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Curriculum delivery in Medical Education during an emergency

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PRACTICAL TIPS

Curriculum delivery in Medical Education during an emergency: A guide based on the responses to the COVID-19 pandemic [version 1]

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Abstract

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The spread of coronavirus (COVID-19) has led the majority of countries worldwide to implement emergency lockdown plans to limit the spread of the virus; this has resulted in the interruption of on-campus school and university instruction. Responses to the COVID-19 pandemic in medical education have varied from country to country, from closures of medical schools to online/distance learning approaches to abiding by country-specific measures such as social distancing to stop the spread of the disease.

The sudden transition from on-campus learning to exclusively distance learning is challenging for both faculty and students and has required a lot of preparation and other efforts in a short time. This paper aims to share the experiences of four authors in the middle east that have dealt with the sudden transition from ordinary teaching and learning to fully online teaching.

The process of Curriculum delivery in Medical Education during an emergency has included; establishing a sense of urgency, establishing working teams, conducting needs assessments, developing implementation plans, communicating the curriculum content, capacity building, managing students' stress, finding tools to be used, managing student engagement and motivation, student assessment, anticipating challenges and planning for how to overcome them, and monitoring and evaluation of curriculum implementation and

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continuous improvement.

The proposed process will hopefully assist the medical schools in response to the current pandemic (COVID-19) and when facing similar situations.

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article can be found at the end of the article.

Keywords

social distancing, COVID-19, online learning, distant learning

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Background

Coronavirus, or COVID-19, is classified as a pandemic affecting 199 countries and territories around the world (*COVID-19 Coronavirus Pandemic, 2020; Sun et al., 2020*). The spread of COVID-19 has led a majority of countries worldwide to implement emergency lockdown plans and apply social distancing strategies to limit the virus' spread; this has resulted in the interruption of school and university attendance (*Hafiz et al., 2020*). It has been estimated that there are 1,5 billion learners affected by school and university closures (*UNESCO, 2020*). The responses to the COVID-19 pandemic/threat by medical schools around the world have varied, from total study cessation to a switch to online/distance learning. This sudden transition to distance learning approaches from on-campus learning is challenging for both faculty and students and has required much planning over a short period of time and without any clear guidelines.

Medical schools' responses to these sudden lockdowns caused by COVID-19 are not well documented in the literature, and there are few works that outline the response to epidemics like these, such as the Severe Acute Respiratory Syndrome (SARS) outbreak. In 2000, some Chinese medical schools responded to SARS by shifting to online problem-based tutorial sessions (*Savin-Baden, 2007*), while in 2003, Chinese medical schools cancelled formal bedside teaching and postponed their exams (*Patil and Chan Ho Yan, 2003*). The Canadian response to SARS included the suspension of clinical clerkships and electives for students for up to six weeks (*Clark, 2003*).

In this paper, the authors provide guidelines that may facilitate dealing with the sudden transition from on-campus teaching and learning to online teaching in the light of both COVID-19 and similar situations. These guidelines stem from the real experience and reflection of the authors. Hopefully to be useful for the medical schools worldwide in the period of COVID-19 and the other similar situations. The guidelines will be presented under different headings and summarized in *Figure 1* below:

Establishing a sense of urgency

The first step to dealing with the shift from traditional curriculum delivery to online teaching is to maintain a semi-equal sense of urgency among faculty members and those who are involved in curriculum delivery. Leaders can do this by referencing both the effect of the pandemic on health and the specific effect of lockdown strategies on medical students (for example, reduced clinical exposure in specific specialities, causing a detrimental effect on competency attainment and future exam performance for students and junior doctors) (*Ahmed, Allaf and Elghazaly, 2020*).

A comprehensive discussion of possible alternative means of communication (since face-to-face meetings may not be possible) for all faculty and administrators must be held in order to introduce the need for continuing the learning process using an online/distance learning approach. Building this sense of urgency is essential to change management (*Pollack and Pollack, 2015*). It is crucial that this step is led by senior educational leaders at the school.

