المحور الأول: تطبيقات وممارسات التعلم المبتكر ... أفكار وتجارب.
Theme I: Innovative Learning Applications and Practices.

Overview of open book-open web exam over blackboard under e-Learning system

Khaled Mohanna, Ayyub Patel, & Mohammed Amanullah

Overview of open book-open web exam over blackboard under e-Learning system

Khaled Mohanna[1]**, Ayyub Patel and Mohammed Amanullah**

Abstract: This paper evaluates the effectiveness of 'open book-open web' (OBOW) examinations in comparison to invigilated closed book-pen and paper exams. An OBOW exam was conducted, wherein 127 students participated in it. The result obtained in this exam was compared with the invigilated exam taken by the same students previously. The percentage of marks obtained by the students were graded as "A" for 90-100% marks, "B", "C", "D" and "F" for 80-89%, 70-79%, 60-69% and 0-60% respectively. Some students were placed under ungraded category ("U" grade), as they faced some technical problems during the exam. Cheating was assessed based upon the time at which the student started taking the exam, the total time taken to complete it and the marks they scored. The results indicated that there was no notable difference in the results between the two types of exams. The number of students scoring "A" grade was almost the same in both the type of exams viz. 36% of all the students scored "A" grade in OBOW as against 38% of the students in the invigilated exam. However the number of students scoring lower grades i.e. "B" to "F" was more in OBOW exams then the invigilated exams. A few cheating cases were observed in the OBOW exam and also in the invigilated exam, which is unavoidable in any circumstance. About 10 students faced technical problems like loss of internet connection, slowing of the internet connection due to traffic congestion in the network, hanging of the user's computer system. It can be concluded that OBOW exams are better in accessing the student's ability to understand the subject and reproduce it.

Keywords: Open book open web examinations, closed book invigilated examination, online exams, authentic assessment

---

(1)   E-Learning Team Manager, E-Learning Specialist for e-Learning Deanship & College of Medicine, King Khalid University, Abha, Kingdom of Saudi Arabia.
       e-mail: kmohna@kku.edu.sa

INTRODUCTION

e-learning is defined as technology-based learning. Lectures, homework, quizzes and exams are delivered almost entirely or completely online. In some instances, no in-person interaction takes place over the length of the course (Joi el al, 2011). A global economy hungry for customized, portable and on-demand educational platforms coupled with the Internet's rise to dominance as the ubiquitous medium of information delivery means that e-learning is increasingly gaining respect as an innovative and viable pedagogical tool, especially for subjects that require multimedia, collaboration tools (wikis, blogs and course-management systems, for example), and other bandwidth-hungry applications prevalent today. Compared with the traditional, face-to- face classroom learning that centers on instructors dictating content and pedagogy, e-learning is a more learner-friendly alternative, also allowing the role of a teacher to be quite different in an e-learning environment.

e-learning does not only enhance the collaborative nature of online learning, it also motivates students to be much more engaged and to take more responsibility for what they're learning. However much e-learning may reshape education and it's meant to supplant classroom learning, but is more of a supplement to it.

Today's medical educators are facing different challenges than their predecessors in teaching tomorrow's physicians (Ruiz et al, 2006). In the past few decades, changes in health care delivery and advances in medicine have increased demands on academic faculty, resulting in less time for teaching than has previously been the case (Ozuah 2002). Changes in sites of health care delivery, from acute care institutions to community-based settings for chronic care, have required adaptations in educational venues (Nair and Finucane, 2003). Finding time to teach new fields such as genomics, palliative care, geriatrics, and complementary medicine is difficult when medical school curricula are already challenged to cover conventional materials. Traditional instructor-centered teaching is yielding to a learner-centered model that puts learners in control of their own learning. A recent shift toward competency-based curricula emphasizes the learning outcome, not the process, of education (Leung, 2002).

e-learning refers to the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance (Rosenberg, 2001 and Wentling et al, 2000). e-learning can be used by medical educators to improve the efficiency and effectiveness of educational interventions in the face of the social, scientific, and pedagogical challenges noted above. It has gained popularity in the past decade; however, its use is highly variable among medical schools and appears to be more common in basic science courses than in clinical clerkships (Moberg and Witcomb, 1999).

After very little change in the university sector for several centuries, there has been something of a 'mini- revolution' in the last quarter of a century or so. The student profile has changed socially, culturally, and economically with the 'massification' of higher education (Carrier, 1990), and there has been spectacular change in the area of educational technology. These changes have been reflected in professional journals and conferences dedicated to teaching and learning which have produced a steady stream of literature reporting on a wide range of research projects including, among other things, experiments with new classroom

techniques, modes of flexible delivery, online pedagogies, and the increasing use of multimedia (Sims, 2004). Yet despite the quite momentous transformation that has taken place, one aspect of university life has barely changed at all; namely, the end-of-semester examination. Indeed, the final examination is a university institution that would appear to be off-limits as far as innovation is concerned.

