

# Students' perceptions of BYOD open-book examinations in a large class: a pilot study

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A bring-your-own-laptop high-stakes open-book final examination for a General Biology course with an enrolment of 672 students was held in November 2013 at the National University of Singapore. Pre- and post-exam online surveys were conducted to solicit the perceptions of the students with regards to the introduction of a bring-your-own-device open-book electronic final examination. Focus group discussions were also held to deliberate on the perceptions in greater detail. Both the surveys and discussions revealed several key areas of satisfaction and also areas for improvement, which will be explicated in this paper. The implementation and limitations of the exam will also be discussed.

Keywords: large classes, BYOD, open-book examinations, e-assessments

## BYOD examinations

In line with the university's initiative to use technology in teaching and learning, the National University of Singapore (NUS) has a bring-your-own-device (BYOD) programme, in which students bring a personally owned device to school for the purpose of learning (based on Alberta Education, 2012), in the form of the Notebook Ownership Scheme. A natural extension of the BYOD programme will be a BYOD final examination, in which students bring their own laptops to school for a high-stakes final examination at the end of a semester.

While numerous studies have found that BYOD promoted deeper and more personalised and student-centred learning by leveraging on students' attachment to their own device (Stavert, 2013), very little or no studies have been conducted to evaluate the impact of the extension of BYOD programmes for assessment purposes, and in particular, open-book examinations. Most of those studies were carried out on attitudes towards e-assessment on the part of instructors, e-learning experts and educational technologist (Bull & McKenna, 2004; Stephens & Mascia, 1995; Warburton & Conole, 2003) but relatively few investigations on students' learning experience (Dermo, 2009). With that, a study on the perception of students to the extension of the BYOD programme for the final examinations was initiated for the General Biology course, with the hope that the findings of the study would provide educators in tertiary institutions with more insights on good practices and guidelines in extending the BYOD programmes of their institutions for assessment purposes that are based on educational research results.

## Background

General Biology is a non-majors biology course at the National University of Singapore (NUS). The course serves as a bridging course for those who are majoring in the Life Sciences but do not have a pass in A-Level Biology, as well as an elective course for non-Life Sciences students. Despite being offered every semester, including one of the special terms during the vacation, the enrolment for Semester 1, which begins in August, ranges between 600 to 800 students.

The high-stakes final examination of the General Biology course has always been conducted in a paper-based, open-book, multiple-choice-questions (MCQs) format. This was intended to promote critical thinking and to dispel the common perception of biology as a subject that could be learned by rote-memorisation. Boud (1995) has asserted that "every act of assessment gives a message to students about what they should be learning and how they should go about it" (p. 37). The idea of having the final examination as an e-examination (e-exam) for Semester 1 of 2013, in an open-book MCQs format, was mooted in May of that year. Aside from the fact that e-exams in the form of MCQs allow for automatic and error-free marking, generation of analytical statistics on the performance of the students, and removal of the difficulties associated with the handling of thousands of pages of question booklets and answer scripts (Bull & McKenna, 2004), studies have shown that MCQs could also be

used to promote high-level cognitive processes when the questions are well constructed (Cox, 1976; Johnstone & Arnbusaidi, 2000). It is to be noted too that Hillier and Fluck (2013) had argued that “e-exams are needed and long overdue for use in high stakes examinations in the tertiary sector” (p. 385).

An e-exam also offers the possibility of higher quality questions through the use of media-rich resources, such as animations, videos and coloured figures in the questions (Hillier & Fluck, 2013; JISC, 2010). Furthermore, since it is an open-book exam, besides the students having access to hardcopy notes and books, an e-exam provides for the possibility of referring to the webcast recordings of the lectures and the numerous animations and videos that have been made available to the students on the learning management system web-portal to illustrate the concepts taught in the course. All of these allow for a greater variety of higher-order thinking skill questions that would further promote critical thinking.

## Implementation

Due to the large enrolment, it was not logistically feasible to conduct the e-exam in computer laboratories, as the limited capacities of the labs would result in the class being divided into too many groups. Hence, a decision was made to have the e-exam as a BYOD exam, in which the students would bring their own laptops and attempt the final exam questions on their own laptops. Since the enrolment of the course in Semester 1 of 2013 was 672 students, the following factors had to be taken into consideration for the implementation of the BYOD exam.

