

## Remote Learning: Opportunity in Necessity

Nesrine Abdel-Rahman El-Refai\*, Ana Maria Crawford and Rosalind Morley

\*Correspondence email: nesrinerefai@hotmail.com

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### Abstract

Remote learning is not a new concept. The first major correspondence program was established in the late 1800s at the University of Chicago in the United States, in which the teacher and learner were at different locations.

Remote learning, sometimes referred to as "Distance Learning", "e-Learning", or "Virtual Learning" has evolved rapidly with the advent of the internet and accelerated with the pandemic. Historically, learning has occurred through didactic methods, delivered through textbooks and in-person lectures. With travel and group meeting restrictions due to the COVID-19 pandemic, educators have been forced to search for novel solutions to continue robust academic training programs, continuing professional development, and international exchange programs.

For all the benefits of remote learning, there remain improvement opportunities. Learners and instructors alike have many logistics and resource demands, to enable meaningful engagement in remote learning. Making online content more accessible, innovative, and interactive through user-friendly tools, can future-proof education systems. An invaluable educational tool for all engaged in medical education and training, the use of remote learning will necessitate equity in access to technology and information.

This article will review the benefits and limitations of remote learning, highlighting its evolution, obstacles with logistics and future directions.

**Key words:** Education, Distance, Access to Information, Multimedia, Literacy, Open Access Publishing, Computer-Assisted Instruction, Pandemics, Cost Savings, Internet Access, Learning, Communications Media, Educational Personnel, Students, Social Networking, Videoconferencing, Software, Problem Solving.

### EVOLUTION OF TEACHING AND LEARNING

Historically teaching has occurred through didactic methods, delivered through textbooks and in-person lectures. A didactic or instructive method is a teaching method that adheres to a scientific approach or educational style and involves face-to-face interaction between educators and students. Didactic methods are criticized by many authors, for being teacher – centered and passive, contrary to current understanding of optimum adult learning. However, it is still used at many levels of education.<sup>1</sup> Traditional educational resources, such as textbooks and journals are heralded for reliability, with peer-review processes ensuring high-quality and relevant content.

There are several limitations to classic learning approaches. The time required for publication and distribution, especially for textbooks, delays dissemination of the most up-to-date information. New research often emerges within the time it takes for textbook publication. Expert opinion provided in

lectures can overshadow independent evaluation of evidence by audience members. Conferences often require costly registration fees and travel expenses. In-person lectures typically occur according to the organisers' schedule rather than that of learners.

Distance education aimed to overcome these inadequacies. The first generation of distance education became known as correspondence learning with scholars receiving textbooks, study guides, assignments, and other study materials through the post.<sup>2</sup> The second generation developed in the 1950s used radio and television broadcasts to manage distribution of materials. More recently, audio and video teleconferencing have benefitted the provision of more effective distance education, through the third and subsequent generations of distance learning.<sup>3</sup>

The COVID-19 pandemic has severely limited clinical teaching, meetings and in-person lectures.

**Nesrine Abdel-Rahman El-Refai MD**

Professor of Anesthesia Intensive Care and Pain Management  
Cairo University  
EGYPT

**Ana Maria Crawford**

MD, MSc, FASA  
Department of Anesthesiology  
Perioperative and Pain Medicine  
Stanford  
CA 94305  
USA

**Rosalind Morley BM FRCA MA**

Royal Manchester Children's Hospital UK  
Department of Paediatric Anaesthesia  
Oxford Road  
Manchester  
M13 9WL  
UK

With pandemic travel restrictions, many are searching for novel solutions to continue academic training programs, continued professional development, and international exchange programs and conferences. Simultaneously, the evolution of webinar technology and expanding access to teleconferencing applications, has allowed many programs to go virtual. Advancement of remote learning has become an opportunity born from necessity. At the end of this article, we have summarized some valuable practical tips for the anesthetists to deliver remote teaching courses.