It is still the norm for examinations to be conducted using pen and paper. This is an anachronism in itself, but more importantly, as an assessment instrument a closed book, invigilated exam – still the most commonly administered in universities today – is at odds with modern learning theory. An 'open book-open web' (OBOW) exam can be a superior assessment instrument on a number of dimensions (Lam et al, 2007). Significantly, opportunities for cheating are deemed to be roughly equal. The paper concludes, therefore, that in the absence of a perfect solution, the best alternative is to opt for the assessment instrument that delivers the superior learning outcomes.

Characteristics of OBOW

The defining characteristic of the OBOW approach is a commitment to authentic assessment (Theophilides and Dionysiou, 1996). It fosters understanding of learning processes in terms of real-life performance as opposed to a display of inert knowledge, and learners are presented with unstructured problems that require the application of relevant skills and knowledge, rather than selection from predetermined options as is the case with multiple-choice tests, for example. Most importantly, it is a model that engages students which, in turn, educes deeper learning (Boniface, 1985). While each OBOW examination is unique, one common feature is that the learner is placed in the role of decision-maker. This is a critical element of the OBOW model, as role play provides an effective bridge between a learner's education and their professional practice; the role of 'expert witness' serving as a useful mechanism for the validation of a student's learning in their own mind. Another critical element is that at the heart of every OBOW exam is a contemporary real world problem brought to life through the use of hyperlinks to web sites and streaming media that serve to enhance the authenticity of the problem.

The OBOW model uses a very simple template which incorporates the design principles outlined above (Herrington and Herrington, 1998). The main objective is to produce a mini-case that gets students to think conceptually about a problem, applying the skills and techniques they have acquired in their study of the course in question.

Preparation and submission of the student's response must be submitted electronically to permit use of plagiarism detection software but, more importantly, the student's answer must make direct references to course- specific materials. This means that an accomplice would first have to become familiar with the subject materials, made more difficult given the time period allowed to complete the task is sufficiently tight. Meanwhile, buying an assignment from an on-line 'cheat site' is not an option given the task is unique and highly contextualized.

In summary, the OBOW model represents a serious attempt to engage students rather than alienate them. The opportunity for academically dishonest practice is less because of the way

these examinations are structured, but so is the temptation to resort to this kind of behaviour in the first place. Students readily relate to the task that lies before them as they can see the point of it. By contrast, the closed book, invigilated exam encourages a strategy of 'cramming' the night before and 'data-dumping' on the day, with little knowledge retention thereafter. The OBOW exam, meanwhile, is thoroughly grounded in an authentic context, and learners have an opportunity to apply their newly constructed knowledge in a meaningful way.

A position frequently adopted by those defending the continued use of closed book, invigilated final examinations is to state that students will cheat unless they are supervised. This assumes (i) that cheating is an easy thing to do within the OBOW model, and (ii) students do not cheat in invigilated examinations. Both assumptions are challengeable, and have been tested in earlier research (Williams (2004).

In this paper we have conducted two different exams one was OBOW exam and the other was ICBPP exam. We herewith compare both the exams, their pros and cons, ways to improve each of the exams and finally confirm the better type of exam of the both.

METHODOLOGY

This paper is based on an examination conducted online and no student survey was conducted, as opposed to earlier articles on this subject, wherein the reports were based on the surveys from the students taking the exams. We conducted an OBOW exam at College of Medicine, King Khalid University, Abha, Kingdom of Saudi Arabia. This non-invigilated exam was made open online to the students outside the University working hours, when the students will be at their residence. A total of 127 students took this exam in Clinical Biochemistry on molecular biology topic. These students were categorized into three different groups as described under.

(1) Group I: Thirty (30) female students belonging to first year undergraduate dental sciences. This group was considered as non-cheating group, because during odd hour's females in Saudi Arabia are not allowed to out to other houses. So each of the female students took the exam independently by herself. Of course the girls might have contacted each other over phone or social networking media, but this was minimized by giving limited time to answer the questions.

(2) Group II: Fifty two (52) male students belonging to first year undergraduate dental sciences. This group was considered as a probable cheating group, because it is but natural that most of the boys, if not all, will sit together in groups, to take the exam.
Based on their previous performance in closed book- invigilated-paper pen exam, this group of boys have been categorized as highly intellectual and those possessing high caliber.

(3) Group III: Forty five (45) male students belonging to first year Medical Laboratory technology course. This group was considered as a probable cheating group, because it is but natural that most of the boys, if not all, will sit together in groups, to take the exam. Based on their previous performance in closed book- invigilated-paper pen exam, this group of boys has been categorized as possessing lower caliber as compared to group II male students.

(4) Control: Equal number of the same students in each of the above 3 groups, were considered as control. Marks obtained by these students in the previous invigilated exam with the books closed on paper were considered for comparison with the OBOW exam.

