THE SPRINTA PROJECT: SUPPORTING STUDENT ASSESSMENT THROUGH A PORTAL

Nicola Bryan and Guinevere Glasfurd-Brown

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Nicola Bryan, University of Essex, njbrya@essex.ac.uk
01206 874369

Guinevere Glasfurd-Brown, University of Essex, guin@essex.ac.uk
01206 872026

Abstract

The SPRInTA Project (Student Portal Resources for Innovative Targeted Assessment), is a two year project at the University of Essex funded through the Higher Education Funding Council for England (HEFCE) as part of Phase 5 of the Fund for the Development of Teaching and Learning (FDTL). The SPRInTA Project aims to develop tutorial guidance and formative assessments for undergraduate Sports Science Students. These resources are being made available via the University's institutional student portal, enabling targeted support for assessment and providing a stimulating learning environment. The Project will disseminate these outcomes and findings to three cognate disciplines and eight Sports Science institutes.

This short paper details the overview and progress to date of the project, with particular reference to a pilot that the project ran involving the development of a large formative Multiple Choice Question (MCQ) bank for a first year Human Physiology Module, BS155

Introduction

BS155, Human Physiology Pilot Module

The SPRInTA Project, which is located in the Centre for Sports and Exercise Science, started in November 2004 and to date has developed a large, formative MCQ bank for a first year Human Physiology module, BS155.

In 2004-05, the Department of Biological Sciences piloted threshold testing in the department. The pilot included BS155, as well as two other modules: BS112 Evolution and Biodiversity, and BS132 Structure and Function of Carbohydrates, Lipids and Pharmacology. The key aim of the threshold pilot was to identify course materials and learning outcomes that each student should know as a basic fundamental of the course i.e. a threshold level learning outcome specifies the minimum level that is required to obtain the degree, any performance above this threshold level adds value to the degree.

The students would then be tested using MCQs at the end of the module on these 'threshold outcomes'. It was expected that the students would have learnt and digested these *basic fundamentals* of the course so the pass rate was set at 80% rather than the 40% needed in the previous year (the end of module MCQ for the previous year tested *advanced* outcomes as well as threshold outcomes). In order to facilitate a deeper level of learning for the threshold outcomes the Department provided the students with a number of formative assessments to prepare them for the final MCQ.

The use and benefit of formative assessment in the sciences is well documented. Daws and Singh (1996) conclude that formative assessment strategies can deepen learning by encouraging pupils to reflect on their learning in a structured and systematic fashion and to discuss their progress with their lecturers and focus on what they need to do to improve and develop greater confidence in their knowledge of science. Black (1998) concluded that formative assessment helps 'low attainers' to improve their learning while raising the overall level of achievement.

The Pilot

In the first phase of the project (November 2004-May 2005), the SPRInTA team authored 600 MCQS using QuestionMark Perception (QMP) software. All questions being authored for the SPRInTA project are designed to be fully IMS QTI compliant to enable sharing of questions between different applications.

The questions were split into four Human Physiology sub-modules and were also split into three levels of difficulty: basic, threshold, and advanced. On the last teaching day of each sub-module the students were sent an e-mail, informing them they were able to access a bank of questions relating to the sub-module they had just been taught. The students were also alerted to the presence of these questions via an alert system on the University's myEssex Student Portal. The Student Portal offers students structured sets of links to online services and information, customised for each user, with further options for users to personalise a range of features. The SPRInTA Project is currently using QMWise to develop automated scheduling of assessments in the portal, so that once logged into the portal a student will be served assessments which are relevant to their learning needs at that point in time.

For the pilot phase, however, students needed to login to QMP before they could access the threshold level of questions. Once logged in, students then took ten randomly selected threshold questions and received feedback for each question and the assessment as a whole. Depending on the outcome of the tests, students were then either encouraged to take another threshold test (if they scored between 60-80%) or re-directed to a more basic set of questions (if they scored <60%) or a more advanced set of questions (if they scored>80%). The aim of this branching within the assessment was to provide a structure which would support a wide range of learning needs. Students were allowed to attempt the formative questions as many times as they liked

and once the assessment was made live on the last teaching day of each sub-module, the assessment stayed open until the end of term.

Incentives

Gibbs and Simpson (2003) have argued that 'you have to assess everything in order to capture students' time and energy'. The SPRInTA team were aware that student uptake of formative assessment can be poor when formative assessment is un-assessed. The SPRInTA team decided to provide an incentive to encourage the students to use the formative assessment provided. Eventually it was decided to place the 30 summative questions within the threshold section of the formative assessments. With this in mind more threshold questions were produced than basic/advanced questions (the 600 MCQ bank was made up of 300 threshold questions, 150 basic questions and 150 advanced questions). The students were informed that the summative questions were within the formative assessment.

