Therefore, the majority believe that introducing a new course to the tight medical curriculum might overburden the already overwhelmed medical students.

However, learning humanities is mostly pleasurable, which might give medical undergraduates a break from their hectic work schedule. It can be used to relieve the growing stress and frustration of both students and teachers with the ongoing restrictions on their academic programmes.

Novel Approaches of Promoting Medical Humanities among Medical Undergraduates

The medical humanities are already well integrated into the curriculums of most of the reputed medical schools in USA, Europe and Australia. The number of studies has investigated the views of medical undergraduates on the usefulness and necessity of the humanities in medical education and have reported a high level of satisfaction[5]. Potential guiding frameworks have also been recommended to introduce humanities into medical education. The methods of integrating these frameworks to nurture creative thinking among medical undergraduates have been widely discussed.

Methods Used in Promoting Medical Humanities among Undergraduates

- Introduction of visual literacy workshops to develop the ability to recognize and understand ideas conveyed through art
- Creation of dialogue about social, and philosophical issues motivating critical reflection on their own life experiences
- Sessions for being aware and reflective of one's personal experiences
- Series of lecture discussions and soft skills workshops on related themes of humanities

Most of these activities had been practised using E-learning platforms which have numerous ways to work in partnership and feel as part of a community. Positive aspects of the application of distance learning in medical humanities programmes would be the flexibility of time and

location, which subsequently increase student participation despite their busy schedules.

In addition to the ability to easy adaptation, it also facilitates multidisciplinary involvement in these teaching-learning activities[6]. Thus, remote learning was found to be a cost-effective as well as a favourable approach in promoting the humanities among medical undergraduates.

One limitation of a 'virtual educational model' in medical humanities would be the lack of in-person stimulation to promote human interactions. However, most of those activities are modifiable to be carried out virtually and found to be successful with a high level of student satisfaction.

Lack of resources is another obstacle in introducing medical humanities to medical undergraduates. These resources can be human resources, infrastructure, internet access, and related devices for remote learning. It is well acknowledged that not all medical schools in the country have similar resources and technologies. However, when it comes to the medical humanities, there is always an opportunity to integrate online teaching learning programmes with active learning modalities.

Way Forward

Continuation of medical education is vital despite the challenging teaching-learning environment for low- and middle-income countries. E-learning has been accepted as a standard approach for medical education from the onset of the COVID-19 pandemic. E-learning projects have been successful and well accepted in promoting medical humanities to undergraduates in developed countries.

The field of medical humanities is still in its early stages of development in the medical schools of Sri Lanka. The existence of a well-organized, reliable, and dedicated department to coordinate this programme is vital for further development of the field. Adapting novel distance learning approaches is a better option for promoting medical humanities among undergraduates, especially in low-resource settings. However, more research needs to be performed to investigate whether the introduction of medical humanities through remote learning methods enhances the overall performances of medical undergraduates.

In conclusion, the introduction of medical humanities to the undergraduate curriculum can only be achieved through a multifaceted approach. Novel technology-enhanced modalities can effectively be utilized to offer the scope and space for students to achieve their learning targets in medical humanities.

1 Drees, W. (2021). What Are the Humanities For? In *What Are the Humanities For?* (p. iii). Cambridge: Cambridge University Press https://doi.org/10.1017/9781108974615

2 Hedy, S. Wald, Jonathan McFarland & Irina Markovina (2019). Medical humanities in medical education and practice, *Medical Teacher*. https://doi.org/10.1080/0142159X.2018.1497151

3 Macnaughton, J. (2000). The humanities in medical education: context, outcomes and structures. *Med Humanit*. https://doi.org/10.1136/mh.26.1.23

4 Masic, I., Miokovic, M., & Muhamedagic, B. (2008). Evidence based medicine - new approaches and challenges. *Acta Inform Med*. https://doi.org/ 10.5455/aim.2008.16.219-225

5 Batistatou, A., Doulis, E.A., Tiniakos, D., Anogiannaki, A., & Charalabopoulos, K. (2010). The introduction of medical humanities in the undergraduate curriculum of Greek medical schools: challenge and necessity. *Hippokratia.*

6 Papapanou, M., Routsi, E., Tsamakis, K.*, et al.* (2022). Medical education challenges and innovations during COVID-19 pandemic, *Postgraduate Medical Journal.* https://doi.org/10.1136/postgradmedj-2021-140032

CHAPTER 15

The Tale of Online Medical Education

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Impact of the Current Turbulent Environment of Society on Higher Education

Sri Lanka is currently facing the biggest economic and social crisis in its history. This is not a known territory to operate for both the citizens and the policymakers of the country. Following two catastrophic years due to the global COVID-19 pandemic, the economic crisis is hindering all sectors of this island nation.