The OBOW exam comprised of 20 multiple choice questions, out of which 10 were easy and direct, another 5 were difficult and twisted and the remaining 5 were very hard and thought provoking. Table-1 shows the difficulty index of the questions as analyzed by the software and that perceived by the instructor.

We allotted a total time of 45 minutes to answer these 20 questions giving 2 minutes per question and a bonus of 5 minutes. Only one attempt was allowed and the system was set to auto-submit the exam when the time expires. The exam was open for a total time of 1 hour 30 minutes. Students had to option to login anytime during this duration. To avoid extensive cheating, the students were compelled that once started, the exam must be completed in one sitting. The system presented the question one at a time and backtracking was prohibited, wherein the students were prevented from changing the answer to a question that has already been submitted. Furthermore, the questions and the options for the answers were appearing to each of the student in random order. Thus, these options minimized the possibility of cheating, though the exam was not invigilated. Additionally, the students in each of these groups were unaware of the fact that another group is taking the same exam at the same time on the same topic, because each group of students belonged to various sections and were from different campuses.

The percentage of marks scored in OBOW exam by each of the student in different groups were analyzed and compared with the marks obtained by the same set of students in a traditional system of invigilated examination. The marks obtained were graded wherein students obtaining 90-100 percent marks were graded as "A" grade. 88 – 89 % as "B" grade, 70 – 79 as "C" grade, 60 – 69 as "D" grade, 0 – 59 as "F" (fail) grade. Students who faced technical problems during the exam were not graded and were included under "U" category (Ungraded).

Table 1. Summarized overall difficulty index for the questions in relation to the answers given by all the students.

Difficulty Guide	Difficulty index	Number of questions			As perceived by the instructor	Average
		Group I	Group II	Group III		
Easy Questions	> 80 %	11	13	6	10	10
Medium Questions	30 % to 80 %	7	5	11	5	7
Hard Questions	< 30 %	2	2	3	5	3

Table 2. Comparison of the number of students in the three groups, scoring different grades in OBOW verses invigilated exams

Grades / Groups	Number of students scoring the grade						Type of Exam
	A	B	C	D	F	U	
Group I (n=30)	11	7	3	5	1	3	OBOW
	12	14	4	0	0	-	Invigilated
Group II (n=52)	26	14	9	2	0	1	OBOW
	17	18	10	7	0	-	Invigilated
Group III (n=45)	9	6	11	7	6	6	OBOW
	19	18	3	1	4	-	Invigilated
Overall (n=127)	46	27	23	14	7	10	OBOW
	48	50	17	8	4	-	Invigilated

A = 90-100%; B = 80-89%; C = 70-79%; D = 60-69%; F = 0-60%; U = Ungraded due to technical problems

each and every student was interviewed personally after the exam to evaluate and to get their views regarding the pros and cons of this OBOW exam and to note their grievances, if any. Further, the online attempt by all the students was analyzed by the instructor to scrutinize the degree of cheating and / or difficulties faced by the students during the exam. Cheating was assessed based upon the time at which the student started taking the exam, the total time taken to complete it and the marks they scored. The number of question not attempted by the student in relation to the total time taken by the student to submit the exam was used as an index to evaluate the technical problems during the exam.

Data analysis

We analyzed the data using the automated data analysis available in the Blackboard version 6.1.3, existing over the e-Learning server for the staff of King Khalid University, Abha, Kingdom of Saudi Arabia. The parameters analyzed by this software included difficulty index of the questions, average score, standard deviation and standard error.

RESULTS

The number of students scoring different grades in OB-OW and invigilated examination are presented in Table 2.

Group I girl students' performance in OBOW exam was on par with the invigilated examination wherein only 11 girls scored the topmost "A" grade as against 12 girls in the invigilated exam. The number of students scoring lower grades increased successively in the OBOW exam as compared to invigilated exam. The number of students scoring B, C, D and F grades in OBOW exam were 7, 3, 5 and 1 respectively, whereas 14, 4, 0 and 0 students scored B, C, D and F grades respectively in the invigilated exam (Figure 1).

Group II student's performance in OBOW exam was much better owing to their intelligence as compared to the invigilated examination wherein 26 students scored the uppermost "A" grade as against 17 students in the invigilated exam. The number of students scoring other grades was less in the OBOW exam as compared to invigilated exam. The number of students scoring B, C, D and F grades in OBOW exam were 14, 9, 2 and 0 respectively, whereas 18, 10, 7 and 0 students scored B, C, D and F grades respectively in the invigilated exam (Figure 2).

