Editorial

Forensic undergraduate education during and after the COVID-19 imposed lockdown: Strategies and reflections from India and the UK

1. Introduction

Since the middle of the month of March, India and the United Kingdom have confronted an unforeseen lockdown imposed amid national and international responses to the COVID-19 pandemic. One of the consequences of this has been that undergraduate students of all disciplines have left their campuses and either moved back to their homes or were isolated in halls of residence. However, despite some poor framing by the press [1,2], universities continued to remain open, and supported their students academically and pastorally. For India and the UK, the impact was significant but short-lived as the undergraduate semester was drawing to a close. Nevertheless, this still proved a challenge, particularly for subjects which rely heavily on practical or hands-on learning sessions. It was clearly argued why higher education should continue [3] and so significant effort was placed on urgently resolving this issue while providing a meaningful education experience for our students. For most, this meant concluding that some form of online education system was the only solution [4] in order to ensure that all students continued to have access to the curriculum.

Comparison of approaches between India and the UK have interest and merit. Both countries have active forensic science higher education sectors. While the UK is more mature and established, India has a rapidly developing profile for forensic science research and education. Recent work by Demir et al. [5] demonstrated that the UK was the second most productive country for forensic and legal medicine research publications (9.2% of global outputs) and India was 12th (with 2.5% of global outputs). Despite their similar educational approaches to teaching forensic science, network analysis of these global publications revealed very small linkages between our two countries.

In terms of delivering course material, universities were required to devise solutions for three typical types of session: the traditional styled lecture, seminars, and practical sessions. Arguably lecture delivery offered the fewest issues, where online video conferencing platforms designed for such activities exist. A combination of live and asynchronous pre-recorded approaches provided flexibility for students, taking into account the pressures created by the pandemic, 'key worker' statuses and volunteering initiatives, meaning that it is not viable to expect students to attend online sessions at set times. Whilst pre-recording content carries an up-front cost, the benefit of having a static, replay-able resource for students to digest in their own time and capacity is seen as of-value. Of course, many lecturers and students alike seek to encourage positive interaction in their lecturing sessions, and indeed such approaches have long since been seen as of benefit to students and their learning [6]. As a result, many institutes will have supplemented recordings with shorter, live question and answer styled sessions to confirm understanding, address any confusion and possibly of most importance, to see their students, check on well-being and simply talk to them. It is important that following the imposed lockdown, academics do no simply disappear from interacting in real time with students, and technology offers a stop-gap solution at this time.

Seminar and practical sessions provide somewhat of a challenge. At the crux of their value lies the ability for students to consolidate knowledge by 'doing' and 'using' the knowledge they have acquired. Work by Erana-Rojas et al. [7] noted that 89% of their students found that practical session broadened their perspective of forensic sciences and 93% understood forensic processes better. Particularly in the context of forensic science and all its sub-disciplines, students need to apply best practices, seek evaluation of their performance and understand the context of any techniques by using them. Furthermore, practical sessions develop the necessary psychomotor skills required in many aspects of forensic analysis. Basic wet laboratory skills such as weighing, pipetting, and microscope slide making, along with DNA swabbing and fingerprint recovery techniques, for example, are important in many aspects of forensic science. Yet often, forensic science equipment must stay within its lab environment due to health and safety, immobility, expense and licensing issues meaning that the lab cannot be 'brought to the student at home'.

Regardless of the method and platform, universities and their academics are encouraged to maintain communication with their students. What would once have been face-to-face, a knock at the office door or a two-minute post-lecture chat, has turned into a computational request for communication. This has the potential to have opposing effects and likely depends on the student in question. On one hand, the temptation to ask questions immediately without prior research because we are so accessible has been removed. As staff we are still contactable but computational requests could afford more time to think about the question more deeply before asking. Furthermore, the lack of

immediate response could encourage an exercise of research skills fostering a more independent approach. On the other hand, what is lacking is the connection and to some extent the opportunity for organic discussions around the questions. The type of student here is important, those that favor independent research will likely thrive, while those that benefit from interaction and talking things through to process ideas and knowledge may find themselves out of their comfort zone or, worse, left behind. Additionally, those once *visible* indicators of students in need of both study and well-being support are no longer there, meaning that it is vital that we continue to be available in order to identify and address any warning signs. Flexibility is key here, ensuring students have multiple opportunities to seek support which in some cases means non-traditional hours-for-contact.

