

Journal of Contemporary Medical Education

available at www.scopemed.org

Original Research

Digital quiz games: A learning and assessment tool for pre-clinical medical undergraduates

Tripti K Srivastava¹, Lalitbhushan S Waghmare¹, Sunita J Vagha², VedPrakash Mishra³

¹Department of Physiology, ²Department of Pathology, ³Datta Meghe Institute of Medical Sciences (Deemed University), Sawangi(M), Wardha, INDIA

Received: June 11, 2013

Accepted: July 12, 2013

Published Online: November 30, 2013

DOI: 10.5455/jcme.20130712013919

Corresponding Author:

Tripti Kamlakant Srivastava (waghmare), Department of Physiology, Datta Meghe Institute of Medical Sciences (Deemed University) Sawangi(M), Wardha, India
drtriptisrivastava@yahoo.co.in

Keywords: Classroom quiz, Digital quiz game, Formative assessment

ABSTRACT

The present study was undertaken to speculate the feasibility, efficacy and acceptability of digital quiz games as a teaching learning and formative assessment method. An Experimental, Randomized, Cross-over, Open-labeled study was conducted in Department of Physiology, Datta Meghe Institute of Medical Sciences (Deemed University). The study introduced digital quiz game under supervision in digital library, in contrast to traditional quizzes in classroom settings; thus ensuring active participation of every student. The study population was undergraduate students in first semester of medical faculty who were randomized into group A (n=50) and group B (n=50). Group A underwent quiz game in digital library after completion of a part of curriculum. This was followed by discussions and feedback regarding quiz items. Group B at the same time underwent traditional classroom quiz with intervening brief discussion. The scores of group A and group B in 1st Part Completion Test were compared. This was followed by crossover of groups and undergoing the same methodology. Scores of Part Completion Examination by both methods was compared for significance by unpaired t-test. Analysis revealed better performance after quiz games with significant difference in scores between groups $P = 0.04$ ($P < 0.05$ was considered statistically significant). Qualitative analysis depicted overall preference of learners for quiz game compared to classroom quizzes; the former being more challenging and interesting. The study suggests that digital quiz games, which have the advantage of better time management and individual student participation, can be incorporated as a routine formative assessment method targeted towards bridging the learning gaps in students and bring appropriate alterations in teaching.

© 2013 GESDAV

INTRODUCTION

The Medical Council of India, under the "Regulations on Medical Education, 1997" [1] recommends that every effort should be made to encourage the use of active methods in teaching and maximize opportunities for self-learning. The educational experience becomes more fruitful by using multiple teaching learning and evaluation strategies which alleviates the otherwise inevitable monotony of vast medical curriculum. Active strategies like quiz, role plays, etc. make learning more interesting and enjoyable experience [2,3]. In their article on creativity in medical education, Handfield-

Jones et al. [4] describes some of the advantages of using innovative techniques to make learning more fun for both teachers and learners. They argued that the use of a new technique to "liven up" a topic increases learners' attention and concentration and can make both learners and teachers more interested and enthusiastic. They suggest that competition and games are potentially very powerful media to facilitate learning as long as they are used with care. Games can make a valuable contribution to learning and assessment, and further use of this or other innovative game techniques seems warranted to improve and maximize learning [5].

Classroom Quiz is a competitive, interesting, and intellectually challenging tool to aid learning. Its benefits as knowledge sharpening exercise and development of self learning abilities are evidenced. Taking these advantages to the benefit of present generation of medical students; short quizzes, can allow them to focus more on concentrated subject areas. Over the past decade, experiments suggest that students who are quizzed recall significantly as compared to students who aren't and that taking a test is more effective than an extra hour or so of study [6]. Apart from being interesting and an active learning method, utility of quiz as a formative assessment tool can be best suited to identify the learning gaps and adapt remedial measures at the level of students and faculty. However; these benefits of traditional classroom quizzes should be weighed against the challenges of being time consuming and ensuring active participation of every student. In spite of efforts to make classroom quiz interesting and thought provoking, there are silent learners who do not benefit from it. In an attempt to overcome these deficits and introduce guided technology in learning ; the present study was undertaken to exploit the obvious benefits of traditional quiz with modification to ensure individual participation for the techno-savvy generation in the form of quiz games. The present study adopted Technology Acceptance Model [7] as a theoretical framework which hypothesizes a direct link between perceived usefulness and perceived ease of use. With two systems offering the same features, a user finds more useful the one that he finds easier to use [8]. Also; as we move further into the "computer age," we are increasingly being dependent on technology as a learning tool and every faculty member should avail modern educational technology while teaching the students [9]. The present study aimed to speculate the feasibility, efficacy and acceptability of digital quiz games as a routine teaching learning and formative assessment method. Care is taken to restrict the use of technology under supervision by careful organization of the learning settings so that games facilitate, and not detract from, the achievement of desired learning outcomes.

