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Student-Focused Modules within Student Management Systems in Australian Secondary Schools

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ABSTRACT

The application of technology in the secondary education sector has come a long way since the early nineties. Schools no longer just have a library system but depend on entire Student Management Systems (SMS) - systems that allow efficient everyday processes such as basic student information retrieval and entry, subject details, scheduling, attendance and grading to occur. Students, as the main beneficiaries, are left with less sophisticated non-curriculum based use of such systems, prompting many questions about the quality of current SMS capabilities in terms of students' self-assessment. This pilot study looks closely at the adequacy of support for student feedback within student modules and implements some of the findings in a student-focused prototype system. Despite limitations in student participation-level and design research, this study can effectively apply to any future advancement in such modules.

INTRODUCTION

Today, many Student Management Systems on school Intranets around the world offer a very limited set of features within the student module, where students can merely view electronic duplications of paper-based reports and in some cases submit work online. Thus, a student's role is currently more a passive one than one that involves active self-management of her/his learning process.

The primary aim of this study was to find the gaps in student-focused modules of current SMSs which if corrected can help students track their progress and allow successful self-management. Based on the collected information, a prototype of such a system correcting perceived deficiencies was built. This system enables extensive progress reporting so that the students can easily identify their own strengths and weaknesses. It also develops features such as a progress comparison capability – including comparison with other students and with the student's own progress in preceding years. Based on such information, students can make their own decisions as to how they should tackle their learning objectives and related future tasks on a subject-by-subject basis.

Potentially, this further level of detail provided in student modules could allow a more effective coordination between teacher and student as they would have the ability to complement each other's efforts to address learning, teaching and overall progress issues. This level of detail, as extensive research suggests, is only possible in a curriculum based SMS.

METHODOLOGY

A secondary data collection of texts relating to Student Information/Management Systems, Information Communication Technology (ICT), Web-Based Assessment (WBA), Intranets and Content Management Systems laid the groundwork for detailed identification of existing functionalities within secondary schools' Intranets as well as their gaps. In addition, an interview was conducted with a staff member at Melbourne High School. This allowed a first-hand insight into existing functionalities, their effectiveness and limitations from the perspective of a network manager. An observation of how these functionalities were used was also conducted. Based on the information gathered and the identified weaknesses in the areas of active student centred support, a prototype was built. The prototype's administration and teacher modules include the most basic features that are imperative for the existence of the new and improved functionalities within the student module. The following technology was used:

- Cold Fusion MX Server
- Oracle 8*i*

Cold Fusion MX Server was used as the Web application server, thus allowing the files that make up the system to be connected to the database created in Oracle 8i. The Cold Fusion script, embedded in HTML, enabled the querying and presentation of data accordingly.

Developing an Improved Student Module

Following the research and comparison of current features available in Australia and overseas, it has been established that the majority of current systems include at least two components: administration and teacher. However, the student module is the third component, which, if present, usually consists of very basic functionalities. The fourth, and most rare, is the parent module. A limited version of the student module that is available to parents for viewing information about their children's progress and enabling online contact with relevant staff**,** does not allow the online submission of work.

The prototype itself is based on the suggestions and descriptions found in the research of an *ideal system* – the range of student-focused functionalities desired but currently non-existent - as well as the functionalities of systems currently used or in the process of implementation at schools – both local and international. McDougald and Bowie (1997, p. 97) argue that a truly effective information service should also be based on the fundamental goals of the curriculum in order to develop independent, information-literate learners.

Since this study aims to build a more effective and detailed progress tracking capability to complement existing features, the system includes the necessary focus on curriculum data to be combined with subject, homework and student information. In order to fully understand how this information reaches the student module, one must consider the fundamental importance and use of the preceding modules, which contain the functionalities that enable data entry and its manipulation towards a range of useful information to aid the day-to-day student management processes.

Administration Module

Due to the fact that the existence of a teacher module - and most importantly, a student module - depends on the availability of basic information, the prototype was developed with narrowed down and

simplified administration functionalities. Thus, additional non-student related features have been avoided.

An integral part of any Student Management System is the ability to maintain an information flow into the system's database – in real-time. This is achieved through administrational functionalities such as:

- Basic Student Details
- Basic Teacher Details
- Subject Maintenance
- Grading Structure
- Homework Structure
- Discipline Structure
- Enrolments
- Scheduling
- Timetabling
- Reporting
- Statistics

The last four functionalities: scheduling, timetabling, reporting and statistics were not necessary for the creation of the teacher module, which is the next step towards building a 'trial' student module with the additional features necessary to fill the perceived gap in functionalities.

