

# Stimulating students' critical thinking skills in pharmacology using case report generation

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## Why was the idea necessary? (What was the problem?)

It is not a debatable issue that the COVID-19 pandemic created several challenges in the education sector, and institutions across the world had to employ various interventions to ensure continuation of teaching and learning. At the University of Pretoria, one of South Africa's largest contact universities, exclusive online learning was implemented for the remainder of the first semester of 2020. Although this was helpful to facilitate learning during strict lockdown, it also came with its own problems. For third-year undergraduate students in the disciplines of nursing, dietetics, physiotherapy and medical sciences, pre-existing issues such as failure to apply critical thinking skills in pharmacology were inflated during this period. Critical thinking in education is defined as a learning process where students analyse, evaluate, interpret or synthesise information, and apply creative thought to solve a problem.<sup>[1]</sup> However, for the majority of the abovementioned student cohort, which comprised 252 students, learning scarcely went beyond memorisation and recall of information and facts. A potential cause of this could have been diminished learning skills owing to pressure and anxiety associated with the pandemic as reported in the literature,<sup>[2]</sup> or a lack of active interaction among the students, where prior to COVID-19, problem-solving was often conducted as a team effort during contact sessions. A combination of these causes is also likely.

Based on historical evidence from the pharmacology module, appropriate application of concepts and principles learned has always been a mammoth task for many students, as evidenced by the poor performance during summative assessments, which makes the module infamous at the University of Pretoria. This was more prominent in the first semester of 2020, where students struggled to contextualise and work through case report type questions in tests and examinations. As a result, we could infer that the new learning environment was possibly contributing to a lack of higher-order thinking, as well as negatively impacting the students' understanding and application of pharmacological principles and concepts. Prior to the COVID-19 pandemic, this challenge was tackled by clarifying any areas of concern and working through practice questions or case-reports during contact sessions such as lectures, tutorials and one-on-one remedial sessions. However, the stringent COVID-19 lockdown regulations meant that contact sessions were rarely conducted and, consequently, alternative online interventions such as game-based learning, flipped classrooms and case report generation activities, were incorporated in the second semester to improve learning. The case report generation activity was developed and implemented to ensure that students refined and applied their critical thinking skills for successful completion of the pharmacology module, with a clear understanding of key concepts.

## What was tried? (Intervention)

To provide a platform for critical thinking development and ascertain that it was taking place, students were tasked to generate case reports for their peers to work on, incorporating pharmacological concepts from the adrenocorticosteroids learning material that had been made available to them. The aim was to stimulate critical thinking by delivering an engaging and highly interactive experience which would compensate for the lack of face-to-face interactions, while at the same time avoiding digital dumping of content on students or using resource-intensive modalities. Asking the students probing questions as they worked through the case reports aided in achieving this goal. To encourage participation, questions from the best case report that indicated higher levels of critical thinking were included in the semester test and exam as an incentive. The assessments that followed case report generation activity indicated that students were able to integrate adrenocorticosteroids with the pathologies mentioned during the semester, and there was evidence of higher-order thinking, not the usual 'copy-paste tendencies' that had previously been observed.

The approach we used is supported by the constructivist framework, which is considered as one of the leading theoretical frameworks of education.<sup>[3]</sup> Constructivism states that learning is a process where learners construct knowledge rather than passively taking in information.<sup>[4-6]</sup> To ensure this information is imparted, an active experience has to be created for students to construct their own knowledge.<sup>[7]</sup> As such, by generating case reports with follow-up questions, students were able to find information from the lecture material provided, construct realistic clinical scenarios to showcase their knowledge, and make relevant connections in order to apply them appropriately.

## Lessons learnt

As the Chinese government's COVID-19 nationwide campaign 'School's out but class's on' demonstrates, critical thinking can still be stimulated on an online platform even in situations where, in the past, face-to-face interactions would have been preferred. Based on the students' participation and engagement, it was apparent that they enjoyed creating the case reports while learning at the same time. The students challenged themselves and took charge of their own work, which was an indication that while the activity stimulated critical thinking, it also developed their independent learning skills. Additionally, students were inevitably drawn to interact with and teach each other, which promoted peer-learning and assessment. This was proof of social constructivism, which is an extension of the constructivist learning approach, where the role of other individuals in the process of constructing knowledge is incorporated.<sup>[8]</sup> Through the case report generation activity, an opportunity was also created for students

to ask the lecturer questions, which helped clarify any areas of concern. However, at the other end of the spectrum, a major drawback was that each student had an opportunity to create a case report, and consequently some reports were ignored because of the large pool that was available. Therefore, keeping the case reports to a minimum, for instance by conducting them in group settings, would be more effective in future.

## What will I keep in my practice?

The inability to appropriately apply concepts and principles is a constant challenge that is experienced each year by most students who undertake the undergraduate pharmacology module. This is evidence of a lack of critical thinking skills, and it goes without saying that the skills have to be developed as critical thinking and problem solving go hand-in-hand, regardless of whether the students find themselves working in a clinical or research setting. The idea of case report generation should therefore be carried forward into the future as it is a learning tool that can be used, among others, to stimulate critical thinking, resulting in improved student performance and appropriate application of knowledge. This is important especially in a clinical scenario as most of the student complement were enrolled for a clinical health profession.

## What will I not do?

As each student had an opportunity to generate a case report, there was an excess of reports, which meant some of them were not attempted by other students. This could potentially discourage the students whose work was ignored, causing non-participation in future. Therefore, to avoid despondency, case reports can be kept to a minimum by dividing students into groups, and each group would provide a case report that the other groups can work on.

## Conclusions

The COVID-19 pandemic has isolated most people and forced them to work remotely. This lack of interaction may cause students to feel isolated and overwhelmed, which may give rise to anxiety, dissatisfaction and performance issues. Case report generation is an activity that can be conducted online and provide social interaction among students, thus compensating for lack of face-to-face interactions. More importantly, this

involves an active, student-centred learning approach where students construct their own knowledge, so that critical thinking skills are developed, ensuring better understanding of principles and concepts.

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## Evidence of innovation



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