Student perceptions of a blended first-year physics course with an open textbook

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In our blended introductory physics course at UBC, all online materials from the same distance course are also used in the corresponding face-to-face sections on campus. The course materials are free to students and include the 'College Physics' open textbook by OpenStax, which was edited and re-formatted into weekly readings on edX Edge. The 'College Physics' end-of-chapter problems as well as previous exam questions were coded into a database, which is used for bi-weekly online tests and weekly problem questions practice sets (also online on our edX Edge web site). The course has been running in this new hybrid form for two years now. Course grades and final exam performance did not significantly change when we switched from the combination of a highly regarded commercial textbook and online homework system to our new free resources. Class attendance (around 70%) also did not change although our web site fully supports self-guided learning of all course topics. The course also has a lab component with experiments that are performed at home with common materials. The lab is described in detail elsewhere [1].

We have conducted a survey and focus groups in an effort to learn what students think about the new hybrid format and the course materials on edX Edge. The students generally appreciated the weekly customized readings as well as the frequent online tests. They also valued that all course resources are free and easily accessible. This is significant because our results and research by others show that a considerable fraction of students does not purchase the textbook to save cost [2], thus missing out on an important resource. Practical advantages are noteworthy as well: the online labs save a fairly large number of teaching assistant hours and the common edX Edge web site ensures that students across all sections are exposed to same course materials. The open-ended questions in our survey provide valuable insights into the reasons behind the participants' views. In the following, we summarize our results.

Students generally had a very positive view of the online readings on edX Edge, mostly because they did not have to purchase a textbook and the readings are customized and closely related to course content. They also valued that the readings are online and can be easily navigated and accessed from anywhere with an internet connection. Furthermore the online readings do not add extra weight (compared to a printed book). Looking more closely at why students value a free textbook reveals that students do not like to spend money on printed textbooks because they are expensive, often not closely related to course content with too much extra material, and are not worth keeping if a student is not interested in taking more courses in the same field (physics in our case). Most students said that the quality of the open text was the same (73%) or better (18%) than the quality of their other science textbooks, and 70% preferred the online text over a traditional textbook, for the same arguments listed above (free, customized, easy access, no weight).

We also asked about the use of frequent tests in our course. Before switching to the new hybrid format, we assessed students' performance with two midterm exams and one final exam (30% and 50% of the final grade). We are now using one midterm exam (15%), one final exam (50%) and five online tests (5 x 3%). Students also have the option to repeat an online test a week later on the same topic, but with different questions ('bonus test'). We count the better attempt of each test/bonus test pair. Despite the low stakes associated with each online test, we were concerned about the amount of testing in our course, given that most of our students are taking three or four other courses at the same time. To our surprise, the students generally appreciated the frequent tests and gave the following reasons:

- The online tests helped them keep up with the course.
- The tests provided regular feedback on learning and what's important.
- The grades are well distributed over tests and exams and a second chance on the tests is offered.
- The tests are lower stress than a midterm exam.
- The tests provide valuable exam preparation.

A minority of students (16%) wanted fewer tests (two or three rather than five) and mentioned that the time required to prepare for each test caused them stress.

Since cheating is always a potential issue in online tests, we asked the students whether they were concerned with the fairness of the online tests. Half of the students (51%) said that they were not concerned, 29% said they were a bit concerned and 20% said they were concerned. Notably, students interpreted fairness in two different ways, i.e. potential for cheating and equitable, impartial, fair grading. Respondents who found the tests fair said that

- the tests helped them learn,
- they matched course content and the exam,
- they were low stakes and low stress,
- they were individualized (randomized questions and randomized numbers in questions),
- they could be done in a quiet atmosphere at home.

Some students recognized the potential for cheating but thought it wasn't a big issue, in part because it wouldn't help them on the higher-stakes assessments. The students who were concerned about the fairness of the tests said that the tests were hard, uneven in difficulty (compared to their friends), did not match course content and the exams, and that other students cheated and worked together. Related to potential cheating issues in online tests, we also asked the students if they would have preferred to write the tests in a tutorial (recitation) session. A large majority (70%) wanted to keep the tests online and mentioned the flexibility in place and time. A number of students mentioned the quiet atmosphere at home as an advantage in this context. Students also said that the tutorial time is valuable for other things such as problem-solving practice. The respondents who would have preferred to write the tests in tutorials (21%) said that this would be more 'like a real exam', i.e. invigilated and in a classroom.

In summary, our survey shows that students had generally a positive view of our online course resources. The reasons students provided in open-ended survey questions point to some advantages that the blended format can offer. The combination of all course resources, free of charge and well-organized, on an easily accessible web site seems to be much appreciated by our students. Furthermore,

the advantages that frequent low-stakes online tests offer far outweigh the potential for cheating in our opinion. The vast majority of our respondents mentioned that this approach helped them learn and to keep up with the course. This is particularly important in a first-year course, such as ours.

References

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