



ORIGINAL ARTICLE

Technology Enhanced Learning in Undergraduate Pharmacology through Online Quizzes: A Pedagogical Approach and Medical Students' Perspective

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Abstract

Background: Technology enhanced learning in medical curriculum is expanding rapidly because of research showing the benefits for learners in terms of engagement, convenience, attainment and enjoyment. **Objectives:** The purpose of the present study was to explore medical students' perspective on technology enhanced learning in undergraduate pharmacology. **Methodology:** This descriptive cross-sectional study was conducted in the Faculty of Medicine during 2016 for a period of three (3) months. Second year MBBS students who were studying in the International Medical School, Management & Science University, Selangor, Malaysia with the age group of equal or more than 18 years of age with both sexes were selected as study population. Several online quizzes were conducted by Quizizz. Data were analysed after online quizzes using semi-structured questionnaire. **Results:** A total number of 42 students were involved in this study. Among these 35(83.33%) surveyed students were strongly agreed with timing for answering the questions however, 39(92.86%) strongly agreed that quizzes stimulate interest in pharmacology and 28(66.67%) strongly agreed that quizzes improve knowledge and skill in pharmacology. Most of the students suggested to continue online quizzes. **Conclusion:** Systematic analysis and stratification of students' perceptions regarding technology enhanced learning initiatives such as online quizzes are essential in gaining insight for educational planning and interventions in pharmacology. [Journal of Current and Advance Medical Research 2019;6(1):14-17]

Keywords: online quizzes; technology enhanced learning; pharmacology quizzes; quizzing

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Introduction

Technology enhanced learning incorporating components of self testing and assessment is an effective and proactive pedagogical technique in medical education. Medical students' are required to comprehend, evaluate, synthesise and retain complex information during their training. To this effect, online quiz is a novel student centred approach to enhance student engagement, reflection, critical thinking, insight, retention and academic success.

Exploring the field of online quiz format of technology enhanced learning has been found to enhance student engagement with positive learning experiences and outcomes¹. It has also been found to be contributory to key learning outcomes by enhancing student exam performance². Furthermore, online teaching and learning resources are effective in increasing student engagement with proper motivation and reminder³. Online quizzing is an active pedagogical technique as it enables faculty to reflect about the effectiveness of various teaching and assessment practices on student engagement, performance and perception⁴. In the Asian context, technology enhanced learning in pharmacology has been underexplored. This study was explored the current understanding, effectiveness and students' perceptions of online quizzing as a novel pedagogical approach in teaching undergraduate medical pharmacology.

Methodology

This descriptive cross-sectional study was conducted in the Faculty of Medicine, International

Medical School, Management & Science University, Selangor, Malaysia during 2016 for a period of three (3) months. The second year MBBS student with the age group of more than or equal to 18 years with both sexes were selected as study population. All 42 students of a batch were involved in this study. There were seven (7) online quizzes conducted by Quizzes which is a free fun multiplayer online quiz tool. These quizzes were prepared on the basis of first semester pharmacology syllabus and course outcome. This syllabus was prepared by Management & Science University accredited by Malaysian Qualifications Agency. Each quiz included 10 objective questions (one correct answer) and allocated time was 1 minute per question. After conducting quizzes, ten (10) semi-structured questionnaires were asked regarding online quizzes and feedback scale were prepared like Likert Scale (strongly agree, agree, neutral, disagree and strongly disagree) and Yes/No wing manually. The statistical analysis was performed by Statistical Package for Social Science (SPSS) version 22.0 (Texas, USA). The qualitative data were expressed as frequency and percentage.

Results

Among the participants, 29(69.05%) students were female and 13(30.95%) students were male. All of the students completed quizzes on time. It had been found that 35(83.33%) students were strongly agreed with timing for answering the questions. It had also been found that 39 (92.86%) students were strongly agreed about quizzes stimulate interest in pharmacology and 28(66.67%) of them strongly agreed that quizzes improve knowledge and skill in pharmacology.

Table 1: Students' Response on Online Quizzes

Variables	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Time given for answering the questions were sufficient	35(83.33%)	7(16.67%)	0.0%	0.0%	0.0%
Quizzes stimulate interest in pharmacology	39(92.86%)	3(7.14%)	0.0%	0.0%	0.0%
Quizzes improve knowledge and skill in pharmacology	28(66.67%)	11(26.19%)	3(7.14%)	0.0%	0.0%
Recommend others to participate these online quizzes	25(59.52%)	16(38.10%)	1(2.38%)	0.0%	0.0%
Suggest to continue online quizzes	27(64.29%)	13(30.95%)	2(4.76%)	0.0%	0.0%

Majority of them (59.52%, N=25) were strongly agreed to recommend others to participate these online quizzes. Most of the students suggested to continue online quizzes of which 27(64.29%) of them were strongly agreed. Neutral response was

negligible and nobody put tick mark on disagreed or strongly disagreed box (Table 1).

Table 2: Students' Preference on Objective Type Questions

Objective Type Questions	Frequency	Percent
One correct answer	15	35.71
True-false answer	27	64.29

Regarding the type of objective questions majority of them (64.29%, N=27) preferred true-false answer and rest of them (35.71%, N=15) preferred one correct answer (Table 2).