As we have already witnessed from the current socio-economic dilemma, a noticeable and major impact is made on every element of human existence by a spectrum of events ranging from a microscopic virus to a mega economic crisis. It has already demonstrated the negative influence on the lives of the budding generation of the nation. The on and off closure of schools and universities brought on by COVID-19 and the economic crisis have seriously disrupted education in the country. The true impact of this crisis on the mental health and social well-being of students and teachers across all educational levels is still not fully known. However, it is clear that the continuous lockdowns, travel restrictions and inadequate transport facilities have permanently altered the education system of more than four million students in the country. Amid all these events, the university system of the country has found ways to survive and continue undergraduate and postgraduate courses with significant success. This is largely due to embracing the novel practices of teaching and learning without only relying on traditional classroom teaching methods.

The Progression of Online Learning

The history of online learning goes back more than 50 years. It began with the introduction of the intranet in 1960, where a linked computer system was used to provide academic material to students. Following the invention of the internet in 1994, the whole world became one global village with regard to information transfer. Digital literacy has been playing a pivotal role in sharing knowledge since then, using a wide array of devices and platforms. Online learning has the advantage of crossing time and geographical boundaries[1], and at the same time, it provides an opportunity for student-centred learning rather than the teacher cantered learning that has been practised for centuries. In addition to that, online learning has the distinct benefit of delivering the most up-to-date, evidence-based content to users. Online teaching-learning has been referred to in many terms, often as e-learning, internet-based learning, or web-based learning. The era we live in today, which is dominated by social media, provides a golden opportunity to shift from traditional methods of teaching and learning programs and embrace novel techniques. Knowledge is no longer an expensive commodity; it can be gathered using a small smartphone and stored in a Nano chip. Although the rest of the world has moved so far ahead of us that they utilised online platforms to deliver knowledge to students decades ago, the only silver lining of the ongoing crisis is, finally, we are ready to keep behind the traditional methods and embrace the latest distance, blended and online learning methods. However, transforming a conventional classroom into an online teaching environment was an enormous task to achieve due to the lack of infrastructure facilities and the uneven distribution of the resources where the rural areas of the island is having very limited access to high-speed internet facilities and updated electronic devices.

Online Learning of Medical Undergraduates across the Globe

Online learning is a relatively new and fast-growing idea in medical education. Medical educators can employ e-learning to increase the efficacy and efficiency of educational activities in light of social, scientific, and pedagogical difficulties. Studies on practising e-learning in the context of medical education have revealed promising results across the globe. It has been shown that the knowledge medical students achieve through e-learning is almost equivalent to that of traditional learning[2]. Further, it has been demonstrated that learners of the online platform are more efficient and had active participation in teaching-learning processes. Harvard medical school, being one of the most decorated medical schools in the world, has started online courses that are led by Harvard medical school faculty, working in collaboration with a multi-disciplinary team of experts in biomedical visualisation, assessment, and the science of learning to create a unique learning experience and to provide the opportunity to the students across

the globe to have access to these facilities via distant learning methods. According to a study conducted in the United Kingdom on online teaching during COVID 19 pandemic, they have identified the flexibility of the timeline of courses, the luxury of not needing to travel, cost saving and the ability to learn at their own pace as the greatest advantages of online learning[3] (Figure 1). Further, it has been revealed that family distractions, problems with the internet connections and timing of the tutorials were the major barriers faced during online teaching (Figure 1). An Egyptian study conducted on online medical education during COVID 19 pandemic has identified problems with internet connections, harder to communicate and interact on online platforms as the major barriers to online learning[4] (Figure 2), the same study has found that there is a huge difference between the online resources utilised before the COVID 19 pandemic and during the pandemic. During the pre-COVID era, pre-recorded lectures on third-party platforms like YouTube were the most preferred and utilised online learning method (Figure 3) and during the COVID 19 pandemic, live lectures/tutorials delivered via e-learning platforms such as zoom became the most prolific and prominent mode adapted by medical faculties (Figure 4). According to a study that involved final-year medical students on an orthopaedic rotation, web-based tutorials on patient-oriented problems significantly improved the performance of the intervention group compared to the control group. This indicates that web-based tutorials help medical students develop their higher cognitive skills[5].

