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Research Article

Study on the impact of open and closed book formative examinations on pharmacy students' performance, perception, and learning approach

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Abstract

Objectives: To study the impact of open and closed book formative examinations on pharmacy students' learning approach and also to assess their performance and perception about open book (OB) and closed book (CB) systems of examination.

Methods: A crossover study was conducted among Year 1 and Year 2 pharmacy students. Students were invited to participate voluntarily for one OB and one CB online formative test in a chemistry module in each year. Evaluation of their learning approach and perception of the OB and CB systems of examination was conducted using Deep Information Processing (DIP) questionnaire and Student Perception questionnaire respectively. The mean performance scores of OB and CB examinations were compared.

Results: Analysis of DIP scores showed that there was no significant difference ($p > 0.05$) in the learning approach adopted for the two different examination systems. However, the mean score obtained in the OB examination was significantly higher ($p < 0.01$) than those obtained in the CB examination. Preference was given by a majority of students for the OB examination, possibly because it was associated with lower anxiety levels, less requirement of memorization, and more problem solving.

Conclusion: There is no difference in deep learning approach of students, whether the format is of the OB or CB type examinations. However, the performance of students was significantly better in OB examination than CB. Hence, using OB examination along with CB examination will be useful for student learning and help them adapt to growing and changing knowledge in pharmacy education and practice.

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Keywords: Open book examination; Closed book examination; Pharmacy students; Learning approach; Deep information processing

Introduction

Assessment is an important component of education. It not only defines the quality of students and educational processes but also seen as a major factor in directing the

learning and behavior of students and faculty.¹ The method of assessment can have a dominant impact on the learning behavior of students,^{2,3} and assessing the students' performance is one of the key activities educators undertake.⁴

Glasziou⁵ claimed in a 2007 presentation that an individual would need to study for about 30 years to gain knowledge of all the known diseases of that time. This is because knowledge is constantly changing and growing in every field.^{6,7} It is difficult for students to recall the increasing amount of facts; some of the facts will change or become invalid by the time they start their careers.

Abbreviations: OB, open book; CB, closed book; DIP, deep information processing

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Hence, it is essential for students in health professions education to be able to apply knowledge effectively when handling new difficulties and changing conditions. This change in students' learning outcomes involves changes in assessment also because assessment drives students' learning behavior.^{8–10}

Open book (OB) and closed book (CB) examinations are the two commonly used examinations by teachers to measure the outcomes of their instructions. In a CB examination, students are not allowed to refer to textbooks, online resources, or other reference materials during the examination. In case of an OB examination, students are allowed to use the textbooks, online resources, or other reference materials while taking the test.

Several studies have reported that CB examinations might enhance the learning process as compared to OB examinations because CB requires challenging retrieval processes, which may produce greater benefits for long-term retention.^{11,12} Ioannidou also suggested that CB examinations may measure similar abilities as that of OB examinations when both types of examinations are designed to test higher order and critical thinking skills.¹³ However, some educators believe differently, and opine that CB examinations measure students' ability to memorize and recall the information within limited time period. On the other hand, OB examinations have the potential to eliminate rote memorization and allow use of reference materials effectively corresponding to real life situations. They can also be used to test higher order thinking skills like problem solving and reasoning.¹⁴ These higher order thinking skills encourage deep learning, which is considered more desirable than surface learning.¹⁵ Students have also reported that they experience more stress and anxiety when preparing for CB examinations than they do for OB examinations.¹⁶ Another advantage of the OB examination is that it encourages teachers to ask questions at higher cognitive levels, thereby stimulating the students to use deeper learning strategies, and further, adopt a more constructive approach during exam preparation. Some other research workers postulate that OB examination changes the learning context and consequently leads to a change in students learning method.¹⁷ For these reasons, some education researchers claim that OB examinations encourage and assess learning more efficiently than CB examinations.^{18–20} The use of OB examinations for assessment programs has been suggested to be more aligned in managing knowledge growth in medical education.²¹

Research also reveals contradictory findings on perceived benefits on OB examinations. The possible drawbacks of OB examinations include lack of preparation for examination, spending too much time referring the resources, increased anxiety due to the unfamiliarity with the format, time constraints,¹³ and inexperience of faculty or insufficient training of faculty leading to an inability to construct questions suitable for OB examinations.²² Examination stress

is usually considered as a major setback of CB examinations. It may also exist in OB examinations but for different reasons. Studies that focus on the comparison of the two systems of examination have also failed to show a difference in student performance between OB and CB examinations.²³ Evidence also suggests that students perform better in OB examination compared to CB examination, but only on items that required simple recall. This difference was not found on items at higher taxonomic levels.²⁴

Rationale and objectives

Research studies on the effectiveness of OB examinations are based on some expectations, including that OB examinations stimulate deep learning and assess higher cognitive levels to a better degree than CB examinations.^{19,22} At the same time, other researchers point out that the OB examination may reduce the preparation effort of students. They also state that grades attained in OB examination are not significantly better than those secured in the CB examination.²⁵

The influence of OB and CB examinations on students' learning behavior and their examination results has rarely been studied, thus addressing this gap will be valuable to health professions educators. Additionally, no such study has been conducted with pharmacy students; and, as previously stated, this is becoming an increasingly important area of health professional education. The aim of this study was to investigate the impact of OB and CB formative examinations on learning approach of pharmacy students, and to assess their performance and perception about OB and CB examinations.

Methods

Study design

This study was conducted among Year 1 (semester 2) and Year 2 (semester 4) students in the Bachelor of Pharmacy program, at the International Medical University (IMU), Kuala Lumpur, Malaysia. The Bachelor of Pharmacy program in IMU is a four-year (eight semester) program. The curriculum is outcomes-based, focusing on producing graduates who are knowledgeable, competent, professional, ethical, empathic, can work effectively with other healthcare professionals, and possess a commitment to continuing professional development and being evidence-based practitioners.

This study was designed as a crossover study, conducted after receiving the approval of the IMU Joint Research and Ethics Committee. The voluntary participation of students was solicited, and they were briefed about the two types of formative examinations, without disclosing the hypothesis of the study. Online informed consent was obtained along with the questionnaire response, and participants were told that the outcome of this examination would in no way affect

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