Basic details incorporated in the SMS involve information about staff and students that may include: names, birth dates, gender, addresses and emergency contacts as well as allergies and any additional data that would potentially assist in daily school processes. Grading, homework and discipline structure involve the maintenance of data to be used by other modules – predominantly the teacher module – when assigning grades to assessment tasks, creating new assessment tasks or tracking student discipline.

Student enrolment details are ultimately the most relevant for the entire system as this enables other modules to work with relevant data and perform processes accurately. In the prototype, enrolments are created on a subject basis. Since existing student details have been entered and each student is automatically assigned a student identification number, all that is required is to choose a year level, select from subjects offered in that particular year level and enrol a student by submitting the relevant ID number.

Teacher Module

Derived from the fundamental information processed in the administration module, the teacher module allows teachers to perform basic tasks online. Attendance and discipline recording is an existing functionality available within many schools' Student Management (or Information) Systems around the world. However, the data stored through the utilisation of such functionalities within this prototype assists a wide variety of information otherwise not made available in the student module.

As McCormack and Jones (1998, p.297) explain: **"**Because attendance information is stored on one central computer, it is possible to harness the capabilities of the computer to convert, analyse and distribute the data".

Exactly how the distribution of this data assists other information used in the prototype is thoroughly described in the following section entitled: *Results*.

Provided that teachers either have a computer in class or, preferably, a laptop at hand, basic processes such as attendance and discipline recording can be completed in real-time.

According to information obtained from an interview with a staff member of Melbourne High School, a leading public school in Victoria, introducing a mandatory utilisation of laptops for staff as well as students is long overdue. In this school, where attendance is marked using barcode readers and where data acquired eventually makes its way to a central database - through data entry by an administrator - after (or during) class, a trial run of intensive laptop usage by staff and students is underway. This trial program will be complemented by a restructure of the entire system in order to efficiently satisfy the needs of administration, teachers and students. The restructure would be closely aligned with current trends in SMSs around the world. This trend is comparable to that in the UK, for instance, where, according to Walsh (2002, p.3), only 14 per cent of schools with networked computers did not use them for curriculum-based applications**.** In addition, 35 per cent of schools in the UK were considering implementing laptop use from many locations by utilising wireless technologies.

The prototype enables teacher usage for curriculum specification, grading, correction and commenting. Since the aforementioned functionalities (basic details, attendance, discipline, grading, curriculum) within this module are fundamental features needed to create or update data that is ultimately used by the prototype's student module - scheduling, bulletin boards and similar teacher-focused functionalities were omitted.

Student attendance and behaviour (the latter is optional) are entered by the teacher who first enters her/his teacher ID. This leads to a list of subjects taught by that particular teacher and, once the relevant subject is selected, a list of enrolled students is made available for the marking of attendance and discipline. The information is stored in the database's ATTENDANCE table. Similarly, work submitted by students (drafts as well as final) is listed in the grading/correction/commenting section. Once the teacher views the work, a commented or corrected version is submitted and a grade allocated.

The curriculum functionality allows the teacher to specify particular topics taught in a subject. These are used for a more detailed overview of the subject's structure and help dissect the performance related data of a student. This, as well as the aforementioned functionalities, allows the student module to support student self-assessment and advancement. As Aggarwal et al note, "self-assessment may be viewed as a mix of formative and diagnostic assessment, that may be used by the student to monitor the level of acquired knowledge in order to decide how and when to face summative evaluation" (2000, p.176).

Formative assessment provides progress monitoring. Where a teacher module exists, it is used to collect progress related information and to adjust the educational process accordingly. At the same time, teachers correct learning errors and ensure further learning occurs. Diagnostic and summative methods identify persistent learning difficulties that are overlooked by the formative process. Summative evaluation assigns grades to students' levels of knowledge. In the prototype, however, data that can be used for formative, diagnostic and summative assessments wasn't applied within the teacher module. This is because the main focus was on students' self-tracking, which is only made evident within this prototype's student module (see below) in a manner that conveys a more detailed, subject-breakdown based progress tracking. Making these features available in the teacher module would *partially* recreate what is already available in a teacher-focused format.

RESULTS

The existing features available in various schools' student modules include a variation of the following *non-curriculum based* progress reports:

- Overall Grades
- Grades Per Subject
- Attendance and Discipline
- Low Detail Year Level Comparisons
- Other Non-progress Related Functionalities

Currently, very little (if any) progress tracking by students is made available by existing Student Management Systems. Even the most advanced - such as those provided by Chancery Software Ltd. (http://www.chancery.com/solutions) or Apple's PowerSchool© (http://apple.com/education/powerschool) - don't provide much more than electronic versions of paper-based reports. (See table 1 for more information on some of the existing features – based on limited individual research).