Table 3: Difficult Component of Pharmacology

Component	Frequency	Percent
Drug group	2	4.76
Pharmacokinetics	5	11.90
Adverse effects	7	16.67
Clinical uses	8	19.05
Drug interactions	9	21.43
Mechanism of action	11	26.19

Students showed their difficulty in pharmacology in following order: drug group 2(4.76%) respondents, pharmacokinetics of drug 5(11.90%), adverse effects 7(16.67%), clinical uses 8(19.05%), drug interactions 9(21.43%) and mechanism of action 11(26.19%) respondents. Most of the students had good knowledge in pharmacology. None of them participated any pharmacology online quizzes before this study (Table 3).

Discussion

Technology enhanced learning through online quizzes is a 21st century formative assessment technique in undergraduate medical education. Despite the popularity of such assessment techniques, systematic studies on their impact on students' perceptions and understanding are limited in undergraduate medical setting. This study addressed the knowledge gaps that exist in the utilization of this technology enhanced learning technique for the discipline of pharmacology in an integrated undergraduate medical course.

The components addressed in this study were student perceptions, motivation, preferences for quiz format, analysis of challenges and difficulties in solving the quizzes based on topical themes that were selected for the online quizzes. This study revealed that, online quizzing in a formative style enhanced motivation in a significant proportion of students. This was revealed by the large proportion of students agreed with timing for answering the

questions (83.33%) in this study and a significant number who agreed that it stimulates interest in pharmacology (92.86%). Furthermore, 64.29% of them preferred to continue this method of online assessment. Insight gained from analysis of the pattern and format of online quizzes reveals that, majority of students preferred a true-false answer format compare to one correct answer format. This preference reflects the lower difficulty index of true-false format as compared to one correct answer format. Regarding the topical themes that were chosen for online quizzes, students perceived mechanism of action as the most challenging followed by, drug interactions, clinical uses, adverse effects, pharmacokinetics of drugs and drug groups.

Systematic analysis of students' perceptions is a vital component in the introduction, improvement and success of technology enhanced teaching and learning programs. It is also a core component of student-centred teaching and learning. To the best of our knowledge, this study is the first to systematically analyse students' perceptions of formative online quizzes in pharmacology in an integrated undergraduate medical curriculum. The limitations of this study were the number of participants whose perceptions were analysed, the choice of online quiz format as one best answer was not included in our study. Another potential limitation was the breadth of topics which were covered in the quizzes. Insight gained from student responses reveals that drug group is the easiest component of pharmacology.

A probable reason may be that, this topic is discussed at the beginning of class when students are not exhausted. Regarding pharmacokinetics, usually key concepts are discussed so student comprehension is optimal. Regarding students' perceptions of difficulties with solving the drug interactions may be due to the higher level of thought processes required to correlate pharmacokinetics and pharmacodynamics of different drugs. Mechanism of action was also perceived as an area of difficulty which may be due to the fact that molecular concepts are involved in this component.

Comparative analysis of research conducted by Urtel et al⁴ concluded that, online quizzes partially increase student classroom engagement and perception. Another research by Ruscio⁵ revealed that, students completed their assigned reading at impressive rates when motivated by the randomly administered quiz technique.

Conclusion

Interactive reinforcement through technology enhanced learning methods such as online quizzes have a significant positive impact on motivation of medical students towards learning pharmacology. This study also revealed that, students' perceptions were significant in analysing difficulty index and choice of question formats. Insight gained from students' perceptions such as difficulty levels and choice of question formats in online questions is essential for medical educators in designing online quizzes. It highlights the need for systematically and comprehensively assessing students' perceptions in technology enhanced education and assessment. Furthermore, it serves as a baseline for continual improvement in designing formative assessment strategies in student centred undergraduate medical education. Systematic analysis of student motivation in the utilization of technology enhanced learning initiatives such as online quizzes are essential in a student centred undergraduate medical education. Stratification of student's perceptions regarding difficulties and challenges of solving problems in different topical themes encountered in pharmacology are essential in gaining insight for

educational planning and interventions. Further studies are necessary with larger groups of students in wide and diverse settings to analyse the educational impact of online quizzing in undergraduate medical education.

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References

1. Lee LM, Nagel RW, Gould DJ. The educational value of online mastery quizzes in a human anatomy course for first-year dental students. *Journal of dental education*. 2012;76(9):1195-9
2. Gibson SI. Promoting an active form of learning out-of-class via answering online "study questions" leads to higher than expected exam scores in General Biology. *Peer J*. 2015;3:e1322
3. Karaksha A, Grant G, Anoopkumar-Dukie S, Nirthanan SN, Davey AK. Student engagement in pharmacology courses using online learning tools. *American journal of pharmaceutical education*. 2013;77(6):125
4. Urtel MG, Bahamonde RE, Mikesky AE, Udry EM, Vessely JS. On-Line Quizzing and Its Effect on Student Engagement and Academic Performance. *Journal of Scholarship of Teaching and Learning*. 2006;6(2):84-92
5. Ruscio, J. Administering quizzes at random to increase students' reading. *Teaching of Psychology*. 2001; 28(3):204-206