Original Article

A Survey of the Students' Perspectives of Open-Book Examinations in the Histology/Embryology Course

Hamidreza Mahmoudzadeh-Sagheb, PhD[1,2]; Zahra Heidari, PhD[1,2*]; Mahdi Mohammadi, PhD[3]

[1] Research Center for Infectious Diseases and Tropical Medicine, Bou-Ali Hospital, Zahedan, Iran
[2] Infectious Diseases and Tropical Medicine Research Center, Zahedan University of Medical Sciences, Zahedan, Iran.

[3] Department of Statistics and epidemiology, Faculty of Health, Zahedan University of Medical Sciences, Zahedan, Iran

Abstract

Background and purpose: *An open-book exam permits the examinees to consult some specific selected reference sources or materials while answering the exam questions. This study focused on the students' perspectives of open-book examinations in the histology/embryology courses, Zahedan University of Medical Sciences (ZUMS), Zahedan, Iran.*

Methods: *The survey was conducted via a questionnaire after open-book examinations had been conducted in the histology and embryology courses, between 2009 and 2010. Of the 254 students who entered the new education system, 160 students were selected at random.*

Results: *The results revealed that 72% of the students preferred the open-book type to the closed-book kind of examinations. Most of the students voiced that this type of examination was more suited to test high cognitive learning skills and solving real life situation problems, involving less stress while preparing for and taking the exam. They also mentioned that their marks in these examinations were not higher than those from the closed-book examinations. The overall satisfaction scores of the students of the biological sciences were significantly ($p<0.001$) higher than those of the medical sciences students (16.28±4.17 vs. 12.65±5.16); in the government run university students it was significantly ($P<0.001$) higher than in the international university students (14.93±4.53 vs. 10.24±5.08); the embryology course results were significantly ($p<0.001$) higher than the histology course (15.23 ± 4.07 vs. 12.79±5.4) and among the MD students it was significantly ($p<0.001$) lower than those of the BSc students (12±5.1 vs. 15.93±4.29). There was a positive correlation between the scores they acquired in their course and the overall satisfaction scores with the open-book type of examinations ($r=0.46$, p value=0.01).*

Conclusions: *The finding of a positive response towards the open-book examination augurs well for extending such a type of examination to other subjects in our university.*

Keywords: *STUDENTS, PERSPECTIVES, OPEN-BOOK EXAMINATION, COGNITIVE LEARNING, EDUCATION*

Journal of Medical Education Winter 2015; 14(1):26-32

Introduction

Currently, health sciences educational programs have to deal with a growing and changing knowledge curriculum. It is becoming increasingly important for students to be able to use and manage their knowledge (1).

Many countries are reviewing their educational systems and preparing to implement changes in order to meet their special needs and demands. One of the directions is to improve the quality of education. This necessitates that great effort be placed on developing those students who are able to think independently and creatively and analytically process the information. Consequently, the curriculum content and assessment methods need to be reviewed (2).

∗Corresponding author: Zahra Heidari, PhD. Associate Professor, Department of Histology, Zahedan University of Medical Sciences, Zahedan, Iran.
Tel/Fax: (+98) 5433414572
Email: heidari@zaums.ac.ir

Open-Book Examinations (OBE) could prove helpful in improving today's assessment programs (1). Tussing posited, as early as 1951, that the open-book examination "removes much of the fear and emotional blocks encountered by students during an examination while, at the same time, it emphasizes practical problems and reasoning rather than recall of facts" (3). Several researches, which followed Tussing's postulate, affirmed the truth of this concept (2, 4-9). These studies show that the OBE is progressively becoming an essential evaluation tool in education, especially at the university level, as it can evaluate the students' high-level skills such as conceptualizing, problem solving and reasoning (2, 7, 8, 10) whereas, the CBEs encourage students to engage more in rote memorization (7, 11). Over an extended period of time, the OBEs have fulfilled both the requirements of an assessment tool and a student-centered approach to education (10). This appears to have resulted in more comprehensive examination preparation by the student, and hence more consistent learning occurs throughout the study course (10, 12, 13).

