Addressing the challenges of assessment and feedback in higher education: a collaborative effort across three UK universities

Conference or Workshop Item

ADDRESSING THE CHALLENGES OF ASSESSMENT AND FEEDBACK IN HIGHER EDUCATION: A COLLABORATIVE EFFORT ACROSS THREE UK UNIVERSITIES

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Abstract

Assessment has been identified as one of the major challenges faced by Higher Education Institutions (Whitelock, et al, 2007). As a response to the challenge, in a project funded by the Joint Information Systems Committee (JISC) Open Mentor (OM) was developed as a learning support tool for tutors to help them reflect on the quality of feedback given to their students on assignments submitted electronically. Its development was based on the fundamental theory that there was convincing evidence of systematic connections between different types of tutor comments and the level of attainment in an assignment (Whitelock, et al 2004). OM analyses, filters, and classifies tutor comments through an algorithm based on Bale's Interaction Process. As a result, tutor's feedback comments are classified into four categories namely: Positive reactions, Teaching points, Questions and Negative reactions. The feedback provided is analysed against an ideal number of feedback comments that an assignment given a mark of a specific band should have. Reports are provided in OM to support tutors in the task of reflecting on their feedback structure, content and style.

The JISC-funded Open Mentor technology transfer (OMtetra) project is continuing the work initiated by the Open University implementing OM at the University of Southampton and King's College London. OMtetra aims at taking up OM and extending its use by developing the system further and ultimately offering better support to tutors and students in the assessment process. A group of tutors from the University of Southampton and Kings' College are at present using OM in their teaching and assessment. In this paper, we explore potential improvements to OM in three aspects: user interface, technology implementation and analysis algorithm design.

For the user experience aspect suggested additions to OM include the creation of a simple entry form where tutors may validate the results of the analysis of the feedback comments. In addition, enhancements to OM will facilitate uploading of students and modules information into the system. Presently, OM utilises a built-in database of users that needs to be maintained separately from institutional systems. Improvements for this system feature include a more flexible authentication module which would simplify the deployment of the system in new environments and thus promote uptake by a larger number of institutions. In order to reach this goal, the system will be migrated to an open source framework which provides out-of-the-box integration with various authentication systems. The last to improve is the analysis algorithm. Currently, OM classifies tutors' comments into four categories by applying an underlying text matching algorithm. This method could be improved if tutors are allowed to confirm comments' classification through the OM interface and a free-text classification algorithm. As the number of users grow, so will the algorithm and analysis process, making it more comprehensive and intelligent as the keywords used during analysis are dynamically expanded.

OMtetra is an on-going project with a lot of potential. We believe that the outcomes from the development and trial implementations of OM will contribute highly to the area of assessment in higher education.

Keywords: e-assessment; tutors' feedback; Bale's Interaction Process; feedback analysis.

1 BRIEF HISTORY OF OPEN MENTOR (OM)

When the Open University developed OM it did so as a response to the challenge of delivering meaningful and learning-conducive assessment to students, which had been identified as one major challenge in Higher Education Institutions. Five years later, the challenge remains and probably has increased in complexity as the proliferation and widespread use of Virtual Learning Environments and Portfolios allows tutors and students to archive written assignments and feedback in order to keep track of the learning progress of a particular subject.

Students give great value to feedback for a number of reasons, one being the obvious mark, but also and interestingly, because learning about tutors' views on students' learning and performance motivates individuals and encourage deep learning of a subject (Higgins et. al., 2002; Rust et. al., 2003).

Considering the impact that feedback may have on students' engagement and attitude towards learning, it becomes easy to see why tutors' feedback must be as good as it can possible be, *good* meaning useful, strategic even, written so that the student receiving it understands the ways in which their work may be improved. The goal of OM is then to support the tutor in writing this good, high-quality feedback in a systematic way by means of a technological solution that will enhance the quality of the feedback without adding an extra load of work to the tutor. Furthermore, unifying the assessment criteria used by tutors to evaluate student's work, helps tutors to clarify "[d]ifferent assumptions about the nature of writing [which] are being brought to bear, often implicitly, on the specific writing requirements of their assignments" (Lea & Street, 1998, p. 160).

