# *Use of BTL Surpass for online exams in Computer Science*
## *An ICBL report*

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## Background

This report describes the use of a computer assessment system, namely BTL's Surpass[1], for online exams in Software Development at Heriot-Watt University[2]. The 'Software Development 1' course is taken in the first semester of the first year by approximately 150 students at Heriot-Watt's Edinburgh campus and 30 students at its Dubai campus. The majority of these students are studying for a degree in Computer Science or related subjects, with a few students from other disciplines taking the course as an elective. Software Development 1 is the first in a track of courses relating to programming, with Software Development 2 and 3 being taught in the second semester. The exam is a high stakes assessment, the result of which affects whether a student can progress to the second year of their degree programme.

Several academics in Computer Science at Heriot-Watt are involved in teaching the course, two at Edinburgh and one at Dubai. Additionally the programme director and academics who teach subsequent Software Development courses had an interest in wider use of online assessment in Computer Science and related courses. Finally, the introduction of the software was supported by staff with a research interest in technology enhanced learning, computer support officers and admin support staff.

## Rationale

Initially, a clear motivating factor in wanting to use automatically marked online assessments was to reduce the time and effort of marking exams. Unlike many other

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[1] http://www.btl.com/surpass/

[2] The data for this study was gathered using the evaluation methodology developed by the EaseIt-Eng project, comprising an interview with the academic staff, and interview with a group of students and a questionnaire given to all students. For more details see A Palipana, P. Barker, S Rothberg and F Lamb (2002) "Developing a standardised evaluation methodology for computer based learning materials" in *Proceedings of the 2002 American Society for Engineering Education Annual Conference & Exposition.* American Society for Engineering Education, Toronto. URL: https://peer.asee.org/developing-a-standardised-evaluation-methodology-for-computer-based-learning-materials

aspects of teaching, marking increases proportionately to the number of students on the course, and the number on this course has doubled in the last few years. However, mere saving of staff time was not the deciding factor in the choice of system or how it was used.

One prime consideration was the pedagogic suitability of this form of assessment. There was felt to be an obvious natural fit between the subject of computer science and the use of computers for assessment. Similarly it was felt that students of computer science would be comfortable using computers and expect them to be used where appropriate. Furthermore, some learning objectives, especially in the first two years of study, largely concern objective factual or procedural knowledge that can be assessed using question types that can be automatically marked. The answers to these questions are often very precise and well-defined, the human eye is not very good at spotting all the mistakes that might be made whereas computer is.

It should be noted that there are other important learning objectives that are assessed through coursework in the form of programming assignments rather than the exam. This coursework, however, is only a partial answer to assessing students' capability as it is difficult to assess whether the student understands what to do and why, as opposed to their ability to find a recipe to follow using online resources such as stack-exchange. Furthermore marking coursework is a heavy burden on teaching staff with feedback to students typically being provided only slowly. It is hoped in the near future to complement the coursework with online assessment during the course to provide rapid feedback to students to help them and course leaders to  monitor their progress against specific objectives, as well as using it for the end of course examination.

There were also operational considerations in the choice of BTL Surpass. Prime among these were security, reliability and scalability.  It was important that the software can be available across all Heriot-Watt campuses internationally and potentially available where Heriot-Watt courses are offered through accredited learning partners. Heriot-Watt is increasingly offering its courses through non-traditional study modes (for example to work-based learners studying as Graduate Level Apprentices), and so the provision of flexible formative and summative assessments is of strategic interest across the institution. BTL Surpass is already used in one other part of the institution, and it was hoped that it might be an opportunity for some benefits of collaboration resulting from its wider use by other departments.

## Academics' perspective

This. the first use of Surpass in the Computer Science department, was something of a pilot run. As such there was little specialist support provided. The staff involved did not find it easy to learn Surpass (it was agreed that we should have taken more advantage of support offered by BTL). It took some time to create questions and staff found it difficult to understand the workflow from question-setting, through checking, to paper delivery, moderation and exporting results. While the staff feel that they will become more proficient in question-setting with practice, they also see the need for specialist support in other aspects of the workflow. However, overall creating questions and papers was described as 'OK', though there are some limitations in the software which were frustrating or annoying, see the issues section below.

Some of the operational details of running the online exam required time and effort, and highlighted some issues that could be improved in subsequent exams. Additional resources were needed to provide Surpass log-in details to students on day; to set up labs with partitions between PCs, set up the secure client on the PCs in those labs. There would be efficiency gains if this were a regular activity. In Edinburgh, in order to have access to enough PCs we had to run the exam twice, and in four separate rooms each time. (The machines in our large teaching labs run UNIX). Running the exam twice meant setting two sets of questions and also increased the effort required

on the day of the exam. Despite students being informed individually in advance of what lab they should attend and when, there were some problems with students turning up at the wrong lab or wrong time.