In spite of almost worldwide agreement among the medical teachers that the current emphasis on rote learning should diminish in favor of a problem-solving approach, many schools have not yet taken the first practical step toward this approach by allowing students to take books to their exams (14).

In our country, all of the university exams are taken by traditional CBEs. From the first semester of 2007-2008 a new education system was introduced in the Department of Histology and Embryology, Zahedan University of Medical Sciences (ZUMS), Zahedan, Iran. This student-centered system relied on effective and cognitive learning more than rote memorization. In this system, all the examinations were conducted using the OBE method. Prior assessment procedures were in the CBE form. At the beginning of the semester, when the students were informed regarding the mode of examination they were also advised that the OBE questions would require higher-order thinking.

The purpose of the present research was to survey the students' perspectives (views and perceptions) of the OBE in the histology / embryology courses.

Methods

Subjects. From the 254 students who entered the new education system, based on a pilot study comprising 35 subjects, a sample size of 160 subjects was selected at random, as the study group, from different fields of study. This student group had the experience of OBEs in histology/embryology. All the other courses in our university continued to follow the traditional form. Thus, all the students who entered our study had experienced two distinctive types of examinations. Students who attended to our department were from the government run ZUMS and its international branch, the "International University of Sina (IUS)" in the medical sciences fields, and Sistan & Baluchestan University (SBU) in the biological field.

Material. In each OBE, short answer questions and multiple-choice tests were prepared based on the textbooks used in education. Recall items yielded about 25% of the maximum score enabling the interpretation and practical type of items to predominate.

For examining the students' perspectives regarding this new examination system, in the first semester (2009-2010) a self-made questionnaire including questions on the preference for the OBEs over the CBEs, the effect of the OBEs on the stress levels before and during the examination, their self-confidence scores and some background information including gender, age, university, field of study, course knowledge and degree level, was filled out by them. The reliability and validity of the questionnaire were checked by construct validity (Weir, 1990). A panel of experts assessed the content validity, and retest reliability was examined through a pilot study comprising 35 subjects. Based on

this questionnaire, the students' perspectives on the OBE were investigated. The overall satisfaction score was calculated via questions regarding the reduction of stress before and during the OBE, increase in self-confidence, and interest in gaining knowledge during the course, effective learning and willingness to take on other courses tested by OBE (the maximum score was set at 24).

Statistical analysis. Data were analyzed using descriptive (frequency and percentage) and analytical statistics. (Mann-Whitney U test was used for comparison among the different subgroups and Pearson correlation test was used to determine any correlation between the course score and satisfaction score). The significance level of 0.05 was considered acceptable.

Results

The mean age of the students was 21.7±4.8 years, among which 61.9% were female. Their fields of study included: Medicine (20.6%), Dentistry (43.7%), Lab Sciences (6.9%), Optometry (6.3%) and Biology (22.5%).

Of the 160 students, 72.5% were doing the histology and 27.5% embryology courses. Most of the students (77.5%) were from the medical sciences stream (ZUMS and IUS) and 22.5% from the biological fields (SBU). About 31.2% were from IUS and 68.8% from the Governmental Universities (ZUMS and SBU). Of them, 64.4% had studied at the MD level and 35.6% at the BSc level.

The analysis showed that about 72% of the students preferred the OBE. About half of the students (46.3%) expressed that their stress levels were lower when preparing for an OBE and 57.5% mentioned that they experienced low or very low stress while taking the OBE. Most of the students (80%) stated that the CBE relied more on rote memorization. About 45% of the students mentioned that the OBEs were more difficult than the CBEs. About 57% of students had greater self-confidence while taking an OBE. However, 48.2% believed that their marks in the OBE were not higher than when they took the CBEs while 50.6% stated that their interest to gain more knowledge in their course increased by this method. Therefore, the OBE was advised for all exams during the semester by 38.1% of the students. Most of the students (53.2%) stated that the OBE resulted in more effective learning and 56.8% stated that they were willing to take other courses tested by the OBE method (Table1).