Group III student's performance in OBOW exam was poor owing to their low intelligence as compared to group II. Only 9 students scored "A" grade in OBOW exam as against 19 students in the invigilated exam. The number of students scoring other grades was in diverse proportion in the OBOW exam verses invigilated exam.
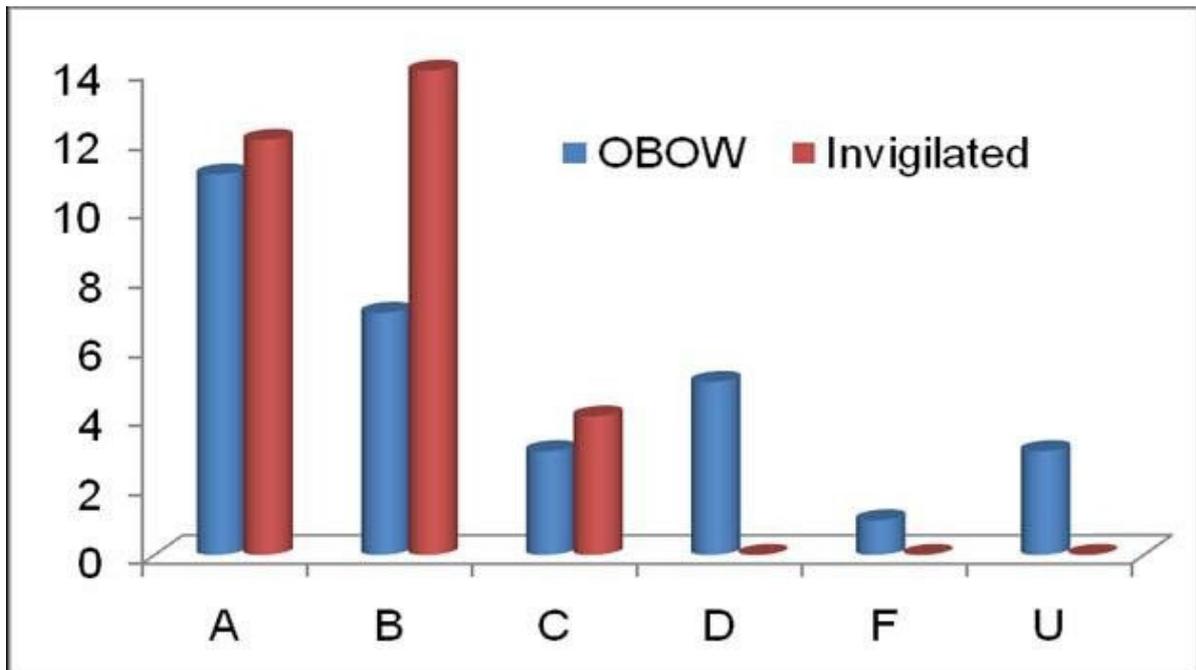
Figure 1. Comparison of the number of students scoring different grades by group I students in OBOW verses invigilated exams
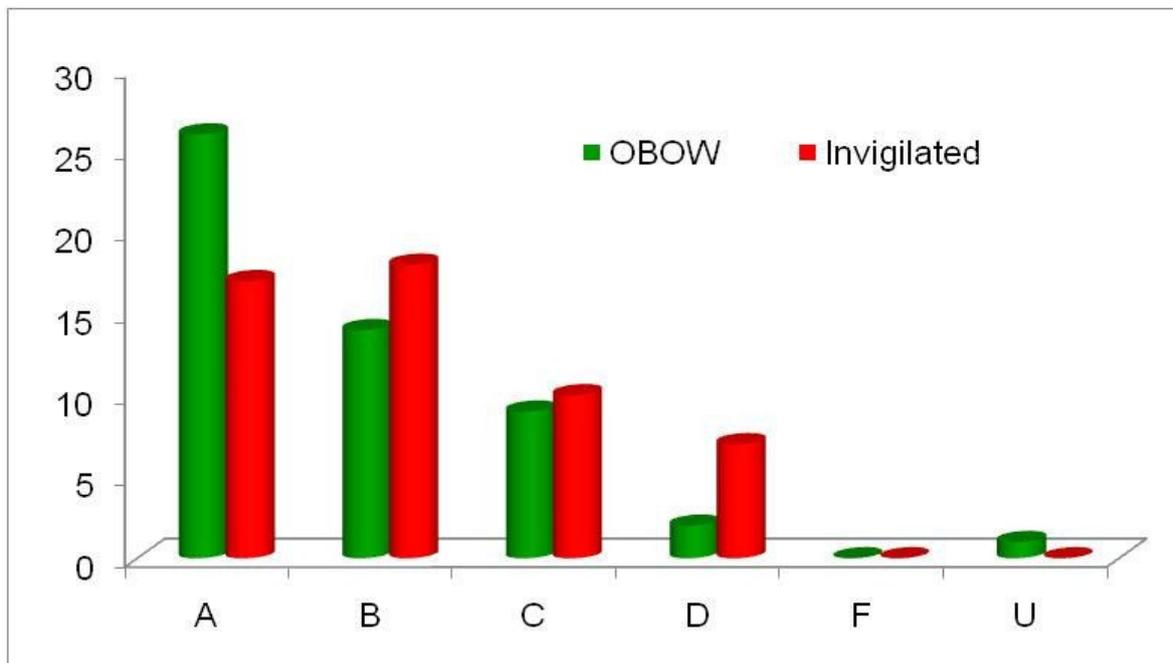