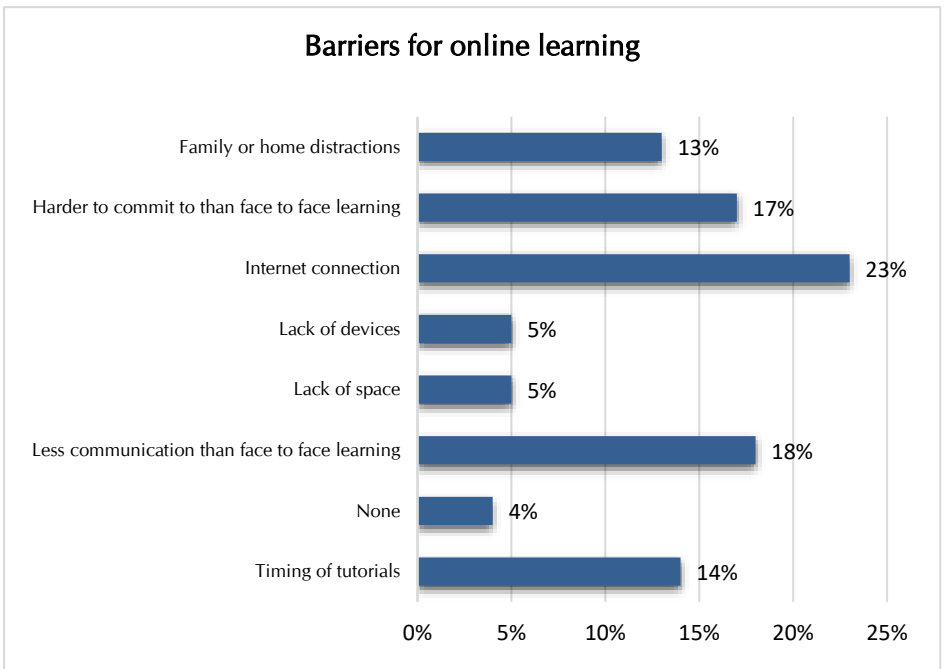

Figure 1: The Barriers to Online Teaching during COVID 19 in United Kingdom

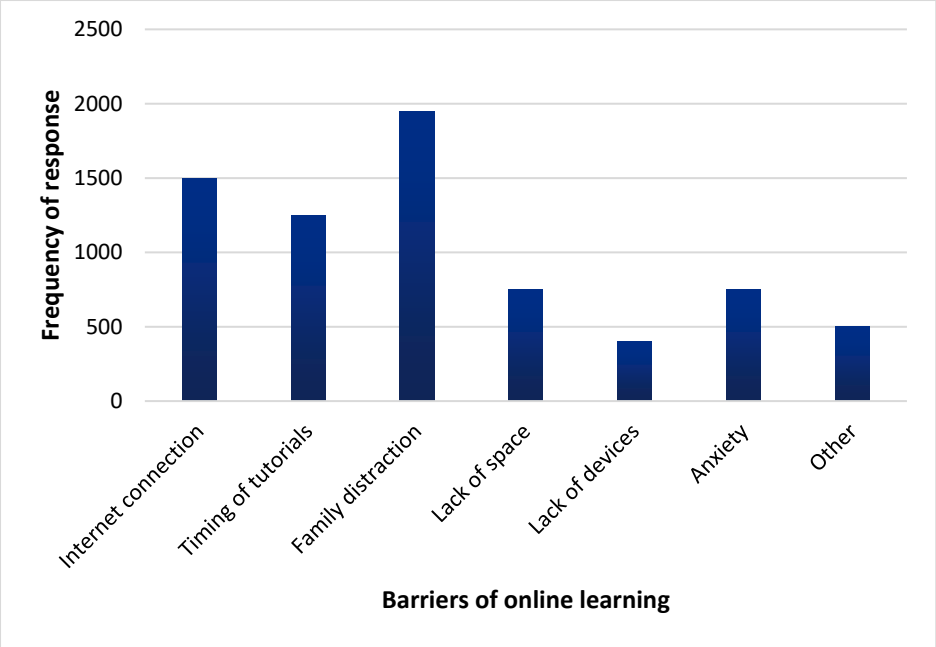

Figure 2: Study Done on Online Medical Education in Egypt during the COVID-19 Pandemic