1.1 Open Mentor

The Open Mentor architecture is based on the following main components (Whitelock & Stuart, 2007):

- A data source for course information and lists of students and tutors
- A data source to store submissions and classified comments
- A classifier which categorises tutor comments
- An extractor which reads tutor comments from word processed files
- An evaluation scheme description which defines the classes of comments, the grading bands and the expected benchmarks
- A logic component which applies the evaluation scheme to the classified comments

How does Open Mentor work?

Open Mentor reads an assignment uploaded in Microsoft Word™ and extracts the comments inserted by the tutors. OM then processes and classifies the feedback comments using the algorithm programmed in the system. This analysis process is performed by OM internally, so that only the results of the classified comments are displayed to the tutor. Reports of the analysed feedback are presented using a standard charting component which utilises a bar chart. In the reports, tutors are able to see two bars, one in which the results of the analysed feedback and one with the ideal (under the Bale's framework) comment distributions for an assignment marked under the band specified by the tutor. This side to side comparison allows the tutor to study the types of comments given to the student with respect to the mark awarded and enhance the feedback provided to reach the ideal.

2 OMTETRA: USING OPEN MENTOR AT KING'S COLLEGE, SOUTHAMPTON UNIVERSITY AND THE OPEN UNIVERSITY

With the purpose of expanding and enhancing OM, collaboration between KCL, UoS and the OU was organised through the OMtetra project. OMtetra aims at exploiting technology-enhanced feedback to enable more authentic and more useful feedback on assignment performance, thus improving assessment quality, enhancing the student experience, and supporting staff. The goal will be reached by packaging the OM technology innovation of the Open University and supporting its transfer to two external institutions, initially, addressing their identified needs for improvement of student feedback. OMtetra is an on-going project which initiated in September 2011 and will end in July 2012. The project takes place in two separate implementation phases spread out in Semester 1 and Semester 2. Currently, phase 1, referred to as Pilot, 1 has been completed and the tutors involved have provided an evaluation of the system which will be used to guide the development of enhancements to OM features which then will be trialled in phase two of the project, Pilot 2.

3 RESULTS OF PILOT 1: TUTORS REPORT THE USE OF OM

During Semester 1 in 2011, tutors at King's College and the University of Southampton have used OM to analyse the feedback given to the students on their written assignments. The tutors involved in Pilot1 agreed to be interviewed and provide us with an overall evaluation of OM. Their feedback was used to plan the enhancements which are detailed in the following section of this paper.

Tutors at the UoS involved in the project reported a need to see improvements on OM's functionality. The following elements were listed as useful improvements to the system: alphabetical order listing of students whose assignments are uploaded; a module for the management of assignments uploaded where operations of viewing, deletion and editing of files may be performed; enhancements to the file extensions accepted by OM to include text or docx files; a module to give students' autonomy to upload and handle their assignments; enhancement in the feedback classification scheme used by OM to analyse feedback. This with the purpose of analysing feedback constructed outside Bale's expected terminology and/or structure.

Tutors at King's were very positive about the opportunity they were given to receive comments on their feedback, as they had not received this type of feedback before in a structured fashion (feedback on assessment practices is received but not consistently at tutors' meetings and sometimes at programme exam boards). They were appreciative of the multidisciplinary aspect of the system, however one of them commented on the particular idiosyncrasies of disciplines that might make evaluating feedback across different disciplines difficult. They would like the system to have a purely formative function (which they claimed would be useful for feedback on draft assignments and where the summative aspect could be 'switched off' (e.g. in feedback given to PhD students). They did not face usability issues and they appreciated the induction that was offered to them, however one of them pointed out that uploading the assignments was laborious and requested help to complete this task.

4 PREPARATION OF PILOT 2: ENHANCEMENTS TO OM

4.1 User and data management

Open Mentor currently maintains its own database of users and authentication credentials. This is an additional administration burden when running a large-scale service. From this perspective, an important improvement to Open Mentor's functionality would be a module for user authentication that could integrate with a university's system. This is not a technically demanding problem, as there are solid technical standards, such as LDAP-compatible modules, that are widely used for this purpose. For example, OM would migrate to Spring Security[1] Framework (previously known as ACEGI Security Framework), which support various authentication systems out-of-the-box, such as Lightweight directory Access Protocol[2] (LDAP) and Shibboleth[3] -both widely used technologies in a large number of institutions. In this case, the users and course information in other management system would not be duplicated in OM's own database, but they would be referred by OM after the configuration, so that other modules in OM can reuse the existing resources from external systems.