2. The response in India

Forensic education in India was largely delivered via the Zoom [8] and Webex [9] applications following instructions and training given to faculty and students. Over time and with continued use of the application, teachers and learners became accustomed to this virtual approach. Regular lectures were arranged using this application for all the learning hours.

For Indian students, the most important advantage of this approach was the fact that lectures could occur in real-time, keeping the students engaged in educational activities and completion of the curriculum as per the schedule. The disadvantages varied from place to place, but included: being unable to confirm the student's attendance, difficulties in achieving active engagement of students, internet connectivity issues, deliberate or inadvertent disturbances i.e. unnecessary voices and annotations over the display screen, and there were a few students who were deprived of the education resource materials.

However, to impart forensic education to our students in a timely and qualified manner, the faculty tried to resolve as many of these issues as possible. Faculty learnt to operate the built-in features in the application to cope up with unwanted sounds and annotations. During an online session, faculty randomly asked one of the students to interact in some way, ensuring the physical as well mental presence of the students and keeping the students alert. Although this was not necessary all the time since many of them were found to show interest and interacted well. At the end of the sessions, students were asked to raise their queries on a WhatsApp group, thus allowing discussions with faculty to continue as much as possible. Attempts have also been made to inculcate photographs of pathological features found during autopsy; radiographs to discuss forensic anthropology and age estimation; videos on forensic taphonomy; links illustrating mechanical injuries; recent news articles reporting medicolegal cases etc. for the purpose to gain knowledge over discussion with ethical considerations at all the stages. This has raised a number of ethical considerations since this material is highly sensitive. One particular issue was that computer screens were sometimes seen by family members due to having to study at home. While attending the sessions on anthropology or sexual offences and perversion or autopsy examinations or deaths due to strangulation etc. people might have faced awkward and uncomfortable moments particularly when stigma prevails among family members. Now that some of these images and resources have been digitized and future use becomes easier, faculty may have to provide clearer warnings, demand complete privacy during teaching sessions, ensure that this material is not shared in a way which is downloadable or avoidance of particular forensic topics.

It has been established already that a blended learning approach can positively influence and impact on the achievements of students, especially when utilized to manage and support distance education [10]. Few universities developed and offered learning cellphone application with 3D technology to medical students [11]. Videos generated prior to the pandemic depicting faculty performing and explaining such things as autopsies emphasized important findings and were shared with the students in a way which maintained confidentiality yet initiated interactions and discussion. Institutional support was also extended to support increased subscription to various e-learning modules, e-books, e-library access, additional international journals, etc. to provide the students with multiple new learning modalities in their homes. Understanding mental stress under lockdown and curfew mentorship sessions were arranged on regular interval and individual basis [12,13]. Students were also provided details of psychological counsellors when required.

While organizing the sessions, it was vital for staff to remember that this wasn't just 'distance learning', but 'learning during a pandemic'. Apprehension, isolation, and ambiguities prevailed among Indian students. Opportunities should be there to connect with one another in chats or videos. A handful of students would be left behind facing difficulties in accessing the online sessions attributable to many reasons. Though, resource materials and recorded videos of the online sessions can be shared to such students, it shall be ensured to cover the syllabus when they will physically be present on campus again afterwards.

Finally, Institutions had to cancel or postpone all assessments. Over the period of time, when lockdown was extended in piecemeal, a planning for an online assessment comprised of multiple-choice questions has been discussed as well implemented using dedicated software. In this regard, appropriate utilities i.e. Google Forms would be preferred. Even, use of open book assessment can be evaluated. As the purpose of distant assessment in this challenging dreadful time would be to keep our students engaged in academic study and encourage them to revisit the curriculum. The most important aspect is to ensure we stop any dissociation of the 'student' inside them while continuously being physically detached from our universities.

3. The response in the UK

Unlike in other countries, some forensic science education in the UK is subject to professional body accreditation. The collection of component standards to which these courses adhere (which include laboratory skills) stipulate the nature of the content and student experience with regard the forensic context. For the undergraduate course, the impact of campus closure on whether these standards could be achieved was minimal for the undergraduate provision, since they can be achieved over a three year period, and the teaching term was coming to an end in many universities. The same is not the case of taught post-graduate provision.

As in India, UK forensic courses adopted a range of online tools to support students up to, and into, the examination period. These included Microsoft Teams, Webex, Zoom, as well as Blackboard Collaborate and Padlet. WhatsApp, Facebook and similar social media apps were used significantly less by comparison.