Establishment of a working team

The function of a working team is to lead the planning, implementation, monitoring, and evaluation of the transition to online/distance learning. The team should include a team leader - preferably the head of the curriculum committee - and medical education experts, as well as course directors, learning management system officers (if applicable) or information technology officers, and student representatives, if possible.

The team should work with a suitable level of flexibility, clear terms of reference that relate to the task of managing the transition to distance learning, and clear lines of reporting and communication.

Conducting a needs assessment

In situations where social distancing is required, there are three scenarios for implementing distance learning approaches (See *Figure 1* above). The first is for colleges that already have a Learning Management System (LMS) or other learning application that is frequently used by all faculty and students. The second scenario is for colleges that have a Learning LMS but with a minimal use or non-functioning LMS.

The third scenario is for colleges that uses no elements of distance or online education.

A needs assessment should be conducted that includes the following and other assessment topics: the knowledge and skills of faculty members in modes of online/distance learning; the available resources and equipment, such as PCs, webcams, headsets, etc.; connectivity and access to the LMS for all students and faculty; and perhaps the rules and regulations that are in place, e.g. assessment methods or completion requirements.

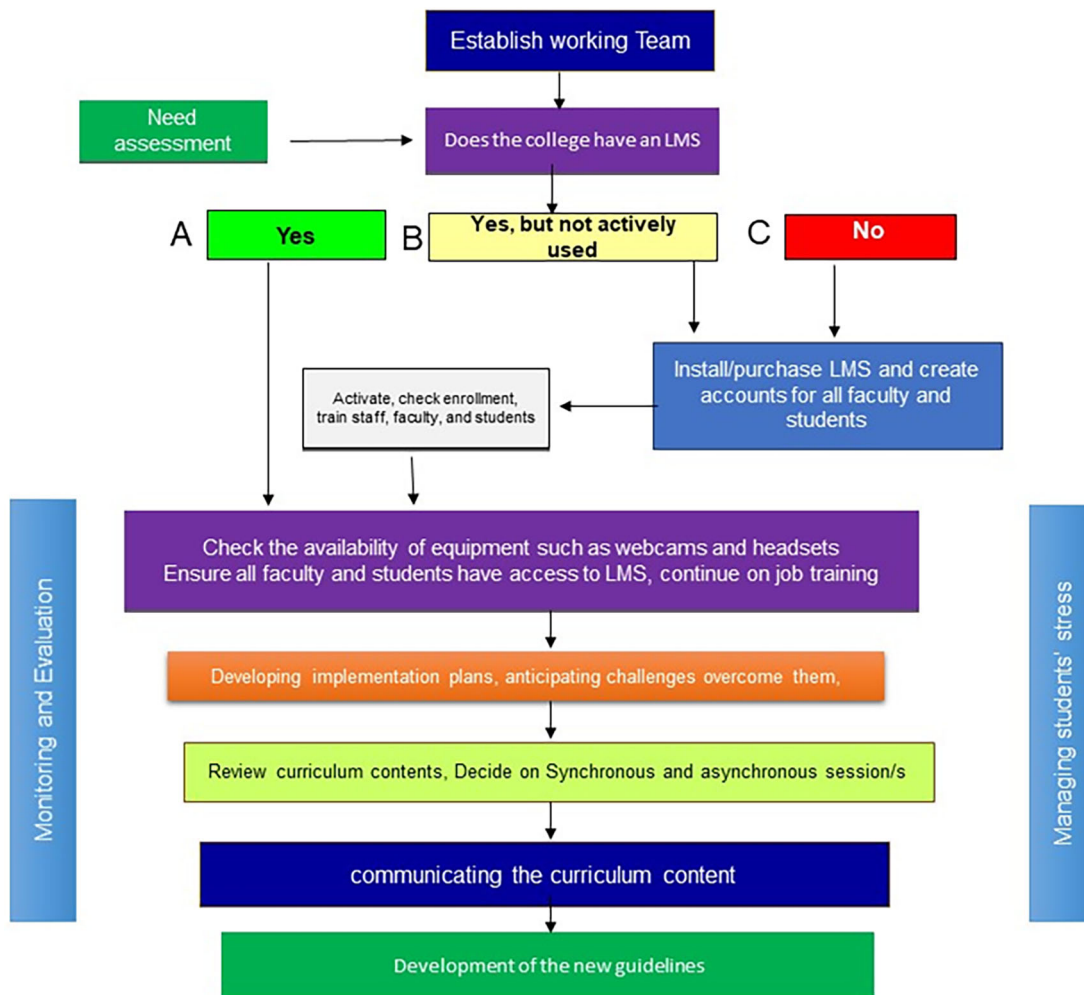


Figure 1. Guidelines for the implementation plans for three scenarios (A) if the college has an LMS; (B) if the college has a non-functional LMS; and (C) if the college has no LMS

Setting the plan

The working team should then develop an implementing plan that considers the type of the curriculum, the academic level of courses, and the results of the needs assessment. The plan should start with faculty development and the curriculum changes. The implementation should include timetables, as well as delivery methods for e-lectures, e-practical labs, e-problem-based learning (e-PBL), clinical skills, and clinical teachings.

The team should settle on which LMS or application will be used. There are several options for LMS used in medical education worldwide, with the most popular being Moodle and Blackboard. The latter has shown its effectiveness over time as the primary LMS used by medical schools (Baig, Gazzaz and Farooq, 2020). It is, however, also important to think about alternatives such as Microsoft Teams and Zoom, since the most popular LMS platforms will likely face high pressure in the coming months (Sutterlin, 2018; Martin and Tapp, 2019).