### Defining Remote Learning

Many types of learning can occur remotely. With Electronic Learning, also called E-learning, the learner accesses course materials and training on a computer, making access more widespread and instant compared with correspondence or broadcasting learning. The outbreak of COVID-19 in 2020 created an emergency situation that forced institutions in many different countries to suddenly shift from a traditional teaching model into a remote one (Emergency Remote Teaching).<sup>4</sup>

Technology-supported e-learning can be online, offline, or both<sup>5</sup>, with the electronic content housed on CDs, DVDs, USB/memory cards or computer-based applications. Online Learning requires access to the internet, allowing learners to communicate with instructors and other students in real time. Depending on how the e-learning is created, learners may be able to download study materials, attend webinars, watch pre-recorded sessions, or complete assignments directly online and uploaded.<sup>6</sup>

An important tenant of remote learning is that of synchronicity (Table 1). Synchronous learning allows learners to engage in real-time with the material. Synchronous learning opportunities also facilitate remote discussions and collaboration with other learners with instructors and allow for instantaneous question and answer sessions.<sup>7</sup> Video conferencing allows learners expanded exposure to colleagues practicing in distant locations. Exchanges between differently-resourced practice settings leads to innovation sharing and creative problem-solving – key skills needed to overcome resource limitations and ensure patient safety.

During asynchronous learning, learners engage with educational materials independently.<sup>7</sup> Asynchronous learning eliminates the need for students to attend scheduled lectures or other learning experience arranged on others' plans. Static online resources allow learners to have repeated access to materials, convenient for their schedules, to use at their own pace, further consolidating learning and understanding. Many programs blend synchronous and asynchronous models for greatest impact.

### Benefits of Remote Learning

Remote learning has evolved rapidly with the advent of the internet and is accelerating within the pandemic.<sup>9-11</sup> Increased global internet coverage allows more timely and convenient access to information, decreasing previous limitations and barriers (Table 2).

In remote learning, the online platforms, software, and applications have evolved to meet end-user needs. Many successful platforms utilize multimedia approaches, including pictures and diagrams, video and audio resources, interactive quizzes, and virtual simulation. Many systems allow continuous monitoring of learner engagement as well as assessment of learning and retention. Whilst creating a new e-learning option -whether from existing sources or a bespoke curriculum - both instructors and learners have the opportunity for collaboration to design learning experiences to best fit the learners' needs within the local practice setting.

Smartphones have revolutionized distance education. Free web-based video conferencing apps include Skype, ooVoo, Tango, Hangouts, Viber, Video Chat, Mico and SOMA that can be used through smartphones enhancing learner/faculty interactions without the requirement of personal computers. Although smartphones are relatively new in education Tuncay<sup>12</sup>, in 2016 concluded that there was no significant difference between the students' exam results whether using paper or mobile phones.

Recent research showed the use of social media by both students and faculty members, has facilitated formal academic communication during the pandemic in developing countries. Students preferred social media as Facebook or YouTube for communication rather than

**Table 1:** Characteristics of Synchronous & Asynchronous Learning

| Synchronous Learning   | Asynchronous Learning  |
|--|--|
| Learners take part in educational activities simultaneously with instructors and other learners.   | Learners engage independently with materials online or downloaded at times convenient to their schedule.   |
| <b>Advantages:</b> <ul style="list-style-type: none"> <li>• Real-time interactions</li> <li>• Learners can ask questions</li> <li>• Participate in immediate discussions</li> <li>• Learners and instructors receive instant feedback</li> </ul> | <b>Advantages:</b> <ul style="list-style-type: none"> <li>• Flexibility - learners study on own time</li> <li>• Self-paced learning</li> <li>• Learners have repeated access to study material</li> </ul>  |
| <b>Disadvantages:</b> <ul style="list-style-type: none"> <li>• Less schedule flexibility</li> <li>• Access barriers to the relevant technology</li> <li>• Effectiveness limited by digital literacy</li> </ul>                                   | <b>Disadvantages:</b> <ul style="list-style-type: none"> <li>• Requires learner self-discipline</li> <li>• Less swift interactions between instructors and students</li> <li>• Learners are unable to clarify concepts with instructor or other learners in real-time</li> </ul> |

Khan BH et al8, in 2021, published a book discussing the eight dimensions of e-learning: (1) institutional, (2) pedagogical, (3) technological, (4) interface design, (5) evaluation, (6) management, (7) resource support, and (8) ethical.