The live delivery of seminars still occurred alongside a blended approach of prerecorded or written content, seminar tutor delivery, time for independent student work, and facilitated group discussions. For example, students were asked to watch a video demonstrating a forensic technique posted on the virtual learning platform or read a document such as a court statement ahead of the live seminar session. Some theoretical content was discussed by the seminar tutors, then the students were assigned a task to work on independently for a short period of time. The session was then resumed and students would be asked to share their work via

the chat box of the platform used, or to share their screen with other members of the seminar class, and a facilitated group discussion took place. This broke up the time spent in the online session, encouraged engagement with the learning, and enabled fruitful group discussion.

A particular example of this approach was the delivery of a simulated courtroom exercise to replace a physical session of cross examination within a mock courtroom. Rather than requiring students to give evidence and be cross examined in the virtual environment in which they may have felt uncomfortable, a scripted cross examination of a crime scene investigator was written and 'performed' by seminar tutors live to the class via an online platform. This gave the students the opportunity to interact in real time with the cross examination process, identify good practice and areas for improvement (which had been written into the script), and consider, based upon their own written statements, how they would have responded to some of the probing questions asked by the barrister. In another example, the adaptation of anatomy bone labs into online worksheets supplemented by Sketchfab (https://www.sketchfab.com). Traditionally, these bone labs are run face-to-face where small groups of students worked together to lay out the skeleton and over three sessions study the structure and function of the human skeleton, specifically looking at the features forensic anthropologists use to estimate biological profiles: biological sex, stature, age, and life history. Without home access to human remains or replicas, these lab sessions instead made use of online repositories of 3D digital models via sketchfab. com with an accompanying digital worksheet containing links to the 3D models and questions to be answered.

Feedback from such sessions indicated that, whilst students miss the face to face contact of traditional seminars, they feel more able to contribute to discussions and have enjoyed the interactive nature of delivery, and staff have reported increased level of engagement via the chat box facility and a greater amount, and depth of questioning in relation to the taught material.

Some of the challenges in delivering lectures online using 'live-classrooms' are associated with inclusivity and accessibility for all students. With the outbreak of COVID-19, many international students chose to leave the UK and go back to their home countries. This created challenges in making sure that online interactive classrooms did not discriminate against those students that were in different time zones. Some universities therefore encouraged lecturers to video record their lectures and avoid giving any 'live' recordings. This however also created a model more in accordance with distance learning, rather than connected learning, which arguably was not what campus students originally registered for. In addition, by overlooking online classroom platforms, some students felt that they lost out on the interaction with academics and lecturers that they previously had, as much of the discussion topics often happened in-class or in live seminars.

4. Moving forward

While writing this, in the month of July, we are seemingly moving into the last phases of lockdown as we move towards phased reopening and unlocking. Currently we do not know the extent of students who will elect to remain away in September, although the fear in India of a continued spread of the virus is high. Academic staff are having to plan in advance for delivering forensic education in an as-yet unknown context with uncertain numbers of students. Even in the post-pandemic period, precautions such as wearing a mask and physical distancing will need to be considered for when reviving the face-to-face forensic education [14]. The timing of our lockdowns near the end of term meant those remaining lab sessions were adapted for online delivery in a short space of time. Before the summer break there was little time for in-depth analysis of the equivalency of the lecture, seminar, and practical generated for distance learning. Further compounding this issue is that many staff are not specifically trained in online/distance learning teaching methods.

As we enter into a new academic year the summer has afforded some time for us in India and the UK to reflect on what worked well and what did not. The initial period was managed through video conferencing packages, such as Zoom and Teams. Over time, other sources of e-learning were being tested and used accordingly which supported greater use of discussions and multipurpose tasks, interactivity and active (as opposed to passive) engagement. There have been differences in the approaches used between Indian and UK forensic educators with regard of the range of online tools that were used and how, particularly with regard the degree of synchronous and asynchronous delivery that the different context of our students needed. Regardless, learning this new content for staff and students was a challenge, even more so when there is a learning curve involved in interacting with these new online packages.

