

**Title:** Computer based immediate feedback and learning in pharmacology

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**Context and setting:** The written assessment system in undergraduate medical teaching in India is traditional and is comprised of long and short answer questions. Answer sheets are manually corrected and the marks are posted on the notice board after a few weeks. Rarely students are offered feedback, and when provided it usually is quite late or is non-specific, losing its formative value. This study is designed to explore the effect of immediate feedback on the learning of second year medical students (n=48) at Christian Medical College, Ludhiana.

**Why the idea was necessary:** There is a need to study the effect of feedback on the learning of the students as part of a strategy to improve the learning. To be effective, the feedback should be immediate, structured and related to the task, and provided at a time when students have the opportunity to make use of it. Many of these objectives can be achieved by the use of information technology. "Hot potatoes" is one such free software, which can be used not only to provide immediate feedback but also remediation.

**What was done:** Feedback modules in pharmacology (FMP) were prepared in two topics, i.e., cardiovascular system (CVS) and chemotherapy using blank templates on "Hot Potatoes." FMP included MCQ-based questions and two versions were developed: one with feedback (FMP-1) and the other without feedback (FMP-2). The FMP-1 module provided immediate feedback for each option as the student clicked, irrespective of whether the right or wrong option was selected. For the right answers, reinforced feedback was provided while for the wrong answers corrective feedback was provided with explanations. FMP-2 had the same questions and answers, but without the feedback comments. Students were randomized to two groups, A and B, to receive the module in CVS, i.e., FMP-1 and FMP-2 respectively. Crossover design was adopted to expose all students to immediate feedback comments. Therefore, group A was administered FMP-2 and group B was administered FMP-1 in chemotherapy. Both groups completed the traditional tests containing short answer questions and MCQs. Test scores were compared and feedback was obtained from students and faculty using a validated questionnaire. A focus group discussion was conducted to clarify the issues raised by the students.

**Evaluation of results:** The module with immediate feedback was much better appreciated by students than the module without feedback. Students spent more time on FMP-1 (41 minutes vs. 25 minutes;  $p < 0.0001$ ); however, there was no statistically significant difference in mean test scores (17 vs. 16.6;  $p \text{ value} > 0.05$ ). The qualitative data collected has provided significant information about the immediate feedback. Students suggested that immediate feedback was an excellent way for self assessment, and improved their deeper understanding of content areas. They also felt that it supplemented their traditional learning habits, and stimulated them to read more. Students enjoyed its non-threatening nature.

**Conclusions:** Qualitative data indicated that immediate feedback improved the deeper understanding of pharmacology and relevance to medicine, although it did not increase the test scores. Overall, immediate feedback had a positive impact on their self-directed learning.