METHODOLOGY

The Experimental, Randomized , open labelled study was conducted at JN Medical college, DattaMeghe Institute of Medical Sciences (Deemed University), Wardha, Maharashtra after due permission from Institutional Ethical Committee. The first MBBS students (n=100) were categorized into group A (n=50) and group B (n=50) by systematic random sampling. After completion of a part of physiology curriculum (General physiology, Haematology and Nerve Muscle physiology); group A students were taken to digital library during a Physiology Practical class. The digital library has 60 terminals. Each student was asked to

occupy one terminal. A quiz game based on the above mentioned topics was pre-loaded in the terminals. The items of the game were randomized in every terminal. The students were asked to solve the quiz game which consisted of 25 items (single best response, MCQ, visual, and fill in the blanks). Total time given was 25 minutes. After the game, students were taken to the lecture theatre for discussion regarding every item in the quiz game. The discussion broadly aimed at clarification of doubts and specific suggestions. Group B, at the same time, was seated in separate classroom. They experienced traditional classroom quiz, consisting of same set of questions with four teams (three members in each team). Rest of the class (38 students) was divided into 4 groups with each group backing their assigned team. They had to back their team of participants, answer the questions in case the team members were unable to do so and thereby score on behalf of their team. This ensured maximum participation in the quiz. The scores in first Part completion examination recorded for both the groups.

The above mentioned methodology was followed after crossing over group A & B. Group A underwent traditional quiz and group B was exposed to digital quiz game. The scores in second Part completion examination were recorded for both the groups. Feedback was obtained by all students (n=100) for both the methods after completion of study. The scores of PCTs by traditional quiz method were compared with scores of PCTs by digital quiz game method by unpaired t – test for significance (Figure 1).

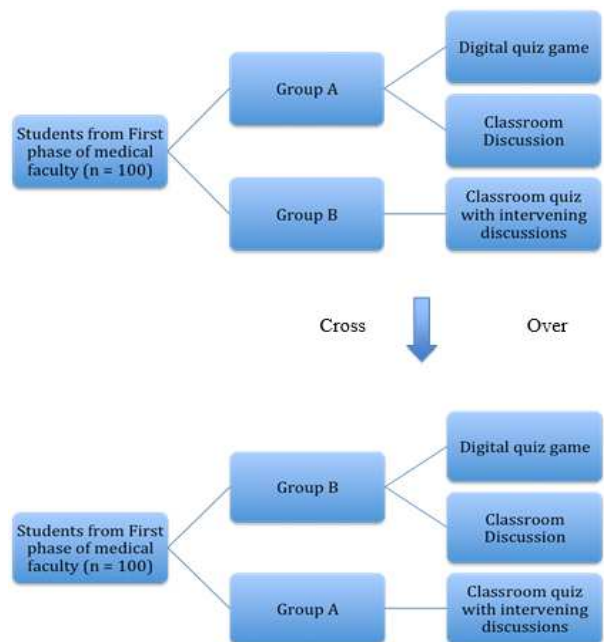


Figure1: Plan of work

OBSERVATION AND RESULTS

The data was analyzed quantitatively and qualitatively. Quantitative analysis by unpaired t – test, comparing the scores by both methods in Part completion examinations, revealed better performance after digital quiz games with significant difference in scores P = 0.04 (p< 0.05 was considered statistically significant).

Table 1. Statistical analysis of scores in Part Completion examination by both methods

Type of quiz	N	Mean	Std. Deviation	Std. Error Mean
Classroom quiz	100	35.0600	4.57192	.37330
Digital quiz game	100	37.4367	6.58611	.53775

The feedback form consisted of 3 parts namely;

Part A (i& ii): Feedback about classroom quiz and quiz game on a 5 point Likert scale

Part B:Rating the efficacy of classroom quiz and quiz

game in better learning, on a 10 point rating scale

Part C: An open ended item

The closed ended items in the questionnaire had a Good internal consistency (Cronbach’s Alpha = 0.742)