It is vital to communicate the plan to the college leadership early, so that they can provide feedback, approval, and alignment with the university’s strategic plan, and create a learning and work environment where faculty and students feel they have the power and initiative to participate effectively in the monitoring, evaluation, and improvement of the distance learning plan that is put in place (Pollack and Pollack, 2015).

Capacity building

The transition of the curriculum delivery from face-to-face instruction to distance/online learning requires a lot of time and work from both faculty and staff members. Capacity building programs should be run at the earliest possible stages of

implementation. Faculty play various roles in online teaching, so training that builds these competencies among faculty should be provided (Liu *et al.*, 2019). Development of this training should be based on the plan, a training needs assessment, and the planned mode of delivery. Four roles had been outlined for the e-teacher including; pedagogical, managerial, social, and technical (Kwon *et al.*, 2019; Philipson *et al.*, 2019; Zygouris-Coe, 2019). Capacity building needs to be accompanied by a post-implementation follow-up in order to address any possible gaps.

A more elaborate plan for capacity building needs to be designed and implemented after the emergency situation concludes, using the results of evaluation.

Agree on curriculum content

The plan should accommodate the fact that whatever is implemented is part of an emergency plan. As such, course committees and course directors should decide on what to implement and any changes to the content - whether, through addition, omission, or postponement - and any new delivery methods should be adopted (Clark, 2003; Patil and Chan Ho Yan, 2003).

Communication of the curriculum content should be done using a central body, such as a curriculum committee. The role of the working group is to facilitate the smooth communication of the content to staff and students. The following should be communicated early to students: timetables and study plans, e-problem-based learning case scenarios, instructions for e-practical labs, simulations, guidelines for online discussion forums, guidelines on virtual learning, and assessments.

Detailed descriptions of each session, whether synchronous or asynchronous, should be included on the timetables along with any reading materials and associated links that must be provided in advance to students.

Contact numbers and email addresses for faculty should also be communicated clearly to the students. Online office hours should be communicated so that students can seek out feedback from faculty members.

Curriculum delivery

There are three main modes for implementing online learning: the synchronous, asynchronous, and blended modes. The third is beyond the scope of this article, but the other two will be addressed below.

