Harnessing the disruption on medical trainee education due to COVID-19 in New South Wales, Australia [version 1; peer review: 1 approved with reservations]

Simone L. Van Es¹,², Aaron J.H. Tan¹, Toni Vial¹, Jo Burnand¹, Claire M. Blizard¹

¹NSW Health Education and Training Institute (HETI), Sydney, Australia
²School of Medical Sciences, Faculty of Medicine and Health, The University of NSW, Sydney, Australia

Abstract
The coronavirus disease (COVID-19) pandemic has caused disruption and uncertainty for junior medical doctor training and education. This has compounded the existing stress experienced by this cohort. However, by choosing appropriate educational models, as well as using novel educational approaches and advancing our online technology capabilities, we may be able to provide acceptable and even, superior solutions for educational training moving forward, as well as promote trainee wellbeing during these uncertain times.

Keywords
medical education, digital learning, COVID-19, online engagement, medical trainee, doctor well-being
**Background: junior doctor training in New South Wales, Australia**

In Australia, the Medical Portfolio in the New South Wales (NSW) Health Education and Training Institute (HETI) supports the education, training, and welfare of prevocational junior doctors in addition to many of the vocational training programs throughout the state of NSW. Using evidence-based approaches and evaluation findings, combined with educational design expertise, we develop contemporary and responsive educational support for these learner cohorts.

The purpose of this paper is to reflect on the watershed moment in online medical education and training for junior doctors in the state of New South Wales, Australia that has occurred due to the impacts of the coronavirus disease (COVID-19) pandemic. Based on Normalization Process Theory\(^1\), we know that ongoing adaptations made due to the COVID-19 disruption will continue to become embedded in medical educational practice. We will discuss how best to shape and embed those adaptations, based on our experience and evidence from the literature.

**Medical training disruptions and stressors due to COVID-19**

In Australia the psychological stress for junior doctors has been reported as up to 12 times higher than age-matched controls in other professions\(^2\). COVID-19 has added to this existing psychological stress due to a number of reasons, including the increased demands and workplace redeployments, and the impact on their education and training\(^2\). Further, the COVID-19 pandemic has resulted in disruptions to medical education and ‘training pipelines’ for junior medical doctors in Australia\(^3\), similar to that experienced by trainees in other countries\(^4\). Uncertainty about training progression and meeting training requirements during the pandemic has exacerbated this stress.

Self-determination theory explains that for a person to flourish they require three basic psychological needs: autonomy, competence and relatedness\(^5\). Through isolation (physical, social and psychological), uncertainty and disruptions to training, as well as medical workforce redistributions, the impacts of COVID-19 challenge all of these basic needs in the junior doctor cohort. It can be argued that by delivering junior medical officer (JMO) education using emerging technology, aligning practice closely with popular educational theories, optimizing our skills as online educators, and constantly aligning our education delivery with trainee feedback and program evaluation findings, we may support these needs and advance the quality of our education and training programs.

Education needs to be a dynamic process that embraces innovation to adapt to changes in the user environment, as well as to constantly maintain engagement with our learners. This statement is reflected in the Von Restorff effect, where a stimulus or item that is different or novel will stand out more and will therefore be more likely to be remembered. Without innovative educational practice, the learning becomes repetitive with risk of saturation and potential for learner disengagement\(^6\). Additionally, people learn in different ways and postgraduate university programs for clinicians report better participation rates and knowledge attainment when the students are offered a choice of how they can learn the same content\(^7\).

By making learning personalized, engaging, connected, learner-centered and by prioritizing choice, we argue that our programs are responding to the training disruption and career uncertainty during the COVID-19 pandemic. We discuss the evidence from the literature for adapting education and training approaches, including examples of how we are translating this evidence into our daily educational practice.