These issues notwithstanding, the online exam was deemed successful. The exam ran successfully and the student results were obtained with minimal human intervention. These results were in line with expectations from results from other courses and the students' coursework results. On the basis of this and positive student reaction, it was decided to use Surpass for the Software Development 2 course. In this case some of the issues described above were successfully addressed: by negotiating access to other large PC labs it was possible to have all students sitting the exam at the same time, and there was some more support for academics in setting the exam.

## Students' perspective

The student questionnaire was completed by 60 of the 150 students from the Edinburgh campus. These were students who attended a lecture in the subsequent Software Development 2 course and chose to return the questionnaire, and thus results are available from reasonably large but self-selected sub-group of those students who took the exam, probably representing the more conscientious students in the class. Responses to five-point Likert scale questions indicated a positive student experience, see below.

|  | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| I was able to demonstrate whether I understood the material being tested. | 1 | 2 | 12 | 25 | 19 |
| I felt adequately prepared to use the software. | 1 | 4 | 8 | 24 | 23 |
| I found the software used to deliver the exam easy to use. | 0 | 2 | 7 | 14 | 37 |
| I was able to enter the answers that I wanted to. | 1 | 1 | 6 | 12 | 40 |
| The feedback from the software about whether my answers had been submitted was adequate. | 0 | 5 | 12 | 20 | 23 |
| The computer lab was a suitable setting for this exam | 1 | 4 | 10 | 13 | 32 |

*Table 1: student responses to questions about their experience using Surpass, showing the number of students choosing each option in the Likert scale (1= strongly disagree, 5 = strongly agree).*

Only 3 of the 60 students felt there should be no more online exams. Additionally there was significant strong agreement to the statement "I would like to be able to self-assess for practice while studying" (42 strongly agree, 7 agree) and "I would like assessment to be in smaller chunks during the course (i.e. continuous assessment rather than one exam at the end)" (27 strongly agree and 8 agree), albeit with a desire expressed for "immediate automatic feedback on my performance" (44 strongly agree, 10 agree).

Written comments from the questionnaires and comments from the interview (again, a self selected group of 6 conscientious students) shed some light on the reasons for these responses, which are largely in accordance with the rationale for introduce online assessment. The students liked the general ease of use of the system, found it easier and less stressful to work with the online system compared to paper-based

exams, specifically mentioning worries about the legibility and speed of their handwriting, the ability to flag questions to which they wanted to return and the display of a timer and progress monitor. They also pointed to the naturalness of using an online system to assess computer science "We're computer scientists, we like computers".

While the overall feedback from students was overwhelmingly positive, there were some significant exceptions, which largely centred on operational issues regarding network delays in logging on to the system. There was also a perception from the students that results from an online exam should be available immediately whereas in fact they need to be approved by the same exam boards as any paper-based exam.

## Issues

- Certain characters could not be used: <>& could not be used as possible or correct responses. These characters are essential in computer science in general). Also specialised logic symbols such as $\nexists \in \forall \cup \wedge$ cannot be used at all.
- When providing the same options for multiple fill-the-blanks questions, e.g. in a single block of code, the academic setting the exam had to retype those options for each part.
- In some circumstances students reported questions not displaying correctly in the secure client, with drop-down menus going out of the display area. This can be avoided with careful question layout.
- The secure client checks for and attempts to install updates before running an exam. Our PCs are set up so that updates cannot be installed from student accounts: there was some trepidation that there might be an update to the secure client immediately before the exam.
- The support and planning required to run an online exam differs from that required for conventional paper-based exams: some of this was not in place for the initial use of Surpass.

## Benefits

- Reliable exam scores were obtained for a large class without a large amount of effort in marking.
- The software supports delivery of the same exam across international campuses.
- The software can potentially be used for continuous assessment to provide students with feedback during the course.
- Students clearly appreciate this form of assessment for computer science.
- There was an unanticipated benefit as the staff involved had not realised how happy students with special needs (e.g. dyslexia) would be.

## Reflections

Surpass did what the staff involved in using it hoped it would.

The staff involved hope to continue using Surpass for computer science exams, and aim to expand its use to formative and continuous assessment for the courses on which it is used. Furthermore it is hoped that other Schools at Heriot-Watt will also use Surpass. Overall there is a need for more specialist support and expertise. In the future the academic staff would want to make sure that some individuals within the School or Institution became expert enough in use of Surpass to support colleagues who perhaps would only use it once or twice a year.