Figure 2. Comparison of the number of students scoring different grades by group II students in OBOW verses invigilated exams

The number of students scoring B, C, D and F grades in OBOW exam were 6, 11, 6 and 7 respectively, whereas 18, 3, 1 and 4 students scored B, C, D and F grades respectively in the invigilated exam (Figure 3).
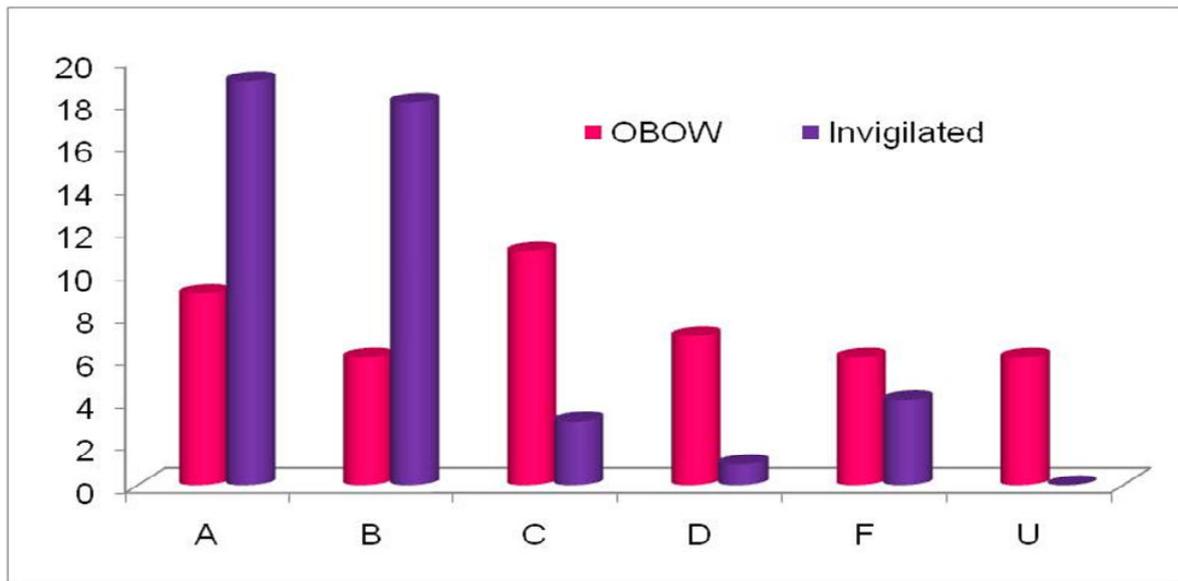
Figure 3. Comparison of the number of students scoring different grades by group III students in OBOW verses invigilated exams

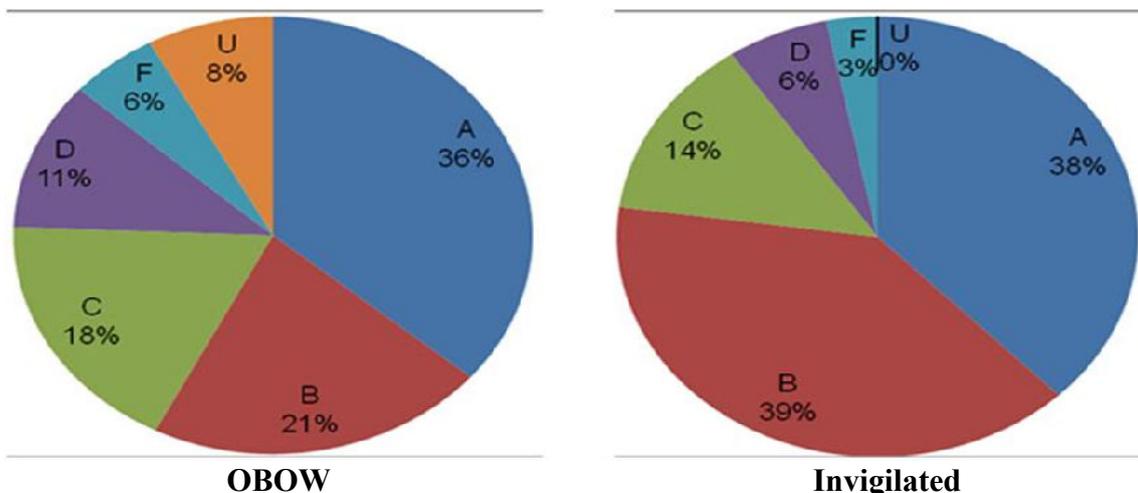**OBOW**   **Invigilated**

Figure 4. Overall comparison of the percentage of students scoring different grades by all the three group of students in OBOW verses invigilated exams

Looking into the overall performance of all the three group of students in OBOW and invigilated exam, it is observed that there is not much difference in the results. 36 % of the students scored "A" grade in OBOW exam as compared to 38 % in the invigilated exams. Further 21 %, 18%, 11% and 6 % of all the students scored B, C, D and F grades respectively in OBOW exams as against 39%, 14%, 6% and 3% respectively in the invigilated exams (Figure 4).