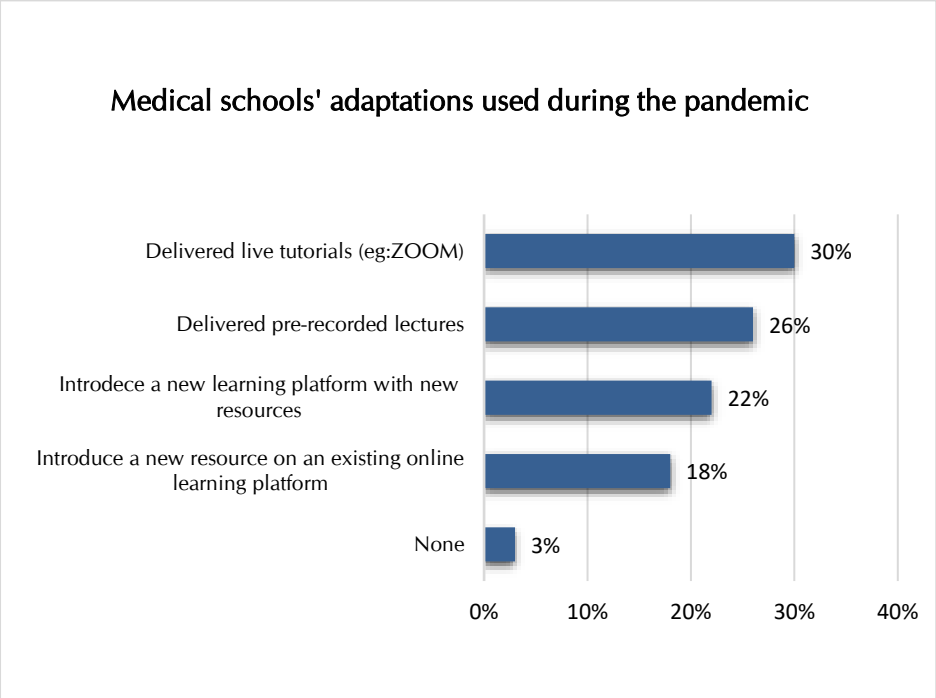

Figure 3: Study Done on Online Medical Education in Egypt during the COVID-19 Pandemic

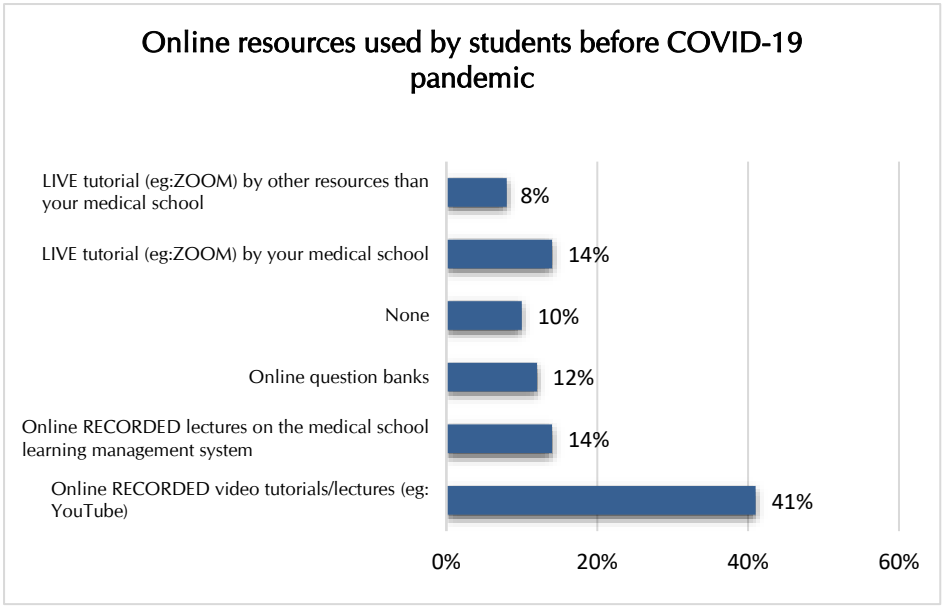

Figure 4: Study Done on Online Medical Education in Egypt during the COVID-19 Pandemic

The Current State of Online Learning in Medical Undergraduates in Sri Lanka

According to a study conducted in the Faculty of Medicine, University Colombo delineating the pattern of use of e-learning methods among medical undergraduates and new graduates. It was found that though the students used a significant number of e-learning methods, evidence showed that students preferred using traditional learning methods over e-learning methods. When searching for the causes, the majority of the students revealed that they encountered a number of problems when using e-learning methods, and most of these problems were related to poor economic status[6]. Another study done in the Faculty of Medicine, Wayamba University of Sri Lanka, to assess the effectiveness of online learning over in-person learning on the academic performance of medical undergraduates showed that there was a statistically significant reduction of marks when the teaching-learning activities were done only in the online platform when compared with in-person learning (Table 1).