In order to keep the forms of assessment consistent for the SPRInTA pilot the summative exam was run online using the same format as the formative questions (QMP). QuestionMark Secure was used with QMP to ensure students could not use e-mail to communicate answers, or navigate to their personal file space on the network when taking their summative exam.

As well as producing formative sub-module assessment it was decided that a week before the exam, the students should have access to a practice exam. Within QMP a test was set up whereby students received 30 threshold MCQs and had 35 minutes to answer the questions. As the summative questions were within the threshold bank of formative questions the assessment was branched so that no more than two summative questions would appear in each 30 question test. Students were limited to 5 attempts at the practice exam.

Results of the Human Physiology Pilot Module

The pilot study has generated a large amount of data relating to student uptake and patterns of usage. Furthermore, detailed analysis is revealing a clear impact of formative assessment on summative results. These data have provided the SPRInTA project team with insights into the relationship between formative testing and summative scores on the three pilot threshold modules, (all of which used a different formative approach).

In addition, students on the Human Physiology pilot module BS155 were issued with a questionnaire after the summative exam, giving them the opportunity to express their views about the SPRInTA pilot, and key findings from this survey are presented below.

Student Uptake

Overall 98 of the 106 Human Physiology students (92.5%) logged into and attempted at least one formative assessment. On average each student completed 45.5±48.6 (mean ±S.D.) formative assessments.

Patterns of Usage

In the eight weeks the formative assessments were available to the students the questions were accessed 6288 times with a total of 4691 assessments being completed. An analysis of the patterns of usage has revealed that the students were not using the formative resources to spread their study time evenly across the module as had been anticipated. There was a peak in the number of completed assessments in the week leading up to the summative exam (see Fig 1 below).

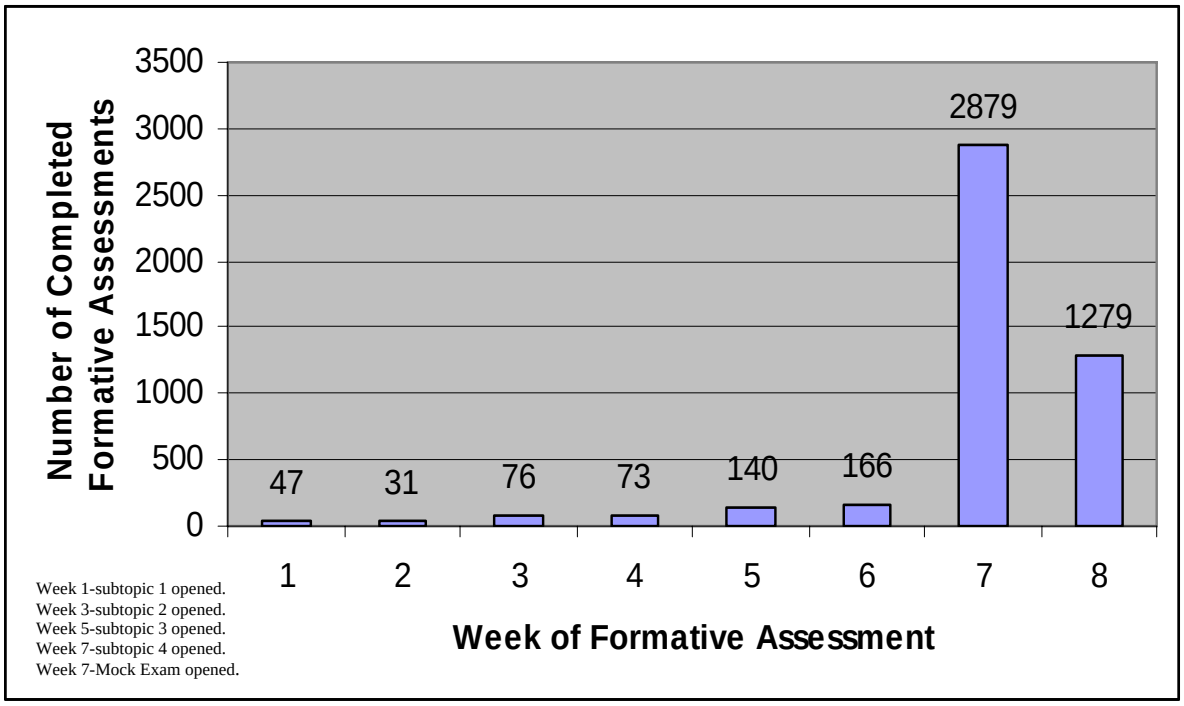

Fig 1. Number of formative assessments completed per week for the formative assessments

Fig 1 demonstrates that the week leading up to the exam saw the largest number of completed assessments; it is worth noting that the summative exam took place at 2.30 p.m. on the Monday of week eight.