The majority of students agreed upon the efficacy of traditional classroom quiz as being interesting, enjoyable, helping in better memorization of contents and better learning outcomes. However; there were few neutral responses about the same (Table 1). The preference; as depicted on 5 point Likert scale was more in favor of quiz games by showcasing majority of students strongly agreeing to its efficacy as a teaching learning tool (Table 2). This was also supported by higher rating to quiz games on a 10 point rating scale (Table 3). 78% students mentioned that quiz game is more effective method to aid in better learning; as represented in the open ended item in part C of the feedback form (Table 4). Some verbatim comments with respect to the reasons of preferences are depicted in Table 4;

Table 2. Part A (i) Feedback about traditional classroom quiz (n=100)

Sr.no	Questions	Strongly Disagree %	Disagree %	Neither agree or disagree %	Agree %	Strongly Agree %
1	Classroom Quiz was enjoyable			40	48.2	11.8
2	It has generated interest in the topic			25.6	74.4	
3	It has helped in better learning		10.8		89.2	
4	It will help in better memorization of contents		12.3	40	47.7	
5	Classroom Quiz should be adopted as a regular method in teaching& learning		3.9	40.3	55.8	

Table 3. Part A (ii) Feedback about quiz game (n=100)

Sr.no	Questions	Strongly Disagree %	Disagree %	Neither agree or disagree %	Agree %	Strongly Agree %
1	Quiz game was enjoyable			9.5	52.3	38.9
2	It has generated interest in the topic				45.2	54.7
3	It has helped in better learning		4.76	2.3	50.0	42.8
4	It will help in better memorization of contents		2.3	9.5	33.3	54.7
5	Quiz game should be adopted as a regular method in teaching& learning			2.38	28.5	69.04

Table 4. Part B - Rating of classroom quiz and quiz game on a 10 point rating scale

10 Point scale	Classroom quiz (% of responses)	Quiz Game (% of responses)
1		
2		
3	13.5	
4	8.1	5.4
5	27	
6	35.1	
7		16.21
8	16.21	51.35
9		21.62
10		5.4

DISCUSSION

Quiz game as an alternative to traditional classroom quiz

At our University, Classroom quizzes are incorporated as a teaching learning tool by being a part of curriculum in all subjects of Medicine. Though it is

widely appreciated by the students ; the challenges of the same being time consuming and limited participation by less motivated students led to explore a method by which quiz reaches each and every learner in a more appealing way. The present study introduced digital quiz game as a modification to traditional classroom quizzes. Learners of today are more inclined to use technology, not only for leisure, but for academic purposes equally. Growing dependence on technology calls for more of its utilization in teaching and assessment techniques as a part of overall medical curriculum. Though quizzing as an exercise in better learning and memorization is proven, the limitation with traditional method is that it limits the number of active participants. The traditional quiz has 4-5 representative team members as participants while rest of the students become passive audience. We tried to maximize participation by assigning groups of audience to one particular team but still it could not ensure 100% participation. Quiz game, on the contrary, enabled every student to participate actively and generate their own responses.

Table 5. Open ended responses

	Classroom Quiz	Quiz game
Preference (%)	22%	78%
Reasons	" it is more interesting" " better competition" " more fun in the classroom" " you get to see how others are performing" " tension is only with the participants, rest can enjoy the quiz" " you need not be prepared , only participants are required to study..we can have fun" " better than revision lectures"	" more interesting" " more challenging" " better for our age group" " more enjoyable with computers" " feels like we are playing computer games" " in classroom quiz, we are not that much involved" " different experience" " novel method" " its like playing games and learning"

Part C. Which method according to you is more effective in better learning; classroom quiz or quiz game? Give reasons?