Further, a study done on the usage of open educational resources and social media for academic information by medical students at the faculty of medicine, University of Kelaniya showed that although the majority of students use the open educational resources and social media to gather academic information, very few of them utilised the reliable sources for the information[7]. Amid all the drawbacks, hardships and unwillingness to adapt to new circumstances, it is still a huge positive that all the medical faculties in the country agreed to practice the online teaching-learning process and

utilise novel techniques to deliver the curriculum to the undergraduates. The learning management system (LMS) utilised has been the backbone of online learning. It has been used to deliver lectures, and give the assignments and tutorials. However, conducting practical sessions and examinations has been the bottleneck in the e-learning process. As medical education requires students to achieve a high level of competency in practical knowledge, the best way to move forward is through a hybrid system of both online and in-person learning. Therefore, the success of the ongoing e-learning processes depends on the support received by the university system from the central government and the IT sector through supplying the necessary equipment and adequate training to the university staff.

Table 1: Comparison of Exam Results Done in the Online Platform and In-Person Learning in the Faculty of Medicine, Wayamba University of Sri Lanka

	Mean	Number	Standard deviation	Std. Error Mean	t value	P value
In-person learning	60.049	71	7.38027	0.87588	8.560	> 0.001
Online learning	52.245	71	11.14017	1.32209		

Integrating Online Learning into Medical Education

The integration of online learning into the medical curriculum should be done with a well-devised and systematic plan after laying the foundation for the learning to be individualised and establishing a proper system for enhancing peer learning and near-peer learning. Although the difficult socio-economic conditions have pushed the limits to cover a significant chunk of the curriculum in an online platform, it will be greatly beneficial if blended learning techniques can be adhered, so that, it will connect the latest medical knowledge with the cutting-edge technology without deteriorating the quality of medical education. This will enhance the limits of medical education in the future as the world is fast moving towards distance learning methods which are efficient and effective because of the online learning. A prominent emphasis within medical education on lifelong learning and competency-based education has forced educators to re-evaluate their roles. In this evolving paradigm, lecturers no longer serve as the sole distributors of knowledge but are more and more becoming facilitators of learning and assessors of competency[8].

1 Saiyad, S., Virk, A., Mahajan, R. & Singh, T. (2020). Online teaching in medical training: Establishing good online teaching practices from cumulative experience. *Int J App Basic Med Res*, *10*, 149-55. https://doi.org/10.4103/ijabmr.IJABMR_358_20

2 O'Doherty, Dromey, M., Lougheed, J., Hannigan, A., Last, J., & McGrath, D., (2018). Barriers and solutions to online learning in medical education An integrative review. *BMC Med Educ*, *18*, 130. https://doi.org/10.1186/s12909-018-1240-0

3 Dost, S., Hossain, A., Shehab, M., Abdelwahed, A. & Al-Nusair, L. (2020). Perceptions of medical students towards online teaching during the COVID-19 pandemic: a national cross- sectional survey of 2721 UK medical students. *BMJ Open*, 10:e042378. https://doi.org/10.1136/bmjopen-2020-042378

4 Mortagy, M., Abdelhameed, A., Sexton, P, Olken, M., Hegazy, M., Gawad, M., ,F., Mahmoud, I., Shah, J., Egyptian Medical Education Collaborative Group (EGY MedEd), & Aiash, H. (2022). Online Medical education in Egypt during the COVID-19 pandemic: a nationwide assessment of medical students' usage and perceptions. *BMC Med Educ*, *22*, 218. https://doi.org/10.1186/s12909-022-03249-2

5 Kumta, S.M., Tsang, P.L., Hung, L.K., & Cheng, J.C. (2003). Fostering critical thinking skills through a web-based tutorial programme for final year medical students-A randomized controlled study. *J Educ Multimed Hypermedia*, *12*, 267-73.

6 Samarasekara, K. (2022). e-Learning in Medical Education in Sri Lanka: Survey of Medical Undergraduates and New Graduates. *JMIR Medical Education*, *8*(1), 1–10. https://doi.org/10.2196/22096

7 Hettige, S., Dasanayaka, E. & Ediriweera, D.S. (2022). Student usage of open educational resources and social media at a Sri Lanka Medical School. *BMC Medical Education*, *22*(1), 1–11. https://doi.org/10.1186/s12909-022-03106-2

8 Trukhacheva, N., Tchernysheva, S. & Krjaklina, T. (2011). The impact of E-learning on medical education in Russia. *E-Learning and Digital Media*, *8*(1), 31–35. https://doi.org/10.2304/elea.2011.8.1.31

CHAPTER 16

How to Use Theories, Concepts and Assumptions to Find Practical Solutions

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This chapter is different from its format and content. Here you will be taken through the process of developing practical solutions by using learnt theories, concepts, assumptions, and tools in higher education.

The process starts with the appreciation of the book's topic and its validity in the current context in the country and the world. Even though there is no restriction in this topic to focusing solely on Sri Lanka and its current situation, it is necessary to consider place, time, and other characteristics of the problem when developing practical solutions. Hence, hereafter, this chapter is focused on Sri Lanka, but when necessary, it turns towards the world to find materials, resources, and learn lessons to achieve the target.