Currently in India and the UK, a range of approaches are being planned and materials being devised to ensure a comprehensive and rewarding experience for students that meets the required learning outcomes (and component standards, where required). By necessity, the curriculum is being classified into core and non-core areas. During the lockdown period, students were deprived of key professional activities as well competency based forensic education. Hence, face-to-face teaching may be reserved for these core areas only. In some cases, 'curriculum shuffles' may be required, placing practical elements in a position in the academic year where the chance of a return to normalcy is higher. Yet this is a risk, and it may still actually be possible to meet the learning outcomes in relation to traditionally practical elements of a course through online delivery. Approaches being planned in both countries include the use of pre-recorded demonstration videos to communicate the key practical aspects of analytical techniques, 360 video captured images of crime scenes and decomposition sites with embedded content to enable a virtual walk through and learning experience, scripted or filmed events that provide scenarios for student evaluation and discussion. Some outdoor practical sessions will be safe to run since it will be possible to adhere to distancing rules with relative ease, and some indoor hands-on activities may also be possible with small cohorts at a distance, but both approaches will still present challenges in terms of the shared use of space and equipment and collaborative practical working which is often inherent in the teaching of forensic practical activities (for example, crime scene investigation)

The challenges of pre-recording material for practical sessions also introduced similar limitations – but this is a nuanced context since the use of laboratories is necessary for the development of critical thinking and experimentation in the forensic sciences, yet some researchers have argued that practical exercise in laboratories is restricting [15,16]. Nonetheless, in both countries, many of the practical elements of the forensic courses needed to be conducted online and will continue to rely heavily on online resources. This process might have introduced some immediate challenges; however, modern technology and communications also offer opportunities to develop virtual and/or remote laboratories, presenting an opening to explore creative ways of using technological solutions to form digitally generated forensic environments. For example, the use of virtual realities in forensic science is not a new concept, and has been argued to offer exciting prospects in teaching and learning, especially with regards to practical sessions such as crime scene investigations [17]. In addition, the use of open source platforms (e.g. Sketchfab) has also made it possible to access 3D models of bones and artefacts in an efficient and cost effective way, allowing for teaching and learning

materials to be conducted using online models as substitutes without subscription costs. In this vein, Future Learn has also been used by forensic educators to provide additional content to students with key benefits being that access is free and students can interact with a multinational cohort of students. Although forensic science research is beginning to explore the advantages of technology;, this has, perhaps, not been fully utilized in forensic science teaching and education [18]. The lockdown has now provided us with an opportunity to explore how technology could aid in forensic science teaching and education with more focus and vigor. Finding the right balance of making sufficient time and training for staff to learn new skillsets might be challenging, and to some extent costly. Yet, the knowledge transfer in a changing environment arguably also needs to meet the skillset of a potentially new market post COVID-19.

It has been noted that we should make attempts to avoid going back to 'normal', and that a greater reliance on online learning supports greater personalized learning, brings more voices into discussions, and can be more inclusive [19]. Indeed, the range of online resources prepared will be greatly beneficial to supplement aspects of face to face teaching, and to promote a more blended approach to learning in the longer term. Feedback of teaching staff and students should be considered and aspects of the online approach which meet the needs of the modern learner should be considered as part of routine teaching practice. We can also use this period of reflection to consider introducing new elements to our curricula, such as allowing forensic science students to develop some key sci-comm skills which has been recognized as being a weakness of many modern forensic science curricula [20]. It seems that there is real potential in recognizing where an online-based task may enable a greater focus on the learning objectives, rather than detract from them. An example of this would be an online walkthrough of a virtual crime scene as opposed to the physical equivalent. Whilst a physical presence at the scene enables students to consider in practice aspects of contamination avoidance, scene control, and evidence recovery methods, often these activities can, perhaps, be a barrier to the more interpretative aspects of crime scene investigation. Through separating the physical application of practical techniques with the more holistic consideration of a crime scene through a virtual approach, it becomes possible to focus the students on aspects of decision making and rationale for activities at the scene, stressing the importance of the interpretative aspects throughout the forensic process, as is key to instill in the next generation of practitioners [21]. Yet all of this good work needs to be considered in the context of recent research that has shown that 71% of students would struggle with motivation to learn and 63% would feel less prepared to take assignments and assessments with limited face-to-face teaching [23].

Forensic science educators have long argued for the use of more innovative approaches in forensic teaching [18,22]. The lockdown has forced individuals and departments to embrace these views with speed. In our post-pandemic world, another transition will be expected as we move to a hybrid learning framework with physical distancing. The recent experiences of Indian and UK forensic science educators as reflected here is mirrored in other countries too [24], and will allow us to move forward with more confidence and optimism than we felt four months ago when the lockdowns began.

Declaration of Competing Interest

The authors confirm that we have no conflicts of interest to declare other than the fact that this Editorial is written from our own personal experiences and reflections of working through the COVID-19 pandemic, and our views may not represent those of our employers.

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