Quiz game as a tool for formative assessment and feedback

A study by JN Hudson [5] utilized quiz, for testing the important physiological concepts of growth and puberty, by using the format of the well-known television game "Who Wants to Be a Millionaire." An evaluation of that formative assessment activity revealed that a cohort of first-year undergraduate medical students valued learning with peers in an enjoyable, interactive environment, where they were able to admit to uncertainties and clarify answers. It also showed that making an educational activity fun need not detract from the focus of giving feedback on learning. As our University had required infrastructure; it was easy to conduct digital quizzes, followed by discussion on the quizzed items in the classroom. The discussions were actually intended to clarify doubts and provide feedback, thus ensuring its use as an interesting formative assessment tool. Michael et al. [10] demonstrated that students may have "undiagnosed" misconceptions from previous learning experiences and instructors need to use contact time with students to detect and correct these misunderstandings. They proposed the creation of active learning environments to deal with this issue, and the interactivity following quiz was one such opportunity for students and teachers to discover misconceptions and provide feedback. The group who underwent classroom quiz in the present study had intervening discussions between quiz items. However, that was more of a clarification of doubts raised by students contrary to the digital quiz group, where due to availability of time, each item in the quiz could be discussed in detail. Classroom quiz actually took complete one hour and since the class is only for an hour; it was impossible to incorporate detailed discussion following the same. The comparison of Part Completion scores between group who experienced classroom quiz and digital quiz game depicted significant difference, showing a better performance with quiz game. Probably the more discussion time had a contribution in improving scores. The same can be done for classroom quiz if duration of quiz is increased, but its relevance for the non-participants cannot be guaranteed as they are not directly responsible for their performance. The perception of learners about the efficacy and value was more in favor of the quiz game when compared with classroom quizzes. The comments about quiz game like "more interesting", "more challenging", "better for our age group", "more enjoyable with computers", "feels like we are playing computer games", "in classroom quiz, we are not that much involved" etc. showcased the preference towards methods which involves technology in a non-threatening environment.

The suggested method (quiz game) can be considered as tool for formative assessment; as it can be conducted in one sitting, involving each and every student, which can be followed by structured feedback best suited to identify the learning gaps and adapt remedial measures at the level of students and faculty.

CONCLUSION

Learning becomes more interesting with competitive methods like quiz games, which are both challenging and fun. By short quiz games, key ideas can be reinforced through engaging the student in a learning environment which is preferred by current generation. It can be appropriately designed to cater as a formative assessment tool which generates effective feedback to close the learning gaps and adjust teaching strategies accordingly. However it is equally important to recognize that an infrastructure is needed to address the technical support needed for a large base of users.

ACKNOWLEDGEMENTS

We acknowledge the support of Dr Sandeep Srivastava, Dean, Jawaharlal Nehru Medical College, for his administrative support in implementation of Quiz game in Digital Library of the Institute, and Mr Bharambhe, Librarian, of the Institute for his technical support.

Sample Questions for Quiz Games

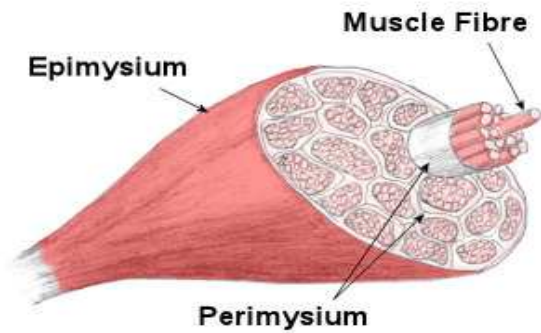
Instructions:

1. Quiz contains 12 questions
2. Each question carries 01 mark
3. Write the responses in the space provided
4. After every response save your answer
5. Time allotted is 10 mins
6. No marks for multiple responses.
7. No negative marking.

All the Best!

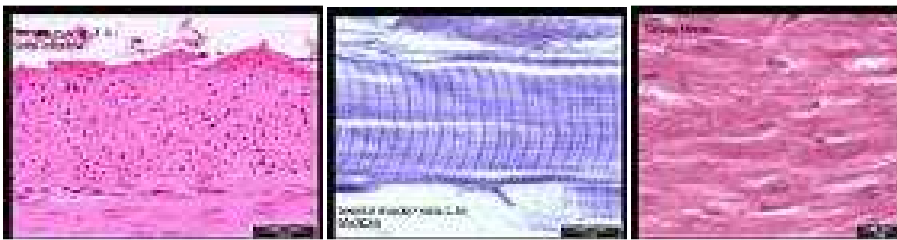
Fill in the blanks

1.