The education system of Sri Lanka struggled through the pandemic, making alterations in teaching, learning, and assessment modes, moving with the world while learning from the world.[1] However, the country is in a unique situation now; it is in the depths of an economic crisis with chaotic political instability. Education in Sri Lanka requires a revolution to keep up with the rest of the world.

The First Step: Brain Storming

There are various words with slightly different concepts hidden inside to describe the process of change in any system.

Rethinking, redesigning, remodeling, reforming, revisiting, and reinventing are some of them. It is necessary to consider various ideas, thoughts, suggestions, and opinions to do any of these. Brain Storming plays a role here.

Here are different pieces of brainstorming for the above topic. They are in different formats. They are from different sources. For some ideas, exact sources can be given, but some came after processing various ideas taken from research papers, seminars, articles, and even internet blogs. So, it is difficult to give an exact source of origin.

There is no order or organization here. They are numbered just to separate them from the others. Readers are strongly advised to concentrate on each idea and try to expand them as much as possible. At the same time, build the conversation with the idea of developing your own argument for and against them.

1. Natural or man-made disasters are the best stimulators to ignite creativity.
2. A crisis is a dreadful thing to waste.[2]
3. People find tools when they struggle to do something without a tool.
4. Tools help to work efficiently. Strategies help to use tools effectively.
5. An economic crisis in a country should not drag education backwards. Instead, education should leap forward and guide all nations to come out of the crisis.
6. Introducing new tools invented by other countries might not help us.
7. The economic crisis means extreme budget trimming for education.
8. The economic sustainability of a country depends on contribution to the future human capital market.
9. Introduction of a new tool may help, but efficient use of the available tool is more cost-effective.
10. We teach today. Students perform tomorrow.
11. Predicting the competencies required for the future is the most critical factor for finding strategies to develop a country economically.
12. Rapidly evolving technologies change the shape of education constantly.
13. The real achievement of a student is reflected when he gets his representation in the future human capital market.
14. The future belongs to a person who isn't afraid of new things and can learn new things quickly and efficiently.
15. Today's assessment should assess the level of future competencies.
16. There can be no progress without taking risks.
17. When changing concepts, a problem may turn into a solution.

The Second Step: Positive Mind Set

Has this brainstorming exercise led the process anywhere? Is it productive in the sense of leading the thought process towards practical solutions?

The ideas seem to be vivid and have touched on some aspects of the problem and possible solutions. But they represent broad concepts with little practical incline. Only one of the selected 17 ideas (economic crisis means extreme budget cuts for education.) represents the problem's constraining or negative impact. Many ideas are similar, and there is an overarching theme. Even though resources are different, it is obvious this is a single-person activity. Every idea revolves around positivity.

Is it really a waste of time?

There is no clue about better practices to implement in higher education to augment student achievement during this economic crisis, but many positive thoughts energise the exercise. The mindset for the task is unshakably positive. This can be marked as the first success point in the process.

There should be a way out. It is a matter of working towards that. A positive mindset is essential not only for this exercise but also for the entire process of finding solutions to real problems in the country's higher education. It should be noted here in bold letters.

The Third Step: Different Approach with a Different View

The question is to find out naval methods to augment student achievement in higher education. Keeping constraints and restrictions due to economic difficulties may not expose all possibilities. If the country is in a conducive environment, are there strategies and tools to help in achieving the target?

Higher education in general, is very broad, and it is difficult to work out a practical solution. While opening one aspect of the problem, the other side narrows down to medical education as a strategy to make it easy to find practical answers.

Now the question is: what are the concepts, strategies and tools to spur student achievement in medical education? To elaborate further following aspects need consideration:

What Are The Future Trends In Medicine?

What are the expected qualities or competencies of a future doctor?

What are the new introductions to medical education?

What changes in the assessment will be used to enhance the achievement of medical students?

Future Trends in Medicine

Sophisticated machinery powered by artificial intelligence (AI) is invading and reshaping the practices and culture of medicine. Telemedicine crosses all physical boundaries and brings the doctor and patient into a computer interphase to interact closely. Even surgeries will be done without a surgeon in the theater. Robotic surgeries are not a dream by now. The extent of the service throughout the world is waiting.

However, humanity will be searched for more and more in the future. Still, that cannot be delivered via machine. Every machine output may need a human touch to heal the patient. When some parts of the world use rocket science in medicine, other parts may be immersed in poverty and lack of resources. So new strategies with equal care for all human beings might become a trend.

