

EVAF4All: Electronic Voting Analysis and Feedback for All

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1. Summary

We propose to develop a web-based system to provide staff and students across different institutions with analysis and visual feedback of data captured using 'clickers' (electronic voting system, EVSs) in their lectures or other teaching episodes. For an individual student, this will allow them to view questions or groups of questions with their own responses (and the responses of the class as a whole) well after a given lecture has taken place on a course, for feedback and revision purposes. For staff, the tool will provide anonymised aggregate statistics and feedback as to the effectiveness of the clicker questions used on their courses, aiding reflection and subsequent development of course materials. The system will be platform independent and will provide 'all in one place' functionality that is currently lacking from integration of common EVS software with Learning Management Systems (LMS).

2. Background and rationale

In recent years, electronic voting systems have become widely adopted through HE, as a tool for interactive engagement and feedback, particularly in large group lectures. The uptake has percolated through most academic disciplines, and much expertise has been accumulated in how to utilise them effectively¹. More and more institutions are routinely providing handsets for entire semesters, using a library 'loanership' model similar to books. The widespread introduction of EVS technology and pedagogy has reinforced the importance of formative feedback as an essential component of the learning process. In some cases, their introduction has catalysed much-needed reform of lectures; still the mainstay of university teaching, but largely unchanged as a format for centuries.

A variety of different hardware (handsets, receivers) and software systems are used to support the use of EVS, all capturing a great deal of data at the point of delivery. Two main companies dominate the UK market; InterwritePRS and Turning Technologies. Both offer software that captures voting data and affords a degree of tutor analysis. However, the vast majority of the data that is captured lies unused, despite offering enormous potential for feedback to staff and students alike. If deployed more effectively, such feedback can become important in the development of independent learning and student autonomy. It is also a potentially a large volume of feedback, since it is not uncommon for courses using EVS extensively to deploy and thus generate data on up to 50 or more EVS questions each presentation.

¹ see for example the online resources at <http://www.psy.gla.ac.uk/~steve/ilig/>

This project proposes a simple but effective solution to this missed opportunity. We aim to provide a web-based tool that will allow effective aggregation of this data, and is able to make it visible to students and staff via a common interface. We will facilitate this by providing solutions to tap in to the 'loanership' schemes thus providing us with the identities of the students who use the clickers during EVS sessions, uniting student voting data with a particular clicker.

3. Description of the system

The system will be authored by one of the project applicants (KB), an e-learning developer with several years experience of undertaking major software development projects at the University of Edinburgh. The back end technology will be based on SQL, with Ruby/Rails being used for the front-end web interface. A similar design has been tried and tested in previous software development projects, most notably a class signup tool that is used to allocate more than 1000 students across many different courses, to timetabled tutorial / laboratory groups within academic units at Edinburgh. Wherever possible, we will make use of open source and freely-available tools in the development, such as the Google chart APIs for graphical display of voting data.

The system will have a single interface, with different functionality for staff and student (and administrator) roles. Staff will be able to upload their question data via a simple, form-based web interface and be able to build up an aggregated (yet anonymous) picture of whole class results. This will provide valuable feedback as to which questions classes found easy (typified by virtually all students selecting the correct answer), difficult (all selecting the wrong answer), which were tricky questions (no clear response pattern) and what have been termed 'banana skin' questions (typified by all student tending to choose the same incorrect answers). Such diagnostic feedback can then be utilised to inform subsequent course delivery and question development.

Students who have their handsets on a 'loanership' scheme as described above will be able to have access to whole-class responses and, importantly, be able to view their own responses for questions or sets of questions. This is valuable formative feedback, allowing them to assess their progress throughout the course and, for example, highlight sections with which they have had problems etc.

The system will be authored and developed in Edinburgh, but the project will recruit other institutions to take part in development testing and piloting of the system. Initial discussions (via the Jiscmail Electronic Voting Systems mailing list) have indicated there would be a great deal of interest from the community for a tool such as this. We have already received expressions of interest to be potential project partners from the Universities of St Andrews, Bath, Leicester and Aberdeen. We believe that this is a genuinely cross-discipline and cross-institution project that addresses a specific enhancement need within a technology of wide uptake.

4. Innovation and originality: going beyond what is currently available

The major innovation behind this project is the simplicity of the idea, and the fact that it has potentially wide uptake across the sector. It offers learning gains (and efficiency gains) for students and staff. Additionally, it is also very timely given the recent growth in uptake of these systems. Finally, it closes the feedback loop between delivery of these questions and follow-up work, an area which recent student satisfaction surveys (eg the NSS) have illustrated is an area with room for much improvement across many disciplines and institutions.