- i. Integrity of exam – students had to download a lockdown browser to take the BYOD exam.
- ii. Internet access – provided through wireless, with additional routers installed to minimise drops in connection.
- iii. Power supply – venues with individual power sockets for every student.
- iv. Spare laptops – for students with no laptops and as replacements for students with problems during exam.
- v. Technical support – setup before exam and troubleshooting during exam.
- vi. Alternative plan – press release and pen-and-paper exam on another day in case everything else fails.

On top of those factors, additional logistical support was also required as, due to limited venues with an individual power socket for every student, the class had to be divided into two groups, with one group sitting the exam one after the other. With the exam being conducted in two sittings, an additional holding venue was required to separate the students. The movement of the students from the holding venue to the exam venues for one group and from the exam venues to the holding venue for the other group without having the two groups meet or communicate with each other required additional planning and manpower.

In view of the enormous challenges ahead, a trial run and mock exam was conducted two weeks before the actual BYOD e-exam itself. It was during the trial run that the students were instructed to download and install the lockdown browser on their laptops and attempt a mock exam that consisted of questions of similar nature to the final exam that they would be sitting for.

## Methodology

Pre- and post-exam online surveys were administered to solicit the perceptions of the students. The questions of the survey were piloted with a few individuals and further fine-tuned before being administered to the students. In the pre-exam survey the students were asked if they welcomed the adoption of open-book final exams that are conducted using their own laptops, while in the post exam survey they were asked if they were satisfied with the open-book final exam that was conducted using their own (or the university's) laptop. The post-exam survey also provided the students with the opportunity to specifically state what they liked about the mode of exam and areas for improvement.

Further to the survey, focus group discussion (FGD) sessions were held approximately 4 months after the BYOD exam. Open invitations were sent out to all the students for the FGD sessions, and a total of four sessions were held. To ensure that the students did not feel hindered in voicing their opinions, none of the instructors of the course were present during the FGD sessions. The facilitator of the sessions led the participants in more elaborate discussions of the questions posed for the pre- and post-exam surveys.

The responses of the online surveys and FGD sessions were collated and analysed, using the spreadsheet software, Microsoft Excel, and the text mining software, IBM SPSS Text Analytics.

## Findings

Out of a class of 672 students, 658 responded to the pre-exam survey, which was conducted about one month before the BYOD exam, giving a response rate of 98%. The post-exam survey, conducted about two weeks after the exam, saw 399 responses, which is equivalent to 59% of the total enrolment of the course. A total of 15 students participated in either one of the four FGD sessions.

From the pre-exam survey, 74.02% (25.08% strongly agree and 48.94% agree) of the respondents welcomed the introduction of an open-book final exam that was conducted using their own laptops for the General Biology course. Interestingly, approximately the same percentage of respondents, 74.14% (12.81% strongly agree and 61.33% agree) were satisfied with the open-book final exam that was conducted using their own (or the university's) laptop for the course.

From the post-exam survey and the FGD sessions, several areas of satisfaction with the BYOD open-book exam and a few areas for improvement were identified.

### Key areas of satisfaction with BYOD open-book exam

#### *Easier access to references*

One of the more popularly cited areas of satisfaction is that the BYOD open-book exam offered the students much easier and quicker access to their reference softcopy materials. Unlike hardcopy notes and books, which required flipping to the relevant (and usually tagged) page, searches on softcopy materials could be easily accomplished using the 'Control-F' or 'Command-F' keys on their laptops.

#### *Media-rich application based questions*

Students were also pleased that the questions of the BYOD open-book exam were application-based questions and not questions that could be answered based on rote memorisation alone. It is recognised that this area of satisfaction is a result of the open-book format of the exam rather than it being a BYOD exam. However, related to this area of satisfaction was that the students appreciated the fact that the use of media-rich resources, such as animations, offered an increased variety of application-based questions, which would not have been possible with a traditional pen-and-paper exam.

#### *Personal learning space*

Another area that received positive responses was that the BYOD exam provided the students with the alternative of using their own devices, namely their own laptops, with which they were familiar with. The following is a comment that was received:

I can use my own laptop which makes me feel very comfortable as I am familiar with it.

Comments that are similar to the above were echoed by 17.07% (n=56) of the respondents. These responses provide an indication that BYOD exams may also contribute to the promotion of a personalised learning environment (Stavert, 2013), which is one area that could be explored with more studies.