The synchronous mode allows learners to engage in discussion with instructors and classmates using the LMS or LMS-equivalent application at the same time; the asynchronous mode allows learners to carry out discussions over the internet at different times. The latter does so by using tools such as discussion forums or email exchanges (Ellaway and Masters, 2008). The synchronous option has the advantage of allowing for instant interaction and feedback, while the asynchronous mode allows for more control of pace and timing.

In the case of a sudden and forced curricular transition, in order to overcome the challenges of online teaching and related technical difficulties, the authors recommend beginning with the asynchronous mode. Simultaneously, training faculty in best practices for synchronous teaching could take place.

There are several tools available for the synchronous teaching of e-lectures e-problem-based learning, e-labs, and virtual patient (Ellaway and Masters, 2008).

When teaching asynchronously, discussion forums and chatrooms can be used to enhance student engagement and interaction. Numerous strategies to increase participation have been proposed, including minimum numbers of posts, awarding marks for particular posts, or carefully constructing questions that are engaging. Awarding marks for particular posts is likely to increase the number of overall posts. However, these can be in the form of mini-assignments rather than requests for students' spontaneous thoughts (Lee and Ferwerda, 2017). Video games and the gamification of learning could also be used to engage and motivate students. There is a growing belief that the success of complex video games demonstrates that such games can teach higher-order thinking skills, such as strategic thinking, interpretative analysis, problem-solving, plan formulation and execution, and promote adaptation to rapid change (Singhal, Hough and Cripps, 2019). The use of virtual patients is a key example of game-informed learning in medical education (Lloyd *et al.*, 2017). Typically, virtual patients take the form of an open-ended clinical narrative or a structured patient encounter, the latter being more common. In either scenario, students may have to search for and/or interpret data, make appropriate clinical decisions, or solve problems such as making a diagnosis or formulating a treatment regimen.

There are several tools and LMS options that could be used for both synchronous and asynchronous online learning (Ellaway and Masters, 2008), which are listed in table 1.

Table 1. Common tools to be used for online/distant learning (some of them are free)(Molly McLaughlin; Daniel Brame, 2020; Sutterlin, 2018; Baig, Gazzaz and Farooq, 2020)

Purpose	Tool	Link
Discussion forum	Blackboard	https://www.blackboard.com/
	Moodle	https://moodle.org
	Slack	https://slack.com/
	Schoology	https://www.schoology.com/
	Edmodo	https://www.edmodo.com/
	Flock	https://flock.com
Online lecturing	Zoom	https://zoom.us/
	Blackboard Collaborate Ultra	https://help.blackboard.com/Collaborate/Ultra
	Skype	https://www.skype.com/
	Google suite	https://gsuite.google.com/products/meet/
	Gotomeeting	https://www.gotomeeting.com/
	Go webex	https://www.webex.com/
	Bluejeans	https://www.bluejeans.com/
	Loom	https://www.loom.com/
	Teamviewer	https://www.teamviewer.com//
	Join.me	https://www.join.me/

There are also simple, user-friendly social media tools such as WhatsApp, Telegram, or YouTube, all of which have demonstrated effectiveness as educational tools in medical education (Jalali *et al.*, 2015; Raiman, Antbring and Mahmood, 2017; Sutherland and Jalali, 2017).

Dealing with students' stress

In face-to-face learning, faculty can observe how their students work and learn and how they interact in the classroom. In online learning, however, it is more difficult for faculty to monitor individual students' behavior and responses.

Several studies have revealed that online learning is more stressful for students than face-to-face learning (Gillett-Swan, 2017). The design of courses can work to alleviate this stress.

In transitioning to online learning, teaching materials must be adapted for online delivery. Minimizing the number of synchronous sessions per day by providing recorded video content has been shown to be beneficial during a sudden shift to online teaching. Providing time for self-directed learning, as long as this has clear instructions, also minimizes student stress. Continuing academic mentoring and having devoted office hours for students is also important.