It is important here to stress the novelty and originality of the system that is proposed: its functionality extends beyond what is currently possible with third party software and LMS. EVS software provided by the 2 main UK distributors both have a certain amount of analysis functionality and both will interact with certain LMS (typically only Blackboard / WebCT) and permit data import into the GradeBook feature of these. However, the design of such the analysis and export facilities within third party EVS software is almost exclusively tutor-focussed, whereas the EVAF4All system stresses the importance of feedback to both students and staff.

The EVAF4All system will have the following advantages:

- It will work with any capture software (that can provide an export of collected data as a .csv file or similar)
- It will be accessible from any OS (one of the main EVS resellers distributes software that will not work on anything other than a Windows platform)
- It will provide data 'all in one place' for students and staff. (Typically when importing EVS data into the Gradebook feature of WebCT / Blackboard the response data is presented in isolation. EVAF4All will allow linking in to specific question datasets or linking out to other resources, plus a screenshot of the question).
- It will permit other staff to act as 'auditors', with permissions to view data that is collected (this is troublesome with other EVS software as it tends to write to local filesystem).
- It will present a student with their individual response plus whole-class data at the same time (this is not possible with current EVS software export to LMS Gradebooks.)
- It will unite individual student data to provide personalised feedback to them, whilst at the same time maintain anonymity of collected data to staff (The rising use of 'loanership' schemes of handsets finally makes it feasible to 'complete the circle' in software and correctly identify students with their data, while maintaining the bond of anonymity from staff. This was not previously possible. This is particularly important since some studies have shown – and our own evaluation supports this – that students are motivated to take part in EVS sessions because the stakes are low and the process is effectively anonymous at the point of delivery. Staff are not interested in which individual responded in what way, but more on the overall performance of the class.)
- It will link in (via well-defined interfaces) to LMS, student information systems and to clicker-loanership systems, using database linkage, sftp download and upload of data. (It will

thus not require manual updating of class or clicker lists, but can automate these functions, making it as easy and as quick as possible for staff to return feedback and data to students. In principle the only manual step would be the upload of class response data by the lecturer after a class.)

- It will have pre-programmed 'standard' staff queries for aggregate data, such as 'display all questions where less than 30% of respondents selected the correct answer' (This will make evaluation and analysis of the questions easier).

5. Relationship with JISC eLearning vision, principles and objectives

The proposal embodies many of JISC's standards and practices: it will be provided free to the community; it will be based on existing web standards and will be designed with transferability and interoperability in mind. The project team have a proven track record of the design and development of modular and open web tools to support student learning. Underpinning the project is that it is based on an educationally-sound rationale; utilising a widely-used and proven technology (EVS systems) and leveraging benefit for teaching and learning. The project is also highly relevant to the current JISC Formative Assessment process modelling exercise that is currently underway.

6. Project work packages (WP) and deliverables (D)

The project will start in Jan 2009 for 1 year.

WP1: We will consult existing EVS users (via the JISCmail list, HEA subject centres and also our own contacts). Interested potential project partners will be directed towards a short online survey to provide details and information gathering about use of EVS systems and integration with institutional information services. (Q1) **M1: 3-4 partner institutions selected, local contacts made and initial visits undertaken.**

WP2: Our approach will be to rapidly develop a basic instance of the system (1st iteration), based on requirements at Edinburgh. This will then be demonstrated to partners to seek feedback and development aims for 2nd iteration. We will focus feedback on data input (student ids and questions); visualisation for staff and students (Q1-2) **M2: initial proof-of-concept system, with specific development feedback.**

WP3: Based on this feedback, we will develop a 2nd iteration of the tool, followed by testing with partners, employing 'real' data for the first time (Q2-3) **M3: system deployed after second development cycle.**

WP4: We anticipate rollout of the system and support for the start of academic year 09-10. We will evaluate uptake (tracking) by staff and students (Q4)

WP5: We will prepare the project final report, complete with evaluation undertaken to date. (Q4)
M4: Project outputs will be the tool and documentation, plus data and evaluation on uptake and usage.

8. Project team

PI: Professor Simon Bates

SPB is Professor of Physics Education and Director of Teaching in the School of Physics and Astronomy. Over the past five years or so, he has developed an interest and research effort in Physics Education and has published and presented widely on the application of learning technology to support on-campus teaching. He has been a member of the Higher Education Academy Physical Sciences Centre Advisory Committee (until 2007) and is a member of the JISC e-learning experts group. Most recently, he has been involved with the second phase Learner Experiences projects, as a project member of LEaD (Learner Experiences across the Disciplines) and will present a half-day workshop on this project at Online Educa Berlin in December 2008.

E-learning developer: Keith Brunton

Keith Brunton is an e-learning developer in the School of Physics and Astronomy at Edinburgh. Over the past 4 years he has been lead developer on a number of successful school and college-wide elearning and administrative projects. He was a developer on the COSMaP Project, a cross-School collaboration aimed at improving core maths skills by flavouring the material according to students' degree interests. He is a member of the university's e-Learning Professionals and Practitioners Committee.