In addition, systems such as WebCT and Lotus Learning Space have similar features to PowerSchool and Chancery, with the exception of Lotus Learning Space, which also includes Assignment Prioritising, Goal Setting and Online Assessment. However, neither enables the student to fully track their progress in order to, for instance, determine the

Table 1: Here, the existing functionalities within the student module of 3 companies and a private school are compared (The question marks represent unavailable secondary data).

	Grades/Attendance Tracking	Homework/Assignments	News And Notices	Online Teacher Contact	Custom Reports And Stats	Enrolments	Scheduling	EBlackBoard	Prioritizing	Goal Setting	Progress Comparisons	Efficiency Measurement	Secure Login
PowerSchool	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes
IntraZone 3.0	Yes	??	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Toorak College	Yes	No	Yes	Yes	No	No	No	Yes	No	No	No	No	Yes
Chancery SMS	??	??	??	??	??	??	No	No	No	No	No	No	Yes

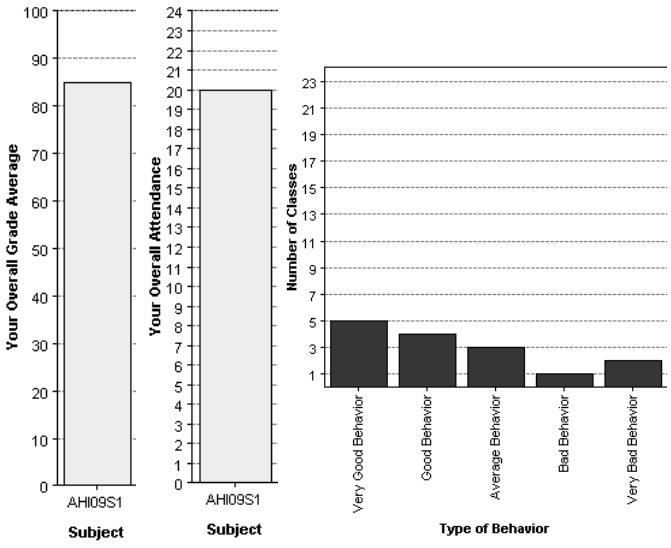
reasoning behind prioritisation and goal setting – particularly on a curriculum basis.

Despite the ability to manipulate and retrieve relevant data accordingly, students simply don't get the type of insight that would pave the way for proactive learning. Based on the research to substantiate the reasoning behind the prototype's functionalities within this module, the current approach used by many schools seems to predominantly focus on teachers and administrational staff. Students are left with presentations of summative data that are limited in effect. Aggarwal et al (2000, pp.177 - 178) emphasises that assessment methods capable of making an objective judgement of students' progress are imperative for teachers as well as schools.

Based on such findings, the student module includes features that allow students to review and track their own progress based on data derived in real-time. This predominantly involves statistics created through queries of *curriculum-based* (per topic within a subject) data such as:

- Grades Per Subject
- Attendance and Discipline
- Progress History Comparison (comparing students' current progress to previous time periods)
- Individual/Peer Progress Comparison
- Work Submission Statistics

Figure 1: Grading, Attendance and Discipline (also available per curriculum).



Grades Per Subject and *Attendance and Discipline* – are features that distinguish themselves from current reports within student modules through a strong emphasis on real-time data flow and individual topics covered within a subject. They are – to a lesser extent - already available in products such as PowerSchool from a non-curriculum based perspective.

The figures showing progress tracking charts exist in two versions within the prototype: the non-curriculum based progress charts followed by statistics based on the particular topic selected for review by a student. The existing real-time reporting styles are imperative for they form the fundamental (and introductory) information set as a progress-tracking platform from which students initiate their quest for more detail.

This detail, as mentioned before, is made possible by directly relating every student-focused set of data to a **curriculum**. Thus, using this information querying technique, the detail is shown by producing grading, attendance and discipline reports **per subject's curriculum topic**. Not only is the student able to view how well she/he performed in a particular subject's topic, but she/he is also able to view information about her/his attendance and behaviour. Consequently, the student can see, for example, the relationship between a poor grade and poor attendance and/or behaviour.

Progress History Comparison – allows a student to review current progress as opposed to progress made in previous years, semesters or terms. The progress description is, however, generalized since different subjects are undertaken during differing time periods.

Individual/Peer Progress Comparison – enables a student to see her/his ranking within the year level. This involves generalized as well as subject and/or curriculum based comparisons to all other students (see Figure 3).

Work Submission Statistics – would allow an overview of how well the student has managed to deal with deadlines and may in fact enable the individual to identify any strengths or weaknesses related to submitting work on time.