Ensure student engagement and motivation

Because students in e-learning environments are more independent than face-to-face learners and content and activities are created and determined by faculty, instructors must do more to engage and motivate online learners.

Clear instructions, as well as pre- and post-exercises, are required to engage students with the teaching materials. Special care should be taken with planning and recording video content. The following measures are recommended when using video in medical education: orienting students to the video content; using interactive elements to promote student participation; aligning videos with learning objectives and course outcomes; integrating PowerPoint slides; including the lecturer's image, on-screen captions, and a transcript; avoiding cognitive overload; and limiting video length (Dong and Goh, 2015). Other activities, for instance multiple-choice questions and mini quizzes, have also been shown to be effective in engaging students taking part in online learning (Irizarry, 2002).

Consider student assessment

Assessing curriculum delivery using online/distant learning approaches should focus on the assessment of “formative” learning rather than “summative” learning. Thankfully, there are already numerous online tools that assist in this process, with the most common being exist [Kahoot](#), [Socrative](#), [Quizlet Live](#), and [Nearpod](#) ([Baig, Gazzaz and Farooq, 2020](#)). Interestingly, simple tools such as Google quizzes have proven to be just as effective in giving frequent feedback to students participating in online learning ([Anderson, 2019](#)).

For summative assessment for the assessment of the knowledge domain, there are many options, including modified essay questions, assignments, and open book exams, using a variety of appropriate tools. Some LMS platforms provide portfolio tools, such as Taskstream (<https://www.watermarkinsights.com/>), that allow learners to build online repositories of their work, experiences, and reflections over time, as well as to link to external images, documents, and media such as podcasts.

Assessment of the psychomotor domain is one of the most challenging in cases of online/distance learning. However, assessment of clinical reasoning can be done using virtual Objective Structured Clinical Examination (OSCE) stations and game worlds such as SecondLife ([Swicegood and Haque, 2015](#)). Virtual patients can also provide many different ways to assess student performance ([Padilha et al., 2019](#)). Finally, there are various e-assessment resources that allow teachers to create questions and tests to assess student learning, such as QuestionMark Perception (<http://www.questionmark.com>) and Respondus (<http://www.respondus.com>) ([Danson, Dawson and Baseley, 2001](#); [Küppers et al., 2017](#)).

Anticipate challenges and plan for how to overcome them

Several challenges that the authors have faced during the implementation of online teaching, in the period of COVID-19, include the pressures on the LMS, internet connectivity at students’ locations, and a lack of skills among some faculty members or instructors regarding the use of specific online teaching technologies. The working team can recommend the following measures to help overcome these challenges: rescheduling the timetable; avoiding the use of synchronized online sessions at the same time, recording the sessions with the addition of discussion forum to engage the learners.

Monitoring and evaluation of curriculum implementation and continuous improvement

Several tools can be used to monitor and evaluate the implementation of online teaching approaches. We recommend seeking student feedback following each session and obtaining daily feedback from faculty members in order to fully explore areas for improvement. This can be achieved with the use of a simple online questionnaire sent to all faculty that covers the following topics: the number of planned sessions, the number of implemented resources per session; the type of e-learning model/s used; comments on student attendance and interaction; the challenges faced during implementation; and suggestions on how to avoid these challenges. The results of these evaluations can be used to design an improved contingency plan for future emergency situations.

Conclusion

The sudden transition from on-campus learning to distance learning approaches is a challenge for both faculty and students and has required a great deal of preparation over a short period of time.

A systematic approach with the involvement of the whole stakeholders is required for this change.

The proposed process will hopefully assist the medical schools in response to the current pandemic (COVID-19) and when facing similar situations.

Take Home Messages

For the successful implementation of the transition to online/distant learning approach:

- Medical colleges have to follow a systematic approach.
- The Process including:
 - Establishing a sense of urgency,
 - Establishing working teams,
 - Conducting needs assessments,

- Developing implementation plans,
- Communicating the curriculum content,
- Capacity building,
- Managing students' stress,
- Finding tools to be used,
- Managing student engagement and motivation,
- Consider Student assessment,
- Anticipating challenges and planning for how to overcome them, and
- Monitoring and evaluation of curriculum implementation and continuous improvement.