At present, Open Mentor also used a built-in database of students, courses, and even assignments. In this area, while there are standards, there is nothing close to the same level of convergence that there is in authentication. In many cases, using built-in databases of students and courses is acceptable, although ensuring that it is usable remains a challenge. However, exposing a clear separation between OMtetra and each of the independent data source components would make it much easier for this data to be drawn from external data sources, such as LDAP servers, VLE databases and web

[1] http://www.springframework.org/spring-security

[2] http://tools.ietf.org/html/rfc4510

[3] http://shibboleth.internet2.edu/

services. Interestingly, the actual design of the user management component in the backend of OM is left open, which allows OM to use some open framework to extend its user management module. OM can be running as a standalone application if no external resources are provided. But OM can be integrated with existing academic management systems, where data sources for student, staff, course lists and assignment content are provided. Having applied the Spring Framework to the architecture of OM facilitates integration of other institutions' own resources with OM. Subsequently, if an institution wants to integrate OM with their own resource of users and courses in an academic management system, a new component, like an OM plug-in, can be easily provided thus reducing implementation and configuration time.

In both cases, the architecture of Open Mentor provided the basic structure required to connect to external data sources. Both the authentication systems and the databases of students and courses are managed as separate components, and could be replaced by institution-specific replacements without modifying the existing code. In the case of authentication, a more flexible approach will be introduced by migrating the system to Grails, an open source framework that provides out-of-the-box integration with various authentication systems. For institution-specific data, improving the documentation, and providing example web service implementations, will significantly assist integration with a university's system.

4.2 Usability enhancements

Several usability enhancements are planned, ranging from improving user control over the analysis algorithms to improving data management, and to interaction with the analysis results. Usability changes to the analysis are a consequence of the (currently poor) performance of the analysis algorithm, and will be discussed in a moment.

A second major concern for usability is the management of any built-in database of students, courses, and assignments. In Open Mentor, these were not editable within the system – at all. Ideally, institutional sources would provide this data, but in practice, much of the time built-in databases would be fine so long as they could be maintained effectively. To accommodate this, allowing bulk lists of students, courses, and assignments to be uploaded would be a major improvement to the maintainability of the OMtetra.

Finally, there are many small usability improvements to be made to the OMtetra interface. When originally developed, Open Mentor avoided use of JavaScript entirely – modern JavaScript toolkits such as JQuery and flot allow data to be displayed – and used interactively – in all browsers. Ajax-type interfaces also enable an exploratory type of data analysis that was not possible in Open Mentor. By observing the interaction needs of the tutors, and identifying the key weaknesses in Open Mentor, OMtetra will be better placed to meet the tutors' requirements.

The enhancements explained above are exemplified with system screen shots as follows.

4.2.1 Assignment uploading process and user interface

When uploading an assignment, the user must give a title to this assignment. However, this title is not given at the same time as uploading, but before that. Figure 4.2.1 shows the process of uploading an assignment to a course in Open Mentor. On the 'Assignment title' drop down list, we can see that the list is empty because no title was given before and the user is not able to input the title either at the same time. The user needs to click the 'Manage Assignments' button first to give a title which is shown on Figure 4.2.2, otherwise OM will not allow the uploading operation to continue. This process and user interface makes users very confused especially the first time user. So during the enhancement development stage of OM, we should provide a more user friendly interface which makes the uploading process more logically.