**The partial shift to a virtual care health model during COVID-19**

Part of the uncertainties and issues for junior doctor training during COVID-19 are the training gaps arising from the closing down of elective surgery, quarantine of junior doctors and re-deployment\(^8\). In parallel with this COVID-19 has forced medical practice in Australia and other locations globally to shift to a partial virtual care model\(^9\), requiring modifications to how clinical interactions are carried out. The increased participation of trainees in telehealth consultations has been suggested by some groups as a potential solution to bolster the training experience needed for this cohort\(^9\). However, this also adds to the pressure faced by trainees to upskill and refine their competencies in online communication and technology, particularly when past surveys have shown that lack of experience and training with teledicine was one of the barriers to using teledmedicine in practice\(^10\). Consequently, offering education to trainees on how to optimally communicate and engage in an online environment is a valuable educational opportunity. Innovative and useful approaches on how to train and supervise in a virtual telemedicine setting have been recently described\(^10\).

**Harnessing the evidence on online education to maximize the junior doctor learning and training experience going forward**

It has long been known that online learning can be efficient, effective, acceptable\(^10,11\) and sometimes even superior to traditional learning, particularly if interactive or engaging tools are used\(^11\). Engagement can also be optimized in a virtual environment if the educational program is structured and facilitated in the right way\(^12\).

Studies have shown both measurable and perceived benefits for adult learners using online learning\(^11,12,13\). This benefit is further augmented when the learning is active and delivered in a time efficient manner by an authoritative or trusted figure\(^13\). There is an opportunity for a community of practice approach to learning in the online environment. Further benefits include equity of access, the perception of a personalized experience, and improved convenience of learning\(^13\). The concept of “learning-on-the-go” can be facilitated by the native smartphone applications of some of the online communication and collaboration platforms in common use today. This would be a distinct advantage for junior medical trainees who may benefit from ‘just-in-time’ or ‘on-demand’ learning.
Timely feedback has been described as extremely helpful in the learning process, particularly if it is individualized, with explanations of associated issues or expected gold standard responses. If that feedback is also visually engaging, which can be easily facilitated with advancing digital technology, the learning experience is further enhanced.

Online delivery allows us to take advantage of engaging visual effects. The educational importance of this is described in dual coding theory, which asserts that we are more likely to remember images than words. A medical audience is also more likely to be engaged in their professional learning by images with judicious use of meaningful text compared to text alone. It captures attention better, and delivers complex concepts more effectively and efficiently. Information is twice as likely to be retained using this approach and is also easily delivered with mobile technology. As a form of ‘just-in-time learning’, or ‘on-demand’ learning for busy junior doctors, infographics delivered on mobile devices are perceived as an effective way to learn by approximately 70% of surveyed junior doctors. Digital technology can facilitate improved visual design and aesthetics of learning, including well designed intuitive interfaces, all of which have a positive effect on learner engagement.

**Features of a successful virtual learning platform**

Choice of a virtual learning platform to maximize trainee engagement and successful learning is important. Almarzooq and colleagues started using Microsoft Teams (Microsoft Corporation, Redmond, Washington) for their cardiology trainees’ education during the early stages of the COVID-19 pandemic in the United States. They highlighted four key features for a successful virtual learning platform. These include integration, collaboration, education and communication features. Security of access to the communication platform is an important consideration when using clinical material in education sessions. This includes scenarios which require the direct involvement of consenting patients, such as during live-streamed ward rounds.

An observational educational approach, particularly when complemented with other forms of teaching, can be crucial for learning complex medical skills and knowledge. Examples of this from our own institution include delivering live streamed expert anatomy demonstrations, using high quality cameras with strategically placed overhead angles, to deliver education to geographically dispersed trainees. This arrangement potentially provides the opportunity for trainees to experience clearer visual-spatial depiction of structures compared to observing in a more crowded group face-to-face setting. This approach produces vivid imagery in the working memory, enhancing skill development. When this learning approach is integrated into a platform that supports different methods of active learning such as chat functions, polling apps and group discussion, the learning experience may be further improved.