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Declarations

The author has declared that there are no conflicts of interest.

Ethics Statement

This manuscript is reflection on experience and practical guidelines.

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Figure 1 was created by the authors.

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Elisabeth Schlegel

Donald and Barbara Zucker School of Medicine at Hofstra/Northwell

This review has been migrated. The reviewer awarded 4 stars out of 5

I am thanking the authors for providing this “atlas” of change. This article outlines many important parameters and strategies necessary to manage the unexpected and challenging adaptations. Importantly, a leading team has to be established first in order to identify the resources needed (“sense of urgency”). Top leadership has to be on-board in order to guide executing the decisions downstream. Overall, many of the difficulties we face now can be compared to medical education in low-resource settings in several global locations. Here, home-grown developments and networking overcome many of the barriers. Thus, I want to encourage to inspire networking and creative thinking as much as possible under the circumstances. I wholeheartedly agree, transparency is key, and representatives from all stakeholder levels need to be included to master the challenges. This is a very comprehensive and timely article and we assigned it as pre-reading to our MS3 medical-student-as-teacher elective students prior to a session on Deliberate vs. Emergency Online Education.

Competing Interests: No conflicts of interest were disclosed.

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James Gray

University of Sheffield

This review has been migrated. The reviewer awarded 3 stars out of 5

I think this presents a relatively useful toolkit for others to follow which is as much an approach to change management as a specific response to Covid19. Like another colleague has said the focus on the LMS perhaps slightly limits its application to those with less resource and broadening this to consider alternatives, or picking that up as a separate piece of work with colleagues in such environments might add some significant value. I would also have liked to see a little more in student stress about the communication process. My own experience has been that a significant contributor to student stress is uncertainty and so frank and open dialogue with them is an additional crucial component that then also lowers your own stress levels. Overall a useful read for anyone in a similar situation

Competing Interests: No conflicts of interest were disclosed.

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Dujeepa D. Samarasekera

National University of Singapore

This review has been migrated. The reviewer awarded 4 stars out of 5

I enjoyed reading this article. Very comprehensive and detailed. The COVID 19 pandemic has changed the way higher education centres engage students and other stakeholders. The article will assist many places to design their teaching-learning environment. Useful take-home messages.

Competing Interests: No conflicts of interest were disclosed.

Reviewer Report 24 April 2020

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Samar Ahmed

Ain Shams University Faculty of Medicine

This review has been migrated. The reviewer awarded 5 stars out of 5

Wonderful work and a guide that we will start introducing into our leadership in curriculum reform course

Competing Interests: No conflicts of interest were disclosed.

Reviewer Report 19 April 2020

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David Taylor

Gulf Medical University, Ajman, UAE

This review has been migrated. The reviewer awarded 4 stars out of 5

This paper is valuable, since it gives some idea of the large number of IT resources which are available. Like other reviewers I noted the reliance on ensuring that one has a learning management system – I would add that institutions with a LMS probably need the staff who can, with a degree of authority based on experience, be able to maintain and adjust such a system. I whole heartedly agree with the take home messages although the issues in delivering them would probably warrant a paper on each item. Well done though for such a concise and timely contribution.

Competing Interests: No conflicts of interest were disclosed.

Reviewer Report 18 April 2020

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Sarmishtha Ghosh

International Medical University

This review has been migrated. The reviewer awarded 4 stars out of 5

In the current situation, when there is a flooding of websites and tools for online teaching-learning for delivery of the curriculum, this article provides specific lists of tools that can be used by educators to deliver the curriculum to the students. The other challenge is how to maintain students' interest and keep them engaged throughout the course. The authors have addressed that issue also categorically which gives the readers an idea of how to implement. Of course, the authors have not shared their own experiences but then delivery is contextual. Hence educators can choose what works best for them and evaluate regularly to improve upon the existing ones. Pandemic has actually created an emergency remote learning situation rather than a planned online learning process. So this article can help people to design online delivery of curriculum, wherever possible, even after the Pandemic is gone, in addition to this quick transition of different formats. The list of "take-home messages" is of particular interest.