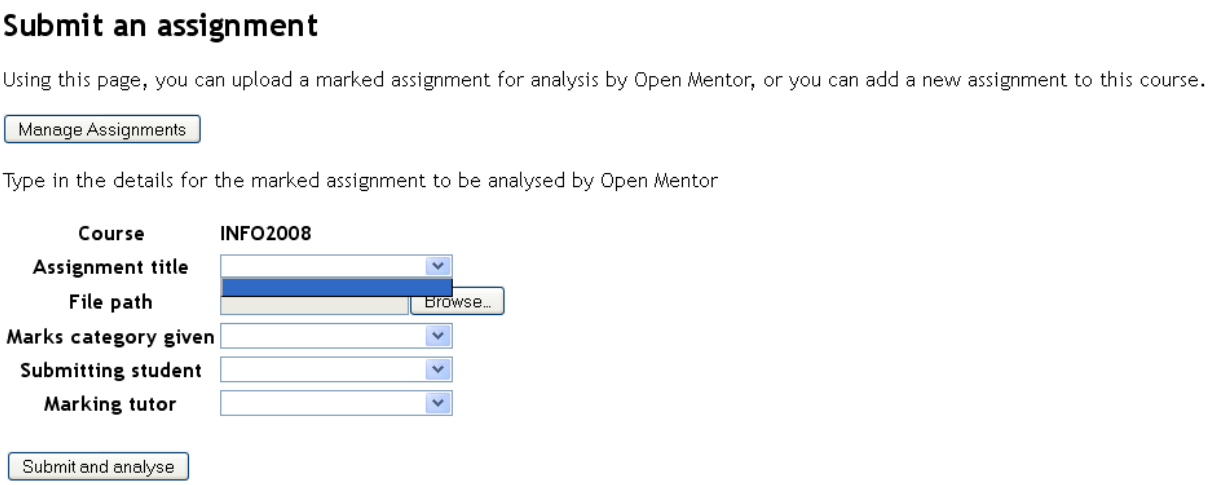

Figure 4.2.1 Upload an assignment in Open Mentor

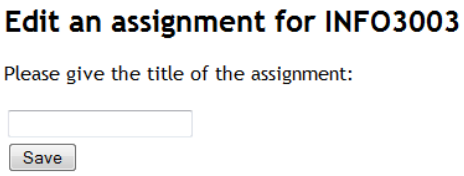

Figure 4.2.2 Give a title to an assignment

4.2.2 Bulk assignments operation

In current OM, a user needs to upload individual assignment into the system. In some cases, the work load is heavy. For example, if a mentor evolves in teaching two courses and the mentor has got 50 assignments in each course. In this case, the mentor needs to do the uploading 100 times when he/she wants to use OM to analyze all the assignments.

4.3 Analysis algorithm

Another feature we have identified for improvement is the analysis algorithm. Originally, Open Mentor classified tutors' comments into four categories by applying a naïve text-matching algorithm. This involved building a substantial collection of comments, manually categorizing them, verifying inter-coder reliability, and then generalizing to a set of static patterns – implemented as regular expressions. The analysis algorithm simply works through the patterns to find the best category match. This is technically complex to maintain, and fragile. The ideal analysis algorithm should require minimal maintenance, and where possible, any maintenance should be implemented to take place automatically through the tutors' use of the system.

Classifying comments is a challenge because there is a comment genre – comments have a form that is distinct from their topic. Positive comments on philosophy essays are similarly structured to positive comments on business essays. It is this aspect of form that allowed the pattern-based approach to work as well as did. A successful analysis algorithm will need to be sensitive to the form of the comments, without being confused by changes in topic. In practice, this means it needs to use structural features (e.g., word orderings, punctuation) as well as linguistic ones (Dewdney et al., 2001; Watt, 2009). A simple 'bag of words' classifier is not sufficient. Genre-based classifiers typically require more complex feature identification – and this is a strength of the pattern-based approach.

Allowing tutors to provide feedback to the classifier through the OMtetra interface would also be a significant improvement. Then, as the number of users grows, so will the quality of the analysis process, making it more comprehensive and intelligent as the precision of the classification improves. However, this is a challenge – it is important that as tutor feedback is incorporated, any changes to the classification still comply with Bales' Interaction Process model.

There are a number of classification algorithms that are amenable to this approach, and that can incorporate feedback through manually classified exemplars. Support vector machines generally perform well in text categorization, as do case-based classifiers (Watt, 2009). Both approaches typically offer better accuracy than a pattern-based approach, and are more maintainable. Some empirical work will be required to provide a definitive recommendation – and it is possible that both approaches are made available, with the option to select configurable by a local administrator.

5 PRELIMINARY CONCLUSIONS

Tutors views on a system that allows them to enhance feedback and improve the positive impact it has on students' learning and performance are quite positive. However, there is a risk of the process outweighing the potential benefits of the system if technology does not simplify the process of submitting an assignment for analysis and the analysis itself is not flexible to accommodate different feedback styles and profiles of tutors adhered to institutions with specific working cultures.

The advantage of planning OMTetra in the way it has, with two pilots and development half-way through the project, allows for technology to 'catch-up' with users' requirements and expectations of a system like OM. We are confident that the changes on the system will improve evaluation of OM greatly towards the ending of the project.

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