**Using emotions to maximize learning in an online environment**

Connecting emotionally and socially is an essential part of the learning process and is an important way to support the psychological well-being of trainees. Promoting positive emotional states can have a strong influence on cognitive processes, including attention, learning, memory and broader flexible problem solving. Surveys of Australian and New Zealand university educators and both undergraduate and postgraduate students early in the COVID-19 pandemic indicated many positive perceptions of a remote online learning experience. These included a perceived increased sense of safety, as well as perceived enhanced lines of communication with supervisors and teachers, with many feeling they received more rapid responses to their questions in online learning discussion boards in the fully online learning environment. However, there was also unfortunately a strong perceived lack of social connection with peers and supervisors, in the early COVID-19 pandemic online learning environment, resulting in feelings of isolation, which then translated into reduced motivation and poor time management.

The risk for negative emotional effects associated with remote online learning can be mitigated through building strong connections within the learner group at the start of a program, ideally with facial visualisation, and an online learning community that will support trainees to keep them on track. The value of some form of facial visualisation, as well as social connection as part of the learning environment in postgraduate medical education, is suggested by the findings of Noguchi and Stanaway. When clinicians had a choice of participation method in a graded postgraduate course, although the online non-collaborative learning approach appeared most popular overall, there was higher uptake of the graded intense weekend face-to-face program, compared to a more extended delivery with online asynchronous collaborative aspects. Participation rates and grades were also better with the intense face-to-face delivery compared to online non-collaborative and online collaborative approaches.

Providing a learning group with a dedicated communal multifunctional virtual space may be important. Such a space might include a channel where the group meets for formal scheduled teaching sessions, as well as a separate but parallel channel, providing opportunity for trainee group chat, group study and collaboration on a 24/7 basis. By following this approach during the pandemic, supervisors of cardiology trainees in the United States perceived an increased quality and consistency in the education they provided, and by fostering a sense of learning community amongst their online trainees through use of Microsoft Teams, they perceived reduced trainee burnout and improved ‘wellness in a time when isolation has become a part of everyday life’.

**Assessments**

To some extent, we can learn from the reported experience of groups who conducted assessments for medical students during the early phases of the COVID-19 pandemic. Clinical assessments via objective structured clinical examinations (OSCE) and other telehealth assessments in the US and UK, respectively, were successfully delivered via Zoom™ (Zoom Video Communications Inc., San Jose, CA, USA) or Microsoft Teams (Microsoft Corporation, Redmond, Washington). Consistent and detailed communication between organizers,
examiners and participants about the organization and technology were described as the keys to success.

In Australia there are over 21,000 vocational specialist training positions. Providing authentic assessments for these trainees during the COVID-19 pandemic has been challenging and disruptive, particularly for large-scale barrier examinations. Positively, in Australia at least, this challenge and disruption has triggered opportunities to review and improve current systems. This includes re-thinking the reliance on high stakes barrier examinations for trainee progression, the associated risks of reliance on technology for these exams, and the security concerns and contingencies for technology failure during exam sittings. Suggested improvements emerging through responding to these challenges include introduction of assessments that are more flexible, as well as more aligned to trainees’ future practice and service delivery, including work place assessments, tele-supervision, online teaching and virtual assessment. The increased focus on virtual care during COVID-19 has also highlighted the importance of integrating education and assessment on digital and tele-health practice going forward.

Managing learning curve expectations with new forms of virtual learning and clinical practice
Lack of both teacher and learner proficiency in effectively communicating in an online environment, as well as in using collaboration platforms and other digital technology, may represent an initial stumbling block. However, both speed and accuracy will increase with use and familiarity. Certainly, in the field of medical education, levels of acceptance and satisfaction with technology show steady increases with time. Findings are similar regarding learning curves for newly created virtual care clinics and newly implemented virtual supervision of medical vocational training and education. It is useful to point this out to trainees, so that the initial learning curves as well as subsequent improvements, will be an expectation if there is a shift to extensive online learning and virtual training.

Training online educators
Using experienced and engaging clinical teachers, who are trained and skilled in online education and facilitation and have a strong online presence (such as using a conversational tone, using a photo for the educator’s online profile, being comfortable with using technology that will keep learners focused), leads to more engaged and motivated learners. Further, these skills are readily transferable to the clinical context and will be helpful for clinicians (including trainees) in conducting the increasingly utilized telemedicine consultations.