Competing Interests: No conflicts of interest were disclosed.

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Susanne Lindqvist

University of East Anglia

This review has been migrated. The reviewer awarded 5 stars out of 5

Thank you for sharing this paper, which includes a number of tools that I will be keen to explore. Universities across the world will have had to rapidly change their approach to education in response to the COVID-19 crisis, and we all know that once this is over the teaching will look different in the future, with more online and blended learning opportunities. The paper serves as helpful guide of key elements that we need to consider in this transition, including the need for team working and making sure everyone has the necessary equipment to connect and indeed knows how to. Moving forward, this paper reminds us of the importance of really think about the impact on this crisis, not only in the in the short- but also the long-term and whether some learning that was previously face-to-face is actually better delivered online. Saying that, I still hope that the 'going virtual' is going 'viral' in a manner that allows us to find balance and truly understand how students learn in the most effective way and how we as teachers evolve alongside. The take home message was very useful to aid this process thank you.

Competing Interests: No conflicts of interest were disclosed.

Reviewer Report 17 April 2020

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P Ravi Shankar

American International Medical University

This review has been migrated. The reviewer awarded 4 stars out of 5

I enjoyed reading this article on teaching-learning during the COVID-19 pandemic. The pandemic has had a severe impact on various aspects of life and teaching-learning has also been affected. The authors provide a step-by-step guide to curriculum delivery in medical education. They provide links to a number of resources which will be useful to readers. The suggestions provide a broad framework which can be further developed by the readers. The list of references is comprehensive. The article will be of interest to all medical educators during the present challenging time.

Competing Interests: No conflicts of interest were disclosed.

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Johnny Lyon Maris

Southampton GP Education Unit

This review has been migrated. The reviewer awarded 4 stars out of 5

Thankyou for submitting this article which is a very useful compendium of the on-line resources available. I would however challenge Figure 1 where you suggest that if the higher education institution does not have a Learning Management System, then it should purchase one. This is a very costly intervention, and for some Universities, not affordable on the scale you suggest. It also relies on fast internet which can also be problematic if the students are in rural and remote areas or attachments. This is not a developing world problem, here in the UK we have problems across the country with internet availability and speed.

Competing Interests: No conflicts of interest were disclosed.

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Judy McKimm

Swansea University

This review has been migrated. The reviewer awarded 3 stars out of 5

I enjoyed this summary of tips for educators to consider during these challenging times. Like some of the other reviewers I felt that reliance on buying an LMS or other IT infrastructure isn't relevant to or possible for those in low resources settings and also that it somewhat simplified what is a very complex set of issues which will probably extend into next academic year for those of us in the global north. However, these resources and quick publications are useful for educators to tap into whilst they are giggling difficult decisions for learners and faculty.

Competing Interests: No conflicts of interest were disclosed.

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Kitiyot Yotsombut

Chulalongkorn University

This review has been migrated. The reviewer awarded 5 stars out of 5

Although experiences in using such approaches as well as the mentioned tools have not been discussed in detail, this article has provided useful approaches regarding online distance medical learning in COVID-19 era.

Competing Interests: No conflicts of interest were disclosed.

Reviewer Report 16 April 2020

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Trevor Gibbs

AMEE

This review has been migrated. The reviewer awarded 4 stars out of 5

As expected, we are seeing an increasing number of papers about managing and coping during the Covid-19 pandemic and all of them provide a good insight into various approaches. This is one such paper seemingly based upon a 12 Tips approach. I enjoyed reading it and it brought out some very salient features. At points I did worry about the superficiality of each of the suggestions and probably left the reader waiting or wanting for more. It does provide however a very good list of references.

Competing Interests: No conflicts of interest were disclosed.