other free online communication tools, e.g., ZOOM and Google Classroom. The students gained a positive learning experience from social media due to its ease of use and perceived usefulness.<sup>13</sup>

For example, anesthetists all over the globe can search for online courses in Anesthesia to find e-learning resources from a variety of providers. e.g. University expert in anesthesia, sedation and resuscitation(<https://www.healthcarestudies.com/University-Expert-In-Anesthesia-Sedation-And-Resuscitation/Spain/Alcal%C3%A1-Formaci%C3%B3n/>). While MEGA Online Anaesthesiology Course on Facebook is another example of remote learning via social media. Courses can be free at point of access or charged a competitive cost. YouTube hosts lectures, videos and courses about anesthesia, intensive care and resuscitation shared by organizations such as PROMPT Maternity Foundation, Saving Lives Academy, ABCs of Anaesthesia and ACLS Training Centre as well as institutions and individuals

Many journals are moving toward open-access publishing, making information available to readers at no cost whilst maintaining the standard of still being peer-reviewed. Online publishing has less physical costs compared with paper copies with a smaller carbon footprint. However some article processing charges and pay walls remain cost-prohibitive for researchers.

In a pandemic, remote learning facilitates infection prevention and control efforts as well. It allows social distancing and minimizes unnecessary in-person interactions especially when community prevalence is high. Remote teaching can allow continuing training for those who might not be able to attend face-to-face due to being clinically vulnerable.

## Limitations of Remote Learning

For all the benefits of remote learning, there remain opportunities for improvement. Distance learning has deprived students of the regular traditional community school environment with ample social opportunities, peer to peer support, face-to-face contact with staff, extracurricular sports and academic opportunities.<sup>14</sup> It is difficult to replicate the rich learning exchange that occurs through personal interactions with colleagues. Similarly, the tangible interaction while mastering both technical skills (e.g., intubation) or soft skills (e.g., closed-loop communication) are difficult to replicate using virtual simulations. Interactions can be maximized with the use of videoconferencing. There remains a requirement for full engagement of all participants. This can be helped with mandated 'camera on' agreements.

In some places limits on internet speeds, unstable connections, expensive data packages and uncertain electricity supply can hamper enthusiasm for engagement with remote learning.

Digital literacy involves the use of current technology to use and interpret online information, found through various electronic media.<sup>15</sup> It also includes an educator's ability to create and sustain online learning modules. Both educators and learners must have digital literacy with ongoing technical support to maximize impact and ensure effective learning with remote programs.

Misinformation and outdated information can be easily mistaken for fact. Although attempts to establish peer-review processes and quality indicators for online learning resources have been made, consensus for accepted guidelines is lacking.<sup>16-18</sup> Online authors and

**Table 2:** Benefits and Limitations of Remote Learning. Adapted from: Dahwan, S. Online Learning: A Panacea in the Time of COVID-19. Journal of Educational Technology Systems 2020, Vol. 49(1) 5–22, under the terms of the Creative Commons Attribution 4.0 License.<sup>21</sup>

| Benefits  | Limitations  |
|---|--|
| <i>Convenience:</i><br>Flexibility for location and time  | <i>Digital literacy:</i><br>Skill using technology varies widely and can lead to frustrations      |
| <i>Expanded Audience:</i><br>Reaches a larger number of learners                                  | <i>Quality of content:</i><br>Lack of consensus and guidelines for quality indicators of content   |
| <i>Information Equity:</i><br>Improves equitable access to information, education, and experts    | <i>Context specific:</i><br>Not all content is relevant to all settings and often needs adaptation |
| <i>Availability:</i><br>Wide availability of online content, platforms, and applications          | <i>Misinformation:</i><br>Inconsistent use of peer-reviewed and evidence-based processes           |
| <i>Collaboration:</i><br>Immediate instructor and learner feedback for course content flexibility | <i>Outdated information:</i><br>Online programs require frequent updates to stay current           |
| <i>Engagement and Efficacy:</i><br>Ability to track learner participation and progress            | <i>Technology Infrastructure:</i><br>Access to computers, internet, cameras, and software vary.    |
| <i>Skills Demonstration:</i><br>Video demonstrations can reinforce hard and soft skills           | <i>Cost:</i><br>Hardware, software and data packages can be costly                                 |
| <i>Learner types:</i><br>Multimedia content for different learning styles                         | Require continuous monitoring and evaluation to ensure relevance of materials                      |
| <i>Cost-saving:</i><br>Open-access and free content without travel                                | Virtual experiences lacking in-person interactions and discussions feel less robust                |
| <i>Infection Control and Prevention:</i><br>Decreased need for in-person participation            | <i>Limited simulation:</i><br>Less robust for hands-on skill acquisition                           |