Cheating

We documented a total of 11 cases of cheating in the entire three groups during the OBOW exam. The ground on which it was concluded that these students might have indulged in cheating is presented in Table 3. As expected, there was only one case of cheating among the girls (Group-I) and five each among the boys (group-II and III). The authors came across a similar number of cheating cases during the invigilated exam. Some of the students were warned, others seats were changed and yet a few were sent out of the exam hall by the authors.

Table 3. Showing the details of cheating cases

Sl. No.	Percentage of Marks scored	Minutes delayed to start the exam	Total time taken to complete the exam	Rationale for assuming as cheating case
GROUP – I				
1	97.6	36	27	Waited for her friends to answer questions and then she began to take the exam 36 minutes late, hence the high score
GROUP – II				
1	82.4	32	19	Waited for all his friends to answer all the questions and then he began to take the exam 32 minutes late and completed within 19 minutes
2	90.4	32	17	Waited for all his friends to answer all the questions and then he began to take the exam 32 minutes late and completed within 17 minutes.
3	99.2	49	13	Waited for all his friends to answer all the questions and then he began to take the exam 49 minutes late and completed 20 questions within 13 minutes and scored high.
4	93.6	24	18	Waited for all his friends to answer all the questions and then he began to take the exam 24 minutes late and completed within 18 minutes.
5	98.4	31	18	Waited for all his friends to answer all the questions and then he began to take the exam 31 minutes late and completed 20 questions within 18 minutes and scored high.
GROUP – III				
1	65.5	23	22	Waited for his friend to complete the exam and then he began to take the exam 23 minutes late
2	89	60	16	Waited for all his friends to answer all the questions and then he began to take the exam 60 minutes late.
3	75	19	24	Clear case of cheating because did not answer the first question - skipped it and passed to next question. Waited for his friends to answer the questions and then he began to take the exam after a lapse of 19 minutes.
4	78	73	10	A case of smart cheating as he started to take the exam 1 hour 13 minutes late and completed it within 10 minutes scoring 78% of marks.
5	67.5	20	15	Cheated – Late start, early submission, considerable good score.

Table 4. Showing the details of the technical problems faced by the students

Sl. No.	Percentage of Marks scored	Minutes delayed to start the exam	Total time taken to complete the exam	Grievance by the student and observations made by the instructor online
GROUP – I				
1	8	5	47	After submission of the first question, the exam did not proceed further – The system got struck up and the exam was auto-submitted after a lapse of 47 minutes
2	0	6	47	First question did not save and the exam did not proceed further – The system got struck up and the exam was auto- submitted after a lapse of 47 minutes
3	0	12	47	First question did not save and the exam did not proceed further – The system got struck up and the exam was auto- submitted after a lapse of 47 minutes
GROUP – II				
1	8	0	47	He faced technical problems. After submitting the first answer the second question did not appear due to internet / browser / system problems
GROUP – III				
1	0	7	47	First question did not save and the exam did not proceed further – The system got struck up and the exam was auto- submitted after a lapse of 47 minutes
2	0	0	47	First question did not save and the exam did not proceed further – The system got struck up and the exam was auto- submitted after a lapse of 47 minutes
3	10	3	3	Exam submitted automatically after submitting one answer with a dialogue that exam successfully completed – Problem with the server
4	40	0	45	Eleven answers not given in 45 minutes and exam was auto-submitted – Student did not respond when asked for the reason – indicates that he intended to cheat
5	33	0	47	Eleven questions not attempted by the student because the exam did not precede further beyond this and the system auto-submitted the exam after 47 minutes.
6	0	0	47	First question did not save and the exam did not proceed further.

Technical problems

The technical problems faced by the students included dropping of the internet connection, slow internet connection, problem with the browser, user computer very slow or totally stuck-up etc. A total of 10 students faced technical difficulties during the exam. The details of these obstacles are given in Table 4.

DISCUSSION

The main purpose of examining a student at university level is to measure how much he/she knows about the subject being examined. It is neither meant to filter the students nor to harass them. Advancement in the teaching methodology in the last few decades has driven

many scholars to device newer and enhanced methods of examining the students, OBOW being one among them (Fluck, 2009). In-order to examine the caliber of a student it is very much necessary to have good and standard questions, so that an extraordinary intelligent student can answer all of them perfectly well. A student with a medium talent can make through most of it, if not all and a poor student can strive hard to solve at least some of the questions and get through the exam. While preparing the questions it must be kept in mind the type of exam being conducted. An invigilated paper pen exam can have uniform questions all through. The present study made us conclude that an OBOW exam should contain mixture of easy, medium and hard question in the ratio of 2:1:1, so as to avoid cheating and plagiarism.