Further breakdown of the pattern of usage provided an interesting insight into student behaviour (see Fig 2).

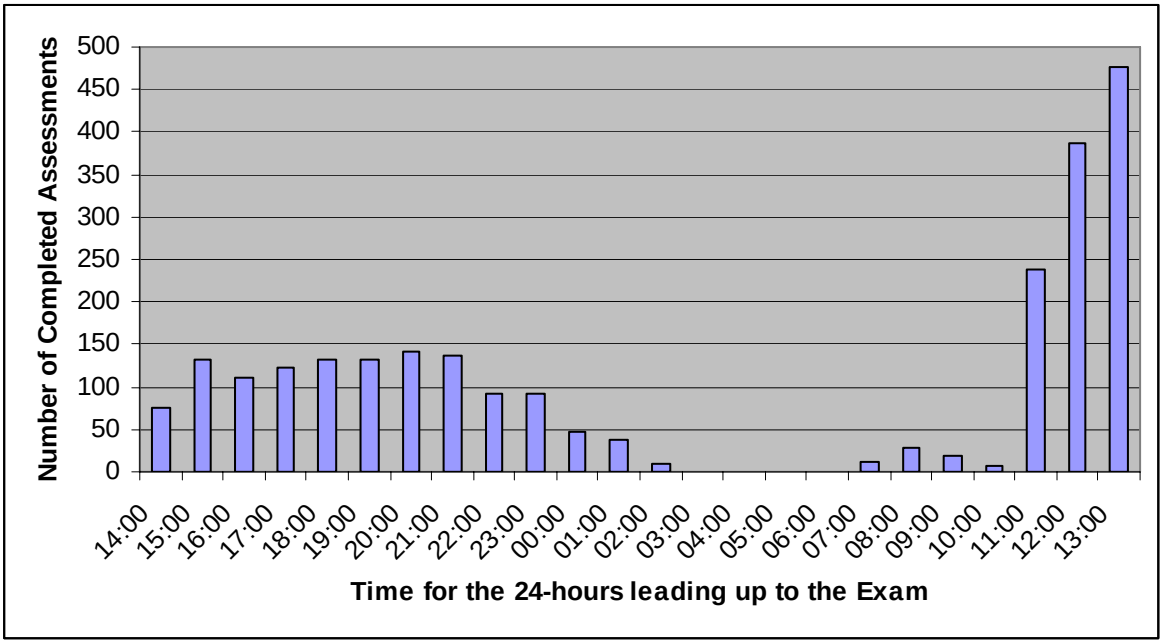

Fig 2. Number of completed assessments by hour in the twenty-four hours leading up to the summative exam

Impact of Formative Assessment on Summative Results

The average score of the Human Physiology MCQ in 2005 (71%±19.7) was significantly higher than the average score of the Human Physiology MCQ in 2004 (46.5%±15.5), p=<0.001 (t-test).

There is also a significant positive correlation between the total number of formative assessments a student completed and their score in the summative exam, p<0.01, r=0.16, (Pearsons product moment correlation; See Fig 3).