The thin layer of connective tissue that which surrounds and loosely binds nearby connective tissue, is referred to as _____

2. Label the type of muscle – skeletal , Smooth and Cardiac

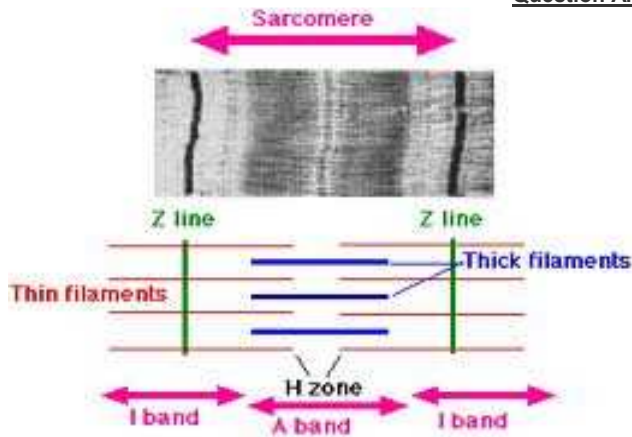


3. RMP of nerve is equal to equilibrium potential of _____ ion.

4. When a neuron is depolarized, the gated channels of the membrane open to allow _____ to enter the neuron. A neuron becomes hyperpolarized when the gated channels of the membrane open thus allowing _____ to exit the neuron

- a. K^+ ; Na^+
- b. Na^+ ; K^+
- c. Na^+ ; protein

Question Answer Type



5. What is the normal resting length of a sarcomere?

Ans.

6. Which part of axon contains more number of voltage-gated sodium channels?

Ans.

Multiple Choice Questions

7. Number of myosin molecules contained by each myosin filament

- a. 200
- b. 600
- c. 1000
- d. 2000

Ans.

8. Which is NOT a function of muscles?

- a. Cause movement
- b. Produce Heat
- c. Absorb nutrients
- d. Maintain Posture

Ans.

9. When several muscle are contracting at the same time, the muscle that has major responsibility for a particular movement is

- a. Synergist
- b. Fixator
- c. Antagonist
- d. Helper muscle

Ans.

10. When a nervous impulse travels from a neuron to a muscle cell, what happens next?

- a. The impulse travels over the sarcolemma in all directions
- b. Calcium is released from the sarcoplasmic reticulum.
- c. Linkages form between the actin and myosin.
- d. Acetylcholine is decomposed by acetylcholinesterase

Ans.

11. Preventing the inactivation of sodium channels will decrease

- a. the relative refractory period of nerve cells
- b. the upstroke velocity of nerve cell action potentials
- c. the downstroke velocity of nerve cell action potentials
- d. the magnitude of the overshoot in nerve cell action potentials
- e. the duration of nerve cell action potentials

Ans.

12. RMP of nerve is equal to equilibrium potential of which ion?

- a. Na⁺
- b. K⁺
- c. Cl⁻
- d. Ca⁺⁺

Ans.

REFERENCES

1. Regulations on graduate medical education, New Delhi: Medical Council of India, 1997.
2. Rotti SB, Soudarssanane MB, Srinivasa DK, Kumar VS, Premarajan KC, Pradhan P. A new approach in training pre-clinical medical undergraduates in community medicine in Pondicherry, South India. *Med Teach.* 1992;14:379-81.
3. Soudarssanane MB, Rotti SB, Premarajan KC. Teaching acute respiratory infections using low cost aids. An experience in Pondicherry, South India. *Med Teach.* 1991;13:369-70.
4. Handfield-Jones R, Nasmith L, Steinert Y, Lawn N. Creativity in medical education: the use of innovative techniques in clinical teaching. *Med Teach.* 1993;15(1):3-10.
5. Hudson JN, Bristow DR. Formative assessment can be fun as well as educational. *AdvPhysiol Educ.* 2006 Mar;30(1):33-37.
6. Finley JP, Sharrati GP, Nanton MA, Chen RP, Roy DL, Paterson G. Auscultation of the heart: A trial of classroom teaching versus computer-based independent learning. *Med Educ.* 1998;32(4):357-61.
7. Davis FD. Perceived usefulness, perceived ease of use and user acceptance of information technology. *MIS Quarterly.* (1989);23(2):145-58.
8. Dillon A, Morris MG. User acceptance of information technology: Theories and models. *Annual Review of Information Science and Technology* 1996;31:3-32.
9. Kumar K, Khilnany M. Innovative interactive video disc units for teaching of pathology laboratory cases. Five years' experience. *American Journal of Clinical Pathology* 1994;101:665-70.
10. Michael JA, Richardson D, Rovick A, Modell H, Bruce D, Horwitz B, Hudson M, Silverthorn D, Whitescarver S, Williams S. Undergraduate students' misconceptions about respiratory physiology. *AdvPhysiolEduc* 1999;22:127-35.

This is an open access article licensed under the terms of the Creative Commons Attribution Non-Commercial License which permits unrestricted, non-commercial use, distribution and reproduction in any medium, provided the work is properly cited.