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Commentary

Cases in teaching and assessment in pharmacy education: Guidelines for assigning difficulty

M. Joy Spark, PhD[a,*], Daniel T. Malone, PhD[b], Greggory Maynard, PhD[c], Ieva Stupans, PhD[d]

[a] School of Pharmacy and Applied Science, La Trobe Institute for Molecular Science, La Trobe University, Bendigo, Victoria, Australia
[b] Faculty of Pharmacy and Pharmaceutical Sciences, Monash Institute of Pharmaceutical Sciences, Parkville, Victoria, Australia
[c] School of Biomedical Sciences, Charles Sturt University, Orange, New South Wales, Australia
[d] School of Medical Sciences, RMIT University, Bundoora, Victoria, Australia

Abstract

Cases, presenting apparently real life situations, can be used to prompt students to integrate theoretical knowledge from across a number of subject areas and to develop analytical skills, and as such, act as a starting point for learner-centered authentic learning opportunities. Cases can also be used as a basis for written or skills-based assessments, the focus of this article. An extensive review of the health profession literature has not revealed evidence-based guidelines to the process of assigning case difficulty. We have evaluated a model from business education, the Case Difficulty Cube, which proposes assignment of case difficulty based on three dimensions—analytical, conceptual, and presentation—and adapted this model for consideration in health education. The development of the model was influenced by reflections of individual academics' experiences with the use of cases in written assessments. This article proposes a model for evaluating case difficulty in pharmacy education.

Keywords: Cases; Case difficulty; Assessment; Pharmacy practice

Introduction

Integration of theoretical knowledge across multiple subject areas and analytic skill development can be prompted by the use of cases, which can create learner-centered authentic learning opportunities. For appropriate use in formative and summative assessment, cases should contain appropriate levels of scaffolding and detail. However, clearly articulated comprehensive guidance around the assignment of case difficulty in health education is lacking.

Two models have been developed, which assign difficulty to pharmacy tasks; the cognitive hierarchy for multiple choice questions and the case-leveling framework for initial medication assessment.[1,2] The cognitive hierarchy model has levels based on Bloom's taxonomy.[2] For example, lowest levels refer to recognition/recall of therapeutic knowledge, while at highest levels multiple factors are considered along with therapeutic plan development.[2] The case-leveling framework has three levels of difficulty.[1] At the lowest level are simple drug-related cases requiring straightforward management using clear treatment guidelines. Highest difficulty level cases are complex and ill-defined with multiple, co-dependent drug-related problems.[1] On reviewing the essence of these models, cognitive hierarchy describes the depth of analysis required to solve a case while the case-leveling framework describes the complexity and presentation of the case.

The Case Difficulty Cube, developed in the field of business, extends the 3-level approach of the case-leveling

* Corresponding author: M. Joy Spark, PhD, School of Pharmacy and Applied Science, La Trobe Institute for Molecular Science, La Trobe University, P.O. Box 199, Bendigo, Victoria 3552, Australia.
E-mail: j.spark@latrobe.edu.au

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framework to three dimensions—analytical, conceptual, and presentation.[3] The analytical dimension relates to the extent of decision-making required. The conceptual dimension relates to case difficulty and the number of concepts covered by the case. The presentation dimension relates to the clarity and presentation of information within the case. Despite extensive citation, discussion within the academic literature of the application of the Case Difficulty Cube to cases is limited.

An Australian nationally funded project in pharmacy education has enabled facilitation of collaborative workshops for academic staff representatives from Australian and New Zealand pharmacy schools over a number of years (2011–2015). The focus of these workshops was to develop pharmacy learning outcomes and exemplar learning standards (http://www.pharmacylearning.edu.au/outcomes-and-standards). During one of these workshops, we sought to adopt the Case Difficulty Cube in the context of pharmacy cases. This would enable a scaffolded approach to be adopted for case-based learning as students progress through pharmacy degree programs from novice through intermediate to advanced pharmacy students. In this article, we present an approach that quantifies the level of difficulty of pharmacy-related cases.

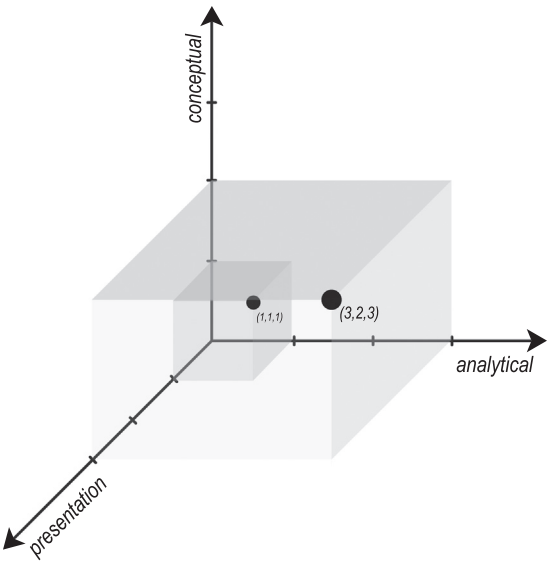

Fig. Application of the Case Difficulty Cube to two pharmacy cases. The three dimensions—presentation (x), conceptual (y), and analytical (z)—with the two points corresponding to the novice (1,1,1) and the advanced case (3,2,3).

Case difficulty cube application to pharmacy cases

The Case Difficulty Cube has three dimensions each with three levels and we have adapted these for pharmacy (Table 1).[3] To alter a case's difficulty, it is possible to use the level descriptions to target changes to specific areas of the case. By scoring each dimension as either one, two, or three it is possible to assign a level of difficulty in a 3-dimensional space (Fig.). Targeted changes can be made in either a single dimension or multiple dimensions to modify a case's overall difficulty. It is also possible to maintain the level of difficulty by increasing the difficulty in one dimension while reducing the difficulty in another dimension. Comparison of cases can then be made at either the dimensional level, or by adding the scores of the individual dimensions to obtain a final score for the overall case difficulty. An overall score allows for a more holistic comparison of difficulty.

Table 1
Dimensions and levels for the case difficulty cube[3] adapted for pharmacy

Dimension	Levels
Analytical	Students have to comment on whether a correct decision has been made Develop alternatives or implement an action plan Make a decision
Conceptual	One simple concept More than one concept or a more difficult concept Multiple and more difficult concepts
Presentation	All information given to students is relevant and well organized in a single medium for presentation Some extraneous information exists or more than one medium for presentation Presentation longer or not well organized, not all information relevant, or multiple media presentation used

When using the three dimensions of the Case Difficulty Cube to evaluate case difficulty we suggest the following levels of difficulty: (1) novice pharmacy students—four or less in total, (2) intermediate pharmacy students—three to six in total, and (3) advanced pharmacy students—four to nine in total.

Novice pharmacy students can be provided with real life cases with level 2 in one of the dimensions, as long as the case is level 1 on the other dimensions. Intermediate students then have a range of potential cases from the easiest (i.e., 1,1,1) to some more difficult cases to attempt (e.g., 2,2,2 or 1,3,2) and advanced students relatively easy cases [e.g., (2,1,1) to potentially quite complex (3,3,3)]. This type of scaffolded approach enables novice students to gain confidence in answering cases, while equipping advanced students with critical thinking skills to solve complex problems.[3] Below are examples that illustrate how an intermediate case was altered to change the difficulty level and how the Case Difficulty Cube captures those changes.[3]

The idea of assigning case difficulty was sparked by the following case that had been completed by pharmacy