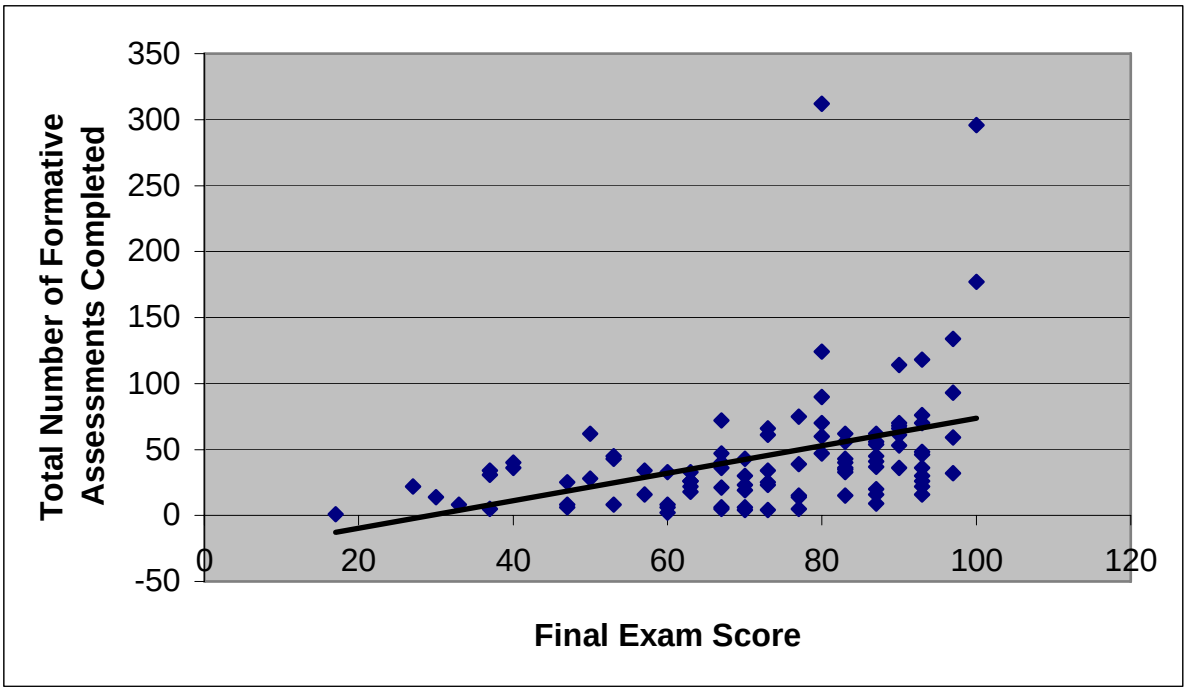

Fig 3. Correlation (positive) between the students final exam score and the number of formative assessments they completed

Analysis of this correlation suggested that students need to complete 57.8 formative assessments to optimise their chances of achieving the threshold testing pass mark of 80%.

Positive correlations were also shown between the final summative exam score and the average formative assessment score, $p<0.001$, $r=0.31$ and the final summative exam score and the average practice exam score, $p<0.001$, $r=0.61$.

Eighty-one out of the 106 registered students (76.4%) took one or more practice exams. Fig 4 shows the number of practice exams the students took compared to the average summative score.

