

ClaSS Technical Whitepaper

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Abstract

ClaSS (the ClaSS Student System) is an information and knowledge management solution for schools and other deliverers of training and education. The software uses the latest in web-based application methodologies to deliver a sophisticated interface to the user's desktop from a single centrally hosted server. ClaSS provides an accessible and timely intervention into the learning environment, closely integrated with the existing information processes. An outline of the application's architecture is given, along with a description of the current feature set and an outline of the priorities for future development.

1 What is ClaSS?

The responsibility of educators to continuously assess, record and report upon the learning process is an established necessity in contemporary pedagogical thinking. It is seen as essential in maximising the achievements of learners. Combined with the more conventional administrative burden of running an enterprise on the scale of even a small school, this need has engendered a large number of software products known collectively to the educational market as information management systems (IMS).

The core IMS functionality demanded by managers of education dealing with student, curriculum and staff information has been supplemented by a diversity of separate products to deal with specific parts of the educational process (exam entries, course-work moderation, reporting to parents) or targeting schools with specialised needs (learning difficulties, behaviour management, staff development).

ClaSS is a radical reinvention of the now well entrenched IMSs to be found in establishments associated with the UK educational system. With the aim being to capture and synthesise information from every aspect of a student's educational experience, ClaSS is designed to deliver a true knowledge resource which can provide reporting and access to all parties with a stake in the educational process from learner, teacher, administrator, to parent.

2 Why ClaSS?

At ClaSS's conception nearly three years ago a number of seemingly disparate factors were suggestive of an opportunity. These factors have now crystallised into an active demand from users for a solution with which they can actually work.

The inadequacies of current proprietary offerings has grown to be an established wisdom amongst a majority of school administrators struggling to deal with their unwieldy complexity. These desktop applications, heavily invested with years of development, have code bases rooted in a different era of computing. The current trend to graft web-interfaces onto these have only highlighted their shortcomings. Designed to replicate office processes and meet the administrative demands passed on to schools by government they are not integrated in any way with the front-line needs of teachers or learners, the primary point of synthesis for student information.

A number of projects can be found which share the aim of offering an Open Source Software (OSS) alternative to the proprietary IMS products. All are at very different stages of maturity, and all but one are closely tied to educational procedures outside of the UK system. This at a time when BECTA, the UK agency for technology in education, is actively promoting the case for OSS in schools. In a report from June 2005 they state:

”Senior staff and administrators were less receptive to the use of OSS for administration and management purposes, due to lack of compatibility and interoperability with existing packages.”

The lack of a mature and complete OSS IMS solution is soon to become a profound barrier to the full adoption of OSS software by UK state schools.

The initiative by the Department for Education to establish an open standard for data interchange, the XML Common Basic Data Set (CBDS), has levelled the barriers to new entrants into the market and provided an invaluable blueprint available to all who wish to meet the considerable demands of

reporting to government. Its adoption by all IMS systems also addresses the above interoperability issues.

While the act of teaching may still be tied to the classroom, learning is not. The enthusiasm with which educators and students alike have adopted web-based tools is testament to the extent that learning has now become a truly non-localised activity. The facilitating technologies for this mini-revolution have now reached a degree of maturity which allows even the most complex of applications to be delivered using web-based protocols. While users become increasingly at home with interfaces contained within the conventions of their web-browsers the opportunity to deliver IMS services using a web-based approach is now technologically viable and educationally desirable.

3 The ClaSS Solution

3.1 Architecture and Technical Overview

The aims which have shaped the design of ClaSS are common to many open source applications. Because of this the combination of the Apache web-server, a MySQL database, and a scripting language such as PHP all running on a Linux system (the LAMP stack) is now well established within the industry.

- To stimulate uptake, ClaSS should be easily deployable on any web-server. The Apache/MySQL combination is to be found on the widest range of platforms beyond Linux, and has reached near-saturation level amongst Internet Service Providers.
- To promote development and extend its reach to schools with specific needs, ClaSS should be easily modifiable by anyone who is technically inclined. PHP is a language with a very gentle learning curve and the choice of a structured programming model over an object-oriented one makes the code easy to modify and augment. Scripting and template engines have also been rejected for the same reasons. As far as possible, variables are systematically named and code reuse is encouraged with a library of functions. A modular structure built around the core administrative base allows additional functionality to be plugged in with new modules. PHP is particularly well furnished with functions for working with MySQL.
- To facilitate simple integration with other open source applications in the educational arena such as virtual learning environments, content management systems, timetabling solutions and office applications. Again LAMP is the most commonly utilised platform, and the sharing of MySQL tables allows for direct integration in some core areas. The PEAR libraries for PHP provide a rich resource for data exchange. The PEAR:XML_Serializer and Unserializer are utilised to provide for the import and export of data files, and to implement the CBDS XML-schema.
- To present a simple and smooth user interface which is deliverable to any desktop. The Mozilla Firefox browser is available on all platforms and has risen to dominate the Linux and Mac desktops. It is also increasingly deployed on Windows desktops, where it is valued for its improved security, customisability and advanced functionality. By adopting Firefox as the sole supported browser, it is possible to adopt strict standards compliance and at the same time simplify code development. A unified and optimised interface is then guaranteed to every user.
- To reduce demands on the server and share processing load with the relatively powerful machines which will soon be almost ubiquitous on the

client-side. The task of display formatting is handled using CSS which also provides for opportunities to add responsive elements to the interface. Where print output is required, the ability of the PHP to deliver raw XML content to the client is used, with the power of client-side XSLT transformations combined with CSS producing the print-ready output.