How to use engagement expertise for effective online learning and teaching
Interactivity, intuitive tools, visually attractive learning resources, and personalization of the learning experience, have all been shown to improve engagement and facilitate understanding and knowledge retention. Learners should be discouraged from ‘hiding’ in an online room, through requiring them to ‘do’ something at least every 5 minutes. Examples of such interactive activities might include commenting in the meeting chat or responding to polls.

Short introductory 2 minute videos on a theme or weekly topic in a course, where learning outcomes are discussed, enhances online teacher presence, creates structure and certainty for learners and may promote a sense of community for trainees. Encouraging trainees or learners to be partners in the learning and design process promotes empowerment and engagement.

Compulsory coursework is often used as a mechanism to ensure program engagement. Rather than providing incentive to engage, it may undermine learner autonomy and lead to reflex defiance and disengagement with the learning process. If elements of online course work are designed as compulsory components of the program, it may be important to provide adequate explanation as to why the component is compulsory, to support engagement and promote the sense of empowerment.

Incentives for online components of a training program
A primary challenge with any new technology or approach to learning is the group’s willingness to embrace the new technology or process. Whilst more than 50% of Australian postgraduate students prefer fully online courses, the retention rates for such courses are slightly less than hybrid courses and face to face courses. To manage this challenge, different incentives may be used to increase participation and completion rates for an online educational program. For tertiary education institution massive online open courses (MOOCs) where there was lack of credit associated with completing the course, dropout rates of 90% have been reported. When an incentive is introduced, such as credit towards graduation, then completion rates accelerated towards 70%. There are similar findings for postgraduate degree programs designed for Australian clinicians. Participation rates in their asynchronous online community learning components increased when incentive marks were given for written involvement in the course online learning forum.

Fatigue and burn-out
Time management is different for online learning when compared to traditional face to face methods. It takes more time to foster an effective remote learning environment, more time to deliver online content and more time to prepare or convert content for online delivery. This phenomenon of increased intensity associated with participating in remote online learning has been prominent enough since the early pandemic to coin the syndrome of ‘Zoom fatigue’. However, these issues can be mitigated by reducing online teaching for trainees into small digestible pieces, sometimes referred to colloquially as ‘chunks’, ‘packets’ or ‘bites’.

Additionally, educators might use existing curated quality collections of medical resources or images (existing radiology, pathology resources for example). These strategies may reduce the intensity of the online learning load and increase both engagement and knowledge retention particularly when that small packet of knowledge is repeated at intervals.
Cognitive load and educational ‘bites’

Traditional live hour-long lectures are becoming increasingly unpopular, regardless of whether they are delivered online or face to face. This is reflected by the dwindling attendance of students at live lectures when a recorded option will be available afterwards which can be watched at an accelerated speed and parts that need focus and reflection can be paused and re-listened to. Challa et al. present evidence that the traditional didactic lecture needs to be replaced with a combination of innovative and modern learning systems which accommodate individual learning differences, and improve clinical reasoning and critical thinking. This may include combined approaches of eLearning, flipped classrooms, team-based learning and observational learning.

Further, 50- to 60-minute traditional teaching sessions are not compatible with the average human attention span and result in inferior engagement. This is compounded when one considers that learner focus is even shorter, when looking at a screen. Simplicity of the learning design in an online learning experience is similarly important. This is reflected in the cognitive load theory, which describes how the average person can only process and retain three to four pieces of information at a time. Consequently, an educational trend is emerging, where digestible educational ‘bites’ or ‘chunks’ of information of 6 to 15 minutes length are being delivered in online education and training programs.

Adapting our practice: future directions

To support junior medical doctor training and education during COVID-19, and to embrace the learnings from new modes of educational delivery, the NSW Health Education and Training Institute (HETI) is in the process of piloting novel online educational approaches, platforms and programs. The objective is to develop acceptable and accessible learning and training solutions that are in line with evolving training frameworks and best educational practice, as well as to support trainee well-being during and beyond the COVID-19 pandemic. In the remainder of this paper we describe some examples.