Table 1. Students' perspectives about open book examination

Students' perspectives	Strongly agree Frequency (%)	Agree Frequency (%)	Neutral Frequency (%)	Disagree Frequency (%)	Strongly disagree Frequency (%)	Total Frequency (%)
Preference of OBE	37 (23.1)	78 (48.8)	12 (7.5)	24 (15)	9 (5.6)	160 (100)
Reduction of stress while preparing for OBE	30 (18.8)	44 (27.5)	35 (21,9)	29 (18.1)	22 (13.7)	160 (100)
	Very high	**high**	**low**	**Very low**	**No effects**	**Total**
Increase of self-confidence by OBE	24 (15)	67 (41.9)	37 (23.1)	15 (9.4)	17 (10.6)	160 (100)
Increase of exam mark in an OBE	18 (11.2)	38 (23.7)	62 (38.8)	15 (9.4)	27 (16.9)	160 (100)
Increment of interest to knowledge course by OBE	30 (18.8)	51 (32)	32 (20)	15 (9.4)	32 (20)	160 (100)
Effective learning by OBE	30 (18.8)	55 (34.4)	49 (30.6)	10 (6.2)	16 (10)	160 (100)
Willing to have other courses by OBE	37 (23.1)	54 (33.7)	31 (19.4)	28 (17.6)	10 (6.2)	160 (100)
Level of stress in an OBE	15 (9.4)	49 (30.6)	71 (44.4)	21 (2.5)	4 (2.5)	160 (100)
	Final exam	**Midterm**	**Class quizzes**	**All exams**	**None of the exams**	**Total**
What exam is in OBE form?	34 (21.3)	35 (21.9)	17 (10.6)	61 (38.1)	13 (8.1)	160 (100)
	More difficult	**Difficult**	**Similar**	**Easier**	**More easier**	**Total**
Difficulty of OBE in comparison to CBE	22 (13.7)	50 (31.3)	16 (10)	64 (40)	8 (5)	160 (100)

Table 2. Students' perspectives about their efforts and effectiveness of OBEs in comparison to CBEs.

Students' perspectives	OBE Frequency (%)	CBE Frequency (%)	Both Frequency (%)	None of them Frequency (%)	Total Frequency (%)
Best efforts on preparation for examination	14 (8.8)	57 (35.6)	84 (52.5)	5 (3.1)	160 (100)
Preparing for real life situations	58 (36.3)	24 (15)	57 (35.6)	21 (13.1)	160 (100)
Suitable for cognitive text based learning	82 (51.2)	31 (19.4)	44 (27.5)	3 (1.9)	160 (100)

Most of the students (52.5%) felt that they had given their best efforts in both types of exams. Most of the students (51.2%) stated that the OBE was more suited for testing cognitive text-based learning and 36.3% mentioned that the OBE was more useful in preparing them to tackle real life situations (Table 2).

In table 3, the mean satisfaction scores and mean course scores of the different subgroups of the students have been presented and compared with each other.

A positive correlation emerged between the mean course score and overall satisfaction score of the OBE (r=0.46, p value=0.01).

Discussion

The present study showed that most of the students preferred the OBEs to CBEs. Most of them stated that this type of examination was more suitable for high cognitive learning and solving real life situations, with less stress in preparing for and during the exam.

Consistent with the results of our study were previous studies, which also revealed that almost always students prefer the OBEs compared with the CBEs, despite the admitted understanding that OBEs generally require the utilization of higher order thinking skills. Studies have shown that students perceive five main advantages in the OBEs: "practice in the creative use of course content, course content proficiency, increased

Table 3. Mean satisfaction score and mean course score of different groups of students compared to each other.