editors may not be clearly identified, challenging learners to trust that provided resources are using evidence-based materials. One solution is to use publication dates and timestamps confirming what is the most current information published.

In order to overcome the above limitations, experts have suggested the following proposals:

1. Provide a reliable network infrastructure, especially the development of 5G.
2. Governments can provide more affordable devices such as tablets or computers.
3. The use of diverse modalities (telecourses, TV, radio, online courses) to provide accessible learning for students in remote areas.
4. Provide training to improve educators' and learners' technological skills.
5. Provide a structured educational plan with suitable materials.
6. Use interactive digital learning resources including video, animations and games.
7. Strategies to improve communication between teachers and students.
8. A blended approach is recommended where face-to-face lessons complement online lessons.
9. The use of artificial intelligence integrated with the pedagogical methodologies used by teachers.
10. More inclusive platforms and devices considering different web contents, to make digital learning resources more accessible.<sup>19</sup>

During the current pandemic, some countries such as New Zealand, has used a combined approach, using two television channels integrated with an Internet delivery and a hard-copy curriculum resource. While Queensland (Australia), had poor Internet connectivity, television has been used for learning.<sup>20</sup>

### Logistics for Remote Learning

For many, resource availability is a limiting factor. Optimized e-learning experiences are reliant on a dependable internet connection with adequate bandwidth. Faculty and users require access to a functioning computer or smartphone, compatible with the technology being used. Those with limited access may need to share computers, cameras, and workspace, while employing infection control measures. Some software such as telecommunication applications are subscription-based, placing potential financial barriers.

However, educators may obtain a free Learning Management System (LMS) such as Moodle.

Moodle (Modular Object Oriented Dynamic Learning Environment) is the most efficient and most commonly used open source LMS, used in 215 countries in 75 languages.<sup>22</sup>

Moodle seems to be attractive to educators for many reasons:

- It supports the Social Constructivist Pedagogy.

- It can be used for synchronous education.
- It requires a simple low technology internet search engine.
- It sends the lesson lists to the internet over the service provider.
- Thousands of lessons can be loaded within the Moodle LMS.
- Moodle incorporates multimedia products such as video and PowerPoint.

There are logistics associated with webinars (Table 3). A calendar is required for interactive sessions. Instructors must create registration links for the teleconferencing software, sending out invitations, and reminder emails. These new programs need be monitored and evaluated. Session preparation is a time-consuming endeavor taxed with the requirement for frequent updates. During sessions, instructors are tasked with screen sharing, advancing slides, and managing questions in the live discussion forum or "chat box".

### Learners' Feedback

In several studies, most learners reported they prefer online courses due to the greater convenience of time and location. Additionally, the integration of multiple media types serves various learning styles. Learners find it helpful to be able to easily communicate with other learners and course instructors.<sup>23</sup>

Still, learners do report some problems with synchronous learning environments including browser-related problems, necessity for software updates, hardware and equipment problems and disconnections. Some of these issues are solved by improving the connection speeds.<sup>23,24</sup>

In one study, 50% of learners cited clinical skills as the biggest gap in the remote learning curricula.<sup>11</sup> Students also felt a loss of motivation when clinical training opportunities were unavailable. Vallée A et al<sup>25</sup> conducted a systematic review and meta-analysis comparing blended to traditional learning in 2020. The pooled analysis showed significantly better knowledge outcomes for blended learning.