The prototype features listed above are aimed at enabling students to make detailed decisions based on information about past as well as current (real-time) progress. It allows an overview of strengths and weaknesses in each topic taught within a subject. This can lead to a more decisive and proactive approach by students towards their own studies, complementing teachers' efforts to diagnose and solve deteriorations of progress (also in real-time). It is important to note that "Teacher-student relationships cannot be exactly the same again once the learner has control of the information" (Walsh, 2002, p.5). This prototype is founded on the belief that students should be granted greater responsibility for their learning outcomes. This granting of responsibility depends on an additional and very decisive factor – student willingness.

Figure 2: Performance History Chart – first chart shown before the student selects a subject for detailed progress tracking.

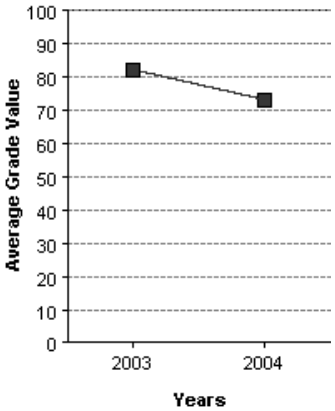


Figure 3: Individual/Peer Progress Comparison

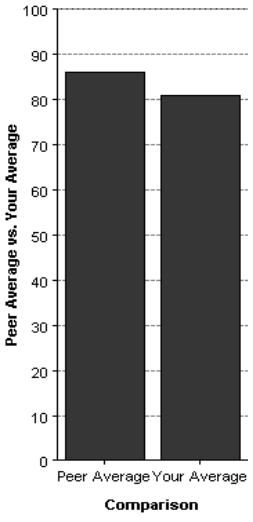
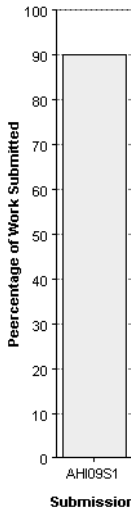


Figure 4: Work Submission Statistics



Some research undertaken by Walsh in recent years suggests that it not only exists, but also presents a positive outlook on potential participation levels for existing as well as new and improved student modules: "Pupils in the Becta survey reported that they spent up to four times as long using computers at home than at school and many expressed frustration with lack of access, speed of access and limitations of curriculum use in schools" (2002, p.3).

Such findings have been acknowledged as important pointers to the direction taken by this research project. They strongly emphasized the importance of improvements to current student-focused functionalities and their potential integration with Information Communication Technology (ICT) and/or Web Based Assessment (WBA).

FURTHER RESEARCH

To be able to fully leverage every possible capability of the prototype, better knowledge of precise curriculum detail is needed. This, however, would require further extensive research of secondary educational systems and a detailed insight into curriculum issues and management in terms of SMS. Thus far, only the very basic concept of curriculum is applied in the database and, consequently, the overall system. Ideally, the system could have an interface tailored by the generic needs of users involved. These needs would have to be precisely identified through further research involving frequent administration/teacher/student interaction/evaluation with the prototype to fully identify all required design aspects. Depending on the success of such an evaluation, other areas of future research could be introduced:

- Student-staff chat/newsgroup/email forum (a real 'active' environment encouraging student participation)
- Recording of non-subject based school material e.g.: Students' roles as peer support leader, member of sporting team etc. and feedback from mentor/coach
- Student-student chat/newsgroup/email moderated forums e.g.: to support home groups and peer support groups; anonymous forum for reporting 'problems' such as school bullies, vandals and discrimination to staff.

CONCLUSION

The aim of extending the capabilities within student modules has been met with the introduction of a curriculum-based approach to presenting student information for progress tracking. The prototype enables students to track their own progress in a much more detailed and timely manner. This complements the existing, electronic duplication of paper-based reporting by utilising further, more insightful, data manipulation. The information obtained through the access to grading, attendance, discipline, achievement-comparison and work submission data per curriculum, addresses the ideal of students being able to take a proactive approach to their learning and overall progress. This level of progress information detail can pave the way towards a student culture of self-management that would be greatly appreciated by teachers, since both parties would speak the same language when tackling learning/teaching issues that may otherwise lead to a deterioration of progress. Although the project doesn't explore important issues such as levels of student participation and the detailed HCI requirements yet to be met, it successfully demonstrates the basic potential of new student-focused functionalities which are largely perceived as non-existent in secondary schools' student management systems in Australia and many other countries. In addition to fiscal obstacles, managing the change and training that it could involve for some, could also present a serious hurdle. However, given the current trends in SMSs and quality in school leadership, it can be concluded that such obstacles are rapidly diminishing.

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