Teaching pharmacology online: Not just another narration

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Why was the idea necessary?

The COVID-19 pandemic placed educators in unique circumstances, not only due to their discipline- and student-specific considerations, but also their personal and professional milieu. Given a series of sudden additional academic, managerial and research responsibilities, transitions of the first author's pharmacology learning opportunities to an online setting required consideration of educational scholarship, resources and a tumultuous daily schedule.

Although hybrid learning was already incorporated into the modules using preparatory, engagement and consolidation features, an overarching concern was passive, complacent and complicit learning, given the transition of the (primarily) physical space of learning to that of digital and online-only learning. Furthermore, pharmacology is perceived as difficult, content heavy and suffering from a demotivating learning environment,[1,2] which has also been observed by the authors. Hybrid- and blended-learning improved this perception, but the sudden and all-encompassing transition of programmes was seen as a trigger to increase anxiety and decrease learning amenability among the students.

What was tried?

With the assistance of the second author, low-maintenance, resource-optimal and effective platforms for student engagement and active learning were planned using the learning management system. Traditionally, sessions were primarily didactic, with less student involvement, contextualisation or authenticity. To stimulate engagement and active learning, an underlying framework of scenario-based learning[3] and socioconstructivism[4] was used to: (*i*) ensure contextualisation of the basic sciences within a clinical environment; (*ii*) provide a level of authenticity to the context of the learning opportunity; (*iii*) foster communication, collaboration and peer-working attitudes; and (*iv*) stimulate critical thinking. For undergraduate pharmacology modules and an honours course that the first author is involved with, resources comprised, at minimum, expansive lecture notes, a narrated presentation, a preparatory exercise and a consolidation activity featuring reflective feedback. Three modalities are discussed: (*i*) interactive narrated presentations; (*ii*) collaborative blogs; and (*iii*) collaborative wikis. Research Ethics Committee approval (ref. no. 345/2020) was obtained for student feedback collected throughout the modules as Likert scales and open-text fields (which were thematically analysed).

For undergraduate modules (3 modules; *N*=55 - 248 students), to deviate from standard narrated presentations, 2 active elements were included: (*i*) hyperlink-mediated scenario-based critical and formative questions; and (*ii*) reflective feedback. Interspaced in the presentation were embedded questions structured as clinical scenarios that required students to either deduce the next logical step in a case and/or apply concepts they had just encountered. Students would answer, and then be redirected to either a correct or incorrect slide containing immediate reflective feedback. This created a teachable moment without requiring direct lecturer intervention by providing information on why it was correct (with a hyperlink to the next section) or incorrect (with a hyperlink to return to the question). Where multiple answers were correct, students could return to the question to seek the other correct answers. Each reflective feedback slide contained a meme (either as a GIF (graphics interchange format) or image), which allowed for a little visual humour alongside the information provided.

For the honours course (*N*=22 students), the *Writing an article* and *Pharmacokinetics* learning opportunities were modified into socioconstructivist activities, with teams of 4 - 5 students. For *Writing an article*, teams were provided with guidelines to writing and 3 published articles of varying quality and scope, as well as instructions to provide short reflective notes on: (*i*) positive aspects; (*ii*) negative aspects; (*iii*) a general opinion on each article; and (*iv*) how it compares with their research protocols. Students needed to compile these into a blog, which after a set deadline, was unblinded to the other teams for their purview. Thereafter, a synchronous consolidation session was held to discuss trends and offer additional insights on factors possibly missed.

For *Pharmacokinetics*, each team was given a pharmacokinetic concept (absorption, distribution, metabolism or excretion) and tasked to construct a clinical scenario, where a self-selected patient factor would modulate downstream effects of the pharmacokinetic parameter for a drug. These 4 scenarios were unblinded to the other teams and discussed during the online session. To consolidate and formatively assess learning, teams were provided with a final activity, where a lecturer-created clinical scenario incorporating pharmacokinetic parameters unique to a certain drug, disease or patient context needed to be discussed using a wiki.

What lessons were learnt?