### Future Directions

Making online content accessible, innovative, and interactive through user-friendly tools, can prepare education systems for uncertainties such as pandemics, natural disasters, and other future disruptions.<sup>21, 24</sup> An invaluable educational tool for all stakeholders engaged in medical education and training, use of remote learning will require equity in access to technology and information. In addition to advocacy for more open-access journals and free educational materials shared by institutions of higher learning, education systems across the globe must also invest in professional development of educators to include the use of technology for improving digital literacy. Remote simulation is evolving to include iterative processes and virtual reality, augmenting hard and soft skills development.<sup>26</sup> Most importantly, remote learning must meet the needs of stakeholders from variably-resourced practice settings through support of technology infrastructure, and context relevant content.

**Table 3:** Considerations when setting up an online course. Practical advice for anesthetists in delivering remote teaching:

|  |   |
|--|---|
| Prepare and master technology:         | <ul style="list-style-type: none"> <li>A reliable computer, a strong internet connection, and the platform to meet your needs as Moodle for example. <a href="https://moodle.org/">https://moodle.org/</a></li> </ul>   |
| Aim of the course                      | <ul style="list-style-type: none"> <li>Preparing for examinations such as Fellowship of Royal College of Anaesthetists (FRCA), <a href="https://rcoa.ac.uk/e-learning-anaesthesia">https://rcoa.ac.uk/e-learning-anaesthesia</a></li> <li>Enhancing safety in anesthesia practice</li> </ul>  |
| Target audience:                       | <ul style="list-style-type: none"> <li>Junior registrars versus senior anesthetists</li> <li>Other members of the peri-operative teams</li> </ul>   |
| Is a new online course required?       | <ul style="list-style-type: none"> <li>Search for existing suitable online resources <a href="https://www.mmacc.uk/nw-anaesthesia/saved">https://www.mmacc.uk/nw-anaesthesia/saved</a></li> <li>Is a lecture series created during the pandemic by anesthetists covering FRCA exam topics</li> </ul>  |
| Topic Choice                           | <p><b>e.g. Basic science:</b></p> <ul style="list-style-type: none"> <li>Monitoring, <a href="https://www.esaic.org/education/courses/basic-sciences-anaesthetic-course/">https://www.esaic.org/education/courses/basic-sciences-anaesthetic-course/</a></li> <li>Teaching airway skills</li> <li>Regional Anaesthesia <a href="https://www.maverickmeded.com/Courses/Regional-Anesthesia-Essentials">https://www.maverickmeded.com/Courses/Regional-Anesthesia-Essentials</a></li> </ul> |
| Course content creation                | <p><b>Implementation of Interactive Elements:</b></p> <ul style="list-style-type: none"> <li>Welcome video</li> <li>Guest experts</li> <li>Questions &amp; answers</li> <li>Case-based discussions</li> <li>Learner led discussions</li> <li>Simulation</li> </ul>  |
| Set the calendar and allocate contents | <ul style="list-style-type: none"> <li>Assignment due dates</li> <li>Share registration links</li> <li>Invite guest speakers</li> <li>Send reminder emails</li> </ul>   |
| Ensuring quality control               | <ul style="list-style-type: none"> <li>Clear authors and editors</li> <li>Reveal conflicts of interest</li> <li>Evidence-based resources</li> <li>Date/time stamped</li> </ul>  |
| Candidate communication                | <ul style="list-style-type: none"> <li>Motivate the candidates</li> <li>Encourages asking for help from peers and other educators</li> </ul>  |
| Learner feedback                       | <ul style="list-style-type: none"> <li>Monitoring and evaluation of learner participation and progress</li> </ul>   |
| Evaluation and Course Monitoring       | <ul style="list-style-type: none"> <li>Participation</li> <li>Engagement</li> <li>Dissemination</li> </ul>  |
| Relevance, Retention and learning      | <ul style="list-style-type: none"> <li>Consider using the Kirkpatrick evaluation model 27 to ensure the effectiveness of training</li> </ul>  |
| Ongoing Maintenance                    | <ul style="list-style-type: none"> <li>Practice change</li> <li>Maintenance</li> <li>Updating and Enhancement</li> </ul>  |

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For brief overview see <https://www.mindtools.com/pages/article/kirkpatrick.htm> [accessed online 20/10/2021]