Expected Qualities or Competencies of the Future Doctor

New technologies, new concepts, and methods are flooding in constantly. Those who are not afraid of new things and learn those new things efficiently and quickly will be considered competent people in the future.

Knowledge is not accepted as a resource in future human capital. Artificial intelligence will deliver more accurate knowledge than human beings. AI will select and apply the most suitable knowledge component. So what are the essential functions or capabilities of future doctor for the well-being of human society?

The Wilson Flora Hewlett Foundation has predicted the quality of future doctor:

1. Effective communication
2. Harmonious collaboration
3. critical thinking
4. Creative thinking
5. Ability to learn how to learn (academic mindset)[3]

The doctor will be a globalized person with localized strategies delivering the service in a unique way (Individualization).

Achievement of Students

Assessments are used to rank student achievement in higher education. The true measure of a student's success, however, is when he is given a place in the future market for human capital. Current educational assessments should be able to evaluate the skills needed for proper placement in the world of the future. The most crucial elements of curriculum construction or change are the accurate identification of necessary competencies and how to assess those competencies. The students' accomplishments will then be defined in a meaningful way.

New Introduction to Medical Education

E-Learning

A decade ago, world-renowned medical schools advertised the facilities of their learning-enhancing classrooms, laboratories with research facilitation, and other physically built resources. The trend has markedly changed. Now they advertise on their online platforms with a high degree of student involvement and interaction. The world is remodeling its online platforms daily. There are virtual ward rounds, virtual simulations that augment reality by using 3D images and 3D printing. Storytelling techniques in primary education have been converted to give real-life experiences according to student decision-making in a program like Choose Your Own Adventure.[4]

Blended – Learning (B- Learning)

Doctors do work with human beings. They need skills to deal with people who are emotionally vulnerable. It doesn't matter what amount of augmented reality a machine can provide; it can't completely replace medical education. There is no way to ignore face-to-face or in-person teaching – learning in a predictable future. The percentage of each component depends on various factors. However, in an ideal situation, the most important factor for the decision is the ability to give the necessary competency to the student. Therefore, blended learning will be the mode of delivery for medical curriculum till the world goes beyond digitalization.

Widening Educational Spaces

In the past, educational space meant the place where teacher and student carried out their teaching and learning activities. It was physically bound to a limited space. In a school, it was a classroom, laboratory, library, or another area nearby. In the university, it was lecture halls, laboratories, factories, or related working fields. Medical education takes place primarily in the ward, operating room, or clinic, but always in the presence of physical patients.

With the digitalization of the world, learning spaces have broken their boundaries and changed their shapes enormously. Currently, it is difficult to define the educational space and, actually, it represents opportunities for teaching and learning. Students can join verity of activities such as virtual classrooms, operating theaters, ward rounds, and simulations in any part of the globe. Not only that, it is interesting that they can engage in activities done in the spaceship outside of our solar system. Massive Open Online Courses (MOOCs) are only one way of widening the educational space.

Student-centred Learning

Even though this method of teaching is not a very new concept, it is deeply rooted in current higher education, including medical education. The reason for this placement is its effectiveness in giving the necessary competencies to the student. Student-centred learning enhances the acquisition of communication, critical thinking, and creative thinking skills. It gives a sense of responsibility and accountability.

The Fourth Step: Important Aspects to Consider for a Practical Solution

Whatever the concept, strategy, or tool that is going to be helpful, it should support blended learning and student-centred learning and teaching.

Most of the new inventions in education are based on digitalization. But medical education in Sri Lanka has a unique identity due to the clinical skills of doctors, which are the result of massive clinical exposure. Suggestions, strategies or tools should not hamper the unique excellence of Sri Lanka medical education.

Instead of giving a new tool, changing the usual way of clinical exposure to a different method would increase student achievement and may be cost-effective and sustainable.

The Fifth Step: A New Proposal for Clinical Exposure

Currently, medical students' clinical exposure is confined to identify teaching hospitals. In some instances, other hospitals may be used when there are no adequate patients or space in the named hospitals. But the method of enrollment and teaching is the same. The faculty gives the named hospital, named consultant, and time duration for the exposure. One group of students consists of 15-20 students. Students are supposed to take histories from the patients in the ward, examine them, and observe patient management and involve patient management under supervision, ensuring patient safety. Compared to many other medical schools in the world, this gives many opportunities to learn from patients.

However, there are drawbacks to this arrangement as well. There are no adequate patients inward for the number of students in the group. One consultant is responsible for teaching 15–20 students while engaging in patient care and other administrative activities. Consultants' jobs are full-time ones with busy schedules, even without medical students. So some students may not get the correct guidance from the consultants. For enthusiastic students, learning opportunities are given adequately, but for students who lack enthusiasm for active involvement, they can just hang over and complete the appointment. The responsibilities of students regarding getting adequate clinical exposure is less.