#### *Environmentally-friendly examination*

The fact that the BYOD exam was more environmentally-friendly because it resulted in the use of less or no paper was also appreciated by the students. It is possible that the current generation of students are more environmentally-conscious, which may be a reflection of the effectiveness of the instructors' teaching on the subject of ecology in the General Biology course.

#### *Efficiency during examination*

Students also felt that the BYOD exam was more efficient as they did not have to spend time shading their answers on the optical mark recognition (OMR) sheets, resulting in more time to think about the questions. Furthermore, with the OMR sheets, they would have to ensure that they had sufficient supply of the appropriate pencils or pencil leads.

#### *Well-organised and structured examination*

Despite facing some technical problems, the students were also satisfied that the BYOD exam was well-organised and structured. In particular, they noted that the trial run and mock exam that was conducted before the actual exam had contributed to the smooth running of the BYOD exam. This is an important point to consider in the implementation of any BYOD exam (Hillier & Fluck, 2013).

## Key areas for improvement

### *Technical problems*

The most cited area that the students would like to see improved can be classified under the broad category of technical problems. These included several cases of dropped wireless internet access and faulty power sockets, and slow downloading of the notes and other softcopy materials during the BYOD exam. Related to this were concerns that those with laptops that are newer and with better technical specifications had unfair advantage over the other candidates with older laptops. The technical problems served as elements of insecurity that could affect the students' performance in the exam. Hence, there were suggestions of replacing the BYOD exam with an e-exam that is conducted in a specialised computer laboratory, or in a computer-equipped exam centre.

### *Quarantine*

Many students were also not happy with the separation that they had to undergo, during which they were not allowed to use any electronic devices to prevent communication with the second group of candidates who might be late for the exam. Being separated and deprived of the use of electronic devices was seen as a waste of time, a precious commodity considering that it was the early period of final exams and the students had to revise for their upcoming exams. Naturally, the suggestion was to have everyone sit for the exam at the same time instead of having it in two sittings.

### *Lockdown browser*

Another area for improvement was with regards to the lockdown browser that was used for the BYOD exam. Students were dissatisfied that they could not resize the windows that were opened. Some students suggested the introduction of a function of allowing new tabs instead of windows on the lockdown browser, which presumably would result in faster switching from one panel to another. NUS has recognised the limitations of the current lockdown browser and is currently in the process of evaluating other alternatives.

### *Personal physical space*

Comments were also received with regards to the exam venues, which were lecture theatres. It felt that the personal physical space was insufficient to place the hardcopy materials that the candidates had brought with them for the open-book exam. Furthermore, the space between the rows of seats of those lecture theatres were very narrow, increasing the time required for the technical staff to move to a candidate seated at the centre of a row to offer assistance when that candidate had technical difficulties, which was perceived as an unfair disadvantage in a high-stakes exam.

## Limitations

It has to be noted that the study is based only on two methods of data collection, namely the pre- and post-exam surveys and FGD sessions. To provide for a richer triangulation of methods, one-to-one interviews could also be conducted in future studies.

Additionally, the FGD sessions were conducted about four months after the BYOD e-exam. Holding the FGD sessions after a relatively long period post-exam might not be ideal as the subjects could have difficulty in providing a comprehensive recollection of the event. On the other hand, the findings of the late FGD sessions could also be interpreted as perceptions that had left deep and long-term impressions in the minds of the students. Hence, it might be surmised that the expressed views of this pilot study are perceptions that could prove to be significant for consideration in the implementation of BYOD e-exams in the future.

Finally, this study was carried out on a specific group of students pursuing the non-majors General Biology course in a global research-intensive university, located in Asia. Similar studies could be carried out in other regions to explore if findings could be impacted by certain cultural differences.

## Next step

Considering the increasing prevalence of tablets, one of the possible next steps should include the use of tablets as one of the devices in a BYOD e-exam. Currently, the use of tablets is still not possible due to security issues, especially in a high-stakes exam. However, it is understood that there are e-exam software companies who are developing the necessary apps for a BYOD e-exam on tablets.

One common thread that runs through the areas for improvement is related to the exam venue, which ideally

could be solved with a dedicated exam centre that is equipped with wired internet connected computers and that is large enough to accommodate a large class. With that, many of the limitations of a BYOD exam discussed in this paper will be eliminated, and the whole subject of a BYOD exam will not even surface. While the university is not discounting this option, the cost of setting-up and running such an exam centre remains as a major roadblock. Going forward, a BYOD e-exam, and all its associated limitations may be the only feasible and economically-viable option.

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