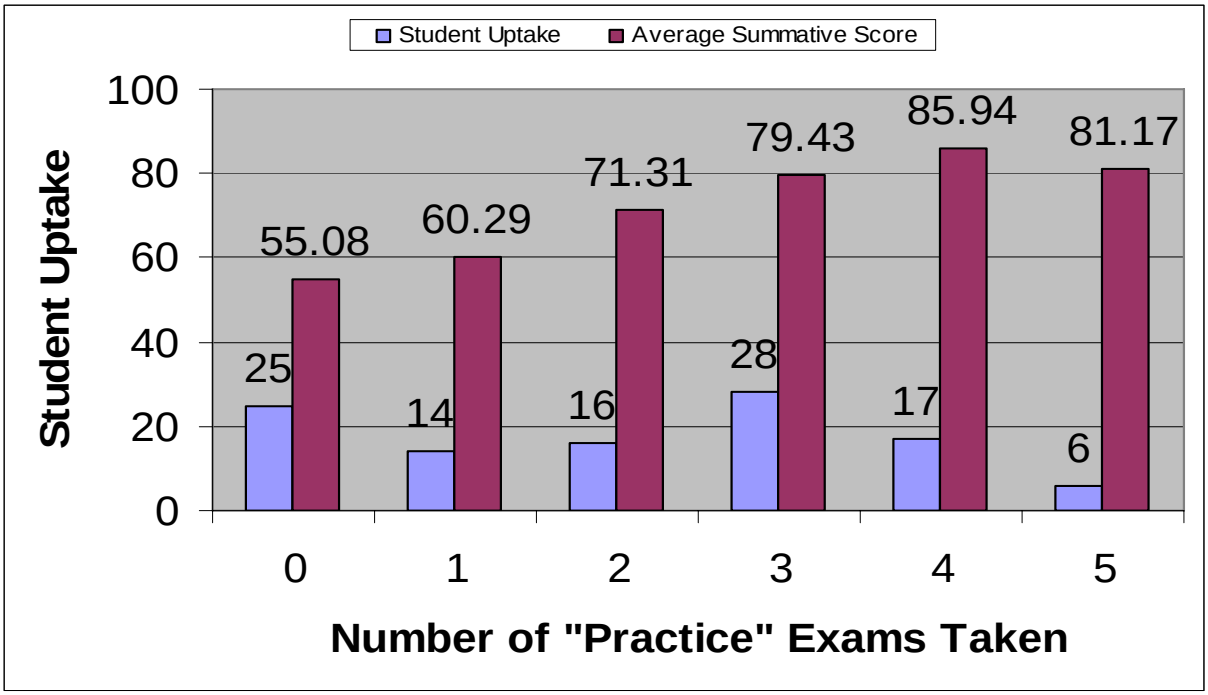

Fig 4. The amount of practice exams completed showing the average summative score from the number of practice exams taken

Fig 4 demonstrates that four practice exams is the optimum number of practice exams. There was a significant difference between the summative exam score of students who had zero attempts at a practice exam and the summative exam score of students who had three or four attempts at the practice exam ($p<0.01$: ANOVA). Students who took three or four practice exams also scored significantly better in their summative exam when compared to students who only took one practice exam ($p<0.01$).

Results of Different Approaches to Formative testing

Human Physiology (BS155), Evolution and Biodiversity (BS112) and Structure and Function of Carbohydrates, Lipids and Pharmacology (BS132) took different approaches to the formative testing pilot. Human Physiology had an extensive formative question bank with limited feedback, BS112 used a smaller question bank (107 MCQs) but had more detailed feedback to each question BS132 used no online formative question banks.

The summative exam scores for 2005 and 2004 for BS155, BS112 and BS132 showed a significant improvement in results for BS155 and BS132 ($p<0.001$) from 2004 to 2005. BS155 showed the most improvement in exam results with the average mark increasing from 46.5% $\pm$15.5 to 71.04% $\pm$ 19.7.

Student Views about the SPRInTA Pilot

BS155 students were surveyed after the summative exam. The survey was optional for the students to complete and generated a response rate of 42.3% (45 out of the 106 students completed the survey). Survey results indicated that students were happy with the formative question bank provided by the SPRInTA project and 96% of students surveyed recommend it for all first year modules. Ninety-three percent of the survey group strongly agreed that it was a useful revision tool with 76% of students agreeing that the questions prepared them better for the final exam. Eighty-nine percent of students surveyed thought splitting the topic into sub modules was very useful and 69% of students thought splitting the questions into three difficulty levels was very helpful. However, only 38% of the survey group found the type of feedback useful, and the general consensuses of opinion was that the students would like more detailed feedback; this is being considered by the SPRInTA team.

Conclusion

There are a number of issues that the SPRInTA team are considering further:

1. Summative weighting

Fig 1 illustrates how students mainly used the assessment in the final week before the exam. In order to spread the students study time out evenly the formative assessment may need to have some form of summative weighting, for example weekly summative MCQs will ensure that the students study evenly throughout the term. This is now being discussed within the Department.

2. Feedback

The survey at the end of the pilot indicated the students would like more feedback. In order to do this with existing resources the number of additional MCQs which are planned for other modules may need to be scaled-down. The SPRInTA team is considering using existing material for example question banks built by other FDTL Projects and other Institutions offering Sports Science, and more time will be spent on this before further question banks are created.

3. Student portal development

A central part of the SPRInTA Project is for all assessments and outcomes to be delivered through the myEssex student portal. This will eliminate the need for the students to login a second time (into QuestionMark Perception) and also makes it possible to remind the student how far they had progressed through the questions in their previous sitting. During the pilot there was an alert on the portal when questions were available, however, it was not possible for students to link directly to the questions through the portal. The SPRInTA technical team is currently developing this capability, using QMWise, and this will be introduced for future banks of formative questions.

The results from the pilot module are encouraging

Student uptake and use of the formative question banks during the course of the pilot was higher than anticipated. Following the success of the pilot module SPRInTA aims to roll out this concept to another five first- year Sports Science modules. The SPRInTA project also aims to develop some short answer formative questions using QuestionMark Perception. There is further information on the SPRInTA Project at: http://www.essex.ac.uk/sprinta/

References

Black, P. (1998). Formative Assessment: Raising Standards Inside the Classroom. School Science Review. 80 (291), 39-46.

Daws, N. Singh, B. (1996). Formative Assessment: to what extent is its potential to enhance pupils' science being realised? School Science Review. 77 (281), 71-78.

Gibbs, G. Simpson, C. "Does your assessment support your students learning?" Learning and Teaching in Higher Education, (2003) 1.