In our study there is not much difference in the number of students scoring higher grades in OBOW exam as compared to the invigilated one. On the other hand it has been observed that students scoring lower grades are more in OBOW exams than in the invigilated exam. Furthermore there is a fair distribution of the students among the various grades in the OBOW exam under review in this article. A good result should, nevertheless exhibit a bell shaped curve. Among our results, the OBOW exam for group-II students showed a curve near bell shape, which is an example of excellent system of examination. Similar reports are published by Olawale and Abdulhamid (2010).

Based on the results of this study, it can be said that OBOW is superior to the closed book, invigilated option on all counts. On the issue of opportunities for cheating, the result is also the same; namely, that there are broadly similar opportunities (Williams, 2006). This is counter to the commonly held view that information technology provides new situational opportunities for dishonest behavior (McMurtry, 2001), and that, as a result, cheating should be made easier, faster, and more convenient, as students can share exam information via chat rooms, plagiarize from the Internet, or share exam questions via email between classes (Kleiner and Lord, 1999). This view has been supported in a study conducted by Chapman et al (2004) which reported that a relatively high percentage of students have already been involved in academic dishonesty in a web-based testing situation. In this study, even though OBOW was ranked slightly higher on this occasion, cheating does not emerge as an important indicator. Factors which are considered most important in favor of OBOW are flexibility regarding the location of the exam; a format relevant to business/professional education, suited to student's learning style, quality of learning outcomes, and intellectually challenging (Williams and Wong, 2007).

The only and the major drawback that the authors observed in the study was the emergence of technical problems during the exam time. About 10 students faced technical problems due to improper technical knowledge of the students. The students are unaware of the choice of right browser to be used for such exams, the correct browser settings, deleting the browser history (temporary internet files, cookies, in Private filtering etc.) prior to taking the exam. The main culprit of computer systems using internet service is simultaneous running of enormous background programs, which hampers the smooth running of the user's computer. An antivirus program is yet another hindrance to take an exam that deploys questions one after the other in a uniform fashion. Appearance of harmonized web page one after the other from the same site is sensed as a virus by an antivirus program, hence the antivirus program

stops the display of further pages from the web site. Therefore many students experienced termination of the exam between 4 and 11 questions of the 20 questions. In addition to these technical problems in the user's computer, the internet service provider in the area where this exam was conducted is not well developed. The internet connection drops completely intermittently or becomes very slow because of over usage by some other users in the network due to excessive amount of the data transfer, causing traffic congestion on the network. Moreover the time of examination in the present evaluation, was the prime time for the usage of internet by all users in the network, thus it's obvious that the internet will be very slow or will completely cut off. As the examination in review was not a final exam, it did not affect the carrier of the students. Hence, an OBOW final exam cannot be conducted until and unless it is confirmed that all the students are aware of the technical problems that could arise during such an exam and the means to rectify them beforehand. Furthermore, the internet service provider should be perfect in providing uninterrupted internet connection to the users.

University examinations continue to be dominated by closed book, invigilated pen and paper tests. It is argued here that this is something of an anachronism given the human capital needs of a knowledge economy, not just because of the absence of technology that is used routinely in everyday business and commerce, but because this type of examination instrument is incompatible with constructivist learning theory that favours deep learning (Ioannidou, 1997). It is further argued that a commitment to authentic assessment will pave the way for a different type of final examination, where real-world problems are allowed to take centre-stage, and multi-media can be harnessed to provide the learner with a more engaging experience. With greater engagement, this, in turn, can yield better results in terms of the depth of student teaching (Feller, 1994).

Importantly, OBOW is a transferable model that can just as easily be administered in an on campus setting as online, and while there will always be a small number of students who will cheat, the main priority should be to focus on the higher quality learning outcomes of the majority, rather than set up an entire system to stop a small minority. Certainly, if there is roughly equal scope for cheating then it would make sense to opt for the model that maximizes student learning (Theophilides, 2000).

CONCLUSION

Finally conclude that OBOW exams are better in accessing the student's ability to understand the subject and reproduce it, provided:

(1) The questions are made in the ratio of 2:1:1: easy: medium: hard. Hard questions must include thought provoking, problem solving and case oriented questions.

(2) The time allotted for the exam should be just enough for an average student to complete the exam.

(3) The total time an exam is available to a user should not be much more than the allotted time for the exam. If the time allotted for the exam is 45 minutes the test available to the user online should not be more than 60 minutes.

(4) The software should not allow the student to begin the exam 10 minutes after the start of the time of the exam to minimize cheating.

(5) The questions and answers (in an MCQ) should be displayed in random order and

backtracking should be prohibited. The exam should be auto submitted on expiry of the allotted time.