In Sri Lanka, students are from all parts of the country. Because of clinical appointments, they have to stay around the particular hospitals.

When all teaching is physical and in-person, it is not an additional burden or expense. However, with freely available digital platforms, many components of the curriculum can be successfully completed online without a negative effect on student achievement. At that point, clinical appointments will become an economic burden and reduce the flexibility of learning spaces.

Dispersing Clinical Training throughout the Country

(Possibility of doing clinical appointment near student's hometown or any convenient place.)

Students will decide their preferred place of clinical placement for each specialty.

To formalize and streamline the teaching, students are given a list of cases with which they should interact during the given period. Their experience should be shared with their colleagues and teachers (facilitators) using digital platforms frequently, almost daily.

To convert an idea or thought into an implementable, practical project, SWOT (Strength, Weaknesses, Opportunities, Threats) analysis will help.

Strength of the Proposed Project

1. Each student will get responsibility and accountability for their clinical training.
2. Students must communicate and collaborate with hospital administration, relevant consultants, and hospital staff. This will improve their soft skills. The University only provides facilitation.
3. When they share experiences with colleague, collectively students are exposed to a large number of consultants, and get an idea of available resources throughout the country.
4. Blended learning will be established as in-person learning with patients and sharing experiences on a digital platform.
5. Cost-effective for the student without increasing the expenses to the university or the government.
6. Being a medical student in a known community will help to improve the student's attitude and self-esteem.

Weaknesses of the Proposed Project

1. When there are more responsibilities and work to do by themselves, students' anxieties and stress may go up, reducing their achievement.
2. Academic staff might feel this as an overburden.
3. Uniform surveillance should be established to ensure that students are actively learning by taking advantage of the opportunities.
4. A pilot project should be run to calculate cost-effectiveness.

Available Opportunities

1. Availability of a network of well-established government hospitals and public health institutions throughout the country.
2. The consultants, doctors, as well as other related health professionals, have been trained by the government institutions and their willingness to train the next generation of their professions free of charge.
3. Acquiring teaching skills is a mandatory component of postgraduate training in all specialities in medicine. As a result, all qualified consultants are qualified to train medical students in any hospital where they work.
4. In Sri Lanka, having medical students for training is a career dream of many consultants. Patients' willingness to become a learning material for medical students, refusal to talk to a medical student or being examined by a medical student is a rare incidence in Sri Lankan culture.
5. The availability of well-established e-learning systems in the faculty as well as student devices.

Threats

1. Fear of the effect on the quality of medical education by changing the available system
2. A pessimistic view of the country's and individuals' future
3. Appreciation of new ideas hasn't become a cultural norm in the country, so ideas to implement as practical solutions might take a long time and be strenuous.

The Sixth Step: Pathways to Introduce a New Strategy to Establish Systems

A new proposal should go through different forums of stakeholders. At different levels, it should be evaluated, receive criticization and need strengthening by cutting and adding.

When it is a naval idea, pilot projects must run first. The appropriate evaluation of the project is crucial before absorbing it into the available system.

Some projects will start from the higher policy-making level. Some can introduce to the system as a smaller project and go upward with success. The second one is the preferred pathway for this proposal.

The proposal is waiting to go to the teaching learning committee of the faculty of medicine at Wayamba University of Sri Lanka as an elective 2 week appointment for the students of year 4 semester 2 period, where they are bridging their acquired para-clinical knowledge with a final year professorial appointment.

1 Hayashi, R., Garcia, M., & Maddawin, A. (2020). Online learning in Sri Lanka's higher education institutions during the COVID-19 pandemic. *Asian Development Bank*. https://doi.org/10.22617/BRF200260-2

2 Helen Chu (2009). *Educational Technology in a Challenging Economy*, national video conference and webcast, University of Wisconsin-La Crosse, https://er.educause.edu/articles/2009/7/educational-technology-in-a-challenging-economy--an-inside-view

3 Farrington C.A. (2013). *Academic Mindsets as a Critical Component of Deeper Learning* [White Paper]. University of Chicago. https://www.hewlett.org/wp-content/uploads/2016/08/Academic_Mindsets_as_a_Critical_Component_of_Deeper_Learning_CAMILLE_FARRINGTON_April_20_2013.pdf

4 Park, J.C., Kwon, H.J.E., & Chung, C.W. (2021). Innovative digital tools for new trends in teaching and assessment methods in medical and dental education. *Journal of Educational Evaluation for Health Professions*, *18*. https://doi.org/10.3352/jeehp.2021.18.13

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