(1) The “Intern lecture series” and the “5-minute journal club” program

We have captured much of the evidence described in the literature in our delivery of weekly education to support junior doctors in their first and second clinical years. Our approach is continuously modified by direct feedback via email and through monthly forum discussion sessions with junior doctors, as well as monitoring participation rates. The pilot was coordinated by the Medical Portfolio’s specialist trainee, who is more senior to the junior medical participant cohort, providing a degree of mentorship and authority but close enough in level of training to provide a degree of connectedness. Advisory support was provided by the Medical Portfolio’s education expert.

Initially at the start of COVID-19, weekly synchronous online 50-minute presentation sessions by discipline experts were organized as part of the program. Whilst the feedback from participants was highly positive, attendance rate diminished over time. Education needs to be dynamic and adapt to changes in user environment. Consequently, we redesigned our approach, converting the 50-minute intern lecture series for NSW junior doctors into a “5 minute journal club”, based on evidence in the literature and junior doctor feedback. A journal article was summarized into approximately five points, accompanied by a visual graphic. The document was then shared via Microsoft SharePoint/Teams and delivered with a bit.ly shortened link allowing accurate assessment of engagement anonymously with the educational resource. This approach incorporates the concepts of cognitive load, just-in-time or on-demand learning, dynamic teaching, and dual coding theory.

(2) Effective online engagement training

Specific training for online teaching is identified as an area of need and there are minimal resources or courses available at present. The effectiveness of using experienced online presenters to engage learners and participants in the online environment has been highlighted in the literature. To facilitate this we have created educational resources and interactive online presentations and webinars at HETI on how to maximize online engagement, as well as how to harness infographics for this purpose. The resources are designed for both our specialist trainers and trainees. This approach has been underpinned by combining evidence from the literature with the practical education expertise within our organization.

(3) “Surgical Sciences Intensive Course” pilot

Another example of harnessing the evidence from the literature is our “Surgical Sciences Intensive Course” pilot in 2021. This course supports junior doctors in their preparation for the General Surgical Sciences Examinations (GSSE) for the Royal Australasian College of Surgery and was delivered completely online in the COVID-19 environment.

The course caters for different adult learning styles, considered essential for effective adult education. It combines recorded lectures from Subject Matter Experts (SMEs), pre- and post-course assessments, regular synchronous question and answer sessions with SMEs, and an intensive synchronous online anatomy weekend. The course is supported by a wide range of SMEs ensuring the engagement by the participants as literature has shown that engagement in education is maximized when delivered by trusted and authoritative figures.

An observational approach, described as important in acquiring complex medical skills, is facilitated through live streamed demonstrations on each anatomical region by expert academic anatomists, complemented by synchronous clinical correlation sessions by expert subspecialist surgeons. Participants are given the opportunity to measure their improvement throughout the course by sitting for authentic pre- and post-course assessments, complemented by personalized feedback and opportunities for reflection with a specialist surgical education and training expert. Course evaluation is detailed with scaled and open feedback for each week, with high evaluation response rates ensured through associated incentivized access to further resources on survey completion.
Executive level support in our institution for the course was essential as initial development costs were significant and a team was required to pull the initiative together. However, as the course is now established future financial resources will be minimal. The course structure is robust, in that it is evidence-based and supported by strongly positive participant feedback, indicating sustainability through any further challenges presented to the medical workforce by the COVID-19 pandemic.

**Conclusions**
The COVID-19 pandemic has caused immense loss, disruption and uncertainty. It has brought us to a watershed moment in all aspects of our lives, including education and training in the medical profession. The most successful learning and teaching is dynamic, adapting to required change and producing something new. It can be argued that the adjusted educational approaches and technology that have emerged through the COVID-19 pandemic offer collaboration, improved educational delivery and engagement as well as sustainable support for the junior medical cohort. The COVID-19 pandemic has also positively triggered a re-thinking of training and assessment processes for junior doctors and specialist trainees in Australia.