Personally, the transition was an ideal time to shift modalities to something new; however, other responsibilities complicated dedicating focus on teaching strategies. Using easily accessible resources and scholarship of teaching and learning, innovative time- and resource-efficient sessions could be created that allowed for active student engagement and greater application of their knowledge. Such a strategy was more beneficial for attaining graduate competencies and facilitating higher-order thinking, and helped to prepare students for online, open-book assessments.

Students' structured feedback regarding the modalities was overtly positive. Interactive narrated presentations were enjoyed, with students speaking towards its ability 'to make students understand and apply knowledge (it's not just about recalling information)'; that it 'makes learning it fun'; and that they 'love the fact that he includes memes and GIFs in his presentation … makes learning so much fun and easy to understand'. The effort was also noted: 'It must've taken a long time to compile and it

really just made my day!' Based on the feedback, the presentation style is enjoyable and fosters a sense of learning. As pharmacology is often noted as difficult and content overloaded, any activity to help lift students' spirits and motivate them to learn is a positive. Using humour as a vehicle for delivering feedback also helps soften the blow to incorrect answers, or allows for some laughter during the learning process, while embedding new knowledge to memory. The size of narrated presentations was greater than desired (30 - 80 Mb) owing to images (inclusive of PowerPoint- and externally mediated compression), which may perturb their use to some.

Writing an article and *Pharmacokinetics* sessions were ranked positively (out of 5.00) in terms of enjoyment (4.29) and knowledge construction by self (4.57), and via collaboration (4.00). Although the socioconstructivist elements were noted positively, the enjoyment of collaboration itself was ranked lower (3.71), supported by 'Collaboration is very difficult online. Some people don't participate and others can't do the work and communicate with the group simultaneously.' The modality is feasible; however, collaboration (whether face-to-face or virtual) remains a contentious topic for students, given the workload distribution, possibility of conflict and perception of 'weak links in the learning chain'. Although both the blog and wiki allowed for synchronous working, students tended to discuss all matters outside of the platform, and then present a consolidated report instead. This appears to be a factor of: (*i*) inexperience with using the formats; and (*ii*) belief that it will be slower to complete. A mental note worth making is that, although students use the learning management system for certain activities, they may not be knowledgeable enough to understand all of its unique properties, especially if it is their first opportunity to use certain features. Both modalities, however, showcased learning outcomes that were reached for both topics. Students were able to differentiate strong and weak elements of all 3 papers, and were introspective regarding where their protocols fell short, which would serve them well during their manuscript writing. Furthermore, students could apply pharmacokinetic knowledge in the construction of their own clinical scenarios, and discuss pertinent considerations during provided case reports, highlighting development of metacognitive and critical thinking skills.

What will I keep in my practice?

All 3 modalities worked well and can be easily adjusted to a hybrid learning approach once a new sense of normality resumes. The scenario-based learning will be strengthened to afford students branched opportunities based on their choices, instead of a linear path. For example, incorrect selection could, instead of being stopping points, lead to subsequent questions to showcase clinical repercussions of their selections (such as adverse effects and interactions that may occur). Introduction of a longitudinal reflective journal can be used during students' writing journey to facilitate meta-reflective practice and improved scholarly discourse.

What will I not do?

Three concerns were observed during reflection. Although the interactive narrated presentations have broad potential, extensive imagery (regardless

of compression) could increase data cost, making it less enticing for those with limited access to the necessary infrastructure. Alternative, or at the very least, clear need for it will be important to assess. More in-depth instructions are needed for blogs and wikis, as the assumption of prior exposure and knowledge about its purpose was incorrect. Collaboration was noted as positive, but had typical frustrations, which could be overcome by having an orientation to such peer work and/or the introduction of roles for each member of the team.

Conclusion

The scenario-based and socioconstructivist learning modalities showcased maintaining of educational scholarship in an online environment, while keeping design minimal to accommodate facilitator responsibilities. The principles used are easily transferrable to other disciplines, with appropriate adjustments. Teaching during the COVID-19 pandemic is challenging for many reasons; however, with careful design and some creativity, it can breathe some life into any session to make it more engaging, rewarding and didactically sound.

Evidence of innovation

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