Parameters		Satisfaction Score	P-value	Mean Course Score	p value
Field	Biology	16.28 ± 4.17	<0.001	14.67 ± 2.68	<0.05
	Medical Sciences	12.65 ± 5.16		13.36 ± 3.68	
University	Governmental	14.93 ± 4.53	<0.001	15.12 ± 2.56	<0.001
	International	10.24 ± 5.08		10.44 ± 3.19	
Course	Embryology	15.23 ± 4.07	<0.001	15.52 ± 2.39	<0.05
	Histology	12.79 ± 5.4		12.95 ± 3.62	
Level	MD	12 ± 5.1	<0.001	13.23 ± 3.86	<0.05
	BSc	15.93 ± 4.29		14.39 ± 2.67	

opportunity for student self-evaluation and feedback, less examination stress and greater student regulation of content studied" (10).

The OBEs may also promote more realistic learning opportunities which emphasize higher order thinking skills. Feller (1994) believed that the "CBEs test only what students can memorize, while OBEs have an increased potential to measure higher level thinking skills and relate more closely to real-world work environments". He believed the OBE was a good method for incorporating realistic, open-ended tasks into higher education (7).

In the work environment, people use multiple assortments of reference materials when they need to answer a question, analyze an issue, prepare a report or solve a problem. The OBEs can eliminate the need for total rote memorization and permit the use of reference materials instead. These tests have the potential to better measure the students' ability to organize and use or apply information rather than mere memorization of it (15). It has been proposed that the OBEs imitate real life conditions and hence such assessments will find a place in most assessment protocols (7).

In our study, most of the students mentioned that their marks in the OBEs were not higher than those from taking the CBEs. Some research findings show that students do better on OBEs than CBEs and earn higher test scores (5). Other researchers reported that students do equally well on the OBEs and CBEs (2, 4, 14). A few researchers found that at least some subgroups of students perform at lower levels on the OBEs (6, 11). For example, Pauker (1974) found that overall scores were not different between the two groups, but the scores of the below the average students were significantly lower on the OBEs (4).

Boniface (15) and Ioannidou (8) both found that students who spent more time in using their texts on the OBEs obtained lower scores. They were observed to spend too much time with their books during the testing period, which limited their ability to successfully complete the test, which, in turn, resulted in lower test scores (8, 15, 16).

A few other researches revealed that generally students do not prepare adequately for the OBEs (2-4, 11, 12, 15, 16); this may explain why the students' scores did not increase on the OBEs compared with the CBEs. A study in a different educational setting showed that preparing for an open-book test necessitates a deeper approach (12).

Our results suggested that the OBEs were not necessarily easier for students than the traditional tests. These results reinforce those of Brightwell (13) and Rakes (15) who also concluded that the OBEs were not easier than the CBEs. Thus, the commonly held concept that the OBE is "easier" than the CBE (6-8, 10, 16) is not supported by our study. This was the first time that the OBEs were conducted in our university, and it could have been a new experience for many students. Besides, the nature of questions set for the OBEs were different from those set for the CBEs; hence, some of them perceived a measure of difficulty.

The present study showed that students experience less anxiety when preparing for and performing open book assessments. This result is consistent with those of the previous studies (6-8, 16).

The OBEs as a possible assessment option can help quiet concerns regarding academic honesty (17) and provide an opportunity to assess higher order thinking skills (7, 18).

Our study showed a positive correlation between the mean course score and the mean satisfaction score of the OBEs. Other researchers also revealed that an open book setting tended to permit a non-significant improvement in the scores of the weaker students (13, 15).

The students who preferred the CBEs perceived the OBE examination as being more difficult in terms of the mean scores than those who preferred the OBEs. This could justify their lower levels of satisfaction with the OBEs.

Our study also showed that the students in the embryology course experienced significantly higher overall satisfaction and course scores.

Students in the embryology course revealed greater skill in the OBEs, because they had already done a previous course (histology) in this manner. This may have helped in familiarizing them with this method.

In the present study there were higher satisfaction levels and course scores in the government run university compared with the IUS students. In our country the students from the government run universities have a higher conceptual level than those from the international universities, because they have to pass a competitive entrance examination. The higher satisfaction scores and course scores by the students from the biological field may be due to their greater interest to improve their basic knowledge of the sciences compared with the medical sciences students. Higher satisfaction and course scores observed at the BSc level in our study may reflect greater motives for more progress compared with the students at the MD level.

Overall, more students preferred the OBEs to the CBEs. It appears that the OBE system promotes the ability to comprehend rather than to memorize; it lessens the stress for the examinees and encourages the students to self-monitor their own learning if properly implemented. Thus, this study indicates that open-book testing may be a rational alternative or an addition to the traditional assessment methods.

Acknowledgements

The Deputy Research of ZUMS supported this study financially. We gratefully acknowledge Dr. Bahari A. and Dr. Heidari F. for their strong support and help.

References

1. Heijne-Penninga M, Kuks JBM, Schönrock-Adem J, Snijders TAB, Cohen-Schotanus J. Open-book tests to complement assessment-programmes: Analysis of open and closed-book tests. Advances in Health Sciences Education. 2008;13(3):263-73.

2. Loi LS, Wu Y. Open book examination. 1998. http://www.ntu.edu.sg/nbs/sabre/working_papers/10-98.pdf

3. Tussing L. A consideration of the open book examination, Educational and Psychological Measurement. 1951;11:597–602.

4. Pauker JD. Effect of open book examinations on test performance in an undergraduate child psychology course. Teaching of Psychology. 1974;1(2):71-3.

5. Mohanan, K. P. Open Book Examination. 1997. http://www.cdtl.nus.sg/publications/cdtllink/link2/obe

6. Francis J. A case for open-book examinations. Educational Review. 1982;34(1):13-26.

7. Feller M. Open-book testing and education for the future. Studies in Educational Evaluation. 1994;20(2):235-8.

8. Ioannidou MK. Testing and life-long learning: Open-book and closed-book examination in a university course, Studies in Educational Evaluation. 1997;23(2):131–9.

9. Chan M. An open and shut case? Taking books into examination- A Hong Kong study. Proceedings of the 2003 ASEE/WFEO International Colloquium.

10. Theophilides C, Dionysiou O. The major functions of the open book examination at the university level: A factor analytic study. Studies in Educational Evaluation. 1996;22(2):157-70.

11. Agarwal PK, Karpicke JD, Kang SHK, Roediger III HL, McDermott KB. Examining the testing effect with open- and closed-book tests. Applied Cognitive Psychology. 2008;22(7):861-76.

12. Theophilides C, Koutselini M. Study behavior in the closed-book and the open-book examination: A comparative analysis. Educational Research and Evaluation. 2000;6(4):379-93.

13. Brightwell R, Daniel JH, Stewart A. Evaluation: is an open book examination easier? BEE-j. 2004; Volume 3. Available from: http://bio.ltsn.ac.uk/journal/voln/beej-3.3.htm

14. Krarup N, Naeraa N, Olsen C. Open- book tests in a university course. Higher Education. 1974;3:157-64.

15. Rakes GC. Open Book Testing in Online Learning Environments. Journal of Interactive Online Learning. 2008;7(1). available from: www.ncolr.org/jiol

16. Boniface D. Candidates' use of notes and textbooks during an open book examination. Educational Research. 1985;27(3):201-9.

17. Olt M. Ethics and distance education: Strategies for minimizing academic dishonesty in online assessment. Online Journal of Distance Learning Administration. 2002; 5(3). Available from

http://www.westga.edu/~distance/ojdla/fall53/olt53.html

18. Gupta MS. Open-book examinations for assessing higher cognitive abilities. IEEE Microwave Magazine. 2007;8(6):46-50.