- To increase the interactivity and speed of the user interface without losing the familiarity of HTML forms. Each of the modules runs within independent frames, the submitting and loading of data being entirely independent in each. A parent frame controls the visibility and display of the module frames using Javascript to manipulate the DOM. This architecture allows for multiple server connections, the actions in one frame influencing or pre-empting the server requests in others. While the design predates the coining of the currently fashionable Asynchronous Javascript and XML (AJAX) acronym for such frameworks, it is similar in architecture. Although XMLHttpRequest has not been utilised, the result is a similarly rich and responsive user experience. The long-term intention is to further increase the sophistication of the browser interface by using XUL to customise Firefox.

3.2 Feature Highlights of the 0.5 Release

The modules are presented to the user as tabbed 'Books'. The core functionality which ties them all together is provided by the LogBook and the Admin pages. Each 'Book' provides a window on the information tailored to a different audience or context.

3.2.1 LogBook and Admin

- personalised user profiles based on in-school duties and categorised as pastoral or academic
- system permissions based on staff responsibilities to tier access to student information
- log-in authentication using encrypted passwords stored in the database, limited lifetime encrypted cookies and an IP-address check
- user access logs
- file import tool for staff, student and parental data
- plug-in 'curriculum packs' to define courses and subjects for the curriculums of different educational systems and age ranges
- start-of-year functions to generate the curriculum structure, teaching classes, and to populate class-lists with students

3.2.2 InfoBook

- search facility to find and group students based on various criteria
- single-page student profile provides a snapshot and a point of entry to all of each individual student's records
- generic tables for user-defined supplementary information such as prizes, activities, background circumstances, etc.
- a dedicated section for students with special educational needs (SEN)
- parental contact information and addresses ordered by priority and with links to siblings

- supporting information including religious belief, first and second languages, nationality, etc.
- area for posting staff comments to record praise and concerns, organised by categories

3.2.3 MarkBook

- personalised management of teaching classes and class lists
- alternate views by subject or course for the staff with relevant responsibilities
- spreadsheet-style display of marks and grades for individual or multiple classes of students
- a set of functions to operate on columns including averaging, summing, levelling, ranking and copying
- a quick but sophisticated hide/show tool to manage the display of large numbers of mark columns
- a core set of grading schemes and mark-types predefined by each curriculum pack
- tools to construct user-defined mark-types, grading schemes and levelling boundaries
- a one-click shortcut to view cross-curricular tracking assessments for an individual student
- flagging of SEN students and one-click access to their individual profile
- highlighting of students with recent concerns and one-click posting of fresh comments and concerns
- linking of mark columns to predefined assessment grades for tracking and reporting
- compound columns to combine numerous marks into one
- special columns for editing and viewing subject reports to parents

3.2.4 ReportBook

- auto-generation of columns in the MarkBook for assessment grades by subject or course
- overview of assessment grades for students grouped by year or form
- averaging and statistics for assessment grades by subject or type of assessment
- a tool to create the structure of subject reports for parents, including the auto-generation of mark columns, and the linking of existing assessments to subject reports
- user-editable XSLT and CSS templates for presentation of subject reports to parents
- a tool to collate and print subject reports to parents individually, by form-group, by subject or by year-group
- a tool to collate and print comments and concerns during a certain period, again by subject, by form-group or by year-group

4 Roadmap for Development

The current stable branch is 0.4, with the most recent version being 0.4.2, released in January 2005. Since then work has moved to the 0.5 branch for developers. The next stable release will be 0.6, ready for the new academic year at the end of August. The 0.6 release will incorporate the feature set described above and is considered a highly functional and useful application for deployment in schools. It is a significant milestone in the development history, meeting the core aims of managing student information, tracking and reporting to parents.

4.1 Outstanding Development for 0.6

- foundations for making the user interface multi-lingual and adding language packs as an option to the curriculum packs
- improved password management, including forgotten password option in the LogBook
- the incorporation of an XML-based DocBook user manual powering help-tips in the user-interface
- generic export tool for writing displayed tables to CVS or XML files
- a true copy and paste tool in the MarkBook
- customised login for support and office staff to simplify access to back-office functions and to integrate as well with office processes as it does with classroom processes
- email notification to pastoral staff of concerns or comments posted with priority status

4.2 Development for 0.8

The focus for 0.8 is the integration of ClaSS with software applications covering other areas of school management. Where possible this will deliver a tightly integrated platform for working with other Open Source tools for office and education.

- rationalisation of the CSS stylesheets to provide a properly tiered application framework which is unified across all of the modules
- integration with a content management system (or virtual learning environment) to share subject and student data
- posting of grades from tasks in the virtual learning environment to columns in the MarkBook
- secure parental access to limited assessment grades and subject reports
- a student registration area for the recording and reporting of attendance statistics
- improved report writing tool, to include a comment bank and feature-rich text editing
- new office tools to include management of new applicants and pending student admissions
- sharing of student and parental data with a billing or accounts application
- improved statistical analysis of assessments, including reporting of results performance to meet school board and government requirements
- expansion of the information stored about staff, to include lesson observations and staff performance