(6) Cheating can be totally avoided if the number of questions added to the test is 4-5 times more than the actual number of questions that a student needs to answer. For instance an exam requiring students to attempt 20 questions should contain 100 questions and thus the probability of 4-5 student getting the

same question if very meager. Cheating can be further minimized by limiting the time of entry to the exam, tighter control on the time allowed for the exam and remote login IP address monitoring as suggested by Gao (2012)..

(7) Technical problems can be minimized by creating a practice exam with dummy questions in order to make sure the system is ready at the student end and moreover the student is in a comfortable situation before the exam, online real time video monitoring and technical support and training and practice with dummy exams.

* * *

REFERENCES:

Boniface D (1985). Candidates' use of notes and textbooks during an open book examination. Educ Res. 27(3):201.

Carrier D (1990). Legislation as a stimulus to innovation. High Educ Manage.2(1):88-98.

Chapman KJ, Davis R, Toy D, Wright L. (2004). Academic integrity in the Business School environment: I'll get by with a little help from my friends. J Market Educ.26 (3):236-250.

Feller M (1994). Open-book testing and education for the future. Stud. Educ. Eval. 20(2):235-238.

Fluck A (2009). Towards Transformation: e-Examinations for ICT- enabled learning outcomes. In World Conference on Computers in Education.

Gao Q (2012). Biometric Authentication to Prevent e-Cheating. INSTRUCTIONAL TECHNOLOGY, 3.

Herrington J, Herrington A (1998). Authentic assessment and multimedia: How university students respond to a model of authentic assessment. High Educ Res Dev. 17(3):305-322.

Ioannidou M (1997). Testing and life-long learning: open-book and closed book examination in a university course. Stud. Educ. Eval. 23(2):131 -139.

Joi LM, Camille DD, Krista G (2011). e-Learning, online learning, and distance learning environments: Are they the same? Internet High Educ. 14:129–135.

Kleiner C, Lord M (1999). The cheating game. U.S. News and World Report.;127(20):54-63.

Lam W, Williams JB, Chua AYK (2007). E-xams: harnessing the power of ICTs to enhance authenticity. Educ Tech Society. 10 (3):209- 221.

Leung WC (2002). Competency based medical training: review. BMJ. 325:693-96.

McMurtry K (2001). E-cheating: Combating a 21st century challenge. Teach High Educ J. 29 (4): 36-41.

Moberg TF, Whitcomb ME (1999). Educational technology to facilitate medical students' learning: background paper 2 of the medical school objectives project. Acad. Med. 74:1146-50.

Nair BR, Finucane PM (2003). Reforming medical education to enhance the management of chronic disease. Med. J. Aust. 179:257-59.

Olawale A, Abdulhamid SM (2010). E-Exams System for Nigerian Universities with Emphasis on Security and Result Integrity. Int. J. Computer, the Internet and Manage. (IJCIM).

Ozuah PO (2002). Undergraduate medical education: thoughts on future challenges. BMC Med Educ. 2:8-10.

Rosenberg M (2001). E-Learning: Strategies for Delivering Knowledge in the Digital Age. New York: McGraw-Hill.

Ruiz JG, Mintzer MJ, Leipzig RM (2006). The impact of E-Learining in Medical Education. Acad Med. 81(3):207-212.

Sims R (2004). Trends, fads and futures: 21 years of educational multimedia: Where have we got to, and where should we go? Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications. Chesapeake, VA: AACE. 3755-3766.

Theophilides C, Dionysiou O (1996). The major functions of the openbook examination at the University level: A Factor Analytic Study. Stud. Educ. Eval. 22(2):157-170.

Theophilides C, Koutselini M (2000). Study behaviour in the closed- book and the open-Book examination: a comparative analysis. Educ Res Eval: Intern. J. Theor. Pract. 6(4):379.

Ward JP, Gordon J, Field MJ, Lehmann HP (2001). Communication and information technology in medical education. Lancet. 357:792-96.

Wentling T, Waight C, Gallaher J, La Fleur J, Wang C, Kanfer A (2000). E-Learning: A Review of Literature. University of Illinois National Center for Supercomputer Applications, Urbana-Champaign, IL, http://learning.ncsa.uiuc.edu/papers/elearnlit.pdf

Williams JB (2004). Creating authentic assessments: a method for the authoring of open book open web examinations. In R. Atkinson, C. McBeath, D. Jonas-Dwyer and R. Phillips (Eds), Beyond the Comfort Zone: Proceedings of the 21st ASCILITE Conference. 934- 937.

Williams JB (2006). The place of the closed book, invigilated final examination in a knowledge economy. Educ. Media Intern. 43(2):107-119.

Williams JB, Wong A (2007). Closed book, invigilated exams vs open book-open web exams: An empirical analysis. In ICT: Providing choices for learners and learning. Proceedings ascilite, Singapore. 1079-1082. http://www.ascilite.org.au/conferences/singapore07/procs/williams- jb.pdf

* * *