**Take home messages**
- COVID-19 has had a marked impact on training, education and well-being for junior doctors in Australia as well as other countries.
- The disruption has resulted in positive shifts in educational practice, expectations and training frameworks for the junior medical workforce.
- Traditional education has been mostly abandoned to the emerging educational trend of using truncated, engaging and easily accessible ‘packets’ of medical practice-relevant educational content; using educators who are skilled in online engagement and who are perceived as authoritative figures by online learners is important.
- Subsequent work is emergent and evolutionary.
- We should continue to capitalize, at relatively low incremental cost, on the significant investment from the past 2 years in medical education and training adaptations
- Robust educational teamwork and leadership is essential in effecting successful innovative change for training and education of junior doctors.

**Data availability**
No data are associated with this article

**Notes on contributors**
Dr Simone L. Van Es (MBBS, PhD, FRCPA, FFSc(RCPA), GradDipMed, CertFPA): is the Medical Program Manager and Education Lead for the Medical Portfolio at NSW Health Education and Training Institute (HETI), an Education Focused academic at The University of New South Wales and a Fellow of The Royal College of Pathologists of Australasia (FRCPA). She has a PhD in Digital Pathology and online medical education.

Dr Aaron J.H. Tan (BMed, MD, GradCertAnalyt, CHIA): is a specialist trainee with The Royal Australasian College of Medical Administrators (RACMA). He was the Medical Administration trainee in the Medical Portfolio at HETI during 2021.

Ms Toni Vial: is a Senior Program Co-ordinator in the Medical Portfolio at HETI. She is the lead co-ordinator for the Portfolio’s Surgical Sciences Intensive Course as part of the Surgical Skills Training Networks as well as the lead coordinator for the non-specialist cohort of medical trainees working in NSW Hospitals.

Dr Jo Burnand (BMed, MPH, Grad Cert [Coaching Psychology], FRACMA): is the Deputy Medical Director of HETI.

Dr Claire M. Blizard (MBBS, FRACMA, MHA(UNSW): is the Medical Director of HETI. She is a Fellow with the Royal Australasian College of Medical Administrators (FRACMA). She also has a masters degree in health administration.

**Acknowledgements**
The authors would like to acknowledge Adjunct Professor Annette Solman (Chief Executive, HETI) for her advice and guidance on this paper, and Ms. Jenny Lam (Marketing & Communications Officer, HETI) for her advice on engaging participants for some of the projects described in this paper. Additionally we would like to thank Associate Professor Robert Rae and Associate Professor Kerin Fielding who have been extensively involved in the successful Surgical Sciences Intensive Course. The authors also acknowledge Dr Isabelle Kapterian, (Medical Administration trainee, HETI in 2020) who designed and facilitated the original Intern Lecture Series referred to in this paper.

**References**


Open Peer Review

Current Peer Review Status:  

Version 1

Reviewer Report 06 May 2022

https://doi.org/10.21956/mep.20480.r31968

© 2022 Sandars J. This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

John Sandars
Faculty of Health Social Care & Medicine, Edge Hill University, Ormskirk, UK

The authors present a description of their experience of the design and implementation of new approaches to educational training that they offered to junior doctors in Australia in response to the demands of the COVID-19 pandemic. There appears to be little evaluation of this approach, although the authors state "The purpose of this paper is to reflect on the watershed moment in online medical education and training".

The design of the new approaches are justified by the authors by making links to appropriate educational theories, 'best practices' and published studies. This information is useful to other educators but would be more useful if the extent to which these approaches are similar or different to other responses made during the COVID-19 pandemic could be clearly discussed. This information is required by other educators for making decisions about applying the presented approaches in their own context.

The article is mainly descriptive but readers would be interested in more in-depth evaluation data on usefulness and ease of use by both educators and learners. This information is required by other educators for making decisions about applying the presented approaches in other contexts.

Overall, this reflective and predominantly descriptive article provides a snapshot within one specific context but is limited in potential applicability for medical educators in other contexts.

Is the topic of the opinion article discussed accurately in the context of the current literature?
Partly

Are all factual statements correct and adequately supported by citations?
Yes

Are arguments sufficiently supported by evidence from the published literature?
Partly

Are the conclusions drawn balanced and justified on the basis of the presented arguments?

Partly

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Technology